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Evolution of high-quality economic development: A bibliometric analysis

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ABSTRACT

China's current development focuses on high-quality economic development (HQED), which aims to enhance the efficiency and quality of growth while simultaneously advancing social, economic, and environmental progress. This approach not only improves the quality of life but also increases national wealth. Despite its significance, HQED has not garnered much global attention. To address this gap, this study employs bibliometric methods and VOS viewer software to analyse the evolution and primary research hotspots of HQED. The findings reveal that the evolution of HQED research can be divided into two distinct periods: (i) from 2018 to 2020, when HQED was still in its infancy, and (ii) from 2021 to 2023, which saw a rapid increase in the number of HQED publications. China has emerged as the leading contributor to HQED research. The journal "Sustainability" serves as the main outlet, while the Chinese Academy of Sciences is the most active institution in HQED studies. Thematic clusters highlight a primary focus on research methods, environmental sustainability, innovation, financial development, and the digital economy. A distinct cluster also emphasizes China's overarching dedication to HQED. Consequently, future research should broaden HQED's scope to further explore green innovation, digital economies, and human capital.

1. Introduction

High-quality economic development (HQED) refers to the comprehensive development of both the economy and society through innovation, coordination, greenness, openness, and sharing. It encompasses various aspects, such as high-quality development concepts, high-quality development momentum, a high-quality economic structure, a supply and demand system, a high-quality social security support system, and

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high-quality comprehensive benefits (Ge & Wu, 2022; Xu et al., 2023). This is a relatively new concept (Li et al., 2021), which fundamentally focuses on improving development efficiency and quality to promote simultaneous progress in society, economy, and environment (Cao et al., 2022; W. Li et al., 2022).

China's current development strategy is centred on HQED (Fengze, 2022). Generally, a country that manages to achieve HQED has a more comprehensive infrastructure, stronger scientific and technological innovation capacity, more rational resource allocation, and a better sustainable ecological environment (Yang et al., 2021). Additionally, HQED is significant for achieving convergence in national income (Xie et al., 2024; Zhao et al., 2023). A country that chooses this path is believed to possess the capacity to fulfil the aspirations of its people for a better life and promote convergence (Jiang & Si, 2023; Pang et al., 2022). Therefore, it is contended that achieving HQED enhances the quality of life and increases a country's wealth and influence (Wang & Wang, 2022). Consequently, pursuing HQED is the only path for the future of economic development in China (Luo et al., 2023a; Zhang et al., 2024).

Recently, China has placed great importance on HQED. This stems from the fact that in 2017, the country announced that it had entered a crucial stage of HQED (W. Li et al., 2022; Sha, 2019). Through recent developments, many scholars have concluded this strategy has positively impacted all areas of development in China (Xu et al., 2023; Zhan et al., 2022). For instance, HQED promotes quality and efficiency, enhances people's well-being, and fosters the common prosperity of the country (Xie et al., 2024; Zhao et al., 2023).

However, despite the numerous benefits, HQED has not received much attention worldwide. Previous studies have examined the association, evaluation system, innovation-driven approach, economic coordination, green ecology, and sharing of people's livelihoods in relation to HQED (Duan et al., 2023; Zhang et al., 2024) . Although these studies are valuable, they do not provide a comprehensive examination of the system and fail to adequately address the research hotspots and future trends related to HQED.

Bibliometric analysis is a quantitative assessment of published articles, which include early access, conference proceedings, and other publications (Tan et al., 2023). Recently, bibliometric analysis has been utilised across various professional domains to understand the current state, characteristics, development, and future prospects of visual knowledge (Kamran et al., 2020). Although this particular analysis is widely used in economic development studies, it has not sufficiently addressed the dynamic evolution of HQED, a concept that integrates innovation, environmental sustainability, and inclusive growth beyond conventional economic indicators. In addition, previous research has primarily focused on isolated elements of HQED, such as green development, coordination, and innovation (Xu et al., 2023; Yuan & Li, 2021), without employing bibliometric techniques to analyse co-authorship structures or the thematic convergence through keyword co-occurrence.

