

REGIONAL COOPERATION, ENERGY DIPLOMACY, AND GEOPOLITICAL DYNAMICS OF FOSSIL FUELS: BIBLIOMETRIC TRENDS IN ENERGY SECURITY

SIMON SUMANJOYO HUTAGALUNG

simon.sumanjoyo@fisip.unila.ac.id

Associate Professor at the Department of Public Administration and International Relations, Universitas Lampung (Indonesia). His research interests include energy security, diplomacy, disaster governance, and adaptive public governance. He has published on governance, resilience, and international political dynamics in peer-reviewed journals.

HASBI SIDIK

hasbi.sidik@fisip.unila.ac.id

A faculty member in the Department of International Relations, Universitas Lampung (Indonesia). His academic interests cover international political economy, energy politics, and regional cooperation, especially in relation to global energy transitions and emerging economies.

MOH. NIZAR

moh.nizar@fisip.unila.ac.id

Lecturer at the Department of International Relations, Universitas Lampung (Indonesia). His research focuses on geopolitics, international security, and foreign policy analysis, with particular attention to energy-related strategic issues and regional dynamics.

GITA KARISMA

gita.karisma@fisip.unila.ac.id

Lecturer affiliated with the Department of International Relations, Universitas Lampung (Indonesia). Her research interests include energy diplomacy, sustainability, and international cooperation, with an emphasis on policy-oriented and interdisciplinary approaches.

NIBRAS FADHILLAH

nibras.fadhillah@fisip.unila.ac.id

Junior researcher in International Relations at Universitas Lampung (Indonesia). His academic interests include energy security, global governance, and emerging issues in international diplomacy, particularly in developing and emerging economies.

Abstract

Emphasizing three main themes—regional frameworks for energy cooperation, the changing role of state and non-state actors in energy diplomacy, and the changing geopolitics of fossil fuels—this paper investigates bibliometric trends in energy research. The study underlines the need for regional energy cooperation, including market integration, cross-border electricity trade, and the acceptance of renewable energy technologies, as well as their relevance. While shaping global energy relations and politics, these systems are vital to improving energy security and sustainability. The paper also examines how non-state actors—businesses, international organizations, and civil society—are increasingly shaping energy diplomacy. Emphasizing the need for global cooperation and private-sector involvement in energy policy, the results point to a shift from state-centered governance to a more dispersed approach. The study also examines how global shifts in energy control affect resource availability, supply routes, and energy security, thereby addressing the evolving dynamics of fossil fuel geopolitics. Efforts to diversify energy sources and reduce dependence on fossil fuels are



reshaping long-term economic plans and international relations. The paper concludes that proactive steps in policy integration, innovation, and international cooperation are necessary to handle the complexity of worldwide energy transitions. Developing plans that promote a stable and sustainable global energy future depends on awareness of these changing trends.

Keywords

Energy Security, Diplomacy, Bibliometrics, Publication Trends, and Research Landscape.

Resumo

Com ênfase em três temas principais — os quadros regionais para a cooperação energética, a evolução do papel dos atores estatais e não estatais na diplomacia energética e a evolução da geopolítica dos combustíveis fósseis —, este artigo investiga as tendências bibliométricas na investigação sobre energia. O estudo sublinha a necessidade de cooperação energética regional, incluindo a integração de mercados, o comércio transfronteiriço de eletricidade e a aceitação de tecnologias de energia renovável, bem como a sua relevância. Ao moldarem as relações e a política energética globais, estes sistemas são vitais para melhorar a segurança e a sustentabilidade energéticas. O artigo examina também como os atores não estatais — empresas, organizações internacionais e sociedade civil — estão a moldar cada vez mais a diplomacia energética. Enfatizando a necessidade de cooperação global e do envolvimento do setor privado na política energética, os resultados apontam para uma mudança de uma governação centrada no Estado para uma abordagem mais dispersa. O estudo examina também como as mudanças globais no controlo energético afetam a disponibilidade de recursos, as rotas de abastecimento e a segurança energética, abordando assim a dinâmica em evolução da geopolítica dos combustíveis fósseis. Os esforços para diversificar as fontes de energia e reduzir a dependência dos combustíveis fósseis estão a remodelar os planos económicos de longo prazo e as relações internacionais. O artigo conclui que são necessárias medidas proativas em matéria de integração de políticas, inovação e cooperação internacional para lidar com a complexidade das transições energéticas a nível mundial. O desenvolvimento de planos que promovam um futuro energético global estável e sustentável depende da consciência destas tendências em mudança.

Palavras-chave

Segurança Energética, Diplomacia, Bibliometria, Tendências de Publicação e Panorama da Investigação.

How to cite this article

Hutagalung, Simon Sumanjoyo, Sidik, Hasbi, Nizar, Moh., Karisma, Gita & Fadhillah, Nibras (2026). Regional Cooperation, Energy Diplomacy, and Geopolitical Dynamics of Fossil Fuels: Bibliometric Trends in Energy Security. *Janus.net, e-journal of international relations*, VOL. 17, Nº. 1, May 2026, pp. 265-284. <https://doi.org/10.26619/1647-7251.17.1.14>

Article submitted on 3 July 2025 and accepted on 10 October 2025 .





REGIONAL COOPERATION, ENERGY DIPLOMACY, AND GEOPOLITICAL DYNAMICS OF FOSSIL FUELS: BIBLIOMETRIC TRENDS IN ENERGY SECURITY

SIMON SUMANJOYO HUTAGALUNG

HASBI SIDIK

MOH. NIZAR

GITA KARISMA

NIBRAS FADHILLAH

Introduction

Energy security is the capacity of a nation or region to sustain a constant, reasonably priced, dependable supply of energy sources, all of which are vital for social development and economic prosperity (Gitemen, Magaril, & Kozhevnikov, 2023). Three main components define energy security: they ensure that a country can meet its energy needs while promoting environmental protection and economic stability. First, it is imperative to ensure that readily available energy sources meet household needs. To maintain its social and economic growth, any country needs dependable and enough energy sources. Maintaining reasonable energy costs for people and businesses also depends critically on price stability. Stable energy costs help households and companies reduce their financial load, hence promoting economic development. Furthermore, sustainability is a major component of energy security, underscoring the need to use renewable and environmentally friendly energy sources to meet the needs of future generations (Gasser, 2020; Khan, Su, Khurshid, & Qin, 2023).

