Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 20, No. 3, 2025

Research Hotspots and Trends of International Energy Cooperation at Home and Abroad Under the Background of The Belt and Road Initiative

Shuang Bai, Xiaoqing Yang

School of Economics and Management, Southwest Petroleum University, Chengdu, Sichuan, 610500, China

Abstract: In 2013, China put forward the "Belt and Road" Initiative. In order to explore the development status and trend of international energy cooperation research at home and abroad, this paper selects SCI, SSCI database of WOS and CNKI core database, takes international energy cooperation papers published from 2014 to 2024 as research objects, and analyzes the distribution and cooperation of authors, institutions and keywords in recent 10 years. This paper systematically summarizes the research themes and development trends of international energy cooperation at home and abroad through keyword clustering and emergence. It provides a more comprehensive perspective for China's follow-up research on international energy cooperation, helps China to conduct forward-looking research on international energy cooperation, improves China's response ability in international energy cooperation, and ensures the smooth development of China's international energy cooperation strategy.

Keywords: International energy cooperation; Belt and Road; Research hotspot; Citespac.

1. Introduction

In 2013, the Secretary - General proposed the "Belt and Road" to promote the establishment of the "Silk Road Economic Belt" and the "21st Century Maritime Silk Road" and the construction of a community with a shared future for mankind [1]. In 2015, "Vision and Action" stated that international energy cooperation should enhance infrastructure connections, ensure transportation security, promote power construction and upgrades, strengthen traditional energy cooperation, and form an integrated industry. In 2017, the first "Belt and Road" Summit Forum offered scientific guidance for energy cooperation and clarified measures. Then in 2018, the first Energy Ministers' Meeting proposed establishing a mutually - beneficial partnership and cooperation mechanism. In 2021, the green development concept of "Belts and Roads" emphasized energy cooperation transformation to green, focusing on carbon peak and neutrality. Finally, in 2023, the 3rd "Belt and Road" Summit Forum showed that the initiative is crucial for responding to international environments, and deepening green energy cooperation and strengthening cooperation mechanism construction are the key directions for future energy cooperation [2].

Over the past decade, the "Belt and Road" has achieved remarkable results with over 150 countries and 30+ international organizations participating. The "Silk Road Maritime" routes are widely accessible, benefiting relevant countries and facilitating economic globalization and global governance [2]. The "Vision and Action" proposes to strengthen green energy cooperation and improve cooperation mechanisms in the future. As it plays a key role in international energy cooperation, this paper uses Citespace to analyze relevant domestic and foreign research from 2014 - 2024 on authors, institutions and keywords, presents research status and trends, and offers reference for subsequent research [3].

2. Data Source and Research Method

2.1. Data Source

To acquire high - value international energy cooperation literature, this study selected common bibliographic and review databases. Chinese data used the China National Knowledge Infrastructure core database, and English data used SCI and SSCI in the Web of Science (WOS) core database. Finally, the collected data was screened and then used for subsequent analysis [5].

2.2. Research Methods

This paper analyzes CiteSpace 6.16 R3 information visualization software developed by Prof. Chen Chaomei. The software can explore intrinsic literature connections and reveal basic research, priorities, frontiers and trends in the current field through graph analysis[6]. Based on bibliographic measurement, this paper uses WOS and CNKI to generate maps via Citespace software. Then it conducts statistical and visual analysis of domestic and foreign international energy cooperation research literature from 2014 - 2024, presenting the knowledge panorama of current international energy cooperation research at home and abroad [7].

3. Visual Analysis

3.1. Annual Publication Trend Analysis

The attention a field receives often reflects its development potential. Higher attention generally results in more abundant research outcomes. The annual number of publications is an intuitive measure of this, clearly showing the research popularity and development trend. Fig. 1 presents the annual statistics of international energy cooperation between China and other countries from 2014 to 2024.

