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Research Article

Analyzing Environmental Public Interest Litigation Research (2003-2023) Through Bibliometrics and CiteSpace: The Perspective of China

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Abstract

Environmental public interest litigation serves as an effective mechanism for environmental protection. A comprehensive literature review in environmental public interest litigation holds significant implications for both practical applications and theoretical advancements. This study utilized CiteSpace analysis software to examine the research hotspots and evolving trends in this field based on 978 articles from the CNKI database (839 articles) and the Web of Science core collection (139 articles) published between 2003 and 2023. The results indicated: (1) In terms of publication volume, the field of environmental public interest litigation in both China and abroad has undergone three phases: an initial exploration phase, a phase of steady development, and a phase characterized by fluctuations in growth or decline. (2) Regarding institutional collaborations, research alliances between Chinese and international institutions in this domain are relatively limited. (3) From keyword co-occurrence and keyword burst perspective, both domestic and international studies predominately focus on "public participation", and burst keywords such as "plaintiff qualifications" and "environmental jurisprudence" continue to be central themes in Chinese publications. (4) Keyword Time-Zone map reveals that shifts in research hotspots closely align with advancements in legal regulations within the practice sector. This study extends prior work by temporal scope, literature breadth, and issue depth, summarizing the environmental public interest litigation research under different backgrounds thereby providing advice for future development in China.

Keywords

Environmental Public Interest Litigation, Plaintiff, Environmental Court, Ecological Damage Compensation, Citespace

1. Introduction

In the 21st century, human activities have persistently led to a degradation in environmental quality and ecological imbalance [1], environmental protection has increasingly become a topic of utmost importance globally [2]. Environmental public interest litigation serves as one of the potent tools for such protection, granting members of society the right to bring legal action in the interest of safeguarding the public environment when it is under threat [3].

Western countries have a longer history of environmental public interest litigation than China. Specifically, Common

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Law jurisdictions, such as the U.S. and the U.K., are relatively more open in their regulations regarding who can bring such suits, compared to Civil Law jurisdictions [4]. Among Common Law countries, the United States has the most advanced system of environmental public interest litigation. As the legislative framework in the U.S. is largely based on the Public Trust Doctrine [5], eligibility to serve as a plaintiff in environmental public interest litigation is broad, encompassing class actions, attorney general claims, and citizen suits [6]. Notably, citizen suits allow "any person" to initiate such litigation, which means in this context, "person" is broadly interpreted to include individuals, corporations, associations, and government entities. The liberalization of plaintiff eligibility for environmental public interest litigation in the U.S. began with case law, specifically with the 1970 case of Association Data Processing Service Organization, Inc. v. Camp, which dates back to the early 1970s. In terms of statutory law, the U.S. formally introduced provisions for citizen suits into environmental law in 1970 with the passage of the *Clean Air Act*. As a response to the "soft law" status of environmental regulations at that time, the legislation allows individual citizens to actively enforce environmental laws when the federal government fails to fulfill its obligations [5]. Compared to Common Law jurisdictions, Civil Law countries have more restrictive criteria concerning who can serve as plaintiffs and what subjects can be litigated in environmental public interest cases [7]. For instance, in Germany, a Civil Law jurisdiction, both federal and state legislations limit the entities that can bring environmental public interest lawsuits to officially recognized non-governmental organizations (NGOs). Moreover, these NGOs are only allowed to initiate legal proceedings on matters specifically outlined under natural conservation laws.

In contrast, China's legal provisions for environmental public interest litigation have unique characteristics compared to other countries, influenced by differences in the legal system, the pace of industrialization, and other factors. In the context of Chinese law, environmental public interest litigation refers to lawsuits filed by entities or organizations without a direct stake in the matter, aimed at protecting the public interest in cases where it is at risk due to unlawful activities or inaction by individuals, legal entities, or other organizations. In China, the main parties allowed to initiate such lawsuits are environmental organizations, ecological and environmental administrative agencies, and prosecutorial authorities [8]. Ordinary citizens without a direct stake in the issue are generally excluded from initiating these lawsuits. In China, environmental public interest litigation is categorized into two types: environmental civil public interest litigation (which includes criminal cases with civil public interest components) and environmental administrative public interest litigation. These types differ in aspects such as who can initiate the lawsuit, who the defendants can be, and preliminary procedures [9]. Current environmental challenges in China are severe, yet environmental public interest litigation often faces neglect, ineffective prosecution, and poor enforcement. These shortcomings highlight the need for continued development in legal frameworks and research. At this juncture, learning from international experiences and comparing research advancements could significantly benefit the evolution of China's environmental public interest litigation.

In China, only a few scholars have reviewed environmental public interest litigation. Zeng Yijun and Yuan Baiwu have conducted literature reviews on this field up to 2011, but their focus was not limited to environmental public interest litigation, instead it also encompassed broader public interests such as environmental pollution, loss of state assets, and group harm (i.e., consumer rights protection) [10]. Additionally, because their research was conducted so early that the number of references they used was limited, and the lack of data analysis software also meant that their study was more qualitative than quantitative in nature. Later, in 2020, Chen Demin and Zhao Zeyu used CiteSpace software to conduct a bibliometric analysis of environmental law research from 2009 to 2019 [11]. However, their research scope was on environmental law as a whole, with only a small portion focused on environmental public interest litigation. Therefore, their analysis doesn't provide a comprehensive view of the development of research in the area of environmental public interest litigation. Most recently, in 2022, Qin Peng used CiteSpace software to categorize past Chinese literature on environmental public interest litigation into four perspectives: procedural innovation in environmental public interest litigation, specialization of environmental justice, green provisions related to the Civil Code, and lawsuits for ecological damage compensation [12]. But his study focused only on Chinese literature and lacked exploration of concurrent foreign literature development, leading to a deficiency in comparative research.

This study improves in three ways to address these limitations: First, it expands the literature sources to include Chinese National Knowledge Infrastructure (CNKI) and Web of Science (WoS), offering new insights through comparative analysis. Second, it covers a broader time span from 2003 to 2023 to identify evolving research hotspots. Third, it summarizes key issues in China's environmental public interest litigation and dives into specific literature for fresh perspectives. The study aims to answer the following questions: What differences exist in environmental public interest litigation research between China and other countries? What are the key issues in China over time, and how have they evolved? What are the reasons and implications of these changes?

2. Methodology

2.1. Selection of Analysis Tool

CiteSpace creates knowledge maps to show relationships

between different studies, often used to display research trends and hotspots [13]. In this study, CiteSpace (version 6.1.R6) was used to visualize the progress and forecast future directions in environmental public interest litigation theory through yearly publication volume trends, institutional collaboration networks, keyword co-occurrence, burst and time-zone maps.