Therefore, this study employs bibliometric analysis to investigate the evolution and research hotspots of HQED. The process involves analysing publication outputs and citation patterns across countries, institutions, co-authors, journals, and the co-occurrences of author keywords. To objectively trace HQED's intellectual trajectory, the evaluation uses bibliometric analysis, a method uniquely suited to visualising field performance through conceptual mapping. It is postulated that the performance of different fields in HQED can be intuitively observed using the approaches. This analysis not only deciphers historical evolution but also identifies emerging clusters (e.g., sustainable development) to redirect future inquiry. Ultimately, it aims to provide new insights and directions for future research.

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2. Data and method

2.1 Data

To compile a comprehensive corpus of professional and scientific materials, the Web of Science Core Collection (WOSCC) was utilised to comprehensively cover global research on HQED (van Nunen et al., 2018). The reason for selecting WOSCC as the data source is its status as the leading database for bibliometric analysis in the social sciences (Zupic & Cater, 2015). Today, WOSCC encompasses 100% of the top economics journals listed in the ABS Academic Journal Guide. In comparison, Scopus excludes 18% of these critical journals due to its less selective indexing (Mongeon & Paul-Hus, 2016). In short, the study selected WOSCC as the main database to collect relevant information to ensure high-quality, economics-focused publications.

The data was extracted from the WOSCC database on August 15, 2024, using the search string TS= ("high-quality economic development"). The exported records from WOSCC included comprehensive data, such as publication year, author, institution, and source journal. These records were saved as text files and accompanied by their respective references (Chen, 2006). A total of 736 publications were identified through searches of the title, abstract, keyword plus, and author keywords. During the screening phase, only the "English" option was selected from the "Language Type" menu. The study exclusively prefers works in English to ensure global comparability. Following this phase, the number of relevant publications was reduced to 734. Ultimately, all 734 publications underwent bibliometric analysis.

2.2 Method

The study selected VOS viewer software due to its superior visualisation clarity in analysing field performance (Van Eck & Waltman, 2010). VOS viewer's distance-based mapping and cluster density visualisation offer exceptional insight for comparing domain contributions, which is crucial for analysing 'field performance' in HQED research (Van Eck & Waltman, 2017). The software also reduces node overlap by employing the Lin Log and modularity normalisation algorithm, resulting in clearer cluster separation compared to Cite Space's force-directed layouts (Van Eck & Waltman, 2017). Furthermore, VOS viewer's association strength normalization compensates for term frequency bias, thereby reducing noise in author keyword networks (Van Eck & Waltman, 2010). Moreover, the software can process up to 10,000 documents, which is 40% faster than Cite Space (Perianes-Rodriguez et al., 2016). On top of that, selecting VOS viewer aligns with much of the prior analysis, as 78% of bibliometric economic research conducted between 2018 and 2023 used VOS viewer, while only 12% used Cite Space (Zupic & Cater, 2015).

In brief, VOS viewer is a beneficial visualisation tool designed by Van Eck and Waltman (2010). Its powerful graphic visualisation capabilities make it an excellent choice for processing massive amounts of data. Within the field of bibliometric analysis, it has been utilised extensively for the purpose of constructing networks of author keywords, authors, countries, journals, scientific articles, and institutions (Van Eck & Waltman, 2010).

Citation analysis is a method for assessing the impact and quality of scholarly works by examining the frequency of citations within them (Parthasarathy & Tomar, 2015). This method allows for the evaluation of both the quality and significance of the research, as well as the author's individual performance (Nightingale & Marshall, 2013). In sum, citation analysis plays an important role in evaluation processes and modern academic communication.

Apart from citation analysis, other examples of critical network analysis include co-citation, co-occurrence, bibliographic coupling, and co-authorship (Yan & Ding, 2012). A node represents an object (such as a country, institution, journal, author, or keyword), while links reflect co-citation or co-occurrence between these nodes (Chen et al., 2015).

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This study focuses on a comprehensive exploration of keyword co-occurrence analysis, a valuable bibliometric technique for evaluating research trends and knowledge structures across various fields (Duvvuru et al., 2012). This analysis typically involves creating networks where keywords serve as nodes, and their co-occurrences are represented as links (Ozek et al., 2023). Each colour in these networks reflects the unique characteristics of its respective small world, emphasising the use of both common and specific terms in research papers (Lozano et al., 2019). Prior research has demonstrated that keyword co-occurrence analysis is an effective method for evaluating the future direction of disciplinary reforms and for accurately reflecting the historical development of research areas (Narong & Hallinger, 2023; You et al., 2021).