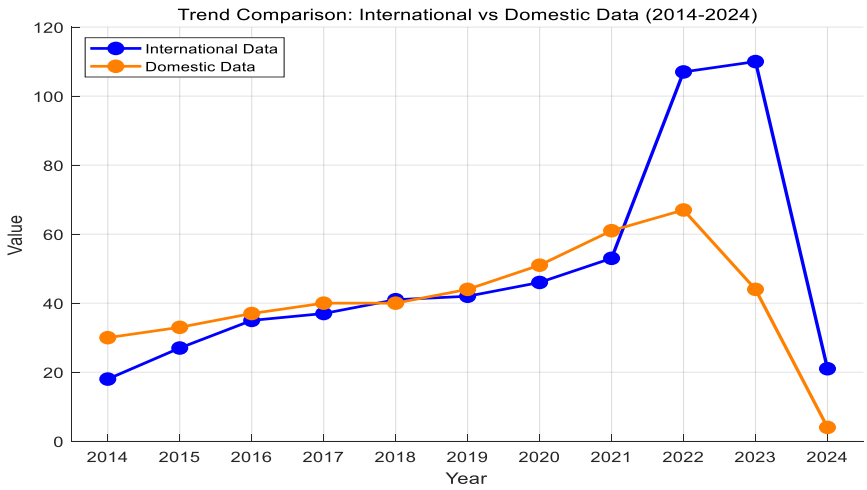

Figure 1. Annual publication of domestic and foreign international energy cooperation

As seen from Fig. 1, from 2014 to 2024, the number of foreign international energy cooperation documents increased, while the domestic market declined slightly first and then rebounded. Overall, both domestic and foreign markets are normally distributed, in line with discipline development characteristics, and the number of documents changes with attention.

Specifically, domestic research is divided into three stages while foreign research into two. In the first phase (2014 - 2016), influenced by China's 2013 "Belt and Road" initiative, it focused on international energy cooperation. As academic research was lagging, the number of publications started rising in 2014, peaked in 2015 and then declined, showing the first normal distribution. In the second domestic phase (2017 - 2021), the number of documents slightly rose and then dropped, with popularity waning. In the third phase (2022 - 2024), it recovered to 44. In the second foreign phase (2017 - 2024), the number of documents kept increasing, exceeding 100 in 2022, and attention grew.

In short, both domestic and foreign research on international energy cooperation has attracted scholars' attention, but it's more popular overseas. Domestic scholars are significantly influenced by national strategies and policies, and their research is cyclical with fewer results than foreign [8] scholars.

3.2. Analysis of Co-Occurrence of Research Authors' Cooperation Network

Using Citespace software's author co - occurrence visualization function, an author co - occurrence map can be obtained to show author cooperation. After importing data, domestic and international author co - occurrence maps of international energy cooperation from 2014 to 2024 are generated (Fig. 2, Fig. 3). Overall, in Fig. 2, domestic authors have Nodes = 270, Links = 95, and Destiny = 0.0026; in Fig 3, foreign authors have Nodes = 308, Links = 145, and Destiny = 0.0031. The number of foreign authors in scientific and technological ethics research is 1.14 times that of domestic ones, and the number of foreign authors in cooperative connections is 1.53 times that of domestic ones. However, the network density of domestic scholars is 1.19 times that of foreign scholars, indicating similar numbers of scholars, but foreign scholars have stronger cooperation and higher communication frequencies.

Figure 2. Domestic and international energy cooperation authors appear together

Two authors, Xu Qinhua and Yu Xiaozhong, have published over 10 articles at home and abroad and are closely followed by scholars like Zhu Yuezhong and Liu Jianguo. Some domestic scholars have formed six large research communities through collaborative research, covering most high - document - output scholars. Xu Qinhua and Xu Hongfeng's research groups analyze China and regional policies from China and global energy strategy perspectives and explore energy technology, network sharing and green development. Meanwhile, Yu Xiaozhong, Luo Xia and Liu Mengwei conduct in - depth research on international energy cooperation models, mechanisms and management from the

"Belt and [9] Road" background. Additionally, Liang Meng, Ren Chongyuan and Peng Yingying explore regional or international cooperation, like problems and strategies in Russia - Kyrgyzstan natural gas cooperation [10], and analyze the Middle - East oil and gas investment environment to support China's subsequent cooperation.

