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The impact of energy efficiency policy on Ukraine's green brand: a bibliometrics analysis

ABSTRACT: This paper summarizes the arguments and counterarguments within the scientific discussion on the impact of energy-efficient development on promoting the national green brand. The primary purpose of the research is to provide an overview of the scientific background devoted to the relationship between the energy efficiency policy and the country's green brand to identify the potential research gaps and highlight the prospects for particular research directions. The systematization of scientific publications presented in the Scopus database showed a rapid tendency for publication activity on the investigated theme from 2000 to 2020. However, there has remained a deficiency in investigating the role of energy efficiency policy in formulating the country's green brand. Therefore, it is appropriate to screen out the relevant publications to detect the future research directions in boosting energy efficiency for strengthening Ukraine's green brand. To obtain the objectives of this study, the paper is presented in the following logical sequence: determining the keywords to find the relevant publications; searching the publications; conducting the evaluation analysis by

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specific metrics; applying the bibliometric analysis for the investigation of keywords and their co-occurrence. The co-occurrence analysis was performed using the VOSviewer software tools. The study sample consists of 3090 publications indexed in the Scopus database. The study involved documents published from 2000 to 2020. The research identified the most productive authors, prestigious scientific journals, and the most contributing countries and institutions. The publications were clustered into five thematic groups, which indicate the main research directions. The authors specified the prosperous lines for future research.

KEYWORDS: green brand, green growth, energy efficiency policy, bibliometrics analysis

Introduction

Energy efficiency policies are essential in strengthening energy security, decreasing the environmental burden, mitigating the negative climate impact, improving social and economic welfare, and increasing the country's competitiveness on the international market, etc. Notably, to double global energy efficiency by 2030, the General Assembly of the United Nations declared 2014–2024 to be the decade of sustainable energy for all. Many academic studies have emphasized that energy-efficient growth requires investments in energy-efficient methods and technologies. In turn, green investments provide a macroeconomic effect due to decreasing energy consumption and improving economic output. Furthermore, they boost employment, create new workplaces, improve public health, and increase business competitiveness. As a result, the country becomes more attractive for international investors.

Figure 1 shows that Ukrainian investment attractiveness is significantly low. For instance, this figure is higher in Poland by 24.9%, Germany – by 36.1%, the USA – by 35.4%, and Cana-

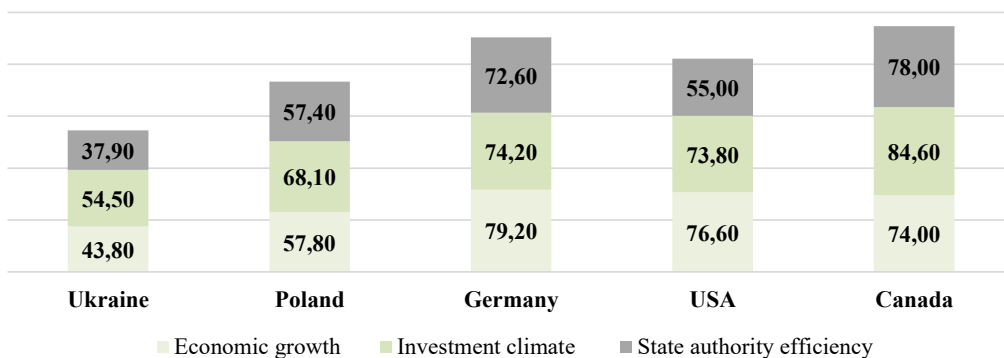


Fig. 1. Comparing the countries' reputations by the dimensions, 2019
 Source: developed by the authors based on Cabinet of Ministers of Ukraine 2020

Rys. 1. Porównanie atrakcyjności krajów dla inwestorów wg różnych wskaźników, 2019

da – by 55.2%. Moreover, the ineffective government policy and investment deficiencies slow down economic growth (Yelnikova and Kuzior 2020).

Many scientists emphasize the necessity to draw more attention to developing the country's green brand by improving investment attractiveness. Yelnikova and Golochalova (2020) proved that green investments contribute to economic growth, while the share of renewable energy in the final energy consumption is increase. Singh (2019) highlighted that green business activity improves performance due to the increased interest of investors. The potential of green financial instruments improves environmental conditions, social life, economic performance, and political situation (Goncharenko 2021).

