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Review

Changes in Energy Sector Strategies: A Literature Review

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Abstract: Sustainable development (SD) can indicate the direction of the development of modern organizations' transition and transformation strategies in the energy sector. Currently, in most countries, the main challenge for the energy sector's strategies is to deal with energy security. The implementation of SD induces changes both in strategy and technology. The strategies are based on the technological transition toward renewable energy sources (RES). The aim of this paper is to explore business management literature dedicated to the transformation and transition strategies in the energy sector. The adopted methods are a systematic literature review (SLR) accompanied by a classical literature review (CLR) in Scopus database exploration. A literature review is developed in VOSviewer software and keyword co-occurrences analysis allowed to identify the main changes of direction in energy sector transformation strategies. The literature was explored by the 26 queries which resulted with 11 bibliometric maps. The analysis of the bibliometric maps was a challenge due to the cross-disciplinary strategic directions of development presented in indexed publications in the Scopus database. The identification of the changes in energy sector strategies is important because of its reliance on depleting resources and natural environment degradation. As a result of this paper, there is a visible shift of the trend in explored scientific publication from not only technological-based solutions but also towards managerial and organizational practices to achieve sustainability in the energy sector. This paper, besides the results, presents the theoretical contribution and managerial recommendations for business practices and addresses future research avenues. There are discussed implications of the presented analysis for further research.

Keywords: alternative energy; energy policy; energy transition; renewable energy; sustainable development; strategy classification

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1. Introduction

Business has always depended on and had an impact on the natural environment [1,2]. However, through a proper strategy, it is possible to reverse or mitigate the negative influence of business [2,3]. The energy sector, together with other economic areas' processes, negatively influences the environment [4,5], despite this sector being a condition of the development of civilization [6,7]. Energy generation worldwide is based on fossil fuel combustion, which especially increases negative climate changes [8,9]. Therefore, energy sector producers have been implementing strategies to change their business models [10,11], technologies [12], and sources of energy generation towards renewable energy sources (RES) [13]. These transformation strategies are anchored in the sustainable development (SD) concept, but this idea is relatively new in business [14]. There have been two sides to the discussion about SD since the late 1980s [15]. The first is focused on the formulation of general laws and setting a formalized direction and strategic goals for business organizations [12]. The second side of this discussion addresses the question about the translation of all theoretical ideas related to sustainability into business practice, especially in the operations of manufacturing companies [16]. The SD paradigm is focused on quality of life and refers not only to the balance between social [17,18] and economic aspects but also the environmental dimension [19]. The number of household energy-saving appliances is constantly growing, though the intention of their producers is to reduce energy demand [20]. This contradiction is more visible in times when access to energy is a criterion of wealth, as it determines economic and social development [21]. On the other hand, ecological issues became an important determinant of the changes in the energy sector due to legal pressure [6,22]. For the energy sector, for a long time, the natural environment was the source of goods and waste reservoirs [23]. Despite public administrations and businesses putting pressure on the energy sector, economic development is still considered through the prism of natural resources exploitation [24]. The use of electricity still negatively influences natural resources and degrades the environment [25]. The lack of expected results from changes in the energy sector can be caused by a non-strategic approach to management [26]. Moreover, the contemporary business environment is characterized by high complexity and volatility, which affects the ways of conducting business in the energy sector [27]. Energy sector companies often struggle to achieve sustainability [9]. Still, the world is more concerned with the delivery of cheap and accessible electricity [28] than its impact on the natural environment [29]. For consumers, less important are the sources of energy compared to the energy prices.

This paper aims to explore the scientific literature indexed in the Scopus database and is dedicated to transformation and transition strategies in the energy sector. This research goal covers both theoretical and empirical research gaps revolving around the transition of the SD idea into practice. Understanding the process of business development in the energy sector and strategies transformation is notably not easy. However, exploration of the context of strategies transformation is the most important research agenda. The contributions of individual scientific papers can often appear minimal. Even when the study of the strategies transformation in the energy sector is viewed in terms of the collective endeavor, the various publications cannot easily be distilled into a consensus that would meet the standards of evidence routinely applied. Therefore, this scientific article employs two literature review methods.

There are two adopted literature review methods. The first is a systematic literature review (SLR) supported by the bibliometric maps generated in the VOSviewer on a query basis. The second method is a classical literature review (CLR), explaining the results obtained from the SLR method and providing an overview of the transformation strategies in the energy sector. This second method applies with special force in the identification of empirically salient transformation strategy determinants.

With this purpose of study, this scientific paper is structured as follows. In the first place, in Section 2, the paper develops a theoretical framework using the two literature review methods. There are limitations of this research caused by the adopted methods. In the third section, there are literature review results that cover two subjects: (1) changes in energy sector strategy directions among energy suppliers and (2) proposed typologies among energy sector strategies. The fourth chapter of this paper is a discussion of the presented results together with the limitations of the used methods. In the conclusions section, the scientific and practical contributions are presented together with the future promising research avenues.

2. Materials and Methods

The Scopus database's indexed scientific publications were the subject of the adopted methods in this research paper [30,31]. Scopus is a multidisciplinary repository that indexes different types of scientific publications [32]. The Scopus bibliographic database is an organized digital collection of references to published scientific literature, including journal articles, conference proceedings, patents, books, etc. [30]. The Scopus has been selected due to the popularity and recognizability of this database among researchers [33,34]. Scientific publications indexed in the Scopus database are considered prestigious. This database secures its scientific content due to rigorous conditions for the indexing of the title sources.

There are two literature review methods employed in this study, used as a collage of methods [35]. The first method is the SLR combined with the CLR, which is the second method used in this research. The purpose of a synthesis of these literature review methods is to identify, integrate, and evaluate research on a selected topic, based on clearly defined criteria [36]. The use of a combined literature review methodology is intended to provide three main benefits: (I) the literature review will include all research results on a given topic, (II) research results that for some reason do not correspond to the researcher's intentions or views will not be omitted, and (III) the possibility of verifying the relevance of the review will be created by enabling its replication. The literature review process [37,38] underpinning the operationalization and measurement of transformation strategies in the energy sector proceeded in three main stages [39]. Stage one was the selection of the literature base. This was followed by the selection of papers included in the analyzed set of results in stage two. Stage three consisted of critical content analysis [40]. Critical to the integrity of the literature review process is the thorough verification of the publications included within the Scopus literature base [41]. This requires reading each publication and preparing a concise analysis report [42]. Based on such work, it was possible to complement SLR with CLR prepared in this step's reports results [43].

The SLR method is used in this study as a tool for the identification of knowledge gaps, and its advanced applications allow the identification of the most common as well as the most desirable directions for further research, their specific assumptions, the operationalization of variables (items), the measurement of constructs, the research method adopted in seminal publications, and even the method of analyzing the raw data. The SLR method variation is supported by the research queries exploring the Scopus database [39]. Before embarking on the process of identifying academic publications in the field of transformation strategies in the energy sector [44], it was necessary to define automated search conditions for papers in the explored Scopus academic database [30,33]. The automation of queries in the Scopus scientific database raises the problem of overfitting [45,46]. In addition to analyzing the total results, an increasingly common approach is to use the most important journals in a given subject area. These are usually the most cited scientific publications indexed in the database being explored [30,47]. The query result sets created are often too large for a detailed analysis of the texts without software support [48,49].

Though linguistic differences are not the subject of this research, the choice of the proper form of a keyword or its synonym has an impact on the achieved results [21,30]. Due to this fact, the choice of keywords exploration for the queries was also limited. This is because if the query in the Scopus database is general, it yields too many results to indicate the proper direction of exploration [50,51]. Omitting the broader categories and successive limitations with the aim to restrict the occurrence of a keyword anywhere in the text is justified, because a keyword in the body of a research paper indexed in the Scopus database may appear accessory. This assumption focuses attention on articles in which the keyword reflects a research category that is relevant and not an accessory to the paper.

There was no initial assumption toward a literature exploration of energy sector transformation and transition strategies. There are some events which highly influence energy sector; however, they were not included into analyzed scientific publications. The factors coming from the geographical distribution of the resources or geopolitical situation were not a limitation of this study. In this study, there was no assumption about the sectoral or business strategy level.

There were multiple research assumptions decided during the Scopus database exploration with queries presented in Table 1. First, the area of the research was settled based on the initial query with the following syntax (TITLE-ABS-KEY ("power sector")) AND ("energy sector") with 1380 results representing all scientific publications indexed in the Scopus database. The syntax element AND is not only used by the Scopus search algorithm as conjunction "and" operator but also as an alternative "or" syntax element.

However, the two presented keywords "power sector" and "energy sector" were also researched independently. Finally, the "energy sector" was selected as most numerous with the highest number of publications indexed in Scopus, and it was the most popular keyword. The keyword "energy sector" initial query in TITLE-ABS-KEY fields in Scopus gave 15663 results compared to 6078 results for "power sector". Therefore, this sector is explored in query syntaxes presented in Table 1. There are two types of query elements in syntaxes, the specified and non-specified, respectively [40,45]. The specified part is marked by the citation marks, and non-specified searched keywords do not have them. In Table 1, there are presented queries used for the calibration and choice of more detailed queries. The queries are numbered continuatively in ascending order across Tables 1–3. Queries presented in the tables were used for studying the Scopus database on 20 August 2022, with different numerical results depending exact syntax of each formulated query.

Table 1. Syntaxes used in queries calibration for the Scopus scientific database exploration.