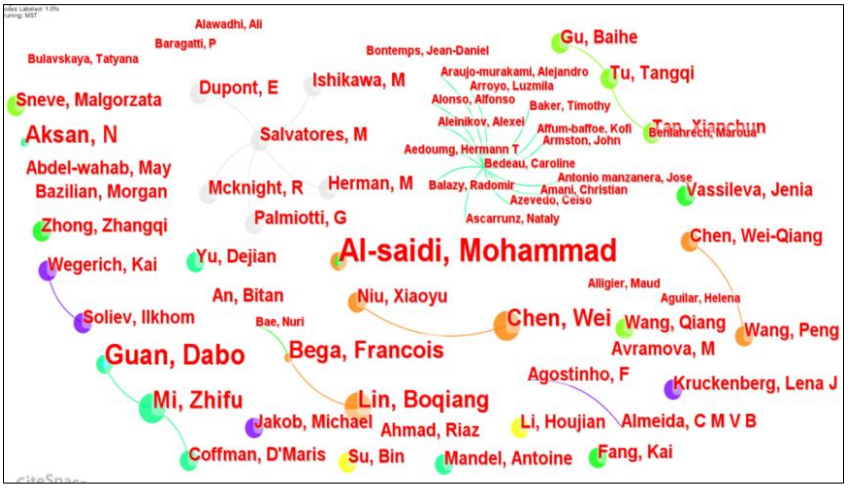

Figure 3. International energy cooperation foreign authors emerge

From Fig. 3, the number of publications by core foreign scholars and authors is mostly single - digit. Abroad, Al - saidi, Mohammad has the most publications. He pointed out that the Ukrainian war made Europe view the Middle East as a potential energy security source, and international energy cooperation should consider long - term mutually [11] beneficial strategies. Some scholars have formed 9 large research communities. The Bega and Francois community found that China's "Belt and Road" civil nuclear cooperation will impact the global nuclear energy pattern and enhance the strategic status of renewable energy [12]. Meanwhile, the Chen and Wei community built the "Belt and Road" energy trade network and explored its long - term evolution by integrating a flexible method [13] framework.

3.3. Co-occurrence analysis of research institutions cooperation network

Based on the author's co - occurrence, Citespace was used to visualize the research institution and obtain its co - occurrence knowledge graph (Fig. 4 and 5). This graph helps analyze international energy cooperation research progress from the research institution's frequency and cooperation. There are two sets of data: one has Nodes = 239, Links = 78, Destiny = 0.0027, and the other has Nodes = 332, Links = 230, Destiny = 0.0045. Additionally, foreign institutions cooperate more frequently and have higher cooperation in network density.

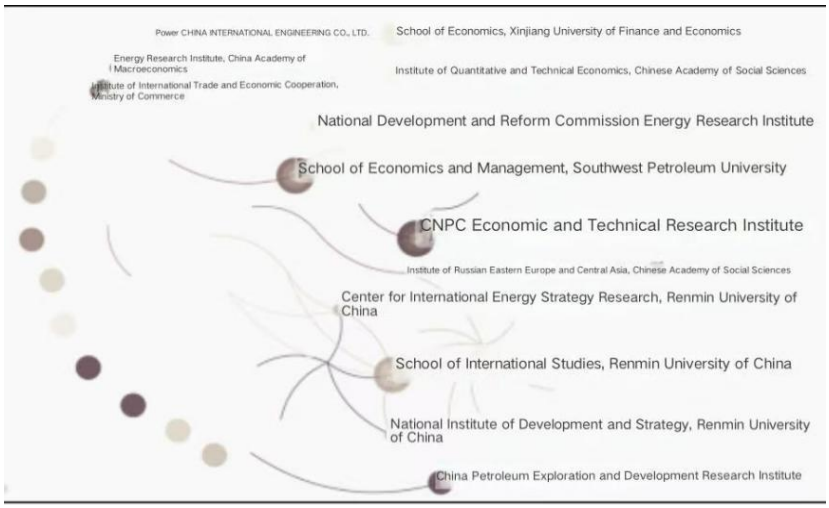

Figure 4. Domestic institutions of international energy cooperation emerged

Fig. 4 shows the top ten institutions in China, such as China Petroleum Group Institute of Economics and Technology and School of International Relations of Renmin University of China. Among the documents issued by these institutions, universities and research institutes are evenly split. This shows that domestic and international energy cooperation research is influenced by national development directions and strategies, and it must meet both academic research and national development needs.

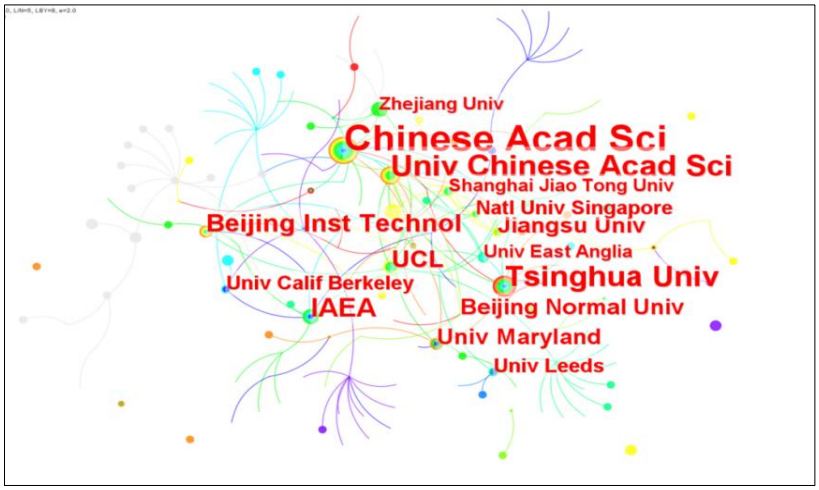

Figure 5. International energy cooperation foreign institutions emerged

From Fig. 5, the top ten institutions in international energy cooperation publishing include Chinese Acad Sci Univ, Chinese Acad Sci, Tsinghua Univ, etc. 12 of the top 20 research institutions are Chinese universities, indicating that China has contributed many research results in international energy cooperation research abroad. Moreover, the Fig shows that Chinese universities are important nodes in the network and play an important mediating role in research.