Remarkably, in another study (Chygryn et al. 2021), the authors highlighted that green competitiveness is essential for creating a strong national brand. In turn, the scientists emphasized the necessity to involve green marketing tools, intensify green innovation, and promote sustainable development principles. Furthermore, Polcyn (2021) emphasized the impact of eco-efficiency on economic growth and social welfare.

Indeed, adopting an energy efficiency policy is a complex process requiring cooperation between government and stakeholders such as the ultimate consumers, the business sector, energy providers, financial institutions and international donor organizations, etc. Kuzior et al. (2021) noted that energy efficiency mainly depends on the relationships and attitudes between contractors and executives. Moreover, energy-efficient development depends on international cooperation that has a powerful political impact, allows comparison of the achievements of different countries with regard to energy efficiency, and contributes to technological development and innovations. Thus, Kharazishvili et al. (2021) presented a model for estimating energy security where the technological, economic, political and international dimensions play an essential role in formatting the regulatory transformations towards energy-efficient development.

Many countries are currently making progress with regard to energy efficiency'. However, the EU is the leader and driving force in promoting green development and mitigating climate change (Hussain et al. 2020). Notably, energy efficiency is the central feature of the Economic Commission for Europe, European Commission, UN Development Programme, United Nations Environmental Programme, etc.

The growing publication activity on green development worldwide makes it appropriate to: systemize the scientific background and visualize the main research tendencies to detect collaborations between scientists; evaluate research contributions by the authors, countries, journals, institutions, etc.; identify the most prestigious scientific journals, and so on. In this regard, several studies applied a set of bibliometric tools to detect prosperous scientific trends in sustainable development and green growth (Vasilieva et al. 17; Li et al. 2018), energy efficiency (Pavlyk 2020; EI Amri et al. 2020; Panchenko et al. 2020), environmental management (Chygryn and Krasniak 2015; Hakobyan et al. 2019; Haberl et al. 2020) and national branding (Bassols 2016; Butt 2017; Dzwigol 2020; Zhylinska et al. 2021). Despite the growing number of publications on the subject, there remains a gap in investigating the role of the energy efficiency policy in formulating the country's green brand.

1. Methodology

This paper addresses the scientific publications presented in the Scopus database. The study aims to provide an overview of knowledge on the impact of energy efficiency on the country's green brand development to detect potential research gaps and highlight possible future research directions. This study follows the review methodology proposed by Khomenko et al. (2020). Thus, the logical sequence of the study is as follows: determining the keywords to find the relevant publications; searching the publications; conducting the evaluation analysis using the metrics of publication dynamic, countries, institutions, authors, journals, and citations; applying a bibliometric analysis for the investigation of keywords and their co-occurrence.

For collecting the data, the keywords "country brand" and "national brand" were combined with "energy efficiency policy", "green development", and "green growth". A search of the Scopus database using the above keywords was conducted in titles, abstracts, and keywords. The period of study is from 2000 to the first part of 2021. The initial total number of publications was 4844 documents. For choosing the appropriate publications, the results were limited by the following subject areas: business, management and accounting, energy, social sciences, economics, econometrics and finance (Table 1). Only studies written in English were chosen. After deleting the duplicates, the final study sample was 3090 publications.

TABLE 1. The analyzed articles by subject area, 2000–2020

TABELA 1. Analizowane artykuły według tematyki w latach 2000–2020

Subject area	Total no. of papers	%
Business, management and accounting	1 205	18.7
Energy	1 176	18.3
Social sciences	1 121	17.4
Economics, econometrics and finance	724	11.2

Source: developed by the authors based on [Scopus 2021](#).

The search results were exported into the file in the CSV format, which included the necessary bibliographical information, abstract, authors and indexed keywords, and some additional information. To visualize the bibliometric findings on the co-occurrence of keywords, the file was imported into the VOS viewer software. The method of visualization for similarities was applied to detect the main research directions of the investigated topic.