2.2. Data Collection Procedure

This study primarily began in February 2023, using the Chinese literature database CNKI and comparing it with the foreign literature database Web of Science (WoS) to enrich Chinese-related research. The time frame for data collection is from 1 January 2003 to 1 January 2023. For Chinese literature, 839 works are sourced from CSSCI journals in CNKI using the keyword "environmental public interest litigation", and similarly, 139 foreign works are sourced from the WoS Core Collection with the same keyword. All of the data was exported in "Refworks" format for ease of subsequent analysis, ensuring both quality and quantity. After that, CiteSpace (version 6.1.R6) was used to generate knowledge maps mentioned above for both Chinese and English literature.

3. Findings and Discussion

3.1. Analysis of Research Trends

Figures 1 and 2 show the number of journal articles on environmental public interest litigation in China and abroad from 2003 to 2023. The absolute numbers and growth rates indicate varying levels of academic interest, influenced by national policies and real-world practice, which serve as important indicators of scholarly attention in this field. It can also reflect overall progress of research in this field [14]. Overall, a comparison of literature volume between CNKI (839 articles) and Web of Science Core Collection (139 articles) reveals that China has significantly more publications in this area than other countries, and both domestic and international research has gone through three phases: initial exploration, steady development, and periods of fluctuation.

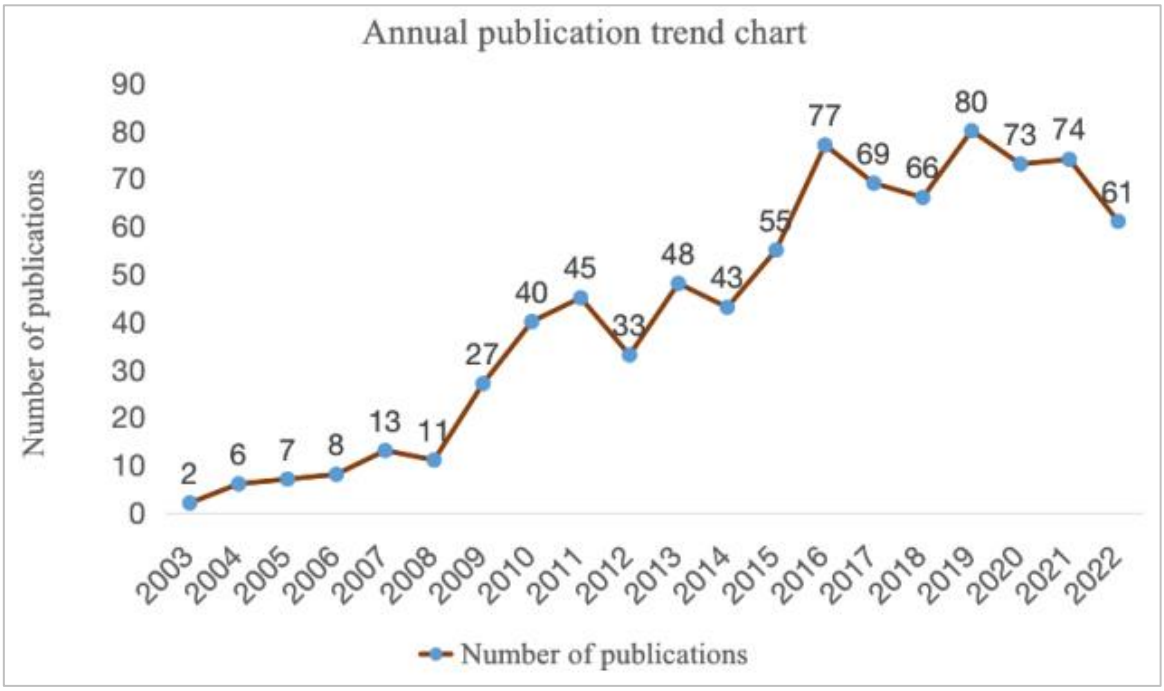

Figure 1. *The number of environmental public interest litigation publications in Chinese journals from 2003 to 2023.*

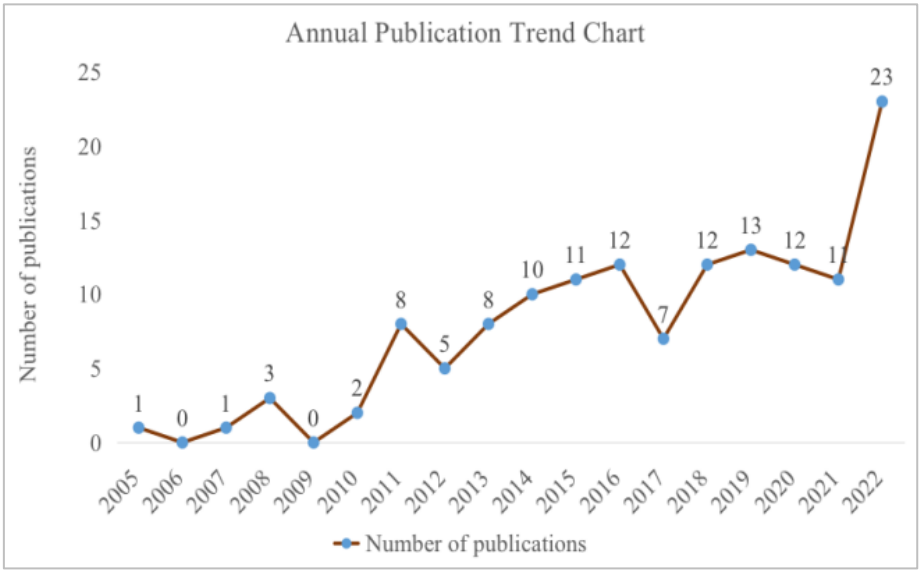

Figure 2. *The number of environmental public interest litigation publications in foreign journals from 2003 to 2023.*

Chinese research on environmental public interest litigation from 2003 to 2008 was in its initial stage, with limited publications averaging about 7.8 articles per year in CSSCI journals. This was due to lagging practical development and a lack of prior research to build upon during this period. After that, China saw a rapid growth from 2009 to 2016, as China's economy grew steadily and sustainable development gained focus, a surge in related literature occurred. This was partly due to *Interpretation of the Supreme People's Court on Several Issues Concerning the Application of Law in the Trial of Environmental Civil Public Interest Litigation Cases* was promulgated from the Supreme People's Court and high-profile cases like the environmental damage case in Fujian's Nanping, which was the first environmental public interest litigation case after the new *Environmental Protection Law of China* Enters into Force. From 2016 to 2023, the volume of literature went through a slightly fluctuating decline stage, but the volume still remained high, averaging over 60 articles per year. This decline doesn't indicate waning research interest but suggests that the field is maturing [12].

From 2003 to 2008, foreign studies on environmental public interest litigation were also in its infancy, with significantly fewer publications than China—averaging about one article per year. There were no articles published in 2003, 2004, and 2006. Between 2009 and 2016, foreign research entered a phase of steady development and started to take off, improving notably with an uptick in publication volume, reaching up to 12 articles per year by 2016. In contrast to China's slight decline from the years 2017 to 2023, foreign publications during this period showed greater variability but an overall significant upward trend. Though still fewer in number compared to China, the field produced a range of rich achievements. Notably, there was a conspicuous increase in foreign publications in 2022, with 23 articles, doubling the number from 2021, indicating that this will likely be a hotspot area of research in the near future.