4. Analysis of Keyword Knowledge Graphs for International Energy Cooperation

Keywords can show scholars' research priority changes in a field over different periods. Citespace can extract keywords from literature to generate knowledge graphs and obtain research priorities and future enthusiasm via keyword clustering and highlighting.

4.1. Hot topics in Research on Domestic Keyword Co-Occurrence Map

According to the domestic keyword map, from 2014 - 2024, the keyword maps of domestic and international energy cooperation have Nodes = 266, Links = 301, Destiny = 0.0085. The top ten keywords include international cooperation, energy cooperation, energy security. As shown in Fig 6, international cooperation, energy cooperation, energy security and the Belt and Road have high centrality, and domestic research is based on them [15].

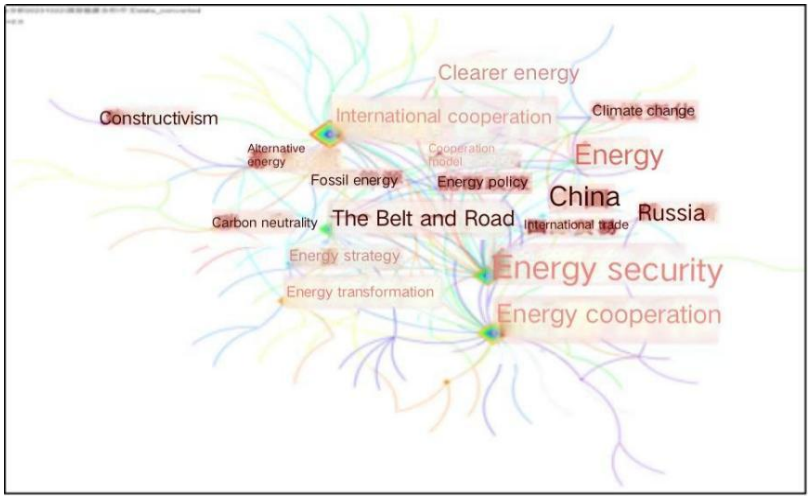

Figure 6. Co-occurrence of domestic keywords in international energy cooperation

Cluster analysis was conducted on domestic and international energy cooperation keywords from 2014 - 2024 (Fig. 6). With modularity Q = 0.70 and Weighted Mean Silhouette S = 0.949, as the Q value is much greater than the critical value 0.3 and the S value is greater than 0.5, it shows a good domestic keyword clustering effect and high result reliability. By researching clustering energy, the research hotspots of domestic and international energy cooperation can be clearly grasped.

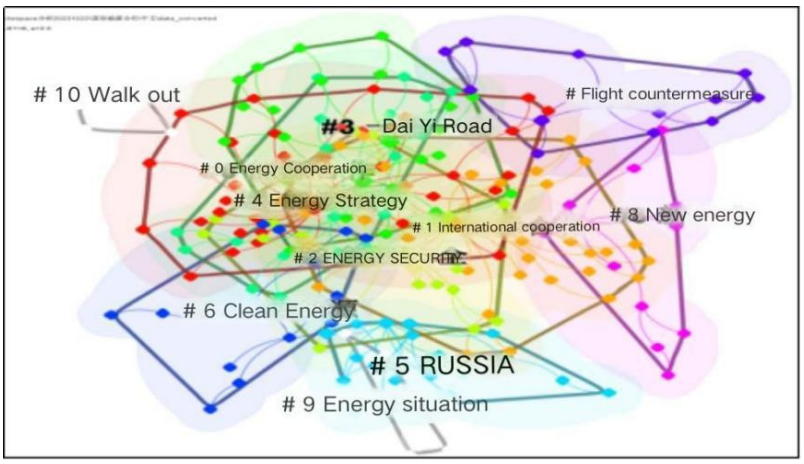

Figure 7. Clustering of domestic keywords for international energy cooperation

From Fig. 7, 11 cluster results such as energy cooperation, international cooperation, energy security, "Belt and Road" were obtained after clustering domestic keywords. After comparing keywords and cluster results, it was found that research topics in English and Chinese literature partly overlap but also differ. Table 1 shows keywords under each cluster after Chinese clustering. Subsequently, a specific analysis of international energy cooperation hotspots different from English literature will be carried out.