2. Results and discussion

Figure 2 visualizes the growth dynamics of scientific publications devoted to the energy efficiency policy and the green country brand. In 2019, the number of publications increased by 1.3 times compared to the previous year. In turn, there is expected to be an increasing tendency for such publications in 2021.

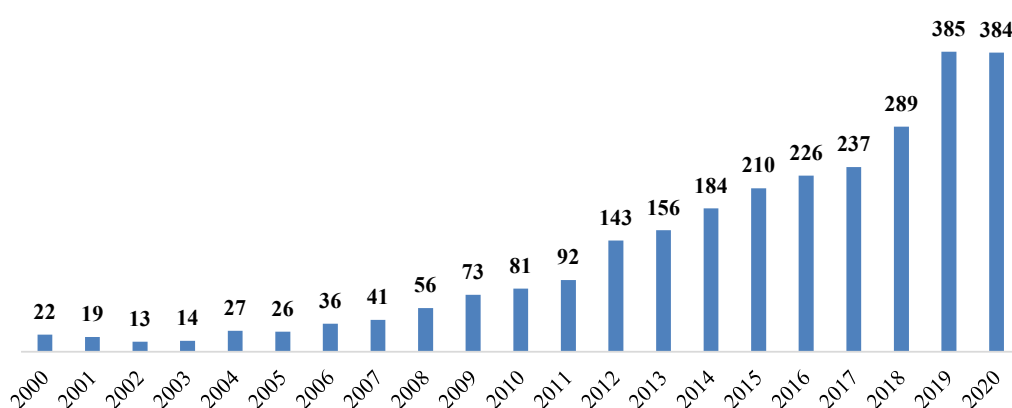


Fig. 2. The dynamic of publication activity on energy efficiency policy and the country's green brand, 2000–2020
Source: developed by the authors based on Scopus 2021

Rys. 2. Dynamika działalności publikacyjnej w zakresie polityki efektywności energetycznej i zielonej marki kraju w latach 2000–2020

Figure 2 demonstrates that Chinese scientists have the most significant contribution to developing research on energy efficiency policies and the country's green brand. They published 657 documents from 2000 to 2020. Among the top-10 productive countries are the USA (624 documents), the UK (275), South Korea (163), Germany (158), Australia (151), the Netherlands (135), Spain (135), France (108) and Italy (100).

The analysis of the most prolific institutions on the investigated topic showed that the most productive authors were from the Chinese Academy of Sciences. They have published 57 documents since 2000. The leading institution is followed by the University of Chinese Academy of Sciences (29 publications) and Lawrence Berkeley National Laboratory from the USA (28 publications). Notably, the rest of the top-10 impactful institutions have approximately the same number of publications – 21–24 papers (Fig. 3).

Table 2 presents the authors who were most engaged in investigating the energy efficiency policy and country's green brand from 2000 to 2020. The Latvian researcher Blumberga Dagnija (h-index – 24) has published 11 papers, mainly devoted to the circular economy, energy security and transition, innovations in the energy sector, etc. The next most published researchers are