While these features provide a foundation for energy security, achieving them remains difficult, especially for emerging nations. Energy insecurity is exacerbated by the unequal distribution of energy resources, rapid industrialization, and the effects of climate change. Furthermore, the ongoing reliance on fossil fuels despite growing calls for a transition to



renewable energy highlights the gap between policy goals and actual practice. Achieving energy security requires implementing numerous interconnected plans. Diverse energy sources are a very important strategy, as they ensure a consistent supply and reduce dependence on a single source. Furthermore, improving energy efficiency is crucial because it reduces waste and makes better use of current resources. Another important component is strengthening the infrastructure supporting energy generation, storage, and delivery, to facilitate their effective application. Moreover, developing energy technologies can inspire creativity and bring fresh ideas to meet changing energy consumption. Last but not least, encouraging international cooperation is essential to supporting group efforts to address global energy issues and ensure an equitable distribution of resources for all (Burns, 2019).

Developing nations, however, face special difficulties in putting these ideas into practice. Restricted financial means restrict their capacity for technological and infrastructure investments. Further obstacles arise from their reliance on developed nations for technological expertise and transfer. These countries are also more vulnerable to global price swings, which could disrupt their economies. The key issue is how these countries can accelerate their shift toward energy security while advancing fair development. Customizing policies to local contexts, supporting innovation, and enhancing regional energy cooperation would help us achieve sustainable and fair energy development. Beyond its conventional role in addressing global issues such as climate change, economic inequality, and geopolitical tensions, diplomacy is essential for ensuring energy security. Within the field of energy security, diplomatic initiatives operate at several levels to address complex, interrelated problems. The restriction of domestic resources is one of the main difficulties. Many countries struggle to meet their growing energy needs; therefore, international collaboration is essential. Through diplomatic efforts, nations can secure access to vital energy resources. Although some resource-rich countries employ energy exports as a political instrument, global energy management is greatly different (Lazard & Youngs, 2021). This raises a crucial issue: How can global systems provide fair access to energy resources while reducing the risk of geopolitical conflict?

Beyond its conventional role in addressing global issues such as climate change, economic inequality, and geopolitical tensions, diplomacy is essential for ensuring energy security. Within the field of energy security, diplomatic initiatives operate at several levels to address complex, interrelated problems. The restriction of domestic resources is one of the main difficulties. Many countries struggle to meet their growing energy needs; therefore, international collaboration is essential. Through diplomatic efforts, nations can secure access to vital energy resources. Although some resource-rich countries employ energy exports as a political tool, global energy management is somewhat different (Griffiths, 2019). Reforming these systems is crucial to meeting the specific needs of emerging countries and promoting a more inclusive global energy system. Furthermore, essential to energy diplomacy is the shift to renewable energy. Although sustainability depends on this change, technology transfer and financing present major difficulties. Many current diplomatic projects overlook the need to ensure that poor nations have adequate access to financial support and renewable energy technologies. Energy diplomacy must change to encourage fair engagement so that every country can both benefit from and help shape the global energy transition (Prontera, 2020). Negotiating



these urgent issues will significantly shape a fairer, more stable, and sustainable global energy future.

Diplomacy in energy security and current research still have major gaps that compromise their effectiveness in addressing pressing issues. Addressing these gaps is therefore essential to provide more complete and lasting solutions. One main difference is the absence of regional energy cooperation systems. Although many energy security projects focus on global solutions, regional cooperation—especially in underdeveloped regions such as Southeast Asia, Africa, and Latin America—is sometimes overlooked. Through regional energy cooperation, nations can pool resources, share infrastructure, and negotiate energy agreements more effectively. A region-specific energy security plan, such as the ASEAN Energy Security Initiative, might call for group investments in energy infrastructure, linked energy networks, and cooperative renewable energy initiatives. This strategy would not only address local energy issues but also help participating nations in practice.

The second disparity concerns the scant involvement of non-state entities in energy diplomacy. Most current studies concentrate on state-led initiatives, therefore ignoring the growing impact of non-governmental organizations (NGOs), multinational companies, and local communities. By driving innovation and helping shape energy policies, these groups are vital. By bringing sophisticated energy solutions to underdeveloped countries, multinational companies can help to promote technology transfer. NGOs fight for fair access to energy to ensure that underprivileged groups are involved in the course change. Analyzing how these players operate as middlemen in energy diplomacy could pave the way for more equitable energy sector governance going forward.

The third gap is the too strong emphasis on the geopolitics of fossil fuels. While issues such as the political consequences of renewable energy and the importance of essential minerals in energy transitions are often overlooked, the present study focuses primarily on the political aspects of fossil fuels. The shift to renewable energy presents new challenges, especially regarding the geopolitics of vital minerals such as lithium and cobalt, which are essential for solar panel and battery technology. Evaluation of how renewable energy supply chains affect energy security depends on an awareness of these processes. Reducing reliance on limited mineral resources through recycling, technological innovation, and diversifying supply chains to lower risks is part of the suggested solutions. Addressing these challenges will enable energy diplomacy and research to better align with the changing terrain of energy security, thereby promoting more inclusive, resilient, and sustainable solutions for both rich and poor countries.

Diplomacy on energy security is changing greatly right now. Global events, including the development of renewable energy technologies and geopolitical changes, influence these developments. Recent studies (Proedrou, 2023) have highlighted the urgent need to address energy-related issues through more integrated and inclusive approaches across these transitions. Although studies on energy security have advanced greatly, the literature still shows major gaps that prevent the useful use of research results in policymaking. Although bibliometric studies have helped identify patterns in research, they often lack practical information for legislators. Monitoring publishing patterns or spotting prolific writers and institutions provides only partial insight into how research results may be used in sensible energy strategies. Furthermore, little study has been



done on how energy diplomacy may balance the sometimes competing interests of rich and poor countries.