Table 1. Distribution of domestic research topics in international energy cooperation

Serial number	theme	Clustering	Keywords
1	International Energy Cooperation	Energy Cooperation, International Cooperation, Go Out	China and Russia, foreign investment, oil trade, BRICS countries, game of great powers, Arctic, international competition, Southeast Asia, low-carbon transformation, carbon emission reduction, cooperation model
2	Energy security and countermeasures	Energy Security, Energy Strategy, Energy Situation, Countermeasures	International relations, energy revolution, multilateral mechanisms, energy trade, energy policy, EU, the United States, energy independence, climate policy, energy strength, multilateral cooperation, mechanism construction, carbon neutrality, countermeasures
3	Renewable energy	Clean Energy and New Energy	Climate change, technological innovation, energy law, dual carbon, new model, institutional reform, ecological environment, low-carbon economy
4	The Belt and Road	"Belt and Road", Russia	New pattern, Asia-Pacific region, energy governance, policy trends, connectivity, geopolitics, natural gas, Central Asia, international oil prices, and energy channels

The first research topic: International energy cooperation

As the world's second - largest economy and the largest developing country, China's economic growth boosts energy demand, so international energy cooperation is necessary and stable cooperation is crucial for its development [16]. The "Belt and Road" countries have varying development levels and multi - field cooperation involves risks. Through a dynamic evolutionary game model and simulation analysis, Xiao Yutong found that international energy cooperation meets national development needs in resources, market and development, enables complementary advantages and aids global carbon neutrality [17]. Therefore, on the basis of existing cooperation, China should actively engage in global governance, strive for favorable development space in a complex environment and pursue its best interests.

The second research topic: strategy and countermeasures

Energy is crucial for national economic development. As China's economy grows, energy demand rises, the supply - demand contradiction is obvious, oil and gas dependence are high, and energy imports face threats due to the complex international situation. China's energy strategy has evolved from single - dependence to active imports and then matured after the "Belt and Road" initiative, achieving a transformation from single to multi - dimensional goals, promoting the energy revolution and strengthening services and governance [18]. From resource, cross - border channel and market perspectives, China should cooperate with resource - rich countries to ensure energy security, expand import channels, build gas pipeline networks, attract foreign investment with its large domestic market, and improve the energy system and emergency response capabilities [19]. Currently, China has closely cooperated with Middle East and Central Asian countries in oil and gas, deeply collaborated with Russia and in China - Africa in coal, oil, gas and electricity, and actively interacted with developed countries in new energy. The cooperation is multi - level, multi - target and involves complex interest games.

4.2. Analysis of Hot Spots on Foreign Keyword Co-Occurrence Map

According to the foreign keyword co - occurrence map, from 2014 to 2024, foreign international energy cooperation has Nodes = 197, Links = 467, and Destiny = 0.0242. The top ten keywords include renewable energy, energy, and carbon dioxide emission. Specifically, keywords like renewable energy, energy, and carbon dioxide emissions are highly centralized, showing that relevant research has focused on them. Moreover, from keywords such as financial development, international cooperation, and sustainable development, it's clear that international energy cooperation

aims to achieve national economic sustainable development. It aims to reduce carbon emissions while maintaining economic growth, improve energy efficiency through technology transfer and innovation for scientific governance, complement each other's advantages, seek common development, and achieve common prosperity [20].