3. Results and discussion

In total, the WOSCC database documented six types of publications in the field of HQED. Compared to others, articles had the highest number of publications, followed by early access, meeting abstracts, proceeding papers, retracted publications, and review articles.

3.1 Publication trends

The annual trend of publication activity and citations is conducive to exploring the development phase, knowledge accumulation, and maturity of HQED. As shown in Figure 1, the total number of publications from 2018 to 2020 was fewer than 100. However, after 2021, HQED publications exhibited a rapid upward trend, increasing from 62 publications in 2021 to 219 in 2022, before reaching 257 in 2023. The evolution of publications can be divided into two periods. The first period, from 2018 to 2020, saw few HQED-related publications, which grew slowly, indicating that HQED was in its infancy. The second period, from 2021 to 2023, was marked by a rapid rise in the annual volume of HQED publications. The limited number of publications in 2024 is possibly due to the focus on data from only the first eight months of that year rather than encompassing the entire year. Overall, the number of publications from 2018 to 2024 indicated that HQED has received increasing attention and that more research is being conducted. Furthermore, scholars' interest in exploring this topic is growing. This trend is apparent based on citation data, where there is an increasing number of scholars who are referencing papers related to HQED. This trend indirectly suggests that more scholars have started to recognise the importance of HQED and demonstrates that the influence of this topic is becoming more profound.

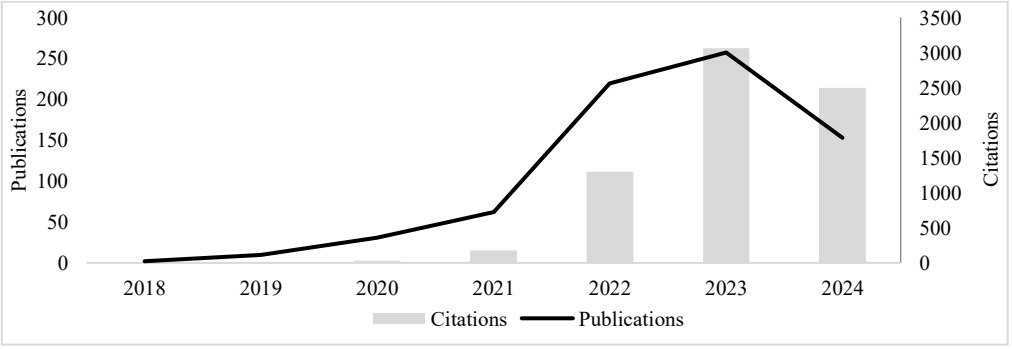


Figure 1. The annual publications and citations of HQED, 2018-2024

3.2 Research areas

Reviewing research areas for HQED can provide insights into the level of study on specific issues over time and highlight subjects that have received increasing attention (Hamidi & Ramavandi, 2020). As shown in Figure 2, HQED is an interdisciplinary research field encompassing sustainability science, economics,

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human geography, ocean dynamics, forestry, telecommunications, and climate change. In total, the literature related to WOSCC covered approximately 45 research areas.

The top 10 research areas included Environmental Sciences Ecology (393 articles), Science Technology Other Topics (262 articles), Business Economics (135 articles), and Engineering (53 articles), among others. Such extensive distribution of the research areas indicates that HQED has been highly prioritised in the scientific community.

In the field of environmental sciences ecology, previous studies have examined ways to promote HQED by reducing carbon emissions, innovating green technologies, and establishing ecological balance (Gao et al., 2023; Zhao et al., 2022). Environmental issues have received the most attention because of global warming events, a serious worldwide problem that requires immediate attention (Ghosh, 2024; Trivedi, 2021). Additionally, science and technology have garnered widespread attention from scholars due to the significant role these fields play in driving development. Similarly, digitalisation and the digital economy have also led to tremendous changes in national progress (Ito, 2022; C. Luo et al., 2023a).

The number of publications in the categories of Environmental Sciences Ecology, Science Technology Other Topics, and Business Economics increased significantly after 2020. In contrast, the number of publications in Energy Fuels, Engineering, and Public Environmental Occupational increased gradually. In summary, HQED research has become more interdisciplinary over time.