In summary, after roughly two decades of development, studies on environmental public interest litigation in China has begun to stabilize, while foreign research has substantial room and potential for growth. Environmental protection is a critical issue in any country, and the field of environmental public interest litigation will likely continue to be a hot research topic at home and abroad, gaining new momentum in the future.

3.2. Analysis of Major Research Institutions

Analyzing the collaboration network of key research institutions can illustrate the academic focus and research strength of research institutions in a certain field. By setting the time slices to 1 year and selecting "institution" as the node type, and then using the Pathfinder tool for pruning and merging and running CiteSpace, a major research institution network map derived from CNKI database with 166 nodes and 52 lines displayed on it could be obtained. As shown in Figure 3, the network density was 0.0038, which meant there was limited inter-institutional collaboration among the 166 entities. As can be seen, the institutions appearing in this map were Chinese universities, affiliated research institutes, and the Supreme People's Court. Notably, the law schools of Renmin University and Wuhan University had significantly higher publication rates and served as key collaboration hubs along with other institutions. Wuhan University's Environmental Law Research Institute, while not having the most publications, is noteworthy for its concentration of recent research in 2022. Overall, CNKI data shows a rich and recent body of work on environmental public interest litigation, but with limited collaboration among institutions.

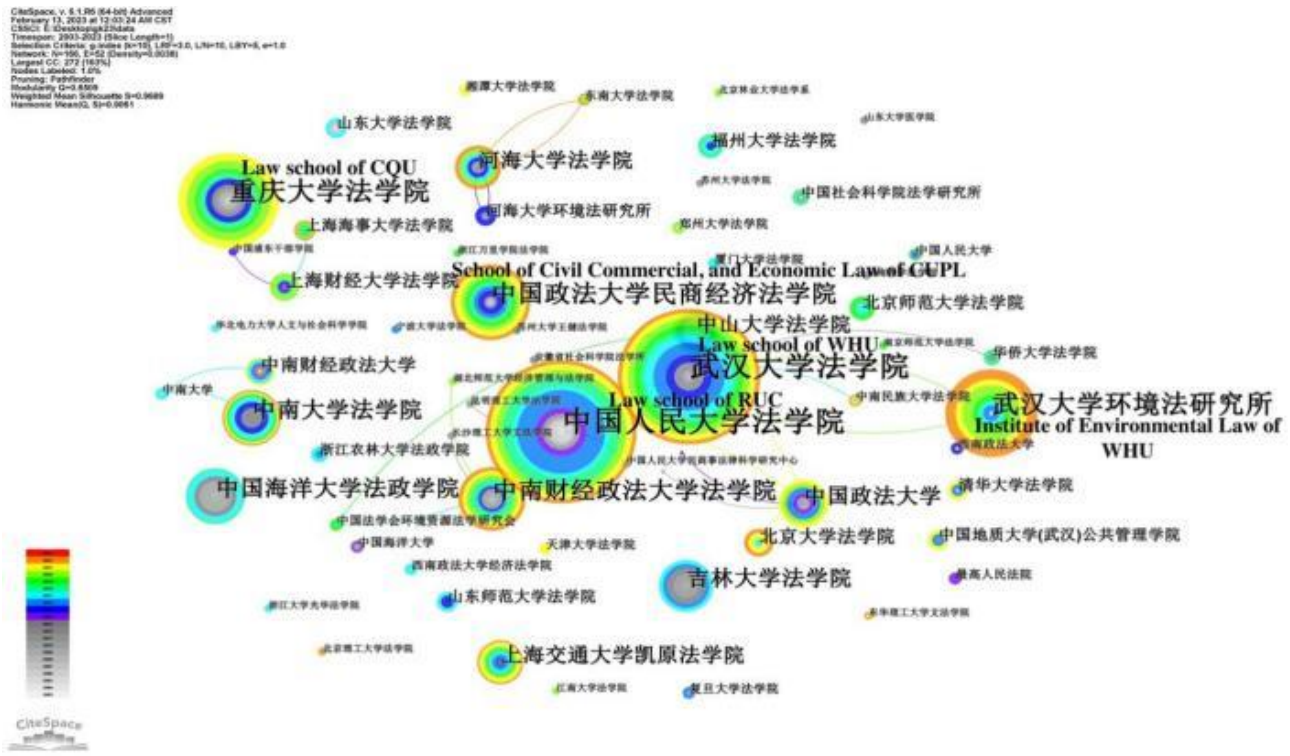

Figure 3. *The cooperative network of environmental public interest litigation research institutions based on the CNKI database.*

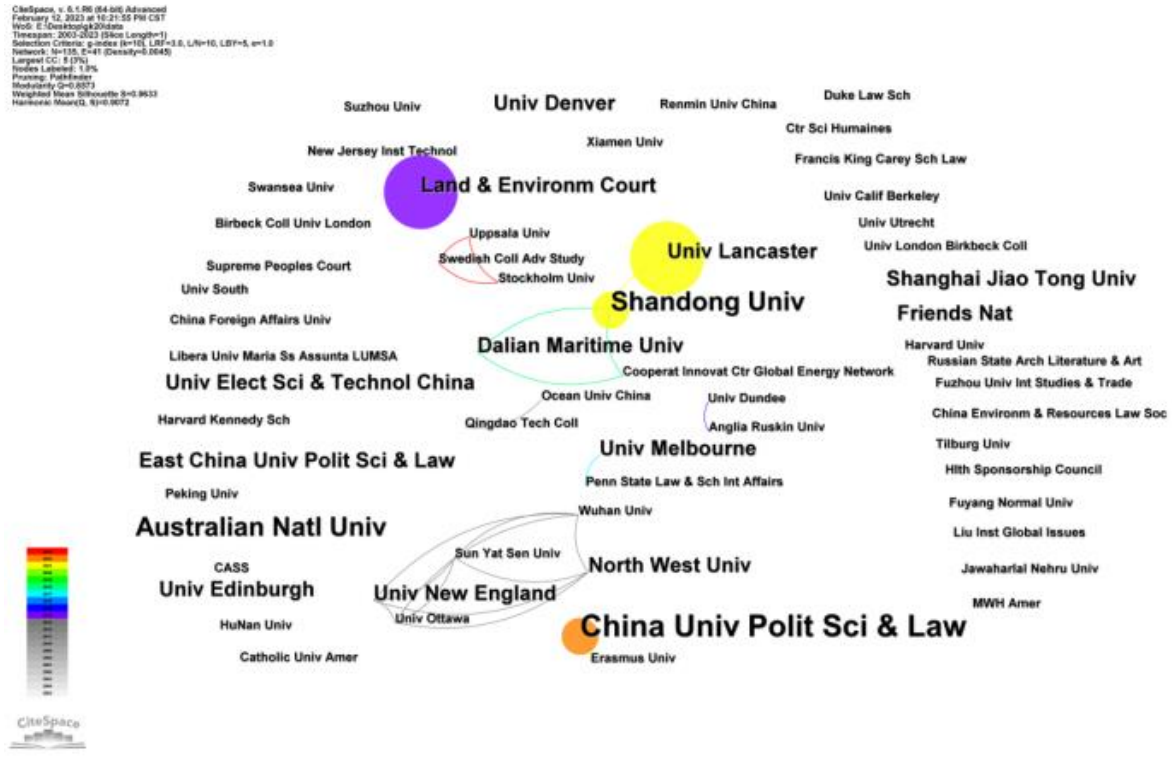

Figure 4. *The cooperative network of environmental public interest litigation research institutions based on the WoS database.*

