# Research hotspots and knowledge graph analysis of the relationship between Urbanization and Ecological Environment in the Yellow River Basin

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**Abstract.** Based on the literature sample data of the research topics related to urbanization and ecological environment relationship in the Yellow River Basin in CNKI database from 2000 to 2022, this paper uses excle and CiteSpace software to systematically sort out the preface, current hot spots and development trends of the research on the relationship between urbanization and ecological environment in the Yellow River Basin through volume analysis, keyword co-occurrence and cluster analysis, and the results show that the existing research scale tends to be smaller, and pays attention to multi-scale analysis and comparison. Comparing research from a large to a small scale is easier to solve practical problems; Secondly, it shows the cross-combination of measurement methods, and some studies pay attention to the cross-combination of mathematical models and spatial measurement methods in coupling measurement methods. Finally, the research content shifted from qualitative status analysis and static evaluation to quantitative analysis and dynamic trend evaluation.

## 1 Introduction

The 20th National Congress of the Communist Party of China clearly pointed out that in order to promote coordinated regional development, it is necessary to promote ecological protection and high-quality development of the Yellow River Basin, and accelerate the urbanization construction with county towns as an important carrier. Among them, the county town is an important spatial carrier to promote high-quality development, urbanization is the only way to high-quality economic development, and how to balance urbanization development and ecological environmental protection is a key issue for regional sustainable development. With the rise of ecological protection and high-quality development of the Yellow River Basin to a major national strategy, the academic community has carried out extensive research on this. Based on the literature on the relationship between urbanization and ecological environment in the Yellow River Basin in CNKI database, this paper uses Excel and CiteSpace software to visually analyze the number of publications, keyword co-occurrence and research trends of this research, and discusses the research hotspots and progress of urbanization and ecological environment in the Yellow River Basin in China in the past 20 years.

## 2 Data sources and research methods

The research sample in this paper came from CNKI core journals and CSSCI source journals, the search time was December 21, 2022, the search period was 2000-2022, and the search conditions were set in CNKI's advanced search: subject = (urbanization + urbanization) * Yellow River Basin * (ecological environment + ecological environmental protection+ green development) and CSSCI journal= Y, in order to ensure the objectivity and accuracy of the analysis, the search results were deduplicated and sorted. In the end, 272 related articles were screened. Export the Refworks format file and name it "download_01", and then use CiteSpace software to format the exported file.

Scientific knowledge as the object of knowledge field, and is an important research method of scientometrics in recent years [1]. Scientific knowledge map is an image that shows the development process and structure of CiteSpace software is to analyze the similarity and measurement of information knowledge units, and use different methods and techniques to draw different types of knowledge maps. This paper mainly uses this software to intuitively identify the hot areas and frontier developments in the research on the relationship between urbanization and ecological environment in the Yellow River Basin by using the co-occurrence analysis and cluster analysis of its keywords, and generate a visual map.

## 3 Analysis of research results

### 3.1 Analysis of the number of posts

Using the literature analysis function of CNKI Literature Management Center, the selected 272 core papers were

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econometrically analyzed, and the results of analyzing the number of published papers are shown in Figure 1.

In 2013, the research on the relationship between urbanization and ecological environment in the Yellow River Basin increased significantly, and the number of articles published increased exponentially from 2013 to 2022, reaching a peak in 2021. Since the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping has traveled to nine provinces and regions in the Yellow River Basin, held two symposiums on ecological protection and high-quality development of the Yellow River Basin and delivered important speeches, elevating the ecological protection and high-quality development of the Yellow River Basin to a major national strategy, providing a fundamental basis for the ecological protection and high-quality development of the Yellow River Basin in the new era. Urbanization development is also the only way for high-quality regional economic development, and it is expected that relevant research will remain hot in the next few years.

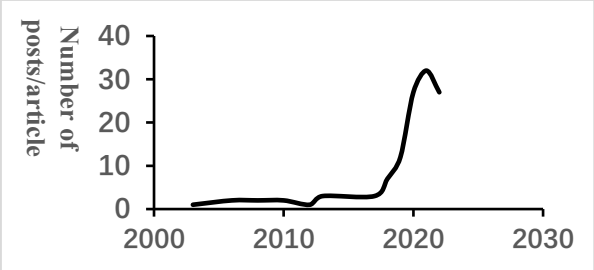


**Fig. 1** Overall trend of urbanization and ecological environment in the Yellow River Basin

### 3.2 Keyword co-occurrence analysis

Keywords are a summary of the main research of the entire article, and the analysis of the co-occurrence of keywords can derive research hotspots and progress in the selected field. When running Citespace, keywords were selected as the node type, the slice unit was 1 year, and the keyword co-occurrence analysis was performed on 272 related literature, and the results are shown in Figure 2.

According to Figure 2, it can be concluded that there are 194 keyword nodes, and each node has a direct connection of 413, and the density is 0.0221. From the perspective of the frequency of keywords, the highest keywords are "Yellow River Basin", "ecological environment", "influencing factors", "water resources", and "coupling coordination", indicating that existing research models are widely used to discuss the coupling and coordination relationship between urban development and ecology in the Yellow River Basin, the improvement path, the influencing factors, the indicator design measurement and the temporal and spatial evolution law [2].