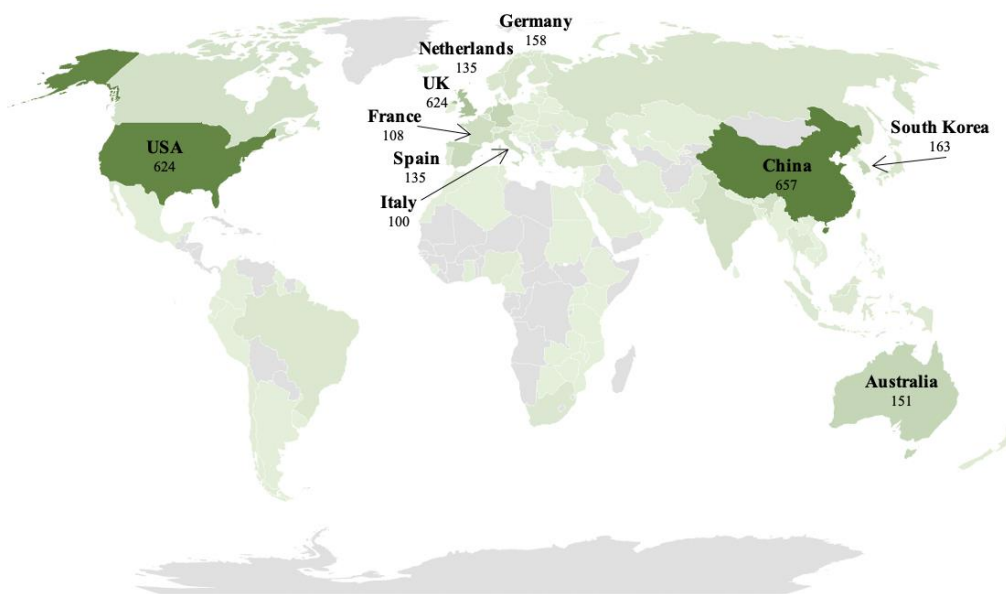


Fig. 3. Analyzed publications by location 2000–2020
Source: developed by the authors based on Scopus 2021

Rys. 3. Analizowane publikacje według kraju afiliacji autorów 2000–2020

Bertoldi Dagnija (h-index – 21) and Rosenow Jan (h-index – 15) from Belgium, and Eichhammer Wolfgang (h-index – 17) from the Netherlands, who published 10 articles in co-authorship.

TABLE 2. The most impactful institutions investigating the researched topic 2000–2020

TABELA 2. Najbardziej wpływowe instytucje badające omawiane zagadnienie 2000–2020

Rank	Institution	Total no. of papers	Country
1	Chinese Academy of Sciences	57	China
2	University of Chinese Academy of Sciences	29	China
3	Lawrence Berkeley National Laboratory	28	USA
4	Universitat Autònoma de Barcelona	25	Spain
5	Fraunhofer Institute for Systems and Innovation Research ISI	24	Germany
6	European Commission Joint Research Centre	24	Belgium
7	Tilburg University	23	Netherlands
8	University of Oxford	23	UK
9	Utrecht University	21	Netherlands
10	Tsinghua University	21	China

Source: developed by the authors based on Scopus 2021.

TABLE 3. The most influential scientists for the analyzed publications, 2000–2020

TABELA 3. Najbardziej wpływowi naukowcy badający omawiane zagadnienie, 2000–2020

Rank	Author	No. of papers	Total no. of papers	h-index	Country
1	Blumberga Dagnija	11	416	24	Latvia
2	Bertoldi Dagnija	10	67	21	Belgium
3	Eichhammer Wolfgang		68	17	Netherlands
4	Rosenow Jan		35	15	Belgium
5	Bronnenberg Bart J.		55	24	Netherlands
6	Choi Yongrok	9	98	21	South Korea
7	Worrell Ernst		243	51	Netherlands
8	Dubé Jean Pierre H.		40	24	USA
9	Martos-Partal, Mercedes	8	27	12	Spain
10	Nenycz-Thiel, M.		36	14	Australia

Source: developed by the authors based on Scopus 2021.

It should be mentioned that most of the analyzed documents were published in highly recognized journals (Table 4). Remarkably, 6 out of 10 journals are registered in the UK, while the journal “Sustainability Switzerland” has presented the most articles on the energy efficiency policy and green development since 2000. All journals except the Netherlands journal “Energy

TABLE 4. The top-10 prestigious journals by the number of publications, 2000–2020

TABELA 4. Dziesięć najbardziej prestiżowych czasopism pod względem liczby publikacji omawiających badany temat w latach 2000–2020

No	Source title	Country	No. of documents	h-index	Quartile	SNIP 2020
1	Sustainability Switzerland	Switzerland	193	85	Q1	1.242
2	Energy Policy	United Kingdom	148	217	Q1	1.941
3	Journal of Cleaner Production	United Kingdom	143	200	Q1	2.475
4	Energy Efficiency	Netherlands	63	41	Q2	0.922
5	Journal of Retailing and Consumer Services	United Kingdom	39	89	Q1	2.534
6	Energies	Switzerland	32	93	Q2	1.161
7	Renewable and Sustainable Energy Reviews	United Kingdom	32	295	Q1	4.684
8	Energy Economics	Netherlands	26	152	Q1	2.238
9	Journal of Retailing	United Kingdom	25	136	Q1	3.580
10	Journal of Product and Brand Management	United Kingdom	23	81	Q1	1.435

Source: developed by the authors based on Scopus 2021.