No.	Query Syntax	No. of Results (20 August 2022)
1	(TITLE-ABS-KEY ("energy sector")) AND (transition AND strategies)	2290
2	(TITLE-ABS-KEY ("energy sector")) AND (transformation AND strategies)	1400
3	(TITLE-ABS-KEY ("energy sector")) AND (transition AND transformation AND strategy)	830
4	(TITLE-ABS-KEY ("energy sector")) AND (transition AND strategy) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	340
5	(TITLE-ABS-KEY ("energy sector")) AND (transformation AND strategy) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	248
6	(TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	134
7	(TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy)) AND (change) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	121
8	(TITLE-ABS-KEY ("energy sector")) AND ((transformation AND transition AND strategy)) AND (shift) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	26
9	(TITLE-ABS-KEY ("energy sector")) AND ("transformation strategy")	23
10	TITLE-ABS-KEY ("energy sector strategies")	15
11	((TITLE-ABS-KEY ("energy sector")) AND ("energy sector strategies")) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	1
12	((TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy)) AND (type AND typology AND classification AND category) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	0
13	((TITLE-ABS-KEY ("energy sector")) AND (transition AND transformation AND strategies)) AND ("startegy type") AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	0
14	((TITLE-ABS-KEY ("energy sector")) AND (transition AND transformation AND strategies)) AND (strategy AND type) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	0

Source: authors' elaboration.

Table 2. Queries focused on typologies used in the Scopus scientific database exploration.

No.	Query Syntax	No. of Results (20 August 2022)
15	(TITLE-ABS-KEY ("energy sector")) AND ((typology)) AND (strategy)	281
16	(TITLE-ABS-KEY ("energy sector")) AND (transition AND transformation AND strategy) AND (type)	217
17	(TITLE-ABS-KEY ("energy sector")) AND (transition AND transformation AND strategy) AND (typology)	105
18	((TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy)) AND (type) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	28
19	((TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy)) AND (typology) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	21
20	((TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy)) AND (category) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	14
21	((TITLE-ABS-KEY ("energy sector")) AND (transformation AND transition AND strategy)) AND (classification) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "DECI"))	13

Source: authors' elaboration.

Table 3. Queries developed upon Query 2 from Table 1 used in the Scopus database exploration.

No.	Query Syntax	No. of Results (20 August 2022)
22	((TITLE-ABS-KEY (“energy sector”)) AND (transformation AND strategies)) AND (“climate change”)	724
23	((TITLE-ABS-KEY (“energy sector”)) AND (transformation AND strategies)) AND ((“climate change”)) AND (“renewable energy sources”)	229
24	((TITLE-ABS-KEY (“energy sector”)) AND (transformation AND strategies)) AND (((“climate change”)) AND (“renewable energy sources”)) AND (“alternative energy”)	56
25	((TITLE-ABS-KEY (“energy sector”)) AND (transformation AND strategies)) AND ((((“climate change”)) AND (“renewable energy sources”)) AND (“alternative energy”)) AND (“energy policy”)	53
26	((TITLE-ABS-KEY (“energy sector”)) AND (transformation AND strategies)) AND (((((“climate change”)) AND (“renewable energy sources”)) AND (“alternative energy”)) AND (“energy policy”)) AND (“sustainable development”)	40

Source: authors’ elaboration.

There are explorative queries presented in Table 2 formulated to search title, abstract, and keywords indexed in the Scopus database of scientific publications related to the energy sector. Queries 15, 16, and 17 were used in unspecified science areas with higher numbers of the results than those achieved with Queries 18, 19, 20, and 21, respectively. The aim of this paper was the main reason for the construction of the queries presented in Table 2. Therefore, the queries used to explore Scopus were limited to the subject area of business management “BUSI” and decision sciences “DECI” due to their scope and specific interest in strategic management [52,53]. Then, initial queries were developed to explore the Scopus database in a selected field of science [54]. The full syntaxes of the used queries are presented in Table 1 and consist of syntax with an element indicating the choice of the science area, as follows: AND (LIMIT-TO (SUBJAREA, “BUSI”) OR LIMIT-TO (SUBJAREA, “DECI”). Then, Query 6 presented in Table 1 was developed into five more specified Queries, 18, 19 20, and 21, in Table 2.

Queries 18, 19, 20, and 21 independently search type, typology, category, and classification of transformation or transition strategies in the energy sector. The exploration settled in the areas of business management and decision sciences. The results of Queries 18, 19, 20, and 21 were the subject of the VOSviewer software (version 1.6.18; Centre for Science and Technology Studies, Leiden University: Leiden, The Netherlands) for further analyses, and they are presented in the Results section. The choice of the query construction was also based on the other tested queries and logic choice of its construction. Authors checked also query syntax consisting of the following elements: (TITLE-ABS-KEY (“strategy type”)) AND (“classification”) AND (LIMIT-TO (SUBJAREA, “ENER”)) to discover that there were 6 results, and two of them belong to the authors of this paper. Therefore, such queries’ results were excluded from the further analysis, though they helped in further queries’ development.

In Table 3, there are queries developed based on Query 2 in Table 1. To the syntax of Query 2, the indexed keywords recognized in the VOSviewer bibliometric map analysis of Query 2’s results were added. The choice of keywords was based on the bibliometric map with the most dominant clusters (presented as Figure S1 in Supplementary Materials File S1). The keywords from these clusters were used to propose more specified Queries, 22, 23, 24, 25, and 26, in Table 3 to explore Scopus scientific database. Five queries differ from each other in the narrowing scope of added specified indexed keywords and the number of the obtained results. To achieve focused Scopus database exploration, there were more specific keywords added to the query syntaxes as presented in Table 3. These keywords were “climate change” (as a dominant keyword in the subnetwork dedicated to climate issues and their solutions, which consists of 96 items), “renewable energy sources” (indicated as the most dominant keyword in the second cluster with 87 items, dedicated mostly to technical aspects and business practice of energy transition), “alternative energy”, “energy policy”, and “sustainable development”. The order of the additional keywords suggested by the VOSviewer software used in the extended Query 2 research presented in Table 1 was confirmed on the indicated keywords' significance by the bibliometric program used.

Obtained results from each query presented in Tables 1 and 2 were downloaded in .csv file format from the Scopus database as a separate set of data. However, during the export, all fields on the publication were marked. For the Scopus database, the following fields were selected for export: citation information, bibliographic information, abstract, keywords, funding details, and other information. Further analyses were carried out on the most recent data. The exported data were used for analyses in VOSviewer (version 1.6.18), and the results are shown in bibliometric maps. The choice of the number of keyword co-occurrences determines the result obtained in its graphical presentation and bibliometric map clarity. Additionally, during the VOSviewer bibliometric map preparation, some indexed keywords were excluded from the set proposed by the software. The excluded keywords were names or abbreviations for continents, international institutions, countries, and regions. The next groups besides their names were names of methods (regression analysis, climate model, or numerical model), publication types (article, review), chemical elements or compounds (carbon dioxide), and names of scientific disciplines (agriculture, chemistry, economics). Plural forms were excluded when the more numerous single form keyword was proposed by the VOSviewer software. Despite so many exclusions of keywords, the number of nodes in the most numerous queries was significant. Maps created, visualized, and explored using VOSviewer include items. Items are the objects of interest—the co-occurring keywords, which in the bibliometric map are nodes. Between nodes are edges that represent the relations between co-occurring keywords. In the bibliometric map, items are grouped into clusters. A cluster is a subnetwork, a set of items included in a bibliometric map. In the visualization of a map, items with higher importance are shown more prominently than items with lower significance.

The methods presented above for the purpose of the literature review were information analysis and synthesis, focusing on findings. The combined methods summarize the substance of the literature and conclude it. Traditional literature review adopts a critical approach, which assesses theories by critically examining the described sources, methods, and results with an emphasis on background and contextual material. On the other hand, the SLR is a review with a clearly stated purpose, questions, or queries and a defined search approach, stating inclusion and exclusion criteria and producing a qualitative appraisal for articles. The method combination can be supported by bibliometric analysis, a method that includes graphical and statistical analysis of published articles and citations therein to measure their impact. Bibliometric maps unveil pivotal articles and objectively illustrate linkages between and among articles focused on transformation strategies in the energy sector.

3. Results

Strategies in the energy sector have been subject to scientific interest since 1975; however, in the 19'80s, transition or transformation strategies emerged [55,56]. There are queries presented in Tables 1–3 along with the numerical results of the formulated queries.

Queries 1 and 2 were proposed to explore the "energy sector" for transition strategies and transformation strategies, respectively (Table 1). The main difference between Query 1 and Query 2 is in the number of results. Query 1 yielded 2290 results, while Query 2 gave 1400 results. This can be related to there being more technology related to transition. On the other hand, a transformation is related to business management and decision sciences areas. This observation is supported by the comparison of the 10 most cited publications in Tables S1 and S2 placed in Supplementary Materials File S1. Each query result in the Scopus database can be analyzed on the full-time horizon by the selection of the "Analyze search results" option. The results of Query 1 are presented as a chart in Figure 1. The number of Query 1 results yielded 2290 scientific publications. Figure 1 proves that transition strategies have been a subject of scientific interest since 1984. However, rapid growth in the number of those publications occurred in 2008 and surpassed 500 in 2021. The year 2022 was excluded from this analysis.

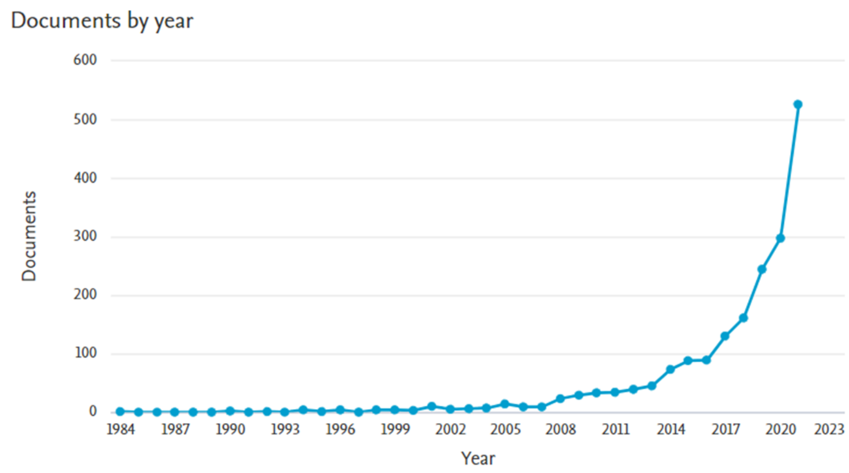

Figure 1. Scopus-indexed publications dedicated to transition strategies in the energy sector as Query 1's (Table 1) results. Source: Scopus database.