In this study, energy diplomacy is understood as the set of diplomatic practices, negotiations, and policy instruments through which states and non-state actors seek to secure access to energy, manage transboundary energy relations, and shape global energy governance. Unlike traditional energy security, which primarily focuses on supply stability and affordability, energy diplomacy emphasizes political negotiation, institutional cooperation, and multi-actor engagement across national and regional boundaries (Prontera, 2020; Griffiths, 2019). This conceptual distinction is essential for bibliometric analysis, as it allows the mapping of how scholarly discourse has evolved from state-centric energy geopolitics toward more complex and inclusive governance arrangements.

This work offers pragmatic models to bridge the gap between policy execution and scholarly research. Using bibliometric analysis to pinpoint important knowledge hubs—including eminent academics, research institutes, and powerful research clusters—and encouraging focused interactions with legislators is one sensible way. Such alliances could help to co-create research-based policies that fit actual requirements. This approach aims to ensure that academic ideas are effectively incorporated into energy diplomacy projects, thereby supporting a fairer and more balanced approach to global energy security. Several bibliometric research questions are proposed in this work: (1) What are the developing patterns in research concerning regional energy cooperation frameworks? , (2.). Over time, how has scholarly study on the functions of state and non-state players in energy diplomacy changed? & (3). How do current research trends on the geopolitics of fossil fuels compare with those on the geopolitics of renewable energy?

Methodology

In scientific studies, bibliometric analysis is a method for examining trends and patterns in data from academic publications (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021). This approach can track the evolution of a scientific field, assess the influence of research, and pinpoint important research topics (Choudhri, Siddiqui, Khan, & Cohen, 2015). Starting with terms and phrases relevant to your study topic, then selecting a database, is the fundamental process for conducting bibliometric analysis using Scopus and VOSviewer. For a bibliometric study, Scopus is a great choice because it covers scientific papers across many fields. Depending on the publication year, publication type (such as books or journal articles), and institutional affiliation, researchers can narrow their search results. In this work, researchers searched the Scopus database for papers emphasizing energy security and diplomacy using a particular formula. Every element of the formula utilized is broken out in great detail below:

Using titles, abstracts, or keywords, this method identifies 82 English-language journal articles on energy security and diplomacy. The next level involves gathering data. Export the Scopus data in a VOS Viewer-compatible format (e.g., CSV), then clean and prepare it for analysis (Öztürk, Kocaman, & Kanbach, 2024). This process may require data reformatting, duplicate removal, and integration of data from multiple sources. In the next stage, we analyzed the data using the VOS viewer program. In the VOS viewer,



import the cleaned data. Among the several options the program offers for visualizing bibliometric data are timelines, cluster diagrams, and network maps. Examine the visualizations to find trends, patterns, and data correlations (Moral-Muñoz, Herrera-Viedma, Santisteban-Espejo, & Cobo, 2020).

Table 1. Formula for Searching for Publication Documents with Energy Security and Diplomacy Topics

Nº	Formula	Explanation
1.	TITLE-ABS-KEY ("energy security" and "diplomacy")	<ul style="list-style-type: none"> - TITLE-ABS-KEY: Search for keywords in the title, abstract and keywords of the article. - "energy security": Search for the keyword "energy security". - AND: Combining two keywords, so the article must contain them second those keywords. - "diplomacy": Search for the keyword "diplomacy".
2.	AND [LIMIT-TO (DOCTYPE,"ar")]	<ul style="list-style-type: none"> - AND: Limits search results to articles that match the conditions specified next. - LIMIT-TO: Limit document types. - DOCTYPE: Document type. - "With": Search for articles ("ar" means "article").
3.	AND [LIMIT-TO (LANGUAGE,"English")]	<ul style="list-style-type: none"> - AND: Limits search results to articles that match the conditions specified next. - LIMIT-TO: Restrict language. - LANGUAGE: "English": Search for articles in English
4.	AND [LIMIT-TO (SRCTYPE,"j")]	<ul style="list-style-type: none"> - AND: Limits search results to articles that match the conditions specified next. - LIMIT-TO: Limit the source of the article. - SRCTYPE: "j": Search for articles from journals ("j" means "journal")

Results

This Results section is structured to address the three research questions proposed in this study. Specifically, the analysis of publication trends and keyword clusters responds to Research Question 1 on regional energy cooperation frameworks; the author and institutional patterns address Research Question 2 concerning the evolving roles of state and non-state actors in energy diplomacy; and the thematic comparison between fossil fuel geopolitics and emerging renewable energy topics addresses Research Question 3. For librarians, legislators, and scholars, understanding annual publishing distribution is vital. Understanding research trends and identifying new areas of inquiry can help us to improve our decisions about policy, education, and research. The following is the annual publication count on energy security and diplomacy:

While major energy-related crises have historically contributed to increases in publication activity, the data show that 2019 had the highest number of publications, accounting for 14.6% of the total sample. This peak cannot be explained solely by the 2008 global energy crisis. Instead, it likely reflects a convergence of factors, including intensified debates on the post-Paris Agreement energy transition, rising geopolitical tensions



surrounding gas supply routes, and growing scholarly attention to China's Belt and Road Initiative in the energy sector.