Using the same method as with CNKI database, a cooperative network map of WoS literature data was generated as Figure 4, with 135 nodes and 41 lines on it. The network density was 0.0045 and the overall network shape was loose, indicating there was also limited collaboration among those institutions. It can be seen that four institutions dominated in WoS core collection literature, and each with unique characteristics as follows: China University of Political Science and

Law mainly focused on the most recent research, primarily in 2022. Lancaster University and Shangdong University collaborated academically in 2021, with the latter serving as a collaboration hub among institutions. Land and Environment Court had older publications and minimal collaboration. Overall, in this figure it was obvious that Chinese universities played a key role in global environmental public interest litigation research and most of them were independent studies. In the future, continuing to strengthen cooperation between institutions and maximizing the international academic influence of Chinese research institutions in the field of environmental public interest litigation need to be paid attention to.

3.3. Analysis of Main Research Hotspots and Frontiers

Keywords serve as indicators of an article's theme, content, theory, and methodology and can be used to identify research hotspots and frontiers in a research field [15]. Therefore, this study used CiteSpace software to create 3 types of keyword knowledge map, namely the co-occurrence knowledge map, the keyword burst knowledge map, and the keyword Time-Zone knowledge map, to analyze and understand research hotspot development trends in domestic and international environmental public interest litigation studies.

3.3.1. Main Research Hotspots in the Field of Environmental Public Interest Litigation:

Keywords Co-Occurrence Analysis

High-frequency keywords can indicate research hotspots in a specific field during a particular period [16]. Using CiteSpace to draw the keyword co-occurrence knowledge maps for both domestic and international literature on environmental public interest litigation, as shown in Figures 5 and 6. Additionally, the top 12 high-frequency keywords were extracted and organized in descending order by frequency, as seen in Tables 1 and 2.

The keyword co-occurrence knowledge maps generated from CNKI and WoS database had 299 and 184 nodes respectively, with network densities of 0.0081 and 0.0199. This indicated that Chinese literature had more core keywords and covered a broader research scope, while foreign literature had a more tightly-knit network and focused on a narrower research area. After removing the most generic keywords like "environmental public interest litigation" and "public interest litigation", the top six high-frequency keywords were selected from each set, notably the hotspots in Chinese literature focused on "prosecutorial authorities", "plaintiff qualification", "environmental rights", "public participation", and "ecological damage". In contrast, foreign literature centered on "litigation", "governance", "environmental law", "climate change", "public participation", and "ecological civilization". Comparing the Chinese and foreign keywords, it reveals that both Chinese and foreign research focused on public participation, but foreign studies in areas like governance and ecological civilization could offer insights for China.

Figure 5. *Co-occurrence network of keywords in Chinese journals.*

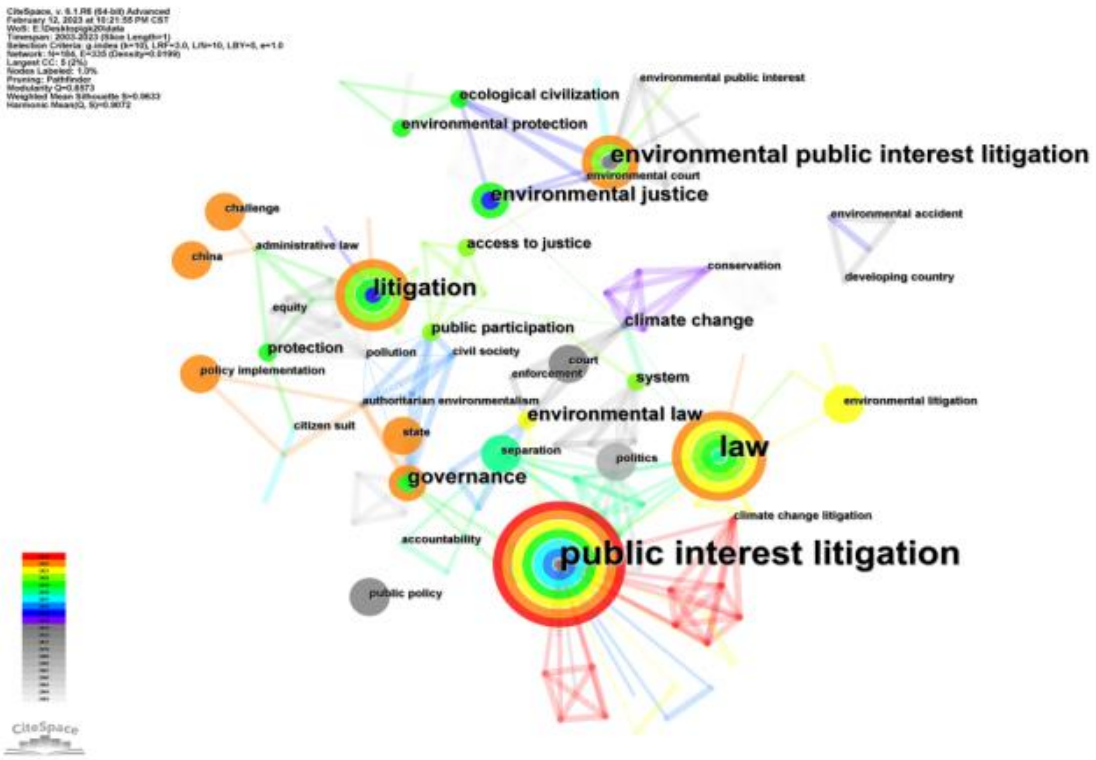

Figure 6. *Co-occurrence network of keywords in foreign journals.*

Table 1. *Top 12 high-frequency keywords in Chinese journals.*

No.	Frequency	Centrality	Year	Keywords
1	324	0.51	2005	环境公益诉讼 Environmental public interest litigation
2	131	0.35	2010	环境民事公益诉讼 Environmental civil public interest litigation
3	116	0.64	2003	公益诉讼 Public interest litigation
4	51	0.6	2007	检察机关 Procuratorial organs
5	51	0.15	2015	环境行政公益诉讼 Environmental administrative public interest litigation
6	40	0.13	2007	原告资格 Plaintiff eligibility
7	28	0.56	2005	公众参与 Public participation
8	27	0.37	2004	环境权 Environmental rights
9	25	0.62	2011	环境司法 Environmental jurisprudence
10	25	0.02	2017	生态环境损害 Ecological and environmental damage
11	25	0.28	2004	公共利益 Public interest
12	24	0.09	2016	生态环境损害赔偿 Ecological and environmental damage compensation