The graphical analysis of the number of other query results (Table 1) follows the same pattern of rapid growth since the year 2008 (Figure 2). However, the number of publications in the case of Query 2's results surpassed 300 publications in 2021. Another slight difference is that the first publication among the Query 2 results was published in 1983. The observation of the similarities in Figures 1 and 2 was the reason for the decision to combine them in a single query: Query 3 (Table 2).

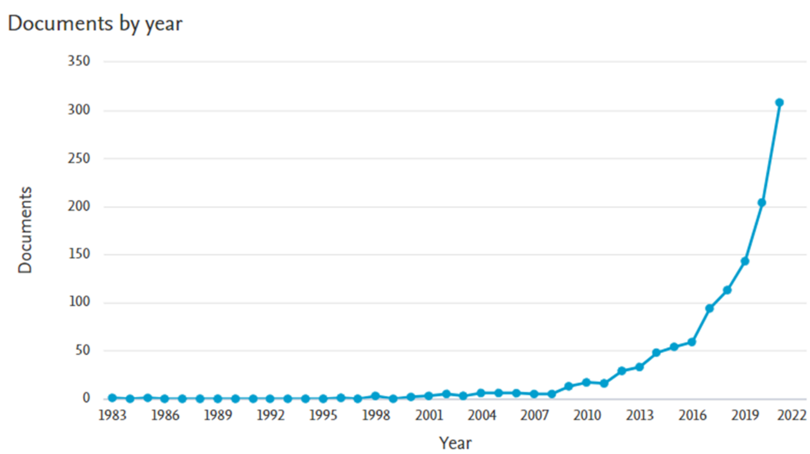

Figure 2. Scopus-indexed publications dedicated to transition strategies in the energy sector as Query 2's results (Table 1). Source: Scopus database.

Query 3, with syntax covering technological solutions ("transition") and organizational or management aspects of the changes towards SD (keyword "transformation"), was analyzed in the VOSviewer software. The chart illustrating the Query 3 results in Scopus also follows the pattern presented in Figures 1 and 2, indicating a lower number of publications when Queries 1 and 2 are combined. This observation stands with the descending number of results presented in Table 1. Query 3 was proposed to cover both indexed keywords of transition and transformation in a specified field of "energy sector". The combination of the two researched independently in Query 1 and 2's keywords yielded 830 results. These results only partially covered previously obtained similarities with the scientific publications resulting from Queries 1 and 2. The publications presented in

Table S3 in Supplementary Materials File S1 were not related to the energy sector despite the specified "energy sector" query syntax element.

Queries 4, 5, and 6 are developed versions of previous queries presented in Table 1. Queries 4 and 5's (Table 1) results in the analysis were the reason for their combination and the formulation of Query 6. There are 134 scientific publications in the Scopus database covering Query 6's results. The obtained results from Queries 4 and 5 were less numerous due to the introduced scientific areas limitation, and such exclusion has also influenced the quality of the most cited works researched from Query 6 that are presented in Table S4 in Supplementary Materials File S1.

Queries 7 and 8 were proposed as the development of Query 6. The scientific area remained the same as in Queries 4, 5, and 6. In Queries 7 and 8, additional keywords' impact on the obtained results is analyzed. Therefore, a broad approach to the topic of transformation strategy in the energy sector also required the consideration of alternative words and synonyms for the word "transition" and "transformation". The "change" or "shift" keyword can be seen as a synonym for transformation or transition words [57,58]. These keywords, however, initially gave very general results. Therefore, there was a careful choice of the synonyms to be explored in the further queries presented in Table 1. Then, the typing of search criteria was carried out starting from the identification of criteria related to the research model and the adopted cognitive context [41,57], i.e., the transformation strategies in the energy sector. In Table 1, there are also queries checking the difference between grammar forms and direct and unspecified queries. The difference between "strategy and strategies" was also tested, and the usage of single or plural forms does not affect the results number in Scopus. For example, query syntax (TITLE-ABS-KEY ("energy sector")) AND (changes) gave 7549 indexed publications as results.

Queries 9 and 10 in Table 1 are specified queries used to search scientific areas not defined in the Scopus database. The number of the results is significantly lower than the number obtained in Queries 1–6. The most cited 10 scientific publications from Queries 9 and 10 are presented in Table S5, and the most cited work results of Query 10 are presented in Tables S5 and S6 in Supplementary Materials File S1. Query 9 yielded 23 results due to its specified syntax: (TITLE-ABS-KEY ("energy sector")) AND ("transformation strategy").

Changes in several indexed publications covering the transformation strategies in the energy sector are presented in Figure 3. The first publication was indexed in the Scopus database in 1998, and the subject was again undertaken in the scientific literature in 2011 and 2015. There has been a growing interest in transformation strategies in the energy sector since 2017.

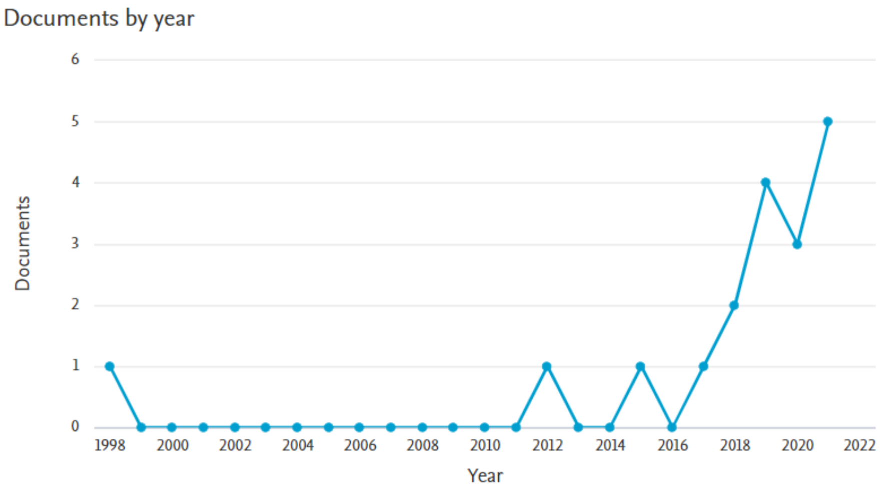

Figure 3. Scopus-indexed publications dedicated to transition strategies in the energy sector as Query 9's results (Table 1). Source: Scopus database.

Query 11 was very specified in its syntax and gave one result. This single scientific publication was titled "How to reform the power sector in Mexico? Insights from a simulation model" by R. Fuentes-Bracamontes [42], cited by seven other publications. R. Fuentes-Bracamontes in his paper addressed "the question of how a developing country, like Mexico, can reform its electricity industry at the same time as addressing climate change issues" [42].

Queries 12, 13, and 14 were too specific and detailed in the indicated area and gave no results to be analyzed. On the other hand, **Queries 15, 16, and 17**, although dedicated to the type or topology research, gave numerous numbers of results of publications (Table 2) that were developed in their syntaxes into **Queries 18, 19, and 20**. These queries, although less numerous, provided better insight into researched types, typologies, or categories of transformation strategies. In Table 2, there is also **Query 21,** the syntax of which consists of all combined searched elements from the previous three queries. Queries 18–21 results were then analyzed in the VOSviewer software (version 1.6.18), shown in detail below.

Query 15's results were explored in the VOSviewer software as a bibliometric map. The analysis of co-occurrences among indexed keywords with the full counting method was selected. The minimum number of co-occurrences of a keyword was 10, and then, among the total of 1573 keywords, 32 met the threshold. In the bibliometric map, three clusters with 32 nodes and 373 links were identified. The three clusters automatically identified were colored by the VOSviewer software and presented as the bibliometric map in Figure 4. This bibliometric map presents the co-occurrences of keywords related to the energy sector strategy typology. In the final dialogue box in the VOSviewer program, none of the keywords were deselected; however, the duplicates were removed.