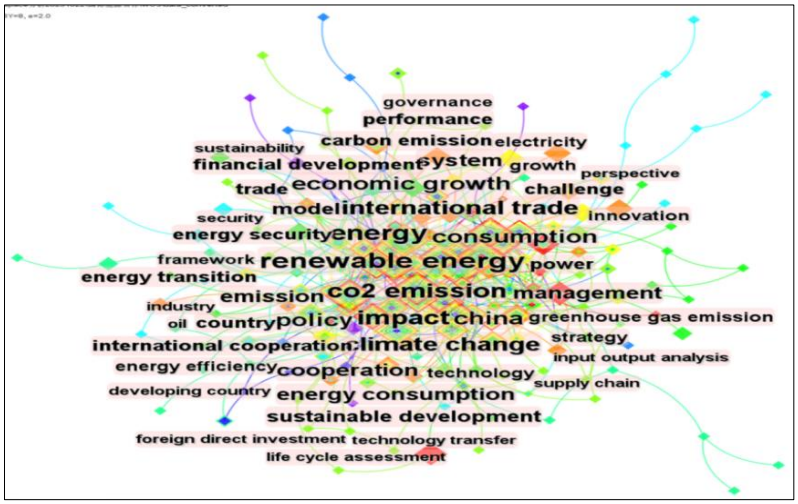

Figure 8. International energy cooperation foreign keywords emerge

Based on keyword co - occurrence, foreign international energy cooperation keywords from 2014 to 2024 were clustered (Fig. 9). After clustering, Modularity Q = 0.4773 and Weighted Mean Silhouette S = 0.81. As the Q value > 0.3 and the S value > 0.5, the clustering effect is good and the results are reliable. Analyzing the results helps to accurately grasp the overall research context and focus of domestic scientific and technological ethics.

Figure 9. International Energy Cooperation Foreign Keyword Clustering

Clustering foreign keywords yields eight clusters: renewable energy, climate change, financial development and so on. After result analysis, the current nine major clusters of international energy cooperation are divided into three hot - spot categories, as shown in Table 2.

Table 2. Distribution of topics for international energy cooperation abroad research

Serial number	theme	Clustering	Keywords
1	Renewable energy	Renewable energy, Wind energy	Energy transition, energy efficiency, greenhouse gas emissions, sustainable development goals, storage, innovation, technology transfer, water
2	Carbon emission reduction and climate change	Climate Change, Kyoto Protocol	Carbon dioxide emissions, clean development mechanisms, wind power, water resources, open innovation, trade, oil, productivity
3	Energy Trading and Economic Development	Financial Development, Energy Trading	Trade openness, economic growth, foreign direct investment, clean energy, electricity consumption, globalization, link prediction, correlations, pattern, complex network
4	"The Belt and Road"	Belt and Road Initiative, Diseases	Country, framework, transformation, investment, intensity, risk, market, ecosystem service, structural decomposition analysis, cge model, medicine, environment

The first research topic: Research related to renewable energy

Traditionally, coal, natural gas and oil are the main economic growth sources. The IEA's "2025 Global Energy Evaluation" report shows the 2024 global energy demand growth rate is above average. In 2023, fossil fuels accounted for 82% of global energy, with oil and coal each taking one - third and one - quarter of consumption, dominating the supply. However, over - reliance on traditional energy has led to many problems, such as environmentally, large - scale use of traditional energy, especially coal, has worsened global warming, triggered environmental problems, and threatened human survival and sustainable development.

The development of renewable energy is key to solving energy problems. Research shows that from 1991 - 2012, renewable energy consumption positively impacted 57% of the country's economic output [22] and is crucial for sustainable development. Due to deep technology accumulation in wind and solar energy, it reduced new - energy costs. So, renewable - energy - related cooperation is

a key area for future international energy cooperation.

The second research topic: Energy trading and economic development

International energy cooperation has complex interest distribution and conflicts. When conflicts occur, countries' governments and enterprises should strengthen communication based on common interests, adopt effective coordination mechanisms and standardized measures to avoid disputes [26]. Energy is crucial for economic growth. APEC countries contribute a large proportion of global real GDP, electricity demand, and world trade. Research shows that in 16 APEC countries, energy consumption and trade opening positively impact economic growth [21]. So, in the future, international energy transactions are closely related to economic growth. Countries should invest more in renewable energy and plan its development for sustainable energy transactions and rapid economic growth.

The third research topic: "The Belt and Road"

In the Belt and Road Initiative, energy cooperation is pioneering and crucial for national energy security. China and the countries along the route are highly interdependent in energy. As of 2023, these countries have rich energy reserves. Fossil - energy proven reserves in standard coal reach 825 billion tons, accounting for 55% of the world; remaining proven crude - oil reserves are about 150 billion tons, 58% of the world; remaining proven natural - gas reserves are about 180 trillion cubic meters, 75% of the world.

These energy resources are mainly in the Middle East - West Asia and Russia - Central Asia. China is passive in energy relations with all countries along the route but active with some (except Russia) [27]. Due to large geographical and cultural differences, energy cooperation needs vary. Cooperative development may cause environmental problems and challenge Chinese companies [28]. The "Belt and Road" is an important globalization strategy for China. Only through win - win cooperation and joint development can national energy security be ensured and new markets [29] opened up.