Table 2. *Top 12 high-frequency keywords in foreign journals.*

No.	Frequency	Centrality	Year	Keywords
1	26	0.32	2009	public interest litigation

No.	Frequency	Centrality	Year	Keywords
2	17	0.27	2004	law
3	10	0.1	2010	environmental public interest litigation
4	9	0.15	2007	litigation
5	6	0.19	2007	governance
6	6	0.22	2003	environmental justice
7	5	0.04	2013	environmental law
8	4	0.34	2013	climate change
9	3	0.05	2016	public participation
10	3	0.01	2006	environmental protection
11	3	0.04	2007	protection
12	3	0.04	2015	ecological civilization

3.3.2. Main Research Hotspots in the Field of Environmental Public Interest Litigation: Keyword Burst Map Analysis

Burst keywords are often used to identify whether research hotspots in a certain field have changed, and tracking their variations can help to predict emerging trends in one field. In this study, by filtering out irrelevant keywords and using CiteSpace to create knowledge maps of burst keywords, the burst time and strength of keywords of domestic and abroad literature on environmental public interest litigation can be visualized as below.

The CNKI burst keywords knowledge map for environmental public interest litigation literature is shown in Figure 7, revealing the first two burst keywords "public interest litigation" and "environmental public interest litigation system" as early as 2003. According to the previously mentioned stages of publication volume, keywords burst can also be divided into three phases. The initial exploratory stage from 2003 to 2008 primarily focused on "public interest litigation" and "environmental public interest litigation". These two foundational terms nearly had the longest burst duration, indicating they laid the groundwork for subsequent research. As mentioned above, the steady growth phase from 2009 to 2016 saw a significant increase in research publication volume. During this period, "plaintiff" first appeared as a burst keyword, along with other terms like "environmental courts", "public participation", "environmental protection law", and "citizen lawsuits". The recent phase from 2017 to 2023 featured burst keywords like "ecological environment", "damage compensation", "pre-litigation procedures", "administrative agencies", and "environmental civil public interest litigation". Notably, the burst keywords in this period are likely to remain research hotspots in the near future as their burst duration mostly continues to this day. Specifically, influence from *the Ecological Environmental Damage Compensation Reform Plan* and ecological compensation clauses in the *Civil Code* have broadened the research scope of Chinese academic circle and ecological environmental damage compensation are expected to be research highlights in the foreseeable future [12].

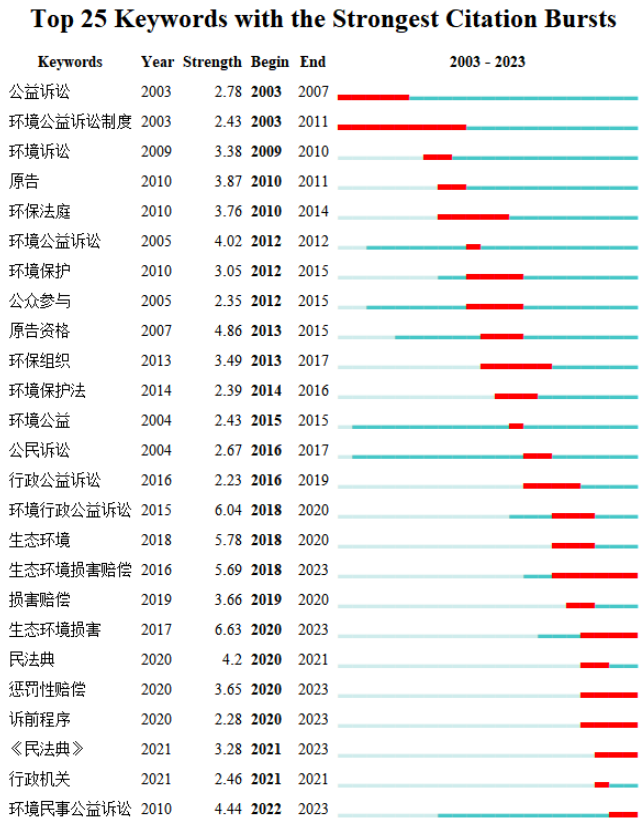

Figure 7. *Keywords burst in Chinese journals.*

Figure 8. *Keywords burst in foreign journals.*

The literature from Web of Science core database showed 25 burst keywords related to environmental public interest litigation studies, as seen in Figure 8. Compared to the CNKI literature, it had relatively low burst intensities, generally below 2. Moreover, most of the burst keywords emerged relatively late, with the first burst keyword emerging in 2009, aligning with the observed fact that the number of foreign publication volume began to steadily increase from the same year. Notably, since a significant portion of contributions in the Web of Science core collection literature came from Chinese researchers and institutions, most articles were highly relevant to environmental public interest litigation in China. From 2009 to 2016, "developing country", "climate change", "environmental court", and "ecological civilization" were long-lasting burst keywords. During this period, a substantial amount of research emerged focusing on the environmental public interest litigation systems in developing countries like China, India, South Africa, Ethiopia, and Kenya. For example, Cao Mingde and Wang Fengyuan provided in-depth discussions on plaintiff eligibility in China's environmental public interest litigation, as well as special rules like litigation eligibility thresholds and registration restrictions that NGOs face [17]. Studies by Tumai Murombo and Heinrich Valentine researched the threat of strategic litigation against public participation (SLAPP suits) in South Africa, suggesting that courts should use existing procedural and substantive legal tools to protect those parties involved facing SLAPP suits [18]. Meanwhile, Francis Xavier Rathinam and A. V. Raja analyzed the economic benefits of citizen participation in environmental public interest litigation in India, noting its effectiveness in pollution control through judicial intervention and public information [19]. After 2017, "citizen suit" and "China" continued to be long-lasting burst keywords in WoS databases. This reflected that the focus of research remained on plaintiff eligibility and had a strong relevance to China in this duration, which aligned with the earlier observation that Chinese research institutions had significantly contributed to foreign literature on environmental public interest litigation. Another characteristic of foreign literature was its focus on comparative law studies, a representative work was by Wang Huishihan, who delved into the differences between Chinese environmental public interest litigation and American citizen lawsuits both theoretically and procedurally. Wang discussed efforts made by Chinese lawyers and Environmental Non-Governmental Organizations (ENGOs) to learn from American ENGOs' private law enforcement experiences in environmental litigation, and then he noted that compared to the American model, many strict procedural requirements of China's system were so unnecessary that Chinese ENGOs were not granted enough authority to oversee government administrative actions. As a result, Wang concluded that China's ENGO-involved Environmental Public Interest Litigation (ENGO EPIL) mechanism solved fewer problems than it created and offered corresponding recommendations [20].