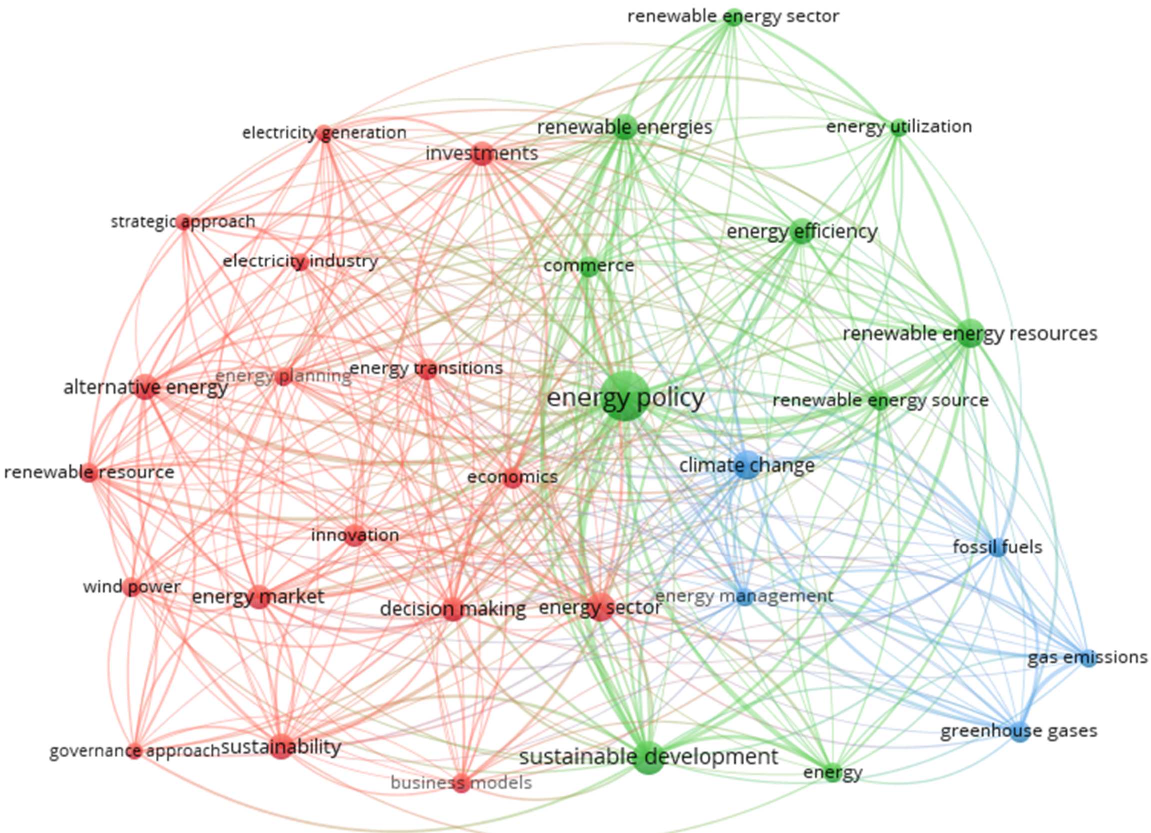

Figure 4. Bibliometric map of indexed keyword co-occurrence results from Scopus based on Query 15. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

Based on the 281 scientific publications distinguished by Query 15, as presented in Table 2, the bibliometric map was proposed in the VOSviewer software. Although the keyword "typology" was included in the Query 15 syntax, there is no keyword related to this specific term. The keywords which were selected and used by the VOSviewer program are gathered in Table 4 and are separated by semicolons. Despite the original writing form, the keywords in Table 4 are written in small letters as in the VOSviewer software's unification procedure. In Table 4, there are clusters identified by colors, as in Figure 4, established by bibliometric software automatically. The order of clusters presented in Table 4 is caused by the number of keywords identified by the VOSviewer and represented as nodes in Figure 4.

Table 4. Clusters of index keyword co-occurrences in Figure 4 for Scopus Query 15.

Cluster	Color	Keywords
1	Red	alternative energy, business models, decision making, economics, electricity generation, electricity industry, energy market, energy planning, energy sector, energy transitions, governance approach, innovation, investments, renewable resources, strategic approach, sustainability, wind power
2	Green	commerce, energy, energy efficiency, energy policy, energy utilization, renewable energies, renewable energy resources, renewable energy sector, renewable energy sources, sustainable development
3	Blue	climate change, energy management, fossil fuels, gas emissions, greenhouse gases

Source: authors' elaboration.

The clusters presented graphically in Figure 4 and their nodes described in Table 4 as keywords indicate the three directions of the energy sector's strategies. The red cluster is the general overview of the energy sector's strategies. The green cluster is related to RES and revolves around sustainable future solutions. The last, blue-colored cluster is related to fossil fuels and energy management and is a subnetwork of the previous green cluster.

Query 18's results were used to propose Figure 5 as a bibliometric map. To draw this map, the minimum number of indexed keyword co-occurrences was selected as two, and then among 174 keywords, 14 met the threshold. The Query 18 syntax was constructed to explore transition and transformation strategies in the energy sector with the limitation to the science areas of business management and decision sciences. The obtained results are the scientific publications which are the edges between the nodes presented in figure's bibliometric map. The size of the node is related to the importance of the keyword. The keywords distinguished in Query 18 are gathered in Table 5.

In Figure 5, there are four clusters. The first is the red cluster with four keywords. This cluster is dedicated to management and economic sciences. The second cluster, also with four keywords, is related to the changes and innovation in the energy sector. There is also a blue cluster pointing at strategies toward renewable energies and energy conservation. There is also a yellow cluster visible in Figure 5, which represents the strategies and energy policies based on alternative energy (relation between two keywords). There is a shift among the presented keywords presented in Figure 5 and Figure S2 in Supplementary Materials File S1. This shift represents the change in scientific interests of publication authors dealing with transformation and transition strategy types in the energy sector (see Query 18). The bibliometric analysis of Query 18's results covered the years 2015–2021. The first keywords presented in Figure S2 were "energy policy", "alternative energy", and "sustainable development". The newest keywords from the analyzed scientific publications are "decision making", "commerce", and "economic and social effects".

The clusters presented in Table 5 are interrelated, and the picture presented in Figure 5 is complicated. However, there are three main directions of strategies presented in clusters two (green) and three (blue). There are strategies in the energy sector dedicated to innovation, transformation, and conservation. There is no connection (edge) between nodes representing innovation and "renewable energies" in Figure 5.

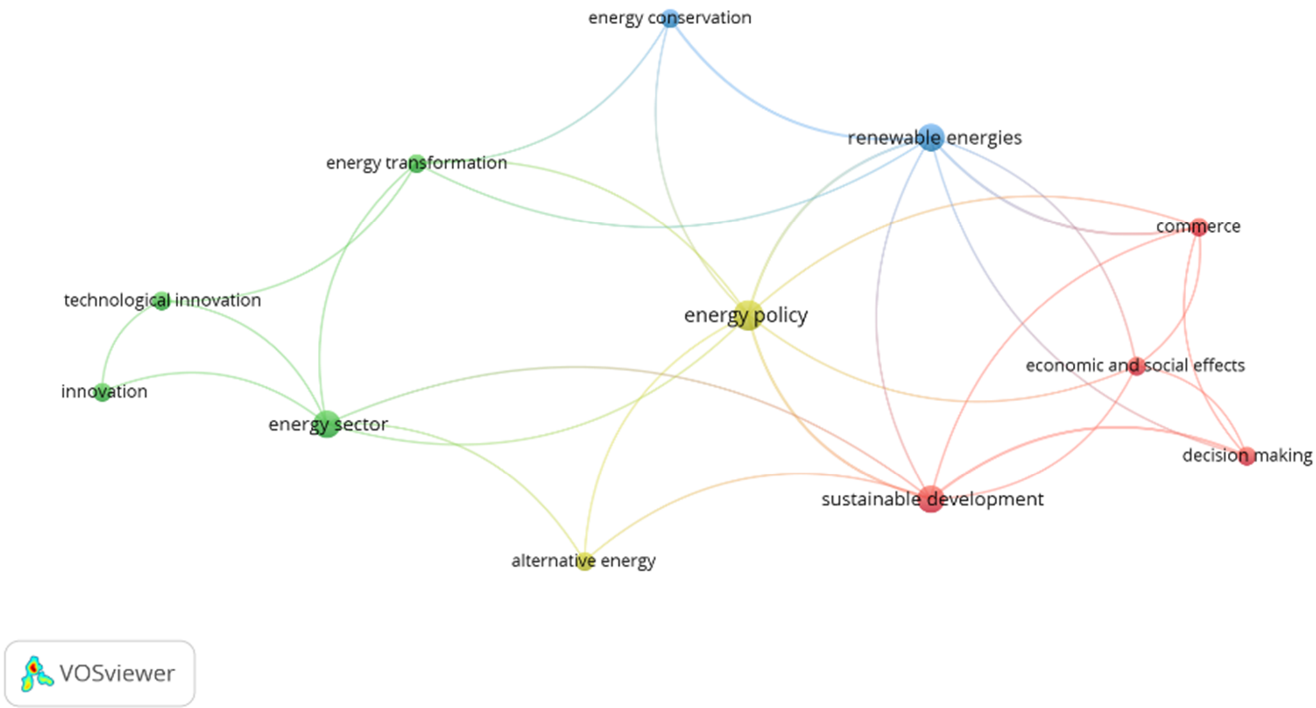

Figure 5. Bibliometric map of indexed keyword co-occurrence results from Scopus based on Query 18. Counting method: full counting. Minimum keyword co-occurrence is 10. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

Table 5. Clusters of index keyword co-occurrences in Figure 5 for Scopus.

Cluster	Color	Keywords
1	Red	commerce, decision making, economic and social effects, sustainable development
2	Green	the energy sector, energy transformation, technological innovation, innovation
3	Blue	energy conservation, renewable energies
4	Yellow	alternative energy, energy policy

Source: authors' elaboration.

Query 18's results were analyzed in VOSviewer by all-keywords exploration. The results of this analysis are presented in Figure 6 and Table 6. The difference between Figures 5 and 6 is caused by the bigger number of all keywords. Therefore, there are five clusters identified by the VOSviewer software.

Table 6. Clusters of all keyword co-occurrences in Figure 6 for Scopus.

Cluster	Color	Keywords
1	Red	bioeconomy, biogas technologies, convergence, patent analysis
2	Green	energy conservation, energy policy, energy transformation, renewable energies,
3	Blue	energy sector, innovation, modeling, technological innovation
4	Yellow	alternative energy, commerce, decision making, sustainable development
5	Violet	coal industry, economic and social effects, renewable energy

Source: authors' elaboration.