Efficiency” and Switzerland “Energies” belong to the first quartile which indicates their high impact on developing the researched topic on energy efficiency and the country’s green brand.

Table 5 presents the most cited articles on the investigated topic from 2000 to 2020. The study (Batra et al. 2000) published in the Journal of Consumer Psychology is the most cited article – 665 citations. The next most cited articles are by Noble et al. (2002) and Ailawadi et al. (2001), which are cited 573 and 526 times, respectively.

TABLE 5. The most cited articles on the investigated topic, 2000–2020

TABELA 5. Najczęściej cytowane artykuły na badany temat, lata 2000–2020

Rank	Title	Authors	Journal	Year	Citation
1	Effects of Brand Local and Nonlocal Origin on Consumer Attitudes in Developing Countries	Batra, R., Ramaswamy, V., Alden, D.L., Steenkamp, J.-B.E.M., Ramachander, S.	Journal of Consumer Psychology	2000	665
2	Market orientation and alternative strategic orientations: a longitudinal assessment of performance implications	Noble, C.H., Sinha, R.K., Kumar, A.	Journal of Marketing 2001	2002	573
3	Pursuing the value-conscious consumer: store brands versus national brand promotions	Ailawadi, K.L., Neslin, S.A., Gedenk, K.		2001	526
4	Pro-environmental products: marketing influence on consumer purchase decision	Pickett-Baker, J., Ozaki, R.	Journal of Consumer Marketing	2008	502
5	The drivers of green brand equity: green brand image, green satisfaction, and green trust	Chen, Y.-S.	Journal of Business Ethics	2010	476
6	Building store loyalty through store brands	Corstjens, M., Lal, R.	Journal of Marketing Research	2000	377
7	Consumer-level factors moderating the success of private label brands	Batra, R., Sinha, I.	Journal of Retailing	2000	315
8	Policies for increasing energy efficiency: thirty years of experience in OECD countries	Geller, H., Harrington, P., Rosenfeld, A.H., Tanishima, S., Unander, F.	Energy Policy	2006	306
9	Overview of current energy-efficiency policies in China	Zhou, N., Levine, M.D., Price, L.		2010	289
10	The contribution of foreign direct investment to clean energy use, carbon emissions and economic growth	Lee, J.W.		2013	273

Source: developed by the authors based on Scopus 2021.

The findings determined that “energy efficiency” is the most commonly used keyword among the analyzed articles from 2000 to 2020 (Table 6). “Energy efficiency” recurred 532 times. Apart from this, this keyword has the highest total link strength – 3399 hits. Table 6 shows that the

TABLE 6. The most frequently used keywords in the analyzed publications, 2000–2020

TABELA 6. Najczęściej używane słowa kluczowe w analizowanych publikacjach, 2000–2020

Rank	Keywords	Occurrences	Total link strength
1	Energy efficiency	532	3 399
2	Sustainable development	403	2 040
3	Energy policy	361	2 654
4	Green growth	299	1 216
5	Energy efficiency policy	286	2 065
6	Sustainability	196	901
7	Climate change	194	1 209
8	Energy utilization	186	1 437
9	Green economy	183	878
10	Economic growth	177	1 079
11	Economics	176	1 243
12	Energy conservation	145	1 024
13	Emission control	142	1 129
14	Environmental economics	127	816
15	Environmental protection	112	741

Source: developed by the authors based on Scopus 2021.

scientists investigating energy efficiency policies and green brands were mainly focused on issues concerning sustainable development (403 occurrences), developing energy and energy efficiency policies (361 and 286 occurrences, respectively), green growth (299 occurrences), mitigating climate change (194 occurrences), developing green economy (183 occurrences), economic growth (176 occurrences), and environmentalization (127 occurrences). Furthermore, strong links were found for energy policy (2654 times), energy efficiency policy (2065 times), sustainable development (2040 times), etc.