3.3.3. Main Research Hotspots in the Field of Environmental Public Interest Litigation: Keywords Time-Zone Analysis

Keyword Time-Zone map can visually show how keywords evolve over time, and based on that this study will prompt further inquiry into the reasons behind these changes. However, due to the substantial space required for analyzing these keyword Time-Zone maps and given that the focus of this study was on the improvement of environmental public interest litigation research in China, foreign research literature will not be delved into in this section.

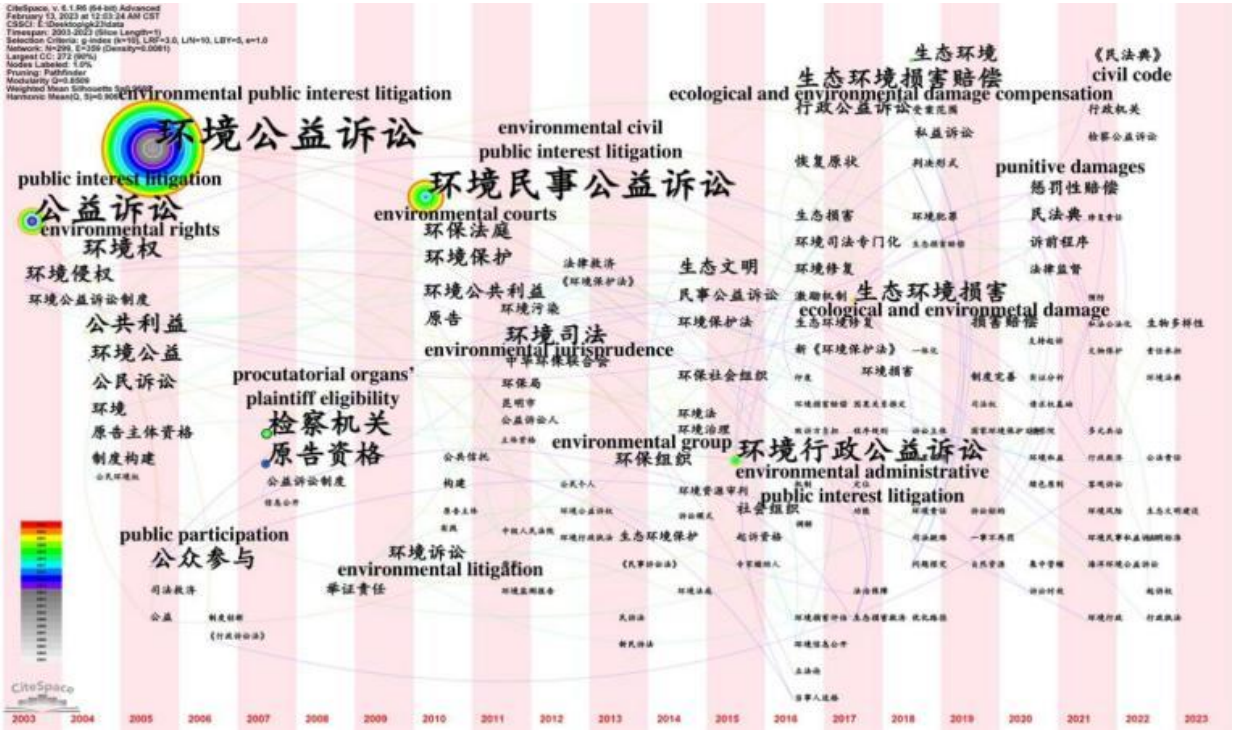

Figure 9. *Keyword Time-Zone in Chinese journals.*

(1) Period focused on procuratorial organs' plaintiff eligibility and theoretical validation of environmental public interest litigation: 2003-2008.

Although China's environmental laws started relatively late, they began to take shape between 2003 and 2008. However, this period also witnessed ineffective control of environmental pollution and ecological degradation, largely due to lagging developments in relevant litigation systems. At this time, the only legal provision explicitly addressing public interest lawsuits was criminal lawsuits brought by prosecutorial authorities to the People's Court, leaving environmental public interest lawsuits legally unaddressed. The plaintiff eligibility for such environmental cases was therefore based on existing provisions in civil and administrative litigation laws. According to Article 108 of *the Civil Litigation Law*, "plaintiffs must be citizens, legal persons, or other organizations with a direct interest in the case" [21], which posed challenges for victims of environmental damage, as their harm is usually indirect and non-tangible. Similarly, existing administrative litigation laws also imposed similar restriction on plaintiff eligibility. For instance, Article 12 of *the Administrative Litigation Law* stated that only those whose "legitimate rights and interests" were "violated" by specific administrative actions could file a lawsuit, which narrowed down plaintiff eligibility to those directly impacted by administrative actions, leaving out those who might want to file lawsuits for the public interest [22]. In this context, discussions emerged on the eligibility of prosecutorial authorities as plaintiffs in environmental public interest lawsuits. Besides, scholars started to analyze and argue for the theoretical foundation of China's environmental public interest litigation system from perspectives such as jurisprudence, law and economics, and legal philosophy.

Scholars have debated intensely over whether prosecutorial authorities should qualify as a plaintiff in environmental public interest lawsuits. Early on, Guo Yinghua and Li Qinghua argued for extending plaintiff qualifications to direct victims, the general public, social organizations, prosecutorial authorities, and future generations [23]. Zhang Shijun and Xie Wei later used comparative research to argue that prosecutorial authorities, as national legal oversight bodies, are justified in representing the state and the public in lawsuits against environmental degradation, drawing comparisons between civil law and common law systems [24]. Lv Zhongmei offered a different perspective, stating that environmental public interest lawsuits are a special type of litigation and prosecutorial authorities are not the best plaintiffs in such cases; instead, environmental protection agencies are more suited to serve as plaintiffs [25]. However, another scholar has refuted this suggestion, Qi Shujie didn't oppose prosecutorial authorities serving as plaintiffs in environmental public interest cases but argued that the qualification for plaintiffs shouldn't be limited to those directly affected. Instead, she suggested China should learn from Western countries by introducing a class-action system, and this would allow public interest groups with legal standing to file lawsuits based on their collective rights, thus pooling the resources of many individuals for stronger legal action [26].

Regarding the issue of establishing a theoretical framework for environmental public interest litigation, Ye Yongfei has

conducted comparative research to differentiate the concepts of environmental public interest litigation, representative litigation in China, class actions and citizen suits in U.S. environmental law, and class action litigation in German environmental law. He has defined the concept of environmental public interest litigation and provided detailed elaborations and summaries on its constitutional, civil law, environmental law, and procedural law foundations in China, aiming to find a foothold for these lawsuits within the existing legal framework [27].