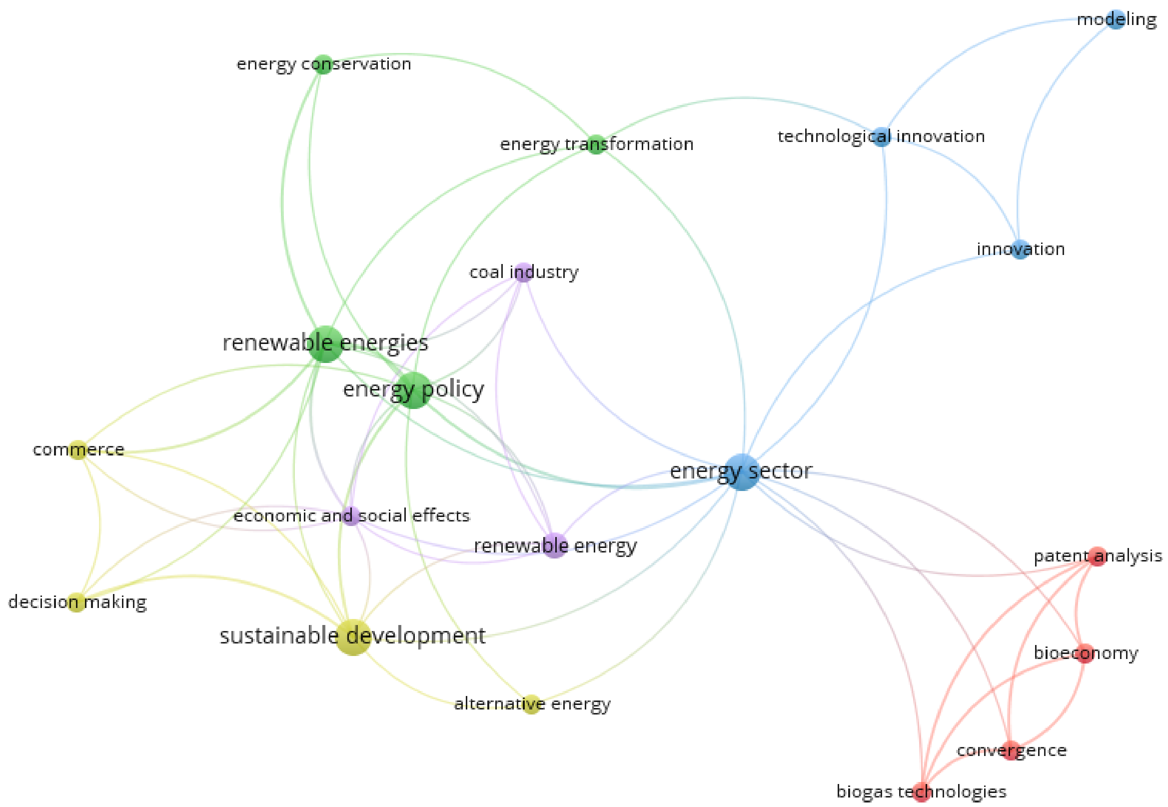

Figure 6. Bibliometric map of all keyword co-occurrence from Scopus based on Query 18's results. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

In Figure 6, all keywords were used, and among 248 keywords, only 22 met the threshold of two minimum keyword co-occurrences. The method used in VOSviewer software was full counting. There were excluded keywords, specifically "india", "europe", and "carbon dioxide", despite their original writing form (the keywords in Table 2 are written in small letters as in the VOSviewer program). In Figure 6, there are clusters distinguished in color due to their common direction. The identified clusters are related to the different areas of the scientific interest of the analyzed scientific publications' authors. Figure 6 presents the graphical results of Query 18 used in the Scopus database exploration. There is a red cluster identified in Table 6. This cluster is related to the "bioeconomy", "biogas technologies", "convergence", and "patent analysis", which are common fields in business practice. The other clusters are more related to theory and are in opposition to the red cluster. The green cluster with four keywords revolves around the strategic direction of energy sector development. The third, the blue sector, is dedicated to technology and innovation. The yellow cluster describes the management sciences involved in alternative energy management in the energy sector. The last sector is violet and describes the choice between fossil fuels and renewable energy. This choice in the energy sector is intertwined with the economic and social effects of such a decision.

The scientific publications explored in Query 18 in both methods of analysis indicate the three main strategy directions; however, with the all-indexed keywords, the practical aspects are more visible.

Query 19's results were the basis for the analyses performed in VOSviewer and presented in Figure 7 and Table 7. These 21 results are scientific publications indexed in the Scopus database. To analyze them, the minimum number of indexed keyword co-occurrences was two, and among 174 keywords searched in the title, abstract, and keywords field, only 24 met the threshold when the full counting method was applied. In this research, no keyword was excluded. The graphical analysis result as the bibliometric map presented in Figure 7.

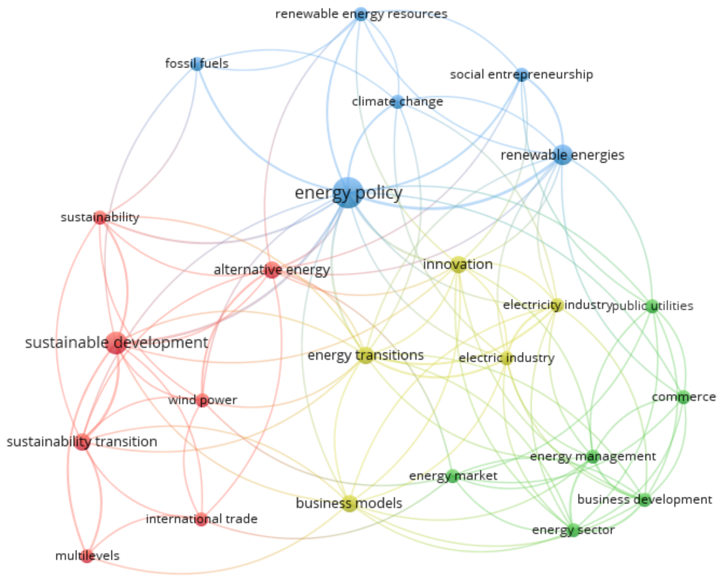

Figure 7. Bibliometric map of index keyword co-occurrence results from Scopus based on Query 19. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

Table 7. Clusters of keyword co-occurrences in Figure 8 for Scopus Query 19.

Cluster	Color	Keywords
1	Red	alternative energy, international trade, multilevels, sustainability, sustainability transition, sustainable development, wind power
2	Green	business development, commerce, energy management, energy market, energy sector, public utilities
3	Blue	climate change, energy policy, fossil fuels, renewable energies, renewable energy resources, social entrepreneurship
4	Yellow	business models, electric industry, electricity industry, energy transitions, innovation

Source: authors' elaboration.

These four clusters are presented in Figure 7 as subnetworks of the presented bibliometric map. Then, there are four directions of scientific interest revealed in Query 19 (Table 2) dedicated to the typology of transformation and transition strategies in the energy sector limited to the subject areas "business, management, and accounting" and "decision sciences" in Scopus. The first and most numerous clusters are colored in red with seven keywords. This cluster's main node is oriented to SD-related topics represented by the keywords "sustainable transition" and "sustainability". The whole red cluster revolves around the development subject. The second subnetwork is the green-colored cluster dedicated to energy sector management. The blue cluster reflects the two main directions of development in the energy sector (pivotal keyword). These two directions are related to fossil fuels and RES. These research subjects are connected with climate change and social entrepreneurship. In Table 7, there is also a yellow cluster. This cluster is focused on management aspects of the electricity industry in the energy sector. Those aspects are "business models" and "innovation". Also visible in Figure 7 is a shift of the scientific interest among keywords in the result of Query 19 and analyzed in Figure S3 in Supplementary File S1. The newest keywords used in 2022 in scientific publications were those from the green and yellow clusters (Table 7): "energy sector", "energy transitions", "energy management", "energy market", "business development", "electric industry", and "electric industry". These keywords in Figure S3 in Supplementary File S1 are collected in the intertwined close yellow network.

The clusters presented in Table 7 are not randomly indexed keyword co-occurrences in the analyzed publications. The order of the clusters presented in Table 7 was caused by the number of keywords identified by VOSviewer and represented as nodes in Figure 7. The presented results were obtained from Query 19's syntax in Boolean style and were explored in two bibliometric maps presented in Figures 6 and 7. The initial number of indexed keywords grouped into clusters in Table 6 was lower than all the keywords analyzed in Table 7.

Query 20 presented in Table 2 the explored categories of transformation and transition strategies among scientific publications indexed in the Scopus database, limited to areas of "business, management and accounting" and "decision sciences". Although the "category" was the main subject explored by Query 20 in Scopus, this keyword is not present in Figure 8 and Table 8. The keywords which were selected and used by the VOSviewer program are gathered in Table 8. Keywords are separated by semicolons. In Table 8, there are clusters identified by colors, as in Figure 8. Despite the original writing form, the keywords in Table 8 are written in small letters as in the VOSviewer program. The order of clusters presented in Table 8 is caused by the number of keywords identified by VOSviewer. The identified clusters are related to the different areas of the scientific interest of the analyzed scientific publications' authors. Figure 8 presents the graphical results of Query 20 used for the Scopus exploration. In Figure 8, the minimum two co-occurrences of keywords are represented as a node in the bibliometric map. Among the 86 identified keywords in the VOSviewer software, only eight keywords met the threshold. In the bibliometric program, no keyword was excluded from the analysis. The edges of the network represent the explored co-occurrences between keywords in the data obtained from Scopus.