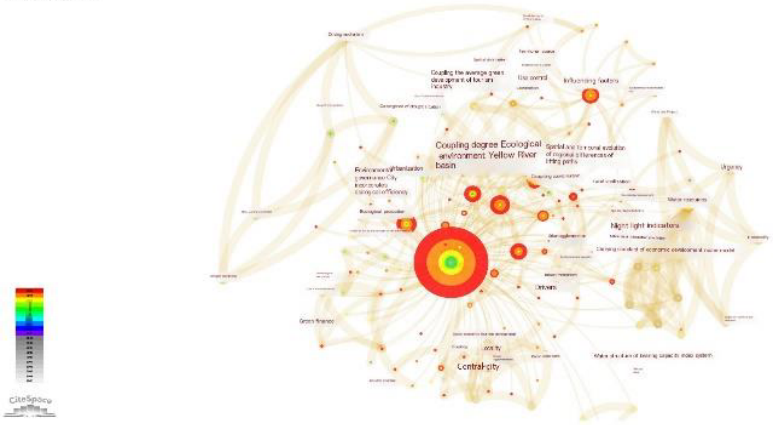


**Fig. 2** Key word co-occurrence map of the relationship between urbanization and ecological environment in the Yellow River Basin

### 3.3 Analysis of research progress

Using CiteSpace software, the selected literature in the research field of urbanization and ecological environment in the Yellow River Basin was analyzed by keyword clustering, and a temporal evolution view was formed, and the results were shown in Figure 3. where the abscissa indicates the year in which the keyword first appears, and the ordinate is to cluster the keyword by node.

As can be seen from Figure 3, the research on the relationship between urbanization and ecological environment in the Yellow River Basin can be divided into four stages: 2006-2009, 2010-2016, 2017-2020 and 2020-2022. Since 2006, Chinese scholars have begun to pay attention to the ecological and environmental problems of the Yellow River Basin, and from 2006 to 2009, scholars mainly focused on the measurement of ecological endowment in the Yellow River Basin [3], No in-depth relationship studies were conducted. In 2010, some

scholars began to pay attention to the issue of coordinated development [4], and from 2010 to 2016, keywords such as coordinated development, green development, and economy began to appear, indicating that China's attention to the coordinated development of the environment and economy began to increase. In 2017, China began to put forward supply-side reform, economic transformation and other social development directions, so there was an increase in research on urbanization as a keyword, and from 2017 to 2020, the research on the relationship between urbanization and ecological environment began to become a hot spot, in-depth analysis of the influencing factors of green development, coupling and coordination relationship, research heat and 2020 peak;From 2020 to 2022, based on the strengthening of the concept of high-quality economic development, coordinated regional development and ecological green development, the research field, research depth and research methods on the relationship between urbanization and ecological environment in the Yellow River Basin have exploded[5], during which scholars began to incorporate the research methods in geography into traditional economic research, and began to pay attention to the spatial distribution, regional differences, temporal and spatial patterns and evolution, and driving factors between urbanization and ecological environment in the Yellow River Basin [6-7]. With the enrichment of research methods, research contents and research scales, the discussion of the relationship between urbanization and ecological environment in the Yellow River Basin will remain the theme of academic research in the future.

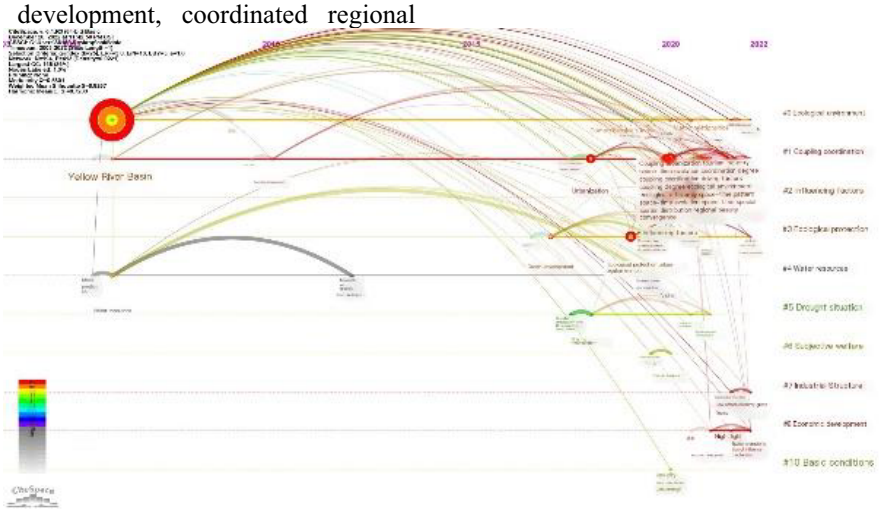


**Fig. 3** Keyword clustering timeline of research on the relationship between urbanization and ecological environment in the Yellow River Basin

## 4 Conclusion

Based on CiteSpace knowledge graph visualization software, this paper analyzes the knowledge graph data of 272 core journals related to the relationship between urbanization and ecological environment in the Yellow River Basin in China from 2000 to 2022. The results show that in the past 20 years, scholars have been really concerned about the development and ecological problems of the Yellow River Basin since 2006. After 2017, it attached great importance to the research on the relationship between urbanization and ecological environment, and although it started late and took a short time, it quickly achieved more results on the basis of economic and economic development and industrial structure research [8].

On the whole, the following new trends have emerged in the research between urbanization and ecological environment: first, the research scale tends to be smaller, and attention is paid to multi-scale analysis and comparison, and it is easier to solve practical problems from large-scale to small-scale research comparison [9]; The second is the cross-combination of measurement methods, and some studies pay attention to the cross-combination of mathematical models and spatial measurement methods and other mainstream methods [10]. Third, the research content has shifted from qualitative status analysis and static evaluation to quantitative analysis and dynamic trend evaluation.

## Fund

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