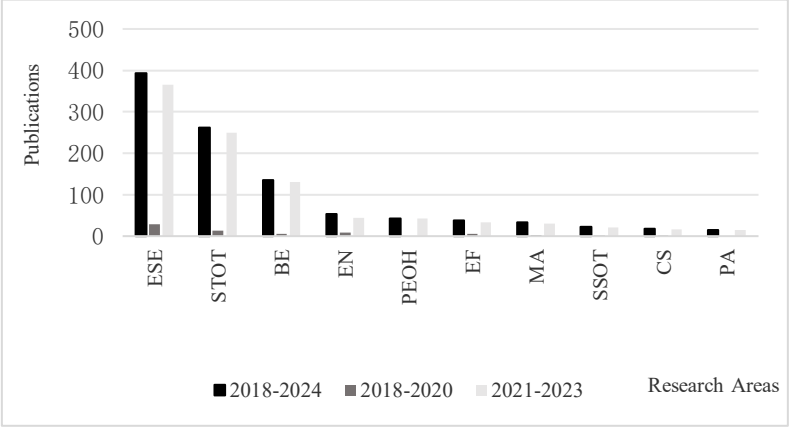


Figure 2. Top 10 research areas based on publications, 2018-2024

Notes：ESE - Environmental Sciences Ecology, STOT - Science Technology Other Topics, BE - Business Economics, EN – Engineering, PEQH - Public Environmental Occupational Health, EF - Energy Fuels, MA – Mathematics, SSOT - Social Sciences Other Topics, CT - Computer Science, PA - Public Administration.

3.3 Top published and cited countries

Table 1 provides a distribution of publications and citations by country in HQED research. China dominated the field with 727 publications, vastly exceeding the output of all other nations combined. The United States ranked a distant second with 12 publications, followed by Pakistan with 9. China was the primary contributor to this research field, and it was able to maintain a high publication rate because it is the only country that prioritised HQED as a national strategic objective (Duan et al., 2023; Zhang et al., 2024)单击或点击此处输入文字。. China's strategic prioritisation of HQED has driven concentrated funding, policy incentives, and interdisciplinary applications across environmental, economic, and social domains. The minimal contributions from other major research economies (e.g., the USA and Pakistan)

suggest that HQED remains a niche or emerging focus outside China. The USA's limited output (12 publications) was particularly striking given its traditional leadership in sustainability and development research. These results could be attributed to differences in national policy priorities or the absence of a dedicated HQED strategy in the country. Pakistan's position as the third-largest contributor (9 publications) highlights potential regional leadership in the Global South, though its absolute output remains modest.

Generally, the overall number of citations for a country serves as an important indicator of its scientific significance, especially in HQED research. China, Pakistan, the USA, England, and Germany all made significant contributions to the overall results. Among these countries, China has the highest number of citations due to its larger volume of research on this topic. As more scholars focus on this area, the number of citations continues to increase (Stremersch et al., 2007). To surmise, a high citation count indicates that this topic is gaining popularity.

As shown in Table 1, fewer publications and citations related to HQED research were produced in other countries, indicating their unfamiliarity with the topic. It is evident that there is insufficient cooperation among countries, highlighting the need for enhanced collaboration.

While China's dominance reflects state-driven research mobilisation, the limited engagement from other countries presents both a research gap and an opportunity for cross-border knowledge transfer. As such, future HQED growth may depend on integrating China's policy-driven model with localised frameworks elsewhere.

Table 1. Top 10 countries, 2018-2024

Rank	Countries	2018-2024 publications	Citations	Subperiods	
				2018-2020 publications	2021-2023 publications
1	China	727	7036	43	6993
2	USA	12	45	0	45
3	Pakistan	9	38	0	38
4	Australia	8	38	0	38
5	England	8	65	0	65
6	South Korea	8	60	0	60
7	Malaysia	7	24	0	24
8	Taiwan	5	15	1	14
9	Ukraine	5	6	0	6
10	Jordan	4	0	0	0

3.4 Institutions

The number of papers published by an institution reflects the academic influence of its research outcomes (Borokhovich et al., 1995). The top 10 institutions for publications in the HQED field are listed in Table 2. The institutions that made significant contributions to the topic of interest include the Chinese Academy of Sciences, Ocean University of China, Xiamen University, China University of Mining Technology, and China University of Geosciences. All of the top 10 institutions are based in China, highlighting the country's outstanding research achievements in HQED. Among these, the Chinese Academy of Sciences placed a greater emphasis on research in HQED and has the highest number of publications.