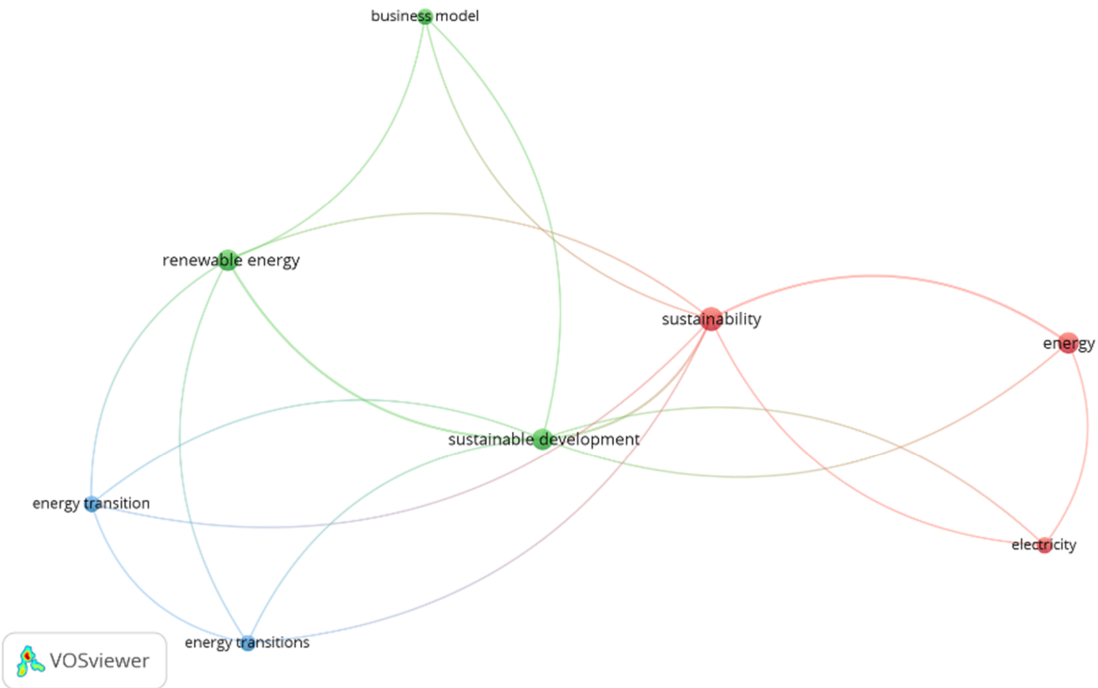

Figure 8. Bibliometric map of index keyword co-occurrences from Scopus based on Query 20's results. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

Table 8. Clusters of keyword co-occurrences in Figure 8 for Scopus Query 20.

Cluster	Color	Keywords
1	Red	energy, electricity, sustainability
2	Green	business model, renewable energy, sustainable development
3	Blue	energy transition, energy transitions

Source: authors' elaboration.

In Figure 8, there are three clusters automatically identified by three colors as clusters in Table 8 and ordered by the VOSviewer program. In comparison to Queries 18 and 19, the number of identified keywords is significantly lower. The first cluster is marked in color red in Figure 8 and consists of co-occurring keywords related to general strategic orientations, such as "energy", "electricity", and "sustainability". The second cluster of keywords revolves around development visible in strategies in the energy sector and business models. Another group of scientific publications gathered in the third blue cluster created papers dedicated to the energy transition. Together with the performed Figure 8 analysis, there was an analysis of the keywords of interest in the VOSviewer software presented in Figure S4 in Supplementary Materials File S1. There was a shift towards keywords related to "sustainability", "electricity", and "energy" visible in the years 2018–2022.

Query 21's results were analyzed in the VOSviewer program in Figure 9 and Table 9. Analysis in bibliometric software was based on two minimum number of occurrences of a keyword among 49 indexed keywords. Only three indexed keywords met the threshold, and no keyword was excluded. These three keywords are included in the wider pool of all keywords, as proved in Query 18's analysis. Therefore, analysis of all keywords from Query 21's results was analyzed, and only nine of all keywords met the threshold of two minimum co-occurring keywords with the full counting method. In Figure 9, two clusters distinguished automatically by the VOSviewer program are visible. The results of Query 21 indicate both the importance and the low number of pieces of literature dealing with the classification of transformation and transition strategies in the energy sector.

Figure 9. Bibliometric map of all keyword co-occurrence results from Scopus based on Query 21. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

Table 9. Clusters of keyword co-occurrences in Figure 9 for Scopus Query 21.

Cluster	Color	Keywords
1	Red	energy transitions, renewable energy, renewable energies, sustainability, sustainable development
2	Green	bioeconomy, biogas technologies, convergence, patent analysis

Source: authors' elaboration.

In Figure 9, there are two clusters visible as connected into a single network. The nodes are all the keywords co-occurring in the analyzed Query 21 results. The edges are the scientific publications that consist of these keywords. The sizes of the nodes represent the higher or lower number of co-occurrences. There are only two edges combining "sustainability" and "sustainable development" in the red cluster with "bioeconomy" in the green cluster. The first cluster is red, and it is the most numerous, indicating the direction of strategies oriented toward RES and SD. There is also a green cluster representing business practice visible in convergence and patent analysis. Among publications gathered in the green cluster, there are also those dedicated to biogas technologies and bioeconomy. The co-occurring keyword on the left side of the green cluster is more general than the keywords on the right side of this cluster. The centrally located keywords present in Figure 9 are also more general and theoretical than those placed in the bibliometric map's peripheries. There are the same keywords as presented in the red cluster in Figure 6 and Table 6.

Queries 22, 23, 24, and 25 were developed upon Query 2 from Table 1 and used in the Scopus database exploration. These queries consecutively limited their scope, reflected in the number of results presented in Table 3.

Query 26's results were analyzed in the VOSviewer program. The method adopted in the bibliometric program was full counting. The minimum number of indexed keyword co-occurrences was five, and among 378 keywords, only 16 met the threshold. There was no keyword excluded in the analysis procedure. There are three clusters presented in Figure 10 based on the 40 publications from Scopus. There is a bibliometric map of co-occurrences of keywords related to the transformation and transition strategies in the energy sector associated with "sustainable development", "energy policy", "alternative energy", "renewable energy sources", and "climate change". Despite such being specified in Query 26, only a few of them are present in Figure 10. The central node of the presented bibliometric map for Query 26 is "energy policy". This node is connected with all three clusters. First is the red cluster, organized around energy policy and decision making in the field of renewable energy sources and resources. The second, the green cluster, is revolving around sustainable development and management in the energy sector. There is also a third, blue cluster characterized by the environmental impact of technological solutions.

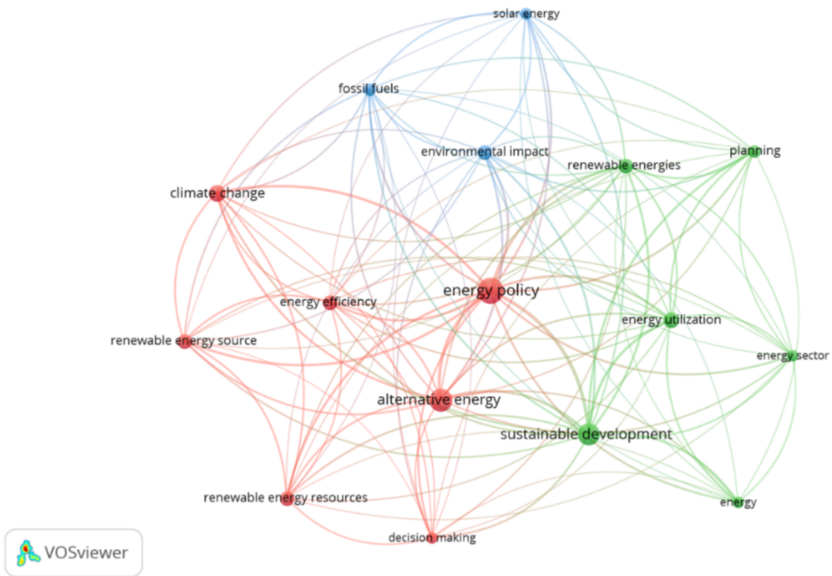

Figure 10. Bibliometric map of index keyword co-occurrence results from Scopus based on Query 26. The authors' elaboration was performed in VOSviewer (version 1.6.18).

The order of clusters presented in Table 10 is caused by the number of keywords identified by the VOSviewer. The identified clusters are related to the different areas of scientific interest of the analyzed scientific publications' authors.

Table 10. Clusters of keyword co-occurrences in Figure 10 for Scopus Query 26.

Cluster	Color	Keywords
1	Red	energy policy, alternative energy, climate change, decision making, energy efficiency, renewable energy sources, renewable energy resources
2	Green	energy, energy sector, energy utilization, planning, sustainable development
3	Blue	fossil fuels, environmental impact, solar energy

Source: authors' elaboration.

Figure 11 presents the division of the co-occurring keywords in the analyzed publication in the years 2019–2021. In this short period, there is a visible shift in scientific interest in publications reflected in the change of keywords in the bibliometric map. The results of Query 26 are publications with the oldest keyword, identified as "climate change" on the left side of Figure 11, and when going toward the right side there are the new and newest keywords in publications colored in yellow that have gained importance. When analyzing the general network of connections in Figure 11, it can be seen that the authors extended the areas of interest that were the focus three years ago. This means that these darker issues have not lost their importance, although the emphasis has slightly shifted toward issues related to planning and renewable energies in the energy sector. This further means that the lens is focused on the concept of energy policy as the equivalent of energy strategy, and this keyword has a central place in the presented bibliometric map.