Table 2. Distribution of Publications on Energy Security and Diplomacy Topics by Year

Years	Σ	%	Years	Σ	%
2024	6	7,3	2013	4	4,9
2023	4	4,9	2011	2	2,4
2022	2	2,4	2010	2	2,4
2021	3	3,7	2009	1	1,2
2020	6	7,3	2008	5	6,1
2019	12	14,6	2007	4	4,9
2018	4	4,9	2006	2	2,4
2017	5	6,1	2004	1	1,2
2016	6	7,3	2002	1	1,2
2015	7	8,5	1999	1	1,2
2014	4	4,9	Total	82	

These dynamics positioned 2019 as a critical moment for research on energy security and diplomacy. Furthermore, helping to explain growing publishing rates are current studies concentrated on energy security and diplomacy. As new renewable energy technologies develop, they could improve energy security and hasten the shift toward more ecologically friendly living. Moreover, financing for diplomacy and energy security could affect publishing patterns. Other elements could influence future bibliometric statistics in these domains. Studies on energy security and diplomacy may be affected by geopolitical events such as rising global tensions or the emergence of new powers. Publications on renewable energy and artificial intelligence could also rise in tandem with developments in these subjects. Moreover, diplomatic ties and energy security are greatly shaped by policies on climate change and energy trade. Examining the distribution of publications across authors helps researchers understand the terrain of their work. This study clarifies active researchers, networks of cooperation, and the results of different research projects. This identifying method is shown in the table below:

Table 3. Distribution of Publications on Energy Security and Diplomacy Topics by Author

No	Author	Σ	%
1	Pradhan, R.	4	2,90
2	Prontera, A.	3	2,17
3	Aalto, P.	2	1,45
4	Bahgat, G.	2	1,45
5	Jirásek, J.	2	1,45
6	Kavina, P.	2	1,45
7	Proedrou, F.	2	1,45
8	Sivek, M.	2	1,45
9	Zholdasbekova, A.	2	1,45
10	Abzhaparova, L.	1	0,72



This study highlights certain bibliometric patterns among authors of publications in the domains of diplomacy, security, and energy. The statistics show that some writers, including Pradhan and Prontera, have made more significant contributions than their colleagues, suggesting they are field leaders. Although some eminent writers are present, the statistics also show that many others contribute to the publication of works on this subject, thereby demonstrating the field's appeal to scholars from all backgrounds and organizations. Still, the statistics do not fully reflect the extent of author cooperation. The large number of publications by different authors underscores the indispensable need for collaborative study in this discipline.

Analyzing these writers' publishing patterns shows a consistent annual increase in the number of works reflecting growing research on energy, security, and diplomacy. Examining the research subjects closely reveals numerous important areas, including (a) climate change and energy security and (b) the part energy technology plays in guaranteeing energy security. Also noted as major players in energy security are non-governmental entities. Furthermore, this paper discusses the moral and ethical aspects of energy security, as well as the link between diplomacy and it. Reflecting a growing interest in energy, security, and diplomacy, as well as the development of several important study areas, the bibliometric data overall indicate that several authors are increasingly dominant in these fields. Using country-specific publication distribution analyses, researchers can better understand the global research landscape, patterns in international cooperation, national research strategies, resource allocation, and the overall influence of research in this domain. This study helps governments, scholars, and other interested parties make informed decisions about scientific inquiry. Completed identification is shown in the table below.

Table 4. Distribution of Publications on Energy Security and Diplomacy Topics by Country

No	COUNTRY	Σ	No	COUNTRY	Σ
1	United States	8	11	Finland	2
2	India	7	12	Germany	2
3	United Kingdom	7	13	Greece	2
4	China	6	14	Iran	2
5	Kazakhstan	5	15	Japan	2
6	Czech Republic	4	16	Qatar	2
7	Pakistan	4	17	Russian Federation	2
8	Turkey	4	18	Saudi Arabia	2
9	Australia	3	19	Singapore	2
10	Italy	3	20	Switzerland	2

The table above compiles the number of publications on diplomacy and energy security from many nations. According to the statistics, publications on energy security and diplomacy indicate that Western countries—including the United States, the United Kingdom, and Germany—hold a more prominent position than other nations. This implies that these countries might be leaders in policy and research. Furthermore, major contributors to this issue include developing and emerging economies such as India, China, and Kazakhstan. This trend shows growing participation of poor countries in research and policy on energy security and diplomacy. Although several countries dominate this field, the statistics also show that many other countries publish on this



topic in line with world interest in diplomacy research and energy security. Various factors affect the publication's dissemination on this issue worldwide. For countries dependent on imports, where maintaining diplomatic relations and energy supply becomes even more critical, energy security is extremely vital. This dependence could inspire more field-based research and publication activity.

Publication variations also depend much on research capacity; nations with strong research budgets and modern infrastructure usually generate more papers on diplomacy and energy security. Government initiatives supporting energy security, diplomatic research, and publishing will help boost the number of publications from many nations. Moreover, international cooperation in diplomatic research and energy security can increase the general quality of national publications. For researchers, librarians, legislators, and others curious in the research scene, measuring research impact, spotting trends, assessing research policies, and contrasting institutional performance, citation analysis grounded in published sources is a useful tool:

Table 5. Distribution of Publications on Energy Security and Diplomacy Topics by Source

No	SOURCE TITLE	Σ
1	Central Asia And The Caucasus	5
2	Energy Policy	5
3	Geopolitics Of Energy	3
4	Asia Europe Journal	2
5	Asia Pacific Review	2
6	India Quarterly	2
7	International Journal Of Energy Economics And Policy	2
8	Journal Of Contemporary China	2
9	Resources Policy	2
10	Romanian Journal Of European Affairs	2
11	Asian Perspective	1
12	Asian Studies Review	1
13	Australian Journal Of International Affairs	1
14	Balkan Social Science Review	1
15	Baltic Region	1
16	Canadian Foreign Policy Journal	1
17	China Perspectives	1
18	China Review	1
19	Chinese Journal Of Population Resources And Environment	1
20	Climate Policy	1

The table shows the number of papers on diplomacy and energy security published in different academic journals. With five apiece, Central Asia and the Caucasus have the most publications of all. Geopolitics of Energy has a moderate count of publications—three—while Asia Europe Journal and Asia Pacific Review have two. With two each, India Quarterly, International Journal of Energy Economics, Journal of Contemporary China, Resources Policy, and Romanian Journal of European Affairs show fewer publications; Asian Perspective and Asian Studies Review show one each. According to the data, regional and specialized journals such as Central Asia and the Caucasus, Energy Policy, and Geopolitics of Energy, publish most papers on energy security and diplomacy. This



suggests that researchers from particular areas and disciplines are especially interested in this issue.