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Table 2. Top 10 institutions based on publications

Rank	Institution	Publications	Rank	Institution	Publications
1	Chinese Academy of Sciences	25	6	Anhui University of Finance Economics	16
2	Ocean University of China	19	7	Shanghai University of Finance Economics	15
3	Xiamen University	16	8	Wuhan University	14
4	China University of Mining Technology	16	9	Jiangxi University of Finance Economics	13
5	China University of Geosciences	16	10	Hohai University	13

3.5 Co-author

The citation network of authors illustrates the relatedness among researchers in the field (Zhang et al., 2019). High-frequency authors and collaboration among them are key forces in the research landscape. In the co-author analysis presented in Figure 3, each dot represents an author, with larger dots indicating more citations (Guo et al., 2021). Figure 3. Mapping of citation on authors in HQED research, showed that there were 21 authors who received three or more HQED citations. Most clusters exhibited some correlation with one another. Of all the citations, 344 were from single-authored publications, while the remaining 1,273 were from multi-authored publications.

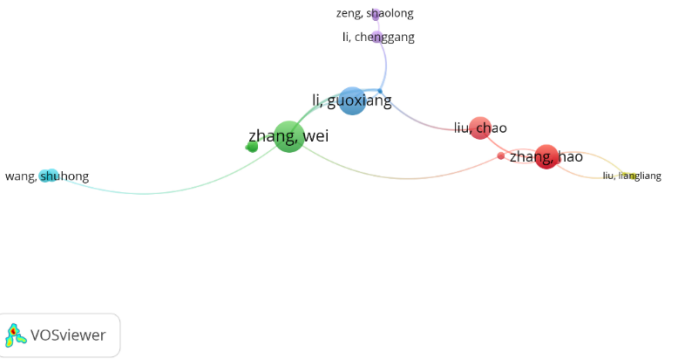


Figure 3. Mapping of citation on authors in HQED research
Notes: minimum citation is three.

3.6 Journals

Figure 4 shows the most prolific journals that published HQED-related articles. Among them, "Sustainability" published the most papers, followed by "Environmental Science and Pollution Research." These journals shared a common goal, which is to contribute to green initiatives and promote sustainable development. This indicates that they represent the frontiers and key aspects of HQED research to a certain extent. In addition, it can be presumed that these journals, due to their high number of publications related to HQED, had the greatest impact on the fields of environment and sustainable development. The "International Journal of Environmental Research and Public Health" and "Environment, Development and Sustainability" were core journals that primarily reported on sustainable and environmental development, while the "Journal of the Knowledge Economy" and "Applied Economics" focused on economic

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development. Clearly, research on HQED emphasizes sustainable development, environmental protection, and economic development.

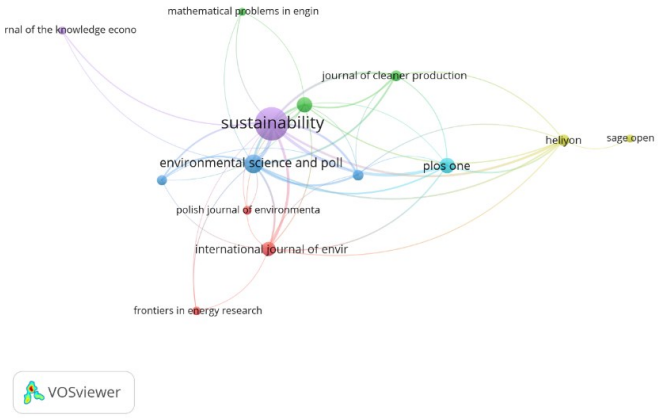


Figure 4. The performance of the top 10 most productive journals

3.7 Keyword co-occurrence network analysis

Keywords can reveal the primary content of literature research. By examining keywords, the study can gain a deeper understanding of the main themes and trending topics within the research domain. The aim of this assessment was to utilise keyword co-occurrence analysis to provide a comprehensive overview of the HQED research field. A total of 1,855 keywords were identified in the 734 publications collected. This study emphasised that any keyword appearing at least five times should be considered significant. Based on this criterion, a list of 70 keywords that represent the most frequently discussed topics in the field of HQED was compiled. In terms of the illustration, the larger the circle, the higher the frequency of the keyword.