(2) Period focused on environmental courts, environmental civil public interest litigation, and environmental administrative public interest litigation: 2009-2016.

As previously mentioned, the volume of academic literature on environmental public interest litigation in China saw a significant increase during this period, closely tied to multiple legal enactments on the subject. The 2012 amended *Civil Procedure Law*, effective in 2013, legally established environmental public interest litigation for the first time. Despite this, courts still refused to accept eight cases filed by the All-China Environment Federation in 2013, sparking renewed debate on improving the system. In 2014, revisions to China's *Environmental Protection Law* and the issuance of *judicial interpretations from the Supreme People's Court* provided a preliminary legal foundation for environmental public interest litigation. While this progress in legislation is encouraging, it was criticized for being too rudimentary, focusing only on who qualifies as a plaintiff without covering specifics like procedures or evidence rules. These gaps led to contradictions between the legislation, judicial interpretation, and actual judicial practice. Under the dual pressures of faltering practical application and accelerated legislation, the number of scholars studying this area increased dramatically. Key topics included the nature of environmental public interest lawsuits, relevant parties involved, and the primary-subordinate relationship between environmental civil and administrative public litigation. Besides, discussions also focused on how to improve specialized environmental judicial bodies and build higher-quality adjudicating teams for such cases.

In this stage of research, environmental courts and judicial processes have become a hotspot, propelled by legislative bodies, academia, and the Supreme People's Court in China. Since 2004, multiple specialized environmental courts were established in various provinces such as Hebei, Guizhou, Jiangsu, and Yunnan in order to expedite environmental cases efficiently. While most people believed that these courts concentrated a cadre of judges with specialized knowledge in environmental issues and the establishment of these courts would accelerate the processing speed of environmental violations and enhance both the effectiveness and economic efficiency of litigation in this domain [28, 29], Liu Chao criticized environmental courts on several grounds. Firstly, he argued that setting up these courts at the local level in Qingzhen city violated *the People's Court Organization Law*, which stated that only Intermediate, Higher, and Supreme People's Courts can establish special courts as needed. Secondly, the current structure of environmental courts didn't align with the two-tiered final adjudication system. Lastly, he contended that the "strong judicial activism" in environmental courts involved instances of proactive and preemptive interventions, which were inconsistent with the conventional norms of judicial passivity and neutrality [30]. However, in contrast, Huang Sha and Li Guangbing offered a counter-argument, addressing Liu Chao's criticisms from both legal and practical perspectives. They acknowledged that while the establishment of environmental courts may lack strict legal basis, these courts were a necessary response to real-world environmental issues, and that the courts' proactive approach is not "strong judicial activism", but rather an essential means to resolve pressing environmental problems effectively [31]. Building on their perspective, Xiao Jianguo and Huang Zhongshun focused on the procedural rules of environmental public interest litigation. They emphasized that courts should appropriately strengthen their judicial activism in environmental public interest litigation, provided that this did not violate the principle of judicial neutrality. Furthermore, in terms of jurisdiction, they argued that, given the broad impact and large number of people affected by environmental public interest cases, jurisdiction should be concentrated in intermediate courts in provincial capitals or those designated by the Supreme People's Court [32].

The study of the relationship between environmental civil public interest litigation and environmental administrative public interest litigation was also a hotspot at this stage. Sun Qian summarized the impact of the amended *Environmental Protection Law* in facilitating public participation, eliminating local interference, and achieving environmental justice since its implementation. She also raised concerns, arguing that the bifurcation of civil and administrative public interest litigation in China leads to logical inconsistencies and practical challenges. She posited that the public, under current legal provisions, cannot initiate environmental public interest litigation against administrative bodies for illegal actions that harmed the national and societal public interest and recommended allowing the public to file environmental administrative public interest lawsuits on environmental matters, thereby establishing a mechanism that was primarily administrative but includes public oversight [33]. Wang Mingyuan contended that the environmental civil public interest litigation system can lead to the judiciary overstepping its authority, thereby weakening the role of administrative agencies and environmental NGOs. On the contrary, an environmental administrative public interest litigation system for environmental issues would leverage the expertise of administrative agencies while ensuring judicial oversight. In conclusion, Wang suggested that the focus should be on developing administrative public interest litigation for environmental issues, with civil lawsuits serving a secondary role [34].

(3) Period focused on ecological and environmental damage compensation litigation: 2017-2023.

As stated above, the number of publications on environmental public interest litigation in China has slightly decreased from the year 2017 to 2023. This coincided with China issuing the *Interpretation on Several Issues Concerning the Application of Law in Environmental Public Interest Litigation Cases by the Supreme People's Court and the Supreme People's Procuratorate* in 2018, which clarified the qualifications of the procuratorial organs as the sole appropriate subjects to initiate environmental administrative public interest litigation. Additionally, the *Environmental Protection Law of the People's Republic of China* was revised twice during this period, in 2017 and 2021 respectively, making China's legal framework for environmental public interest litigation relatively complete.

After over a decade of research in academia, the foundational theories of environmental public interest litigation have matured. Scholars were focusing on new emerging areas, particularly reforms in ecological damage compensation as *the Ecological Environment Damage Compensation Reform Plan* and *the ecological compensation provisions in the Civil Code* have garnered scholarly attention. In simple terms, ecological damage compensation lawsuits allow administrative agencies to represent the state in suing individuals or organizations that have caused environmental damage, which represents the development of environmental public interest litigation in China in the new era. In practice, China began piloting these reforms in some regions in 2015. In 2017, *national guidelines for ecological damage compensation reforms* (the guidelines) were officially released to implement these reforms nationwide. The guidelines mandated administrative agencies to engage in consultations before initiating compensation lawsuits, making it a required preliminary step. And the guidelines also instructed the Supreme People's Court to study the relationship between ecological damage compensation lawsuits and environmental public interest litigation as the guidelines didn't provide explicit provisions regarding the order in which of them should be initiated. However, in practice, both social organizations and prosecution authorities can initiate environmental public interest litigation, while local governments authorized by the guidelines can also file ecological damage compensation lawsuits for the same environmental harm. This means even if one suit has already been filed, another can still be initiated, namely overlapping jurisdiction, leading to inefficiencies in the judicial process. To address this issue, clarifying the relationship between these two types of litigation has become a new hotspot in Chinese academic circle.