Furthermore, the results reveal that many publications on energy security and diplomacy exist in general and multidisciplinary journals such as the *Asia-Europe Journal*, *Asia-Pacific Review*, and *India Quarterly*, stressing the relevance of this topic across several academic and policy spheres. Although some publications are the best venues for this kind of study, the data also show that many other publications contribute to the growing body of work in this field. This broad and varied attention from researchers worldwide is evident in their distribution. Academic publications feature issues of energy security and diplomacy, depending on several elements. Leading academics and more publications in these fields are attracted by prestigious research and policy magazines. Specialized or multidisciplinary publications, meanwhile, give professionals from many disciplines a forum to investigate linked problems. Furthermore, editorial policy influences which papers are approved and published, including research approaches and thematic focus. Furthermore, open-access publications expand readership and encourage more scholarly participation, and they are included in important academic databases.

Table 6. Journal Title Based Distribution of Publications on Energy Security and Diplomacy Topics

Authors	Title	Year	Source title	Cited by	Author Keywords
Hache E.	Do renewable energies improve energy security in the long run?	2018	International Economics	86	Critical materials; Energy security; Energy technology; Energy transition; Patents
Odgaard O.; Delman J.	China's energy security and its challenges towards 2035	2014	Energy Policy	72	China; Energy security of supply; Regional conflict potentials
Zhao S.	China's global search for energy security: Cooperation and competition in Asia-Pacific	2008	Journal of Contemporary China	68	
Holmes J.; Yoshihara T.	China's naval ambitions in the Indian Ocean	2008	Journal of Strategic Studies	57	China; Energy Security; Indian Ocean; Maritime Strategy; Soft Power
Lall M.	Indo-Myanmar relations in the era of pipeline diplomacy	2006	Contemporary Southeast Asia	48	Geopolitics of energy; India; India's new foreign policy; India's Northeast; Myanmar; Myanmar gas reserves; Pipeline diplomacy
Vatansever A.	Is Russia building too many pipelines? Explaining Russia's oil and gas export strategy	2017	Energy Policy	47	Energy security; Natural gas exports; Oil exports; Pipelines; Russian energy policy; Transit
Aalto P.; Korkmaz Temel D.	European energy security: Natural gas and the integration process	2014	Journal of Common Market Studies	47	
Bahgat G.	Pipeline diplomacy: The geopolitics of the Caspian Sea region	2002	International Studies Perspectives	45	Caspian Sea; Crude oil; Natural gas



Aalto P.	Energy market integration and regional institutions in east Asia	2014	Energy Policy	31	ASEAN; Energy; Institutions; Market; North east asia; South east asia
Gholz E.; Awan U.; Ron E.	Financial and energy security analysis of China's loan-for-oil deals	2017	Energy Research and Social Science	30	China; Diplomacy; Loan-for-oil deals; Oil finance
Stern J.	Natural gas security problems in Europe: The Russian–Ukrainian crisis of 2006	2006	Asia-Pacific Review	27	
Conker A.; Hussein H.	Hydraulic mission at home, hydraulic mission abroad? Examining Turkey's regional 'Pax-Aquarum' and its limits	2019	Sustainability (Switzerland)	26	Hydraulic mission; Middle East; Turkey; Water conflict; Water diplomacy
Cheng J.	A Chinese view of China's energy security	2008	Journal of Contemporary China	25	
Szulecki K.; Overland I.	Russian nuclear energy diplomacy and its implications for energy security in the context of the war in Ukraine	2023	Nature Energy	22	
Prontera A.	The new politics of energy security and the rise of the catalytic state in southern Europe	2018	Journal of Public Policy	19	catalytic state; energy diplomacy; energy security; European Union; gas market; regulatory state
Bird T; Hommel D	The trans-political nature of Southwest China's energy conduit, Yunnan Province	2016	Geopolitics	17	
Hancock L.; Wollersheim L.	Eu carbon diplomacy: Assessing hydrogen security and policy impact in australia and germany	2021	Energies	14	Australia; Carbon diplomacy; Energy policy; Energy security; EU; EU CBAM; Germany; Hydrogen; Regulation
Cheng J.Y.S.	China's relations with the gulf cooperation council states: Multilevel diplomacy in a divided Arab world	2016	China Review	14	
Zhiznin S.Z.; Timokhov V.M.	Economic and geopolitical aspects of the nord Stream 2 GAS pipeline	2019	Baltic Region	14	Energy security; Gas pipeline; Geopolitical and economic factors; Nord Stream 1; Nord Stream 2; NS 1; NS 2; Third energy package

Furthermore, the data show a significant upward trend in publications on energy security and diplomacy over the years. This implies that legislators and academics still find the field increasingly attractive. Although there are now more publications overall, yearly variations are clear. Changes in research interests, funding availability, and significant worldwide events that influence diplomacy and energy security help explain several



factors driving these developments. Driven by the ongoing global energy crisis, rising geopolitical tensions, and the rapid transition to renewable energy, publications are expected to increase significantly in 2023. Most publications from 2018 and 2019 indicate a pivotal period for research and policy debates on energy security and diplomacy. Furthermore, notable years such as 2014, 2016, and 2022 are critical, significantly increasing the overall volume of publications in this sector. Over the years, scholars have regularly investigated energy security and diplomacy, thereby highlighting the rich historical backdrop and ongoing growth of this topic.

Three particularly highly referenced books in energy security and diplomacy should also be mentioned: "Do renewable energies increase long-term energy security?" (2018) with 86 references, "Chinese energy security and 2035 problems" (Odgaard & Delman, 2014) cited 72 times, and "China's global energy security quest: Asia-Pacific cooperation and competition" by Zhao (2008) with 68 references. The chart highlights several strong keywords; "energy security" is the main theme and appears in most of the articles. Reflecting China's major influence on the world energy scene, many of these works concentrate on its energy security. Globally, political dynamics shape energy security. In bibliometric research, a major technique is the study of publication distribution based on keyword frequency. This method clarifies the study terrain inside a scientific field, tracks research trends, and points out common research themes. The following list shows the discovered subjects:

Table 7. Distribution of Keywords on Energy Security and Diplomacy Topics

No	Keyword	occ	total link strength	No	Keyword	occ	total link strength
1	Asia	5	25	13	Eurasia	5	25
2	central asia	5	15	14	european union	8	33
3	China	15	35	15	foreign policy	8	27
4	Diplomacy	8	20	16	Geopolitics	12	39
5	diplomatic relations	9	38	17	India	6	23
6	Energy	10	36	18	international relations	6	19
7	energy diplomacy	11	20	19	middle east	5	20
8	energy market	6	28	20	natural gas	8	32
9	energy planning	7	27	21	pipeline diplomacy	6	15
10	energy policy	14	53	22	russian federation	5	18
11	energy resource	8	32	23	strategic approach	5	22
12	energy security	37	88				

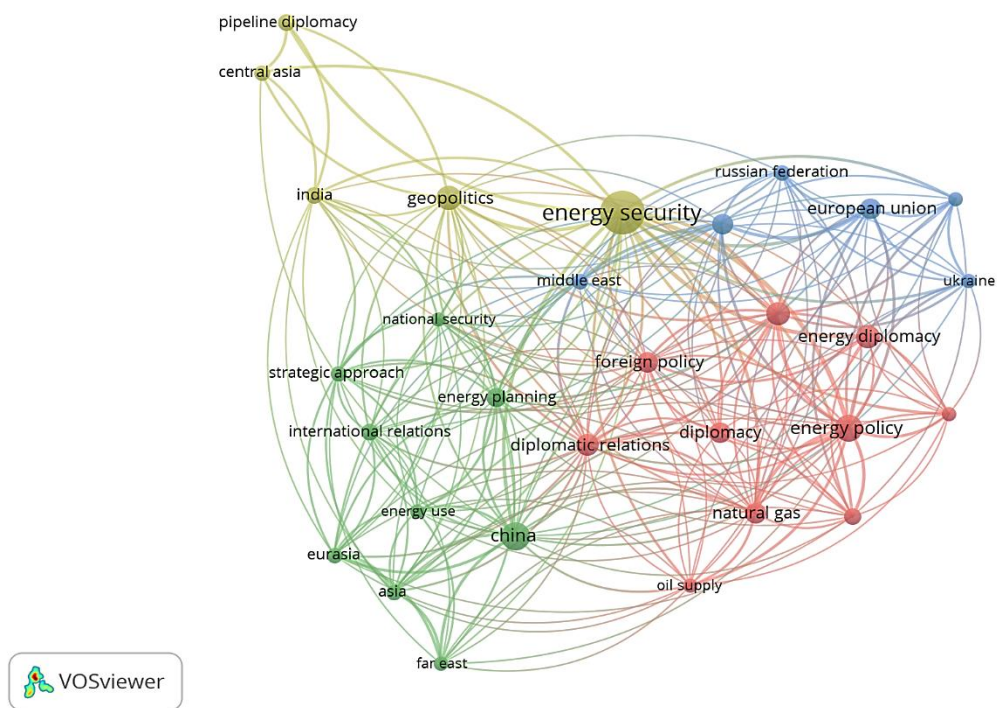
The term "energy security" is most often used and has the strongest network of links, underscoring its importance in the study of energy security and diplomacy. Reflecting its major influence in scholarly debate on these subjects, "China" also ranks highly in both frequency and strength of linkage. With strong link strength, the word "Geopolitics" underscores its indispensable relevance to the study of diplomacy and energy security. Energy security, China, and geopolitics interact to show that China's energy security is closely linked to global geopolitical trends. Studies in this field address energy markets, energy planning, energy diplomacy, pipeline diplomacy, foreign policy, the Russian Federation, the Middle East, India, the European Union, Eurasia, and Central Asia.



Energy security and diplomacy topic network visualizations

In bibliometric research, the study of publication distribution with network visualization serves numerous significant purposes. Network visualization facilitates the identification of important scientific field study subjects. Usually, when representing these subjects, large, densely connected nodes help researchers identify emerging research trends and grasp the primary areas of concentration in their field. Furthermore, network visualization helps clarify links across several research subjects. Thick and frequent lines—edges—connect closely related subjects so that scholars may investigate the links among several spheres of research and find multidisciplinary research prospects.

Figure 1. Publication on energy security and diplomacy network visualization



The bibliometric data network visualization above helps us identify patterns and gaps in the literature on diplomacy and energy security. Several important conclusions of the trend analysis are: (a) the dynamics of China's partnerships and their consequences for energy security receive much attention. A clear cluster in the middle of the graphic links the phrase "China" with several facets of energy security, including "energy policy," "energy diplomacy," and "energy security." This link indicates a critical area of research. (b) A noteworthy cluster at the top of the figure links the keyword "natural gas" to other subjects, including "energy markets," "geopolitics," and "energy policy," suggesting that natural gas is increasingly recognized as a major energy source and a central theme in energy security studies. (c) The clusters at the bottom of the figure link the term "energy infrastructure" with related subjects, including "pipelines," "investment," and "energy



security." This indicates that energy infrastructure, such as pipelines and power grids, plays a crucial role in energy security and is a main area of study. The image clearly shows the link between geopolitics and energy security: "geopolitics" is connected to several energy-related security issues, therefore underlining their relevance in this field. The visualization also reveals several smaller clusters that point to emerging research topics, including "energy transition," "sustainability," and "multi-stakeholder energy diplomacy." This indicates that fields of energy security and diplomacy are changing and combining important new themes. Furthermore, the visualization highlights gaps, suggesting that research on energy security is largely focused on particular domains.