As shown in Figure 5, there were eight clusters in the co-occurrence network visualisation maps, each closely linked to HQED. Cluster 1 (red) was the largest group. In this cluster, the largest node was the Spatial Durbin Model, which connected 12 keywords, including green total factor productivity, mediating effect, HQED, driving factors, regional differences, convergence, social network analysis, and the Dagum Gini coefficient. This cluster focuses primarily on the research methods used in HQED studies. Most scholars studying HQED employ the Spatial Durbin Model, and a significant number of the variables explored in their articles involve mediating effects (Du et al., 2022; Wang & Wang, 2022). The centrality of the Spatial Durbin Model highlights that spatial interdependence is a foundational analytical lens in HQED research. Furthermore, the research scope was found to not be limited to large subjects; the direction has evolved toward exploring regional differences, suggesting that distinct convergences may occur in various regions (Liu et al., 2022; Wang et al., 2023). Researchers prioritise understanding how policies or innovations in one region affect the neighbouring areas (e.g., pollution transfer, economic convergence). Regional differences, convergence, and the Dagum Gini coefficient reinforce this focus on geographical inequality and cross-regional linkages. From Cluster 1, it was observed that researchers have employed a wide range of complex methods to analyse HQED, including social network analysis, mediating effects, and the Dagum Gini coefficient, among others. This evidence indicates that HQED research requires multi-method approaches to understand systemic complexity, moving beyond simple econometrics.

Cluster 2 (green) contained the most prominent nodes, with the term HQED appearing 56 times. This cluster was primarily related to HQED, green finance, coupling coordination, the Yangtze River Economic Belt, influencing factors, coupling coordination degree, urbanisation, spatial effects, intermediary effects,

and carbon emission efficiency. Cluster 2 shared some similarities with Cluster 1, as researchers were also determined to have utilised intermediary effects in their studies. The coupling coordination suggests that HQED research emphasises the synergistic relationships between subsystems, particularly between the economy and the environment. This evidence indicates that HQED is not an isolated sector but should be viewed as an integrated system that requires coordination. Additionally, more green elements have been introduced in Cluster 2, such as green finance and carbon emissions. Green finance promotes HQED, and carbon emission reduction has emerged as an important transmission mechanism, highlighting the close relationship between HQED and green development (Liu & Li, 2024). Green finance, as a policy tool, facilitates the low-carbon transformation of industries through financial instruments like green loans and carbon trading, serving as a crucial bridge between concept and implementation for HQED. This evidence suggests that HQED's development focus is increasingly aligned with sustainable growth that fosters ecological conservation.

Cluster 3 (dark blue) was very similar to Cluster 2 since it is primarily related to carbon emissions, economic growth, environmental pollution, heterogeneity, enterprise innovation, green credit, green development, carbon neutrality, mediation effects, and fiscal decentralisation. Green elements remained closely linked to the environment. The triad of carbon emissions, economic growth, and environmental pollution formed the backbone of the cluster. This evidence clearly frames HQED as a development strategy that balances development imperatives with ecological constraints. Meanwhile, fiscal decentralisation and heterogeneity revealed that HQED's success depends on localized governance. This implies that HQED is not a singular theory but rather a governance challenge. Enterprise innovation and green credit highlight the recognition that macro-finance alone is insufficient; micro-finance tools are essential to stimulate enterprise innovation. Cluster 3 employed mediation effects on the analysed elements. To maximise the utilisation of green elements, researchers have implemented various measures, including reducing carbon emissions, increasing carbon neutrality, promoting the use of green credits, imposing financing constraints on energy-saving and environmentally friendly enterprises, and encouraging the development and adoption of green technology innovations (Zhang et al., 2022).

Cluster 4 (yellow) was primarily associated with the acts of upgrading industrial structure, sustainable development, economic growth, innovation, spatial spill over, financial development, the PVAR model, artificial intelligence (AI), foreign direct investment, and economic resilience. Upgrading industrial structure anchors the cluster, signalling that HQED is fundamentally driven by economic restructuring. Additionally, both innovation and AI act as enablers of industrial upgrading, linking technological advancement to sustainable growth. This cluster emphasises innovation and financial development, which are widely recognised as key drivers of economic, sustainable, and social progress. The rapid advancement of AI has significantly improved work efficiency and replaced manual labour across various industries(Yadav et al., 2022). As developments continue, AI is anticipated to revolutionise scientific discovery, decision-making processes, and technological innovation, thereby establishing a robust foundation for HQED (Amanov & Pradeep, 2023). The PVAR model suggests that HQED requires a multi-period, cross-jurisdictional policy design that extends beyond static or localised approaches.