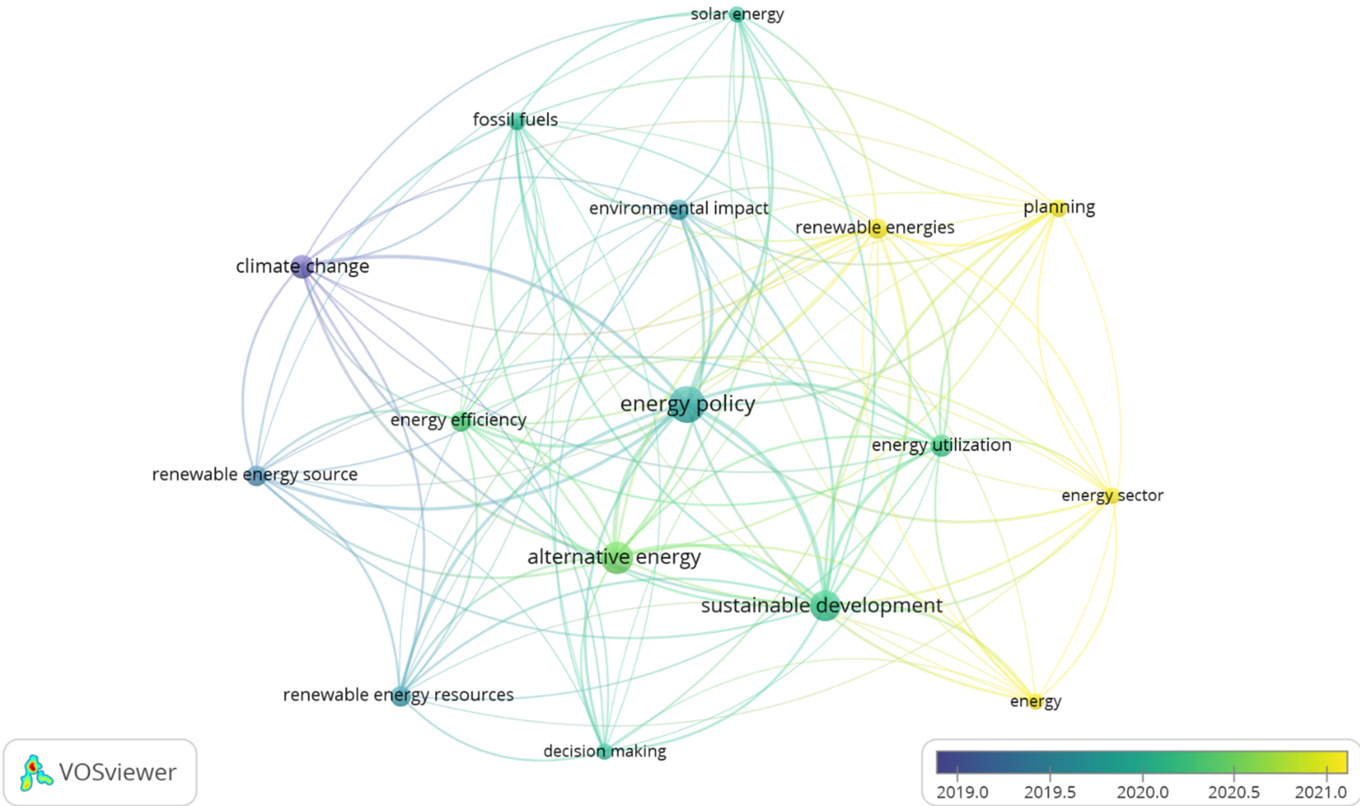

Figure 11. Bibliometric map of index keyword co-occurrence results from Scopus based on Query 26. Counting method: full counting. Minimum keyword co-occurrence is 10. Source: authors' elaboration performed in VOSviewer (version 1.6.18).

The exploration of the texts allowed for the identification of one more area of consideration. Based on Tables 4, 5 and 7–10, it can be noticed that there are more and less common keywords co-occurring in the publications indexed in Scopus. These tables were analyses of Queries 15, 18, 19, 20, 21, and 26, respectively. The maximum number of common keywords is six due to the number included in the analysis of six tables as sources. On the other hand, if the keyword is occurring only once among these tables, it can be stated as a difference in a strategic approach among analyzed strategies based on technology and those based on management and social change strategies in the energy sector. Additionally, the keyword "energy policy" is localized in all presented bibliometric maps in the central place.

In the analysis of the research results collected in Tables 4, 5 and 7–10, the keywords from the clusters were summarized. In this way, knowledge was gained about the keywords that are most often recurring and constitute a common element for most clusters of the resource. Also extracted were those keywords that are rarely realized research topics, presented in the last row of Table 11. Then, the gathered keywords in Table 11 represent the shift of the strategic direction and context in the third column, from the general perspective to the most specific solutions.

Table 11. Common and different keywords among analyzed Queries 15, 18, 19, 20, 21, and 26.

No of Occurrences	Keywords	Strategy Direction and Context
6	sustainable development	Strategic aim and priorities
5	energy transition *	Technological change
4	alternative energy; energy policy; energy sector; renewable energy *; sustainability	New energy sources
3	climate change; business model *; commerce; decision making; fossil fuels; innovation; renewable energy resources	Mitigation of negative changes in natural environment
2	electricity industry; energy; energy efficiency; energy management; energy market; energy utilization; renewable energy; renewable energy sources; wind power	Energy management and increase the energy efficiency
1	bioeconomy; biogas technologies; energy convergence; economic and social effects; economics; electric industry; electricity; electricity generation; energy conservation; energy planning; energy transformation; environmental impact; gas emissions; governance approach; greenhouse gases; international trade; investments; multilevels; patent analysis; planning; public utilities; renewable energy sector; renewable resources; social entrepreneurship; solar energy; strategic approach; sustainability transition; technological innovation	Future development and innovative directions

Source: authors' elaboration; * keywords occurring also in plural form.

The results of the keyword research are shown in Table 11. Taking the frequency of use in scientific articles as a criterion, the keywords were divided into six groups. The classification presents the keywords in descending order, beginning with the most frequently used. The author's elaboration is also presented in our strategic direction and context column.

The keyword that most often appears, analyzed in Table 11's queries, is "Sustainable Development". The context for the use of SD in energy sector research can be described as the main strategic aim and priorities. The second keyword that appears most often in the research is "energy transition", defining future development direction. The third group of keywords most frequently identified are "alternative energy", "energy policy", "energy sector", "renewable energy", and "sustainability". These keywords refer to research related to the future development direction of the energy sector in the context of technological change. Other keywords appeared three, two, and a single time in the surveyed texts of scientific publications, as indicated in the first column of Table 11. The first group of keywords consists of "climate change", "business model", "commerce", "decision making", "fossil fuels", "innovation", and "renewable energy resources", used in the context of the energy sector's future development direction. Twice the keywords appeared in the surveyed publications, "electricity industry", "energy", "energy efficiency", "energy management", "energy market", "energy utilization", "renewable energy", "renewable energy sources", and "wind power", pointing in the direction of research energy management. Keywords occurring a single time were listed in the last row of Table 11. To summarize the keywords in the scientific texts studied, they mainly refer to energy management, strategic concepts, and future development directions.

The directions of the changes in energy sector strategies can be generalized and became universal organization profiles implemented in the other economic sectors. In Table 12, there is a universal typology which can be assigned to energy sector companies illustrating their changes as progress between types I–IV. Those changes in strategies are confirmed by the bibliometric maps analysis, which illustrates shifts of scientific interest in explored publications.

Table 12. The energy sector strategy groups.

Source	Organizations' Profiles According to Transformation Strategy Types			
	I	II	III	IV
James, 1992 [59]	Non-compliance	Compliance	Compliance-plus	Excellence
Bostrum and Poysti, 1992 [60]	Resistant	Passive	Reactive	Innovative
Welford, 1994 [61]	Cowards	Laggards	Thinkers	Doers
Meima, 1994 [62]	Problem Fixer	Obstacle Jumper	Opportunist	Activist
Roome, 1994 [63]	Indifference	Offensive	Defensive	Innovative
Loknath and Abdul Azeem, 2017 [64]	Stable	Reactive	Anticipatory	Entrepreneurial
Sulich and Grudziński, 2019 [26]	Isolation	Redundancy	Adaptation	Cooperation
Zhou et al., 2019 [65]	Avoidant	Reverse	Pioneering	Aggressing

Source: author's own elaboration based on [64].

In the researched literature, there are also different divisions based on corporate responses to environmental pressures. The first group in Table 12 is the energy companies that have been forced to improve their environmental performance as a result of some well-known failures. The second group is the energy sector companies that have been able to exploit the opportunity created by green technology to gain a competitive advantage [66,67]. The third group includes energy companies that have moved beyond compliance and have incorporated their environmental strategy into their overall business strategy [64,66]. There is also the fourth group, which gathers the companies that exceed those in previous categories. However, among the presented groups, the authors focused on the different aspects of the organizations' profiles and their strategies proposing their classifications.

Although there are models of strategic options which include more than four strategy types, these four groups are the most popular and are used interchangeably by different authors (Table 12). These four categories are: indifferent, offensive, defensive, and innovative, proposed by Roome [63]. These classifications can be used also in other economy sectors. Indifferent companies are those that have low environmental risk and even less environmentally based opportunities for growth [63]. Offensive companies are those that have considerable potential for exploiting environmentally related market opportunities and include companies that manufacture pollution control equipment [63]. Those adopting a defensive strategy are companies such as chemical companies, which have high environmental risk and cannot afford to ignore environmental issues, or their very survival could be at stake [63]. The innovators are those that have high environmental risk and also a lot of environmentally based opportunities for growth.

Loknath and Abdul Azeem in their conference article presented a review of types of green management strategies, and among them they list four other element categorizations of strategy types, which were compared in Table 12. The first group is organizations that not only assume that concern for the environment is a passing phase and their impact on the environment is negligible but also assume that their competitors feel the same and hence carry out nothing to conserve the environment. The second group consists of organizations that are aware of the environmental challenges facing them but are unable to combat those challenges because of cost constraints, lack of trained manpower, and lack of knowledge. The third group is organizations that are aware of problems but are still waiting for others to show the way forward. Then, there are organizations that have proceeded to put their assumptions into action, and they make up the fourth group. In the science, there has been a shift in viewpoint from theorizing and successive divisions of strategy to more concrete solutions from management science in working out strategy. Then, strategies and types of strategies have ceased to be the center of academic interest.

The implementation of the transformation strategies by organizations operating in the energy sector began in the previous century, and it was a part of technological progress, which has provided a new eco-friendly solution. This technological change forced companies to leave fossil fuels consumption. In the new century, the energy sector should become an eco-centric one. Then, it must become focused on sustainability despite investments, risk, and time [68]. Therefore, an ever-greater number of organizations have begun to notice that the idea of sustainability is becoming a natural element of their action.