5. Research Conclusions and Prospects

5.1. Conclusion

Taking the literature on international energy cooperation under the background of the "Belt and Road" Initiative from the CNKI and WOS (SCI/SSCI) databases between 2014 and 2024 as the research object, this paper uses CiteSpace software to analyze the publication trend, author cooperation, institutional cooperation, and keyword characteristics. The core conclusions are as follows:

Publication Volume Trend: The number of domestic and foreign literature on international energy cooperation has generally shown an upward trend, but there are differences. The number of overseas literature has increased year by year, reaching 107 in 2022 and remaining at 110 in 2023, with stable attention. The annual number of domestic literature is no more than 50, showing periodic fluctuations driven by policies such as the "Belt and Road" Initiative (rising first and then falling from 2014 to 2016, fluctuating slightly from 2017 to 2021, and rebounding from 2022 to 2024). It is still a niche field in domestic universities, and the sustainability of research needs to be improved.

Author Cooperation Network: Foreign authors (308 nodes, 145 links, density 0.0031) have closer cooperation than domestic authors (270 nodes, 95 links, density 0.0026). The number of foreign authors and their cooperative connections are 1.14 times and 1.53 times that of domestic authors respectively, forming 9 large research communities (e.g., Al-Saidi and Mohammad focus on energy security in the Middle East, while Bega's team pays attention to the impact of the "Belt and Road" nuclear energy cooperation). Domestically, 6 research clusters have been formed, with Xu Qinhua and Yu Xiaozhong as core authors, and most studies focus on national strategies (such as "Belt and Road" cooperation models and regional energy policies).

Institutional Cooperation Characteristics: Foreign research institutions have a higher frequency of cooperation (332 nodes, 230 links, density 0.0045) than domestic ones (239 nodes, 78 links, density 0.0027). Among the top 20 domestic research institutions, 12 are universities (60%), and their research meets both academic and national strategic needs.

In terms of keywords: After further clustering, differences in research hotspots between home and abroad are more obvious. Domestic research focuses on energy strategy and security, energy cooperation, renewable energy, and the "Belt and Road" Initiative. Energy strategy and security involve national energy security at multiple levels. Energy cooperation research discusses innovative models. Renewable energy is a hotspot, emphasizing its integration into national strategies. "Belt and Road" - related research analyzes relevant factors of countries along the route to guide cooperation.

Foreign research focuses on new energy, climate change, economic growth, and the "Belt and Road". For new energy, investment and application promotion are carried out. Climate change research assesses its impact and industry responses for low - carbon transformation. It also explores the relationship between economic growth and energy for sustainable growth. In "Belt and Road" research, foreign scholars focus on China's role and advocate strengthening cooperation with China.

In summary, there are differences in international energy cooperation research priorities at home and abroad, reflecting countries' interests and development needs and offering broad space for bilateral exchanges. Mutual learning will promote more effective and sustainable global energy cooperation.

5.2. Outlook

With global economic development, China's energy demand has risen. To ensure energy security, China has carried out pan - regional energy cooperation. Based on the security assurance theory, this cooperation uses collective advantages and resource optimization to tackle external threats. Due to the imbalance in global resource allocation, regional cooperation enables countries to contribute as they can, share benefits, and create a stable environment. China's pan - regional energy cooperation helps countries use energy rationally, optimize allocation, and achieve win - win results. In the past decade, China has achieved fruitful results, such as building a regional energy cooperation platform, establishing oil and gas cooperation zones and power networks, and ensuring the smooth progress and security of cooperation. However, due to differences in needs, rules, mechanisms, and capabilities among countries, pan - regional energy cooperation will still face challenges in the future.

Energy supports economic development. The world faces an energy and environmental crisis, and new energy can replace traditional energy to ease shortages and environmental issues. China's energy endowment is "abundant coal, insufficient oil, and scarce gas". It imports a large amount of energy, but the unstable international

environment makes it difficult to obtain stable and low - cost energy. So, developing new energy is the main path.

Supported by the state, China's new energy industry has developed rapidly. Relying on technological innovation, a complete industrial system, a huge domestic market, and a green development strategy, China leads the world in new energy. As of 2023, its renewable energy power generation installed capacity accounted for 40% of the world's total, with new additions exceeding other energy sources; key components like wind turbines accounted for over 70% of the global market, and photovoltaic product output exceeded 80%.

In conclusion, future energy cooperation between countries and regions will be closer, focusing on new energy. China will face more challenges. This study analyzes the research results, hots pots, and trends of international energy cooperation under the "Belt and Road" framework in the past decade, which helps improve China's international energy cooperation level and promotes the healthy development of related research.

References

[1] Wei L,Guoqiang L, Qi Z,et al. Changes of the International Economic Structure and China's Strategic Choice in the next 15 years [J]. Management World, 2018, 34(12):1-12.