Cluster 5 (purple) was primarily related to the digital economy, environmental regulation, technological innovation, green technology innovation, regional heterogeneity, difference-in-difference analysis, energy efficiency, environmental information disclosure, and industrial structure. This cluster combines the contents of clusters 2, 3, and 4 by incorporating both green and innovative digital elements. This evidence indicates that green practices, environmental protection, digital development, and innovation are essential in HQED. In a similar sense, regional heterogeneity and differences were also significant, as reflected in clusters 5 and 3. These regional differences ultimately contributed to the convergence observed in cluster 1.

Cluster 6 (blue) included nine words, such as green innovation, financing constraints, digital finance, moderating effect, heterogeneity analysis, and digital transformation. This cluster provides a comprehensive study of clusters 2, 3, and 5. It is argued that digital finance and digital transformation can

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promote green innovation (Yu, 2023). For example, by lowering financing constraints and increasing R&D expenditures, digital finance can encourage the development of green innovation in polluting industries, with this effect being amplified by digital transformation (Li et al., 2023). Notably, this cluster focused on the moderating effect, whereas the other clusters primarily examined the mediating effect.

Cluster 7 (orange) consisted of seven words, including China, high-quality development, total factor productivity, human capital, and air pollution. In this cluster, the word "China" appeared 48 times, indicating that the country, for the past years, has been concentrating on the topic of high-quality development. Hence, addressing the development of human capital and air pollution plays an important role in promoting HQED in China.

Cluster 8 (brown) has only 2 words: spatial spill over effect and threshold effect. This means that the spatial threshold model can be used to study HQED. Generally, this particular model is built to systematically study the threshold effect and spatial spill over effect.

In summary, the main focus of the findings was on the digital economy (occurring 59 times), China (occurring 48 times), environmental regulation (occurring 39 times), green finance (occurring 35 times), and technological innovation (occurring 29 times). Due to the sheer frequency of occurrences, both the digital economy and technological innovation are expected to drive HQED. The digital economy promotes HQED by encouraging consumption, increasing productivity, and improving regional capacity for innovation (Yu et al., 2022). At the same time, green finance and environmental regulation will also promote the HQED by reducing environmental pollution and lowering energy consumption in China (C. Li et al., 2022; G. Luo et al., 2023b). These factors play an important role in a country achieving HQED.

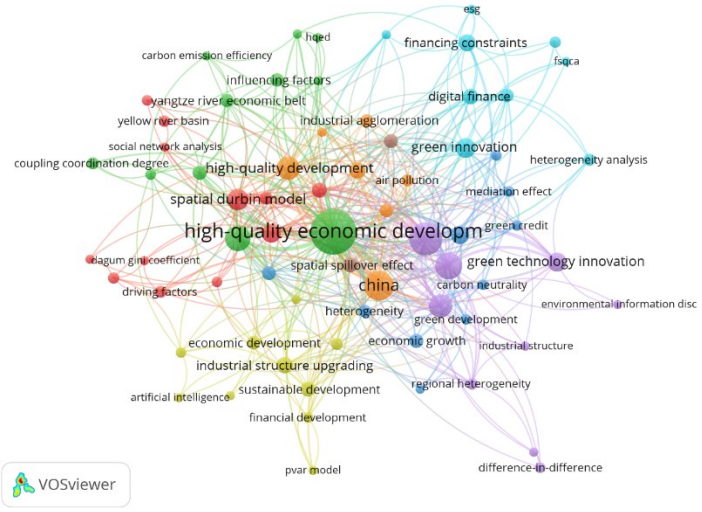


Figure 5. Author keywords co-occurrence network visualisation maps.
Notes: The keyword frequency threshold was set to five. This produced 70 keywords and 8 clusters.

Figure 6 displays the keyword co-occurrence overlay. The overlay visualisation maps displayed both past and current hot research topics. The size of the circle indicates the weight of the keyword link, while the gradient colour, transitioning from blue to yellow, refers to the evolution of keywords. The current hot keywords included HQED, digital transformation, innovation, coordination, human capital, green innovation, digital economy, and regional differences. Based on the trend, it can be predicted that future research on HQED will develop in the direction of digitalisation, green innovation, human resources, and

coordination. Additionally, the gaps caused by regional differences will also change due to HQED in various regions.