Cheng Duowei and Wang Canfa have conducted earlier analyses on this matter, positing that ecological damage compensation lawsuits neither fell under the category of public interest litigation nor civil litigation. Instead, they belonged to a distinct category termed "national interest litigation". As a conclusion, Cheng and Wang argued that the systems for ecological damage compensation lawsuits and environmental public interest litigation should operate in parallel without contradiction. [35] Wang Jin later studied the illegal waste discharge case involving DyStar Company and compared it with other ecological damage compensation cases from the same period. He concluded that ecological damage compensation lawsuits were a form of private interest litigation and such lawsuits should take precedence over general environmental public interest litigation, which meant social organizations can urge the rightful claimants—namely the state, collectives, and relevant operators who have property interests in the specific ecological environment and natural resources—to negotiate or litigate for ecological damage compensation in a timely manner, however, these social organizations themselves could only initiate environmental public interest litigation when the rightful claimants for ecological damage compensation did not take action as they didn't have substantive claim rights. This article served as an important clue in linking ecological damage compensation lawsuits and environmental civil public interest litigation [36]. Liu Huihui disagreed with Wang Jin's view that inaction by the rightful claimants for ecological damage compensation should be a prerequisite for initiating environmental civil public interest litigation. She suggestd that when both types of cases existed concurrently, the court should first address the ecological damage compensation lawsuit and then proceed to the environmental public interest lawsuit, using a method of suspending one case to handle the other [37].

4. Discussion

By conducting analysis and summary of existing domestic and international literature on the subject of environmental public interest litigation, answers to the three questions posed at the beginning at this paper are as follows:

4.1. Differences in Domestic and International Research Findings

Firstly, from the perspective of the number of published journal articles, the volume of literature on this topic from both China and abroad has gone through three distinct phases from 2003 to 2023: an initial exploration phase, a steady development phase, and a fluctuating rise/fall phase. Over the course of these phases, research on the subject has progressively deepened in both contexts. Secondly, in terms of research institutions, collaborations between domestic and international organizations were not very close. Most studies were conducted independently, with Chinese institutions comprising a significant portion of the research landscape. Thirdly, from the standpoint of keywords, both Chinese and foreign research focused on "public participation", and keywords like "governance" and "ecological civilization" in foreign literature, of which a significant portion engaged in comparative studies of environmental public interest litigation in China, could be beneficial references for Chinese studies. In addition, although emerging research hotspots such as

ecological damage compensation lawsuits were increasingly receiving attention in Chinese academic circle, long-standing keywords like "plaintiff eligibility" and "environmental jurisprudence" remained focal points. In the past two decades, Chinese research was continuously constructing theoretical frameworks based on practical development and legal updates, and was expanding into new related areas.

4.2. Changes in China's Research Hotspots over Time

Between 2003 and 2023, the focus of research on environmental public interest litigation in China has undergone the following changes: From year 2003 to 2008, the hotspots were the qualifications of the prosecutorial organizations as plaintiffs and the theoretical foundation of environmental public interest litigation. This focus shifted from 2009 to 2016 to the role of environmental courts, environmental civil public interest litigation, and environmental administrative public interest litigation. Subsequently, from 2017 to 2023, discussions have concentrated on the relationship between ecological damage compensation lawsuits and environmental public interest litigation.

4.3. Implications of These Changes

The changing research hotspots over time reflected the close relationship between scholarly focal points in the domain, the refinement of legal regulations, and the actual practice state of environmental public interest litigation in China. For example, the implementation of revised laws, such as *the Civil Procedure Law* in 2012 and *the Environmental Protection Law of the People's Republic of China* in 2014, has stimulated academic research. This research, in turn, influenced practical developments and gave rise to new scholarly focal points. This also showed the regularities within a field of study in China that shifts in academic discourse generally began with discussing the basic constituents of a concept, followed by comparative analyses, further specific construction of the concept, and finally extending to differentiations and connections between that concept and another newly emerging concept.

5. Conclusion and Future Research

This study used CiteSpace software to analyze 839 articles from the CNKI database and 139 articles from the WoS Core Collection, spanning 2003 to 2023. By visualizing trends in publication volume, institutional collaboration, co-occurring keywords, burst keyword, and keyword Time-Zone, it delved into the underlying context and core issues through the lens of the evolution of environmental public interest litigation in China over the past two decades. In summary, although China has achieved substantial results in this field, with research continually deepening and diversifying, China's research still needs to address the following deficiencies:

(1) First, despite extensive research on the practical aspects of environmental public interest litigation, there is a lack of focus on theoretical study in China. Chinese scholars have conducted thorough explorations into the practical aspects, devoting significant attention to technical details and institutional designs like citizen plaintiff qualifications, the prosecutorial role in lawsuits, and environmental courts. However, the theoretical core issues underpinning the construction of the environmental public interest litigation system have been largely overlooked [25], and deep studies on issues like claim basis, the constitutionalizing of environmental rights, and judicial confirmation of environmental rights have not received much scholarly attention [12]. The advantage of focusing on practical research is that it can provide direct solutions to real-world problems. However, the downside is the absence of a theoretical foundation for constructing the basic framework of environmental public interest litigation as theoretical research has significant guiding value for practical studies, and a shaky theoretical foundation can undermine the robustness of the research developed from it. Future research on environmental public interest litigation in China should balance deepening theoretical insights with practical analysis to establish a standardized academic and theoretical framework [15].

(2) Second, the foundational theories related to environmental public interest litigation in China has been transplanted from abroad, leading to a dearth of localized research. Given the earlier development of such theoretical work in foreign contexts, both theoretical and practical exploration in China has lagged. To expedite progress, many theoretical and practical positions have been directly imported from overseas. However, this straightforward transplantation approach presents challenges due to legal system disparities and differing practical conditions, exemplified by the awkward position of Environmental Non-Governmental Organizations (ENGOs) in Chinese environmental public interest litigation. Moving forward, Chinese research can glean insights from foreign efforts in cultivating public participation awareness, or delve deeper into the adaptation of Public Trust Theory and Environmental Rights Theory [38]. Nonetheless, the focus should be on localizing these concepts to fit the unique Chinese context.

(3) Third, there is a tendency to focus on doctrinal legal analysis, with a lack of empirical legal research. Empirical legal research has increasingly gained favor within the legal academy because, unlike doctrinal research, it emphasizes generating general theories from specific, empirical facts, thereby offering a more accurate reflection of judicial practice [39]. However, in the field of environmental public interest litigation in China, only 15 intersecting entries were found when setting

"environmental public interest litigation" and "empirical research" as keywords in the CNKI database. That is, out of the 839 samples used in this study, only 15 employed empirical research methods. This indicates that there is a shortfall in the application of procedural, experiential, and quantitative approaches represented by empirical research in this field [40]. In the upcoming era of big data, there will be increased opportunities to obtain massive datasets and the research paradigm for environmental public interest litigation is likely to undergo significant upgrades in this new context, and such advancements are highly anticipated.

Abbreviations

CNKI: Chinese National Knowledge Infrastructure
WoS: Web of Science
CSSCI: Chinese Social Sciences Citation Index
NGOs: Non-Governmental Organizations
SLAPP: Strategic Litigation Against Public Participation
ENGOs: Environmental Non-Governmental Organizations
EPIL: Environmental Public Interest Litigation

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Conflicts of Interest

The authors declare no conflicts of interest.

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