[2] National Development and Reform Commission, Ministry of Foreign Affairs, Ministry of Commerce. Vision and Action to Promote the Joint Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road [EB/OL]. (2015-03-28).

[3] Office of the Leading Group for Promoting the Construction of the Belt and Road. Unswervingly promote the vision and action of deepening and practical high-quality development of the Belt and Road——Prospects for the development of the joint construction of the Belt and Road in the next decade [EB/OL].(2023-11-24).

[4] Chen C, Morris S. Visualizing evolving networks: Minimum spanning trees versus Pathfinder networks [C]. IEEE Symposium on Information Visualization 2003 .

[5] Liang L, Ruifeng K, Hua W. Trends and Characteristics of Research on Public Health Emergencies—Analysis of Knowledge Graphs Based on CiteSpace [J]. Journal of University of Electronic Science and Technology of China, 2021,23(04):46-52.

[6] Chaomei C. CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature [J]. Journal of the American Society for Information Science and Technology, 2005, 57(3):359-377.

[7] Kleinberg J. Bursty and Hierarchical Structure in Streams [J]. Data mining and knowledge discovery, 2003, 7(4):373-397.

[8] Vakulchuk R, Overland I, et al. Renewable energy and geopolitics: A review [J]. Renewable & Sustainable Energy Reviews, 2020, 122.

[9] Yu Xiaozhong, Huang Qin. Research on the Integrated Innovation of International Energy Cooperation Models under the Belt and Road Initiative [J]. Research on Scientific Management, 2019, 37(05):162-166.

[10] Meng L, Jia L, Yingying P, et al. Natural gas cooperation and reflections between Russia and Kyrgyzstan [J]. International Petroleum Economy, 2022, 30(11):23-31.

[11] Mohammad A-S. White knight or partner of choice? The Ukraine war and the role of the Middle East in the energy security of Europe [J]. Energy Strategy Reviews, 2023, 49.

[12] Lin B, Bae N, Bega F. China's Belt & Road Initiative nuclear export: Implications for energy cooperation [J]. Energy Policy, 2020, 142.

[13] Wei C, Xiaoyu N, Wenqian K, et al. Investing the energy trade networks in the Belt and Road regions: Structures and evolution [J]. Energy, 2023, 283.

[14] Yue C, Chaomei C, Zeyuan L, et al. Methodological functions of CiteSpace knowledge graph [J]. Scientific Research, 2015, 33(02):242-253.

[15] Danlei Z. Discussion on the construction of the "Belt and Road" energy cooperation mechanism under the changes in global energy governance [J]. International Economic and Trade Exploration, 2023, 39(02):106-120.

[16] Xingkun Q, Chaoquan L, et al. Price stabilization and recovery of the industry in full recovery - Overview of the development of domestic and foreign oil and gas industry in 2017 and outlook for 2018 [J]. International Petroleum Economy, 2018, 26(01):32-38.

[17] Yutong X, Jun C. Evolutionary game analysis of international cooperation in green energy under the vision of global carbon neutrality [J]. Resources and Industry, 2023, 25(03):19-30.

[18] Qinhua X. China's global energy strategy: from energy strength to energy power [J]. People's Forum·Academic Frontiers, 2017, (05):62-68.

[19] Meng L, Qi Z, Yingying P. Path to build a natural gas security guarantee system in China under open conditions [J]. Natural Gas Industry, 2021, 41(11):161-169.

[20] Bega F, Lin B. China's belt & road initiative energy cooperation: International assessment of the power projects [J]. Energy, 2023, 270.

[21] Zafar M W, Shahbaz M, et al. From nonrenewable to renewable energy and its impact on economic growth: The role of research & development expenditures in Asia-Pacific Economic Cooperation countries [J]. Journal of Cleaner Production, 2019, 212:1166-1178.

[22] Bhattacharya M, Paramati S R, et al. The effect of renewable energy consumption on economic growth: Evidence from top 38 countries [J]. Applied Energy, 2016, 162:733-741.

[23] Shahbz M, RAaghutla C, et al. The effect of renewable energy consumption on economic growth: Evidence from the renewable energy country attractive index [J]. Energy, 2020, 207.

[24] Zhimin W. Current development status, international experience and path selection of China's carbon emission trading market [J]. Qiushi Journal, 2015, 42(05):64-71.

[25] Zhejiang University Of Technology H, China and etc. Does international cooperation affect CO2 emissions? Evidence from OECD countries [J]. Environmental science and pollution research international, 2020, 27(8):8548-8556.

[26] LIU P, HEI Z. Strategic analysis and framework design on international cooperation for energy transition: A perspective from China [J]. Energy Reports, 2022, 8:2601-2616.