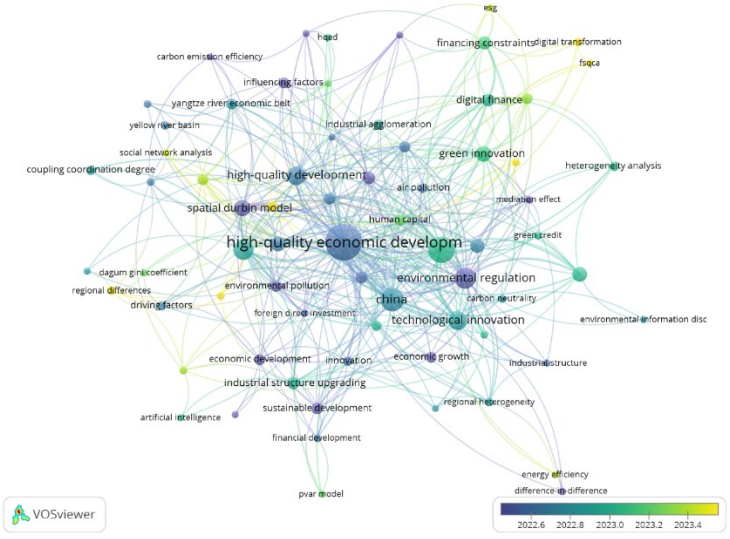


Figure 6 Author keywords co-occurrence overlay visualization maps
Notes: The keyword frequency threshold was set to five.

4. Conclusion

HQED is a relatively new topic. Its main foundation and purpose are to improve the efficiency and quality of development while concurrently advancing social, economic, and environmental progress. Since 2018, HQED has become an independent field, with its growth accelerating since 2021, reflecting the growing urgency of the global sustainability paradigm. Today, China dominates research output (727 publications), driven by national strategic prioritisation (Luo et al., 2023a)单击或点击此处输入文字。, while contributions from OECD economies remain minimal. As a result, the geographic scope of HQED research can be considered to be very limited.

In essence, HQED is a comprehensive development that connects environmental science, economics, and digital technology across disciplines. The journal "Sustainability" was the primary publication in HQED studies, while the Chinese Academy of Sciences was the most active institution involved in the field and is expected to become a strong collaborator for many in the near future. Meanwhile, the most cited author was Zhang et al. (2022), whose research on HQED had a significant influence on the field.

Several main research clusters emerged from the author's keyword co-occurrence analysis. Cluster 1 focused on research methods used in HQED studies. In contrast, Clusters 2 and 3 introduced additional green elements and considerations regarding environmental quality. Cluster 4 emphasised the significance of innovation and financial development. Clusters 5 and 6 covered topics related to the digital economy, digital finance, and digital transformation, while Cluster 7 highlighted China's commitment to high-quality development. Additionally, the main research clusters were Clusters 2, 5, 6, and 7. These clusters indicate that the digital economy, green technology innovation, and environmental regulation will all contribute to HQED in China.

From clusters 1 to 8, it can be seen that although many studies have delved deeply into HQED, their focus has primarily been on macro-level modelling (spatial econometrics, PVAR), overlooking micro-level participants (consumer behaviour) and qualitative insights (governance barriers, judicial influence).

Similarly, studies have rarely focused on or overlooked the connection between HQED and agriculture, health, education, and the informal economy.

In the recent decade, HQED research has rapidly evolved from conceptual exploration toward a policy-applied science focused on harmonizing growth, sustainability, and equity. While China's state-driven model has anchored early scholarship, future progress demands diversified geographies, inclusive frameworks, and multi-scalar solutions that transcend techno-economic reductionism. The field's next frontier lies in translating spatial, green, digital, and resilience insights into contextually grounded, socially accountable development practice, a task requiring equally innovative science and governance. At the same time, future studies will expand the empirical scope and integrate an analysis of micro-foundations, such as conducting comparative studies on HQED in the context of the EU's circular economy policy and ASEAN's green transition.

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Conflict of interest statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

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Authors' contributions

Huang Yi carried out the research, collected data, used software to do visual analysis, and wrote and revised the article. Both Yan-Ling Tan and Roslina Mohamad Shafi reviewed and edited the article. The final manuscript was read and approved by all authors.



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