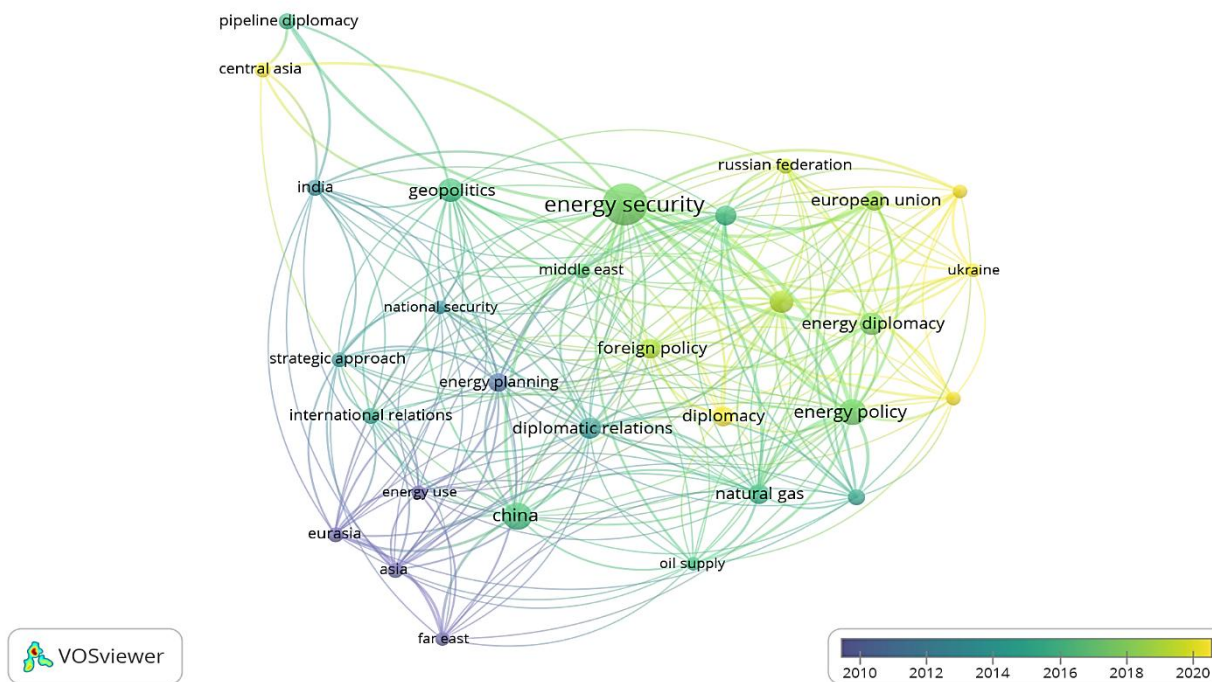
Visualization analysis with overlay overlays

In bibliometric research, one key strategy is to study publication distribution using overlay visualization. Based on elements such as publication year, author's country, journal, keywords, and institution, this approach uses visual tools to show patterns and links among scientific publications. In a scientific study, overlay analysis enables investigators to identify temporal trends. Through analysis of annual publication distribution, scientists can identify patterns in the popularity of various study domains, highlighting both increases and decreases.

Using bibliometric data visualizations of relevant publications, this paper investigates the evolution of the topics of energy security and diplomacy over time. a). Reflecting a growing interest among researchers and stakeholders in this field, the visualization shows a steady year-over-year increase in the number of publications on energy security and diplomacy. b). It also highlights a shift in emphasis over time from diplomacy to energy security. At first, conventional geopolitical and energy security concerns—especially regarding natural gas and oil—were of primary importance. Topics such as the energy transition, sustainability, and multi-stakeholder energy diplomacy have recently attracted significant attention. The evolution of the subject over time exposes the following: (a). 2010–2014 is the timeframe. At this time, conventional geopolitical and energy security concerns dominated attention. The image shows that topics such as energy geopolitics, energy security, and oil appear in lighter colors, suggesting they were published more frequently throughout this period. (b). Timescale: 2015–2019. This era brought increasing focus on sustainability and energy transition. Lighter colors indicate the growing presence of topics such as the energy transition, sustainability, and renewable energy in publications over this period. {c}. 2020–present is the current timeframe. Multi-party energy diplomacy and international cooperation have taken center stage. Based on their lighter hues, the picture shows that issues such as "multiparty energy diplomacy," "international cooperation," and "global energy governance" have been progressively highlighted in publications during this period.



Figure 2. Overlay Visualization of publications on diplomatic and energy security issues.



Over time, several elements can affect the evolution of issues and trends in publications on energy security and diplomacy. First, the shift toward renewable energy sources, rising energy demand in developing countries, and the consequences of climate change are driving major changes in the global energy landscape. This development underscores the need for sustainability, energy transition, and collective energy diplomacy. Second, the study's focus on energy security and diplomacy might be affected by geopolitical concerns, regional disputes, and global economic crises. Third, new research opportunities in this field are created by technological advances in the energy sector, including renewable energy and energy storage. Finally, an emphasis on sustainability and energy justice is resulting from expanding knowledge of the social and environmental effects of energy. Through an overlay visualization of bibliometric data, one can understand the trends and evolution of issues in publications on energy security and diplomacy over time. Influenced by changes in the global energy landscape, international political and economic developments, technological innovations, and shifting societal norms and values, this study shows a pattern of increasing publication numbers and a shift in topic focus.

Analysis of Density Visualization

In bibliometric research, the application of density visualization in publication distribution analysis serves various significant goals. This approach enables scientists to identify



policy," as emphasized here by the graphic. Topics such as "energy transition," "sustainability," "multi-party energy diplomacy," "Africa," "Latin America," and "South Asia" show lower density, indicating they are not discussed as extensively in this context. Bibliometric data visualizations offer insightful analysis of trends and the topic density in papers on diplomacy and energy security. This study highlights important issues, including China's energy security and relations, the significance of natural gas, and the need for energy infrastructure. Less often discussed are topics such as the energy transition, sustainability, and multi-stakeholder energy diplomacy. These topics should be the main focus of future studies to help us better grasp diplomatic difficulties and energy security.