The findings on the co-occurrence analysis identified five clusters that reflect the main research directions in investigating energy efficiency policy and country's green brand such as national brand, renewable energy, energy efficiency, green growth, and green economy (Fig. 4). Therefore, the most significant cluster is red (45 keywords) and associated with green growth, especially environmental regulations, economic and social effects, investments, and regional development. A smaller cluster is green (40 keywords). This cluster combines the article devoted to energy efficiency aspects and emissions control. The third cluster is blue (37 keywords) and relates to country brand. The articles of this cluster cover the investigations on country reputation, consumer behavior, green marketing, etc. The fourth cluster is mustard (17 keywords), covering climate change, environmental economics, sustainability, etc. The smallest cluster (15 keywords) combines the articles devoted to energy planning and policymaking.

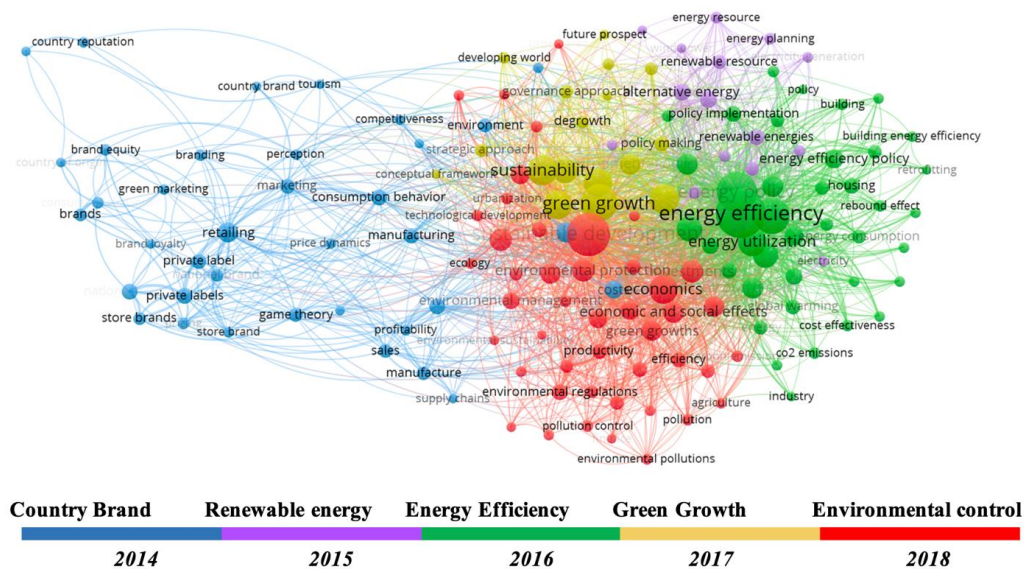


Fig. 4. The co-occurrence network map, 2000–2020
 Source: developed by the authors based on Scopus 2021

Rys. 4. Mapa sieci współwystępowania 2000–2020

The visualization of keyword occurrences show that scientists have been investigating the issues on country brand development since 2014. This research direction is followed by scientists' interests in studying renewable energy (from 2015), energy efficiency, especially energy efficiency policies (from 2016), green economic development (from 2017) and environmental regulation (from 2018).

Conclusion

This study presents a bibliometric analysis of 3090 publications to summarize the main research directions on energy efficiency policy and the country's green brand from 2000 to 2020. The study sample is formed using publications indexed by the Scopus database tools. The study investigates into the annual growth of publications, research contributions by countries and worldwide institutions, authors productivity, journal engagement, citations, keywords and co-occurrence analyses.

The obtained results show the snowballing growth of publication activity. Furthermore, there is progressing interest in researching environmental regulations and global perspectives in green

development. The findings show that China makes the most significant contribution to knowledge on energy efficiency issues in green growth, while the USA is in second place in this regard. The analysis of the most influential institutions showed that the Chinese Academy of Sciences and the University of Chinese Academy of Sciences were the leaders in exploring this theme of study.