4. Discussion

In the presented bibliometric maps and tables, there is less interest among publications' authors in developing strategy theory (typology, type, or classification) in explored publications. Despite the formulated queries consisting of the part dedicated to strategy types, the results proved that there is focus on solving specific practical problems related to the energy sector [69]. This may be because of the strategic importance of the energy sector to economic and social development. On the other hand, the difficult situation in this sector is accompanied by its close synergy with the natural environment's depleting resources [70] and rapid change in the natural environment's deteriorating conditions [71]. In the results of the performed study, there was no specified sectoral strategy identified, neither in bibliometric maps in the SLR method nor in the CLR results. There were general change directions and types of energy sector strategies identified.

In the result tables associated with the bibliometric maps, there are results identified by the authors' strategic directions and contexts. There are then two categories of the results. The first group consists of the keywords identified by the VOSviewer program. The second group of results is formulated by the authors as the research directions. The identified clusters also reflect the shift from general perspective to the more specific solutions in the energy sector [72]. The identified clusters in bibliometric maps are explored as three main groups: strategies and management; technological innovation; and change in business practice. Among the identified clusters in the analyzed publications in the Scopus scientific database, the shift from protection and conservation toward environmental management is visible [73,74]. In addition, within the separate clusters there are subnetworks reflecting very specific subjects of the explored publications in Scopus. This is also a change of the paradigm which influences the strategies in the energy sector. Despite of the focus on the energy sector and the management and economics sciences' issues, there are also other subjects of rapidly growing attention to scientists: "social entrepreneurship" [75], "innovation" [76], "bioeconomy" [77], "biogas technologies" [78,79], "convergence" [80], and "patent analysis" [81,82]. These topics are related to the decision-making process in light of the shift from fossil fuels to RES.

The maps and results do not show clear divisions and ordering of strategy classifications, despite the fact that such an inquiry was formulated in the queries. The keywords lack direct mention of classification and strategy. It can be assumed that a typology of strategies can be found in the content of the scientific articles but is not explicitly called a classification. These maps show some strategy directions other than the typologies. The bibliometric research results indicate that companies operating in the energy sector attach great importance to strategy planning and business policies [83,84]. This observation is supported by the pivotal role of the "energy policy" keyword in presented bibliometric maps [85,86]. Therefore, the energy sector companies are looking for the most significant and influential activities [57,87].

This paper's goal was achieved by the exploration of the business management literature dedicated to the transformation and transition strategies in the energy sector. The adopted methods are a systematic literature review (SLR) accompanied by the classical literature review (CLR) in Scopus database exploration.

The limitation of this study's methods is an institutional access to the Scopus database. The researchers without the provided access to the Scopus, for example, cannot achieve reproducibility of this study. Another limitation of this study method could be related to the question of the research area limited by the subject area in Scopus or the presentation of the 10 most contributing scientific publications (presented in Tables S1–S6, Supplementary Materials File S1). Another limitation is also the fact that Scopus is an international database where English is a dominant language in science; therefore, keywords were only searched in this language. The restriction to the English language is an expression of the selection of only those works that have been internationally evaluated and circulated internationally [5]. On the other hand, there are no limits in terms of time span, publication accessibility, scope or type, geographical area, or author-related information in the presented results. Another limitation of this research is based on the aggregation of the plural forms from the keywords list. Another limitation is the authors' interpretation of the keywords collected in the clusters. However, there are two main macro streams in the explored publication in the Scopus database, the first related to SD and the second to strategies in the energy sector [65,88]. They reflect the clear division between more theoretical and empirical publications.

In the bibliometric study results, it is not surprising that SD is most often indicated as a keyword. The idea of SD is close to politicians, business leaders, entrepreneurs, and societies, but its implementation causes many problems [89]. SD should build a common future based on the energy sector.

Sustainable development builds on the concept of quality of life in an unlimited time span because its assumptions are timeless and universal [90,91]. Therefore, planning is the most crucial element of the strategies in the energy sector. This raises the question of how companies competing in the energy sector are to shape a high quality of life as part of their strategy. These assumptions must take into account the strategies of companies in the energy sector where diverse environmental, economic, and social problems are considered in a broad context. Thus, business sustainability is based on the ability to manage or mitigate pollution and depletion of non-renewable resources. This can be achieved by usage of technological innovations, recognized as the main groups of issues in the Scopus exploration. However, decision making and management have to initiate and coordinate those actions.

Publications analyzed in this research proved then that the lack of rapid changes and results in implemented strategies in energy sector companies constitute a premise for researching this area. Problems may be strategically conditioned and result from inadequate management and the lack of implementation of these strategies. The selection of strategic goals that positively impact the environment is essential when it is translated into the strategy's implementation by energy companies. The result of this bibliometric research is that current energy sector strategies are not studied from a theoretical point of view but as planning in the energy sector to achieve practical goals related primarily to SD.

The objectives of energy sector strategies are aimed at involving the improvement of the environment or minimizing anthropo-pressure. There is also complexity of the decision-making process in strategy field results from the growing number of elements (participants) of the business environment system and the ties between them, which are the result of unexpected events (discontinuities) that determine volatility, technological breakdowns, changes in consumer habits, economic transformations, and crises.

5. Conclusions

In this paper the authors assumed that scientists, who are authors of the explored publications indexed in Scopus, cooperate with business. Therefore, their works reflect the changes in the energy sector's strategies. There is close cooperation between academia and the business environment to achieve sustainability in the energy sector. To illustrate this close relationship and to perform a literature review, two methods of review were used. The combined methods of CLR and SLR were used to identify the state of the art and integrate and synthesize the existing body of literature but also explore the main directions for further research on transformation strategies in the energy sector.

The main conclusion of this paper is that there are the changes in the energy sector, but the pace those changes is too slow in relation to the real actions. This disparity is caused by the imbalance between struggles to improve the quality of life and stop climate change and especially the rise in levels. Energy sector transformation strategies aim to overcome the disadvantages caused by localization and gain energetic independence and diversification in energy generation. Therefore, there are multiple directions among those strategies. There are different driving forces behind the strategic changes in the energy sector; however, they have not appeared in the results of this bibliometric study despite the full-time analyzation period, and words such as "war", "armed conflict", or "pandemic" were not excluded.

The methodological contribution of this paper is based on the comparison of the two methods employed in this literature review. The SLR method has a clear advantage over the CLR method, as it avoids many of the typical inadequacies and at the same time opens the way for replication of bibliometric research, strengthening the development of management science. With the growing practice or dissemination of the standard of systematic literature review in the preparation of promotional works and empirical studies, problems specific to this method arise. The bibliometric study based on the SLR with queries can be an initial step in the exploration of the research problem. The results of this SLR method provided only initial recognition of the general directions of strategies and their contexts. The subject of the changes in energy sector strategies was deeply explored in the CLR method, which allowed the identification of missing typologies and strategy classifications. Better results are obtained only when these two methods are combined.

The scientific contribution of this study is based on the exploration of the research gaps. The first is the taxonomic research gap, which is satisfied in this study by the proposed order in bibliometric maps and their clusters. The second is the knowledge gap about the direction of the changes in energy sector strategies, which is answered in this study. In this study, the methodic research gap is also covered in terms of the combination of the two adopted methods. The last research gap addressed in this study is based on rare literature reviews and slender publications dedicated to the changes in the energy sector's strategies. However, these research gaps indicate promising research avenues which can be developed in future research.

The practical contributions of this paper can interest researchers, managers, and policymakers interested in energy sector strategies. The presentation of the directions and context of the strategies combined with their typologies allow one to assess the current situation of a company in the energy sector. The bibliometric maps along with their descriptions provide valuable information about promising scientific research which can combine subjects identified as outlier keywords. The direct implication for policymakers is the visible creation of the biogas and hydrogen power generation sectors of the bioeconomy. This specific direction of the development of strategies in the energy sector involves both managerial and technological solutions.

Among the publications, there are multiple shifts reflecting the authors' scientific interest changes. The dimensions of those shifts are, among others, change from a theoretical to empirical perspective, change from protection and conservation towards environmental management, and there is also growing interest in RES as technological innovation over fossil fuels. Among the results, there was no visible discussion about clear energy production or nuclear energy generation as alternatives and renewable energy sources. However, the RES advantages are listed in many publications as diversification solutions in strategies, providing energetic independence. Those advantages are presented more often than disadvantages in the explored research indexed in Scopus papers. Along with the positive image of the strategies in the energy sector, their influence on the labor market is present in scientific publication. The elements of the strategies employed by the energy sector's companies are also introduced in other sectors. The reason for an absence of classifications in the energy sector's strategies can be a lack of typologies and a lack of divisions in the bibliometric maps. Among the publications, there is ongoing generalization of the strategic-management-related topics and presentation of the new subjects than exploration of the well-explored and known strategy elements.

The novelty of this bibliometric research is based on the identification of the changes in energy sector strategies and is important because of its reliance on resources and natural environment degradation. Another novelty feature of this research is the presentation of the existing research gaps and identification of main directions of ongoing research.

New possibilities such as information and communication technologies, especially the easy access to scientific information, have led to the rapid development of systematic methods of knowledge management [92]. In recent years, there has been a particular development of systematic literature review methodology, which, by using a replicable and well-described research procedure, allows for the search, selection, and evaluation of all available scientific evidence in a given field of inquiry. The method allows for the synthesis of this evidence, through which it is provided in a user-friendly way, with reliable information from an up-to-date evidence base. Systematic literature reviews are used by researchers preparing new research projects. A review of the literature allows for an understanding of a given issue and for the identification of a body of knowledge that needs to be supplemented in subsequent research. As a prerequisite for increasing the effectiveness of public decision making is to base it on sound and reliable scientific evidence, it is worthwhile for politicians to use systematic reviews. Given the usefulness of systematic literature review methods, there is a need to disseminate knowledge about what the reviews are and how they can be used.

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