Conclusion

This bibliometric analysis demonstrates three key findings. First, research on energy security and diplomacy has increasingly emphasized regional cooperation frameworks, highlighting the importance of institutional integration, cross-border infrastructure, and coordinated energy markets in enhancing resilience. Second, the literature reveals a gradual shift from state-centered energy governance toward more inclusive models that recognize the growing influence of non-state actors, including private firms, international organizations, and civil society. Third, while fossil fuel geopolitics remains a dominant theme, recent studies show a clear expansion toward renewable energy, energy transition, and sustainability-oriented diplomacy. By systematically linking publication trends, thematic clusters, and keyword dynamics, this study contributes to a clearer understanding of how energy diplomacy research has evolved over time. The findings provide not only a structured overview of the research landscape but also insights that can inform policymakers and scholars seeking to navigate the complex intersection of energy security, diplomacy, and global governance. Recent developments imply that reaching sustainability and energy security depends on these models. The results are especially significant, as they could influence international energy policies and prompt legislators to focus more on regional synergies to enhance the resilience of the global energy system. Notably, there is also a change in the roles of state and non-state actors in energy diplomacy. The results reveal a notable shift in the roles that both state and non-state players play in energy diplomacy. Though state actors remain essential, the growing participation of non-state actors—private energy firms, international organizations, and civil society groups—is reshaping energy governance. Indicating a shift toward a more inclusive and cooperative framework, multilateral cooperation and private-sector initiatives are increasingly significant in shaping energy diplomacy. Globally, this transition has significant consequences that might affect the balance of power in energy governance and encourage creative ideas by including several players. Furthermore, current studies investigate the geopolitical dynamics of fossil fuels. These factors are driving the global energy transition, demonstrating that although fossil fuels still play a major role, there is a clear trend toward diversifying energy sources and reducing reliance on them.



References

- Burns, M. G. (2019). *Managing energy security: An all-hazards approach to vital infrastructure*. Routledge. <https://doi.org/10.4324/9780429022831>
- Choudhri, A. F., Siddiqui, A., Khan, N. R., & Cohen, H. L. (2015). The work concentrated on bibliometric parameter analysis and interpretation. *Radiographics*, 35 (3), 736–746. <https://doi.org/10.1148/rq.2015140172>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). An overview and some instructions for doing a bibliometric analysis. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Gasser, P. (2020). Gasser studied energy security indices in 2020 in order to evaluate national performances. *Energy Policy*, 139, 111339. <https://doi.org/10.1016/j.enpol.2020.111339>
- Gitelman, L., Magaril, E., & Kozhevnikov, M. (2023). Energy security: Fresh dangers and remedies. *Energies*, 16 (6), 27. <https://doi.org/10.3390/en16062127>
- Griffiths, S. (2019). S. Griffiths (2019) investigated energy diplomacy under an era of energy transition. *Energy Strategy Reviews*, 26, 100386. <https://doi.org/10.1016/j.esr.2019.100386>
- Khan, K., Khurshid, A., & Cifuentes-Faura, J. (2024). Energy security analysis conducted in a geopolitically volatile environment: A causal investigation. *Resources Policy*, 83, 103673. <https://doi.org/10.1016/j.resourpol.2023.103673>
- Khurshid, A., Khan, K., Su, C. W., & Qin, M. (2020). Does security of energy help renewable energy? We look at this issue geopolitically. *Energy*, 282, 128824. <https://doi.org/10.1016/j.energy.2023.128824>
- Kut, P., & Pietrucha-Urbanik, K. (2023). Using two European countries as an example, a bibliometric study of renewable energy research reveals insights, difficulties, and future possibilities. *Energies*, 17 (1), 176. <https://doi.org/10.3390/en17010176>
- Lazard, O., & Youngs, R. (2021). The EU and climate security: Towards ecological diplomacy. *Carnegie Europe*, 12. <https://doi.org/10.47893/2021.CE.12>
- Lewiński, M., & Mohammed, D. (2019). Arguing for the delicate consensus in global multilateral diplomacy: The 2015 Paris Climate Conference. *Journal of Argumentation in Context*, 8*(1), 65–90. <https://doi.org/10.1075/jaic.8.1.04lew>
- Lis, A. (2023). Energy security within national security strategies: A multiple case study regional benchmark. *Analysis and Forecasts*, 19 (2), 75–85. <https://doi.org/10.2478/aaf-2023-0005>
- Monaghan, A. (2022). Energy security: Complementary limited role of NATO. *JSTER*. <https://doi.org/10.1080/09662839.2022.2030456>
- Moral-Muñoz, J. A., Santisteban-Espejo, A., Cobo, M. J., & Herrera-Viedma, E. (2020). Modern evaluation on software tools for bibliometric analysis in scientific fields. *El Profesional de La Información*, 29 (1). <https://doi.org/10.3145/epi.2020.ene.03>



Ostrowski, W. (2022). The crisis of European energy security over twenty years: US, Central and Eastern Europe. *Geopolitics*, 27 (3), 875–897. <https://doi.org/10.1080/14650045.2022.2030456>

Öztürk, O., Kocaman, R., & Kanbach, D. K. (2024). Design of bibliometric research: A framework proposal and a summary. *Examination of Managerial Science*, 1–29. <https://doi.org/10.1007/s11846-023-00567-9>

Pastukhova, M., Pepe, J. M., & Westphal, K. (2020). Beyond the Green Deal: Modernizing EU energy diplomacy for a new century. *SWP Comment*, 2020 (47). <https://doi.org/10.18449/2020C47>

Proedrou, F. (2023). Geopolitical explanation of the Eastern Mediterranean conundrum: Sovereignty, balance of power, and issues of energy security. *Cambridge Review of International Affairs*, 36 (5), 679–696. <https://doi.org/10.1080/09557571.2023.2181234>

Prontera, A. (2020). Beyond the status of regulations: Reevaluating European Union energy security policies and political framework. *Comparative European Politics*, 18 (3), 330–362. <https://doi.org/10.1057/s41295-020-00211-7>

Rabbi, M. F., Popp, J., Máté, D., & Kovács, S. (2022). The study centers on energy security and energy transition as strategies of reaching carbon neutrality. *Energies*, 15 (21), 8126. <https://doi.org/10.3390/en15218126>

Razavi, S. A. (2022). Examining and clarifying OPEC-based energy diplomacy: An approach or challenge for Iran's oil industry development. *Energy Strategy Reviews*, 39, 100761. <https://doi.org/10.1016/j.esr.2021.100761>

Sharifi, A., Simangan, D., & Kaneko, S. (2021). Three decades of climate change and peace research: A bibliometric study. *Sustainability Science*, 16, 1079–1095. <https://doi.org/10.1007/s11625-021-00922-3>