Noteworthy is the fact that most influential authors were not affiliated with the Chinese institutions but the EU. The Latvian scientist Blumberga Dagnija (h-index – 24) is the most productive having published 11 papers. Next on this list are the Belgians Bertoldi Dagnija (h-index – 21) and Rosenow Jan (h-index – 15), and the Dutchman Eichhammer Wolfgang (h-index – 17), who published 10 co-author articles. The scientists mostly present their works in highly prestigious journals of the first quartile. Thus, the journal “Sustainability Switzerland” is the most influential in developing energy efficiency policy for green development research. Notably, six out of the ten most influential journals are from the UK. The findings showed the most cited authors were Batra R., Ramaswamy V., Alden D.L., Steenkamp J.-B.E.M., and Ramachander S. (2000), who published their article in the *Journal of Consumer Psychology* (665 citations).

The keywords analysis identified that “energy efficiency” is the most frequent in studies from 2000 to 2020. The highly recurring investigated terms were energy policy, energy efficiency policy, sustainable development, green growth, climate change, green economy, etc.

For detecting the main retrospective and future research directions, a bibliometric analysis on the co-occurrence keywords was applied. The findings showed five clusters indicating the research tendencies in energy efficiency policies for green growth. Therefore, the most significant dimension could be determined as environmental control. This is associated with green growth under environmental regulations, economic and social effects, investments, and regional development. The next most significant dimension is energy efficiency, which covers energy efficiency aspects and emissions control. After this comes the dimension of country brand, which denotes the studies on country reputation, consumer behavior and green marketing etc. The next most influential dimension is renewable energy, which covers climate change, environmental economics, sustainability, etc. The smallest dimension is determined as green growth, which involves studies devoted to energy planning and policymaking.

The obtained results showed that scientists were mostly interested in elaborating on the country’s brand formations from 2014. Therefore, future endeavors would lie in green economic development in environmental management, alternative energy promotion, reducing carbon emission, improving energy efficiency policy, and investigating consumption behavior, etc.

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Wpływ polityki efektywności energetycznej na zieloną markę Ukrainy: analiza bibliometryczna

Streszczenie

W artykule podsumowano argumenty i kontrargumenty w dyskusji naukowej na temat wpływu efektywnego energetycznie rozwoju na promocję narodowej zielonej marki. Podstawowym celem badania było dokonanie przeglądu polegającego na określeniu relacji między polityką związaną z efektywnością energetyczną a zieloną marką kraju w celu zidentyfikowania potencjalnych luk badawczych i naświetlenia perspektyw dla poszczególnych kierunków badawczych. Systematyzacja publikacji naukowych zebranych w bazie Scopus wykazała szybki wzrost aktywności publikacyjnej na temat efektywności energetycznej w latach 2000–2020. Wciąż jednak brakuje badań na temat kształtowania zielonej marki danego kraju w zależności od tej polityki. W związku z tym dokonano selekcji odpowiednich publikacji, aby określić przyszłe kierunki działań w zakresie zwiększania efektywności energetycznej dla wzmocnienia zielonej marki Ukrainy. Aby osiągnąć cele niniejszego artykułu, dokonano opisu kolejnych zrealizowanych kroków, wykonanych w następującej logicznej kolejności: określenie słów kluczowych dla odnalezienia odpowiednich publikacji; wyszukanie publikacji; przeprowadzanie analizy ewaluacyjnej według określonych metryk; zastosowanie analizy bibliometrycznej do badania słów kluczowych i ich współwystępowania. Analizę współwystępowania przeprowadzono za pomocą narzędzi programu VOS Viewer. Próba badawcza składała się z 3090 publikacji zindeksowanych w bazie Scopus opublikowanych w latach 2000–2020. W badaniu zidentyfikowano najbardziej produktywnych autorów, prestiżowe czasopisma naukowe oraz kraje i instytucje, których publikacji jest najwięcej w Bazie Scopus. Publikacje zostały pogrupowane w pięć grup tematycznych, które wskazują główne kierunki badawcze. Autorzy określili najbardziej pożądane kierunki przyszłych badań.

SŁOWA KLUCZOWE: zielona marka, zielony wzrost, polityka efektywności energetycznej, analiza bibliometryczna