

Review

# Paper Analysis of the Relevance of Place Attachment to Environment-Related Behavior: A Systematic Literature Review

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**Abstract:** The discourse regarding place attachment (PA) has grown even more divergent, and an array of scholars and practitioners apply place attachment concepts in their work, drawing out associations between PA and environment-related behavior and revealing how an understanding of people's attachment to place can influence research, policy, and design practice. In this paper, we use bibliometrics and CiteSpace software to quantify and visualize 528 publications of place attachment and environment-related behavior research (PAEBR) in the core collection database of Web of Science (WoS) from 1 January 2004 to 1 November 2022 and trace the main overview of the research from the number of published papers. First, we present the number of papers published, research discipline distribution, the core authors of articles, the fundamental condition of countries and research organizations, and the major journals of articles involved in PAEBR through bibliometrics. Second, we identify trending research topics in PAEBR using keyword co-occurrence analysis. The results show that the four research trending topics involved climate change, pro-environmental behavior, and environmental threat. All of these provide readers with a preliminary understanding of PAEBR, indicating that cooperation and analysis involving multiple disciplines, specialties, and perspectives will become the dominant trend in this field.

**Keywords:** place attachment; environment-related behavior; CiteSpace; mapping knowledge domains; trending topics



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## 1. Introduction

Since the 20th century, human–land relationships have become an increasingly important focus in society, especially in terms of the deep-rooted emotional ties between people and places, which has become an essential topic of academic research, as problems related to resources, environment, and population have become more prominent under the intensification of global climate. Place attachment (PA), a key theory in the exploration of human–land relationships, is a positive emotional relationship between an individual and a place [1]. Since the introduction of the theory, it has been favored by academics and has been continuously focused on in environmental psychology, human geography, sociology, as well as environmental studies, environmental sciences, hospitality leisure sport tourism, and other intersectional fields, and it has achieved more fruitful results in terms of concept definition, theory construction, dimensional division, and research methods and applications [2].

Historically, this concept was primarily of interest to earlier phenomenological scholars in terms of environment–behavior issues [3,4]. In 1963, Fried [5] introduced the study of place theory from a phenomenological perspective by describing the adverse psychological consequences of the forced relocation of residents. In 1974, Tuan [6] introduced Topophilia into geography to explain the unique emotional experiences and bonds of people with places, which had a profound impact on the development of the subsequent theory of PA. In 1976, Relph's [3] interpretation of the concept of sense of place was introduced, in which the existence of place is no longer a mere spatial unit, but the social activities of people

give it a special meaning and make it more valuable [7]. Although the term PA emerged in the 1970s, the relationship between related terms describing human–land relationships (e.g., community attachment, sense of community, sense of place, place identity, and place dependence) has not been clearly defined, which has hindered the progress of PA-related research to some extent. In 1989, Williams and Roggenbuck [8] defined the concept of PA as a human–place bond based on emotion, cognition, and practice, which has been widely accepted by academics and has been the subject of numerous theoretical and empirical studies. In 1992, the publication of *Place Attachment*, edited by Low and Altman [9], transformed the fragmented research into a relatively complete research system. At this point, place transcended the concept of spatial geography and became a unit of cultural cognition.

After 2010, as research continued to gain momentum, the theoretical system of PA was perfected, and the number of results regarding practical applications increased, gradually becoming the focus of research. At the same time, alongside increasingly serious environmental problems, research related to PA is affected by the systems thinking of natural and social science [10]. The outbreak and spread of COVID-19 left economies worldwide in a state of weakness, and the stagnation in space prompted people to rethink the relationship between people and place, further reminding people of the powerful interconnections among place, health, and wellbeing [11]. Against this backdrop, Manzo and Devine-Wright [12] called for a reinterpretation of PA and a more nuanced analysis of human emotions while re-examining the relationship between people and places, offering new perspectives for understanding the relationship between people and the living world. PA has become an effective tool for understanding and organizing sustainable development and environmental protection measures [13].

To intervene in undesirable environmental behaviors, promote people's participation in environmental protection behaviors, and counteract negative global ecological changes, a wave of research regarding the relevance of PA to environment-related behavior has been initiated in academia. The associations between PA and environment-related behavior include climate change, pro-environmental behavior (also known as environmentally responsible behavior and environmentally friendly behaviors), tourist-related actions, and environmental threat (also known as environmental risk). Firstly, the climate is the basic attribute of a place. Environmental changes can affect the PA of individuals or groups and trigger certain response measures. Secondly, individuals who are attached to a place are more likely to protect it, participate in civic activities conducive to the local environment, and spontaneously protect local resources. Thirdly, tourism is an important way for people to perceive the environment. PA can affect people's environmental perception of the tourist destination and have a positive impact on perceived environmental risks and actions taken. Lastly, PA is an important predictor of environmental threat response. Together, these applications offer significant insights to inform environmental policies, management strategies, and pro-environmental behavior.

According to a search of the Web of Science (WoS) citation database, there are a few review papers regarding the relevance of place attachment to environment-related behavior research (PAEBR). In an article by Ramkissoon et al. [14], a conceptual framework that unifies the many PA subconstructs was created, and several hypotheses regarding how they relate to pro-environmental behavioral intention were presented. Neil Adger et al. [15] reviewed research across the social sciences to show that climate change threatens cultural dimensions of lived aspects that include PA, which is emerging as an important factor for climate adaptation. Bonaiuto et al. [16] reviewed 31 papers addressing PA with various natural hazard risks and considered that PA ought to be given more weight in the management of natural environmental risks. Dang and Weiss [17] reviewed the relationships between PA and behavioral intentions in different research areas and revealed a significant relationship between PA and willingness to pay, loyalty, risk-coping behavior, land management practices, civic engagement, pro-environmental behaviors, and pro-tourism

behaviors. Along with the progress achieved in the field so far, it is important to determine and analyze the overall state of PAEBR.

Due to evolving demands for data and information visualization, mapping knowledge domains describe a newly evolving interdisciplinary area of science aimed at the process of charting, analyzing, sorting, and displaying knowledge. CiteSpace has become one of the most representative knowledge-mapping tools. In this systematic literature review, we aimed to examine developments in the field over the years without a particular focus on one research field, but rather to provide a general overview across all disciplines. Taking bibliometrics citation and co-occurrence analysis as our theoretical basis, in this paper, we utilized CiteSpace to quantitatively analyze existing publications regarding PAEBR. On the basis of previous studies, we systematically combed the research results of PAEBR included in the core database of WoS from 1 January 2004 to 1 November 2022 to provide a reference for related research.

The structure of this paper is as follows: first, we introduce the data sources and methods. Second, we present the research results from an overview of PAEBR. Then, according to the co-occurrence distribution of the keywords map, we show the trending topics of PAEBR over the years. Lastly, we summarize the overall situation in PAEBR and propose suggestions for future research.

## 2. Materials and Methods

### 2.1. Data Collection

The Science Citation Index Expanded (SCI-E) and Social Sciences Citation Index (SSCI) databases were chosen as data sources based on the WoS core collection platform. A total of 544 publications were found when cross-searching the “topic” (which covers the article title, abstract, author, keywords, keywords plus, and country) as PAEBR, with “place attachment”, “environmentally responsible behavior”, “environmentally friendly behavior”, “pro-environmental behavior”, and “climate change” as the retrieval items. As the first article on PAEBR was recorded in 2004, the time span for data extraction was set from 1 January 2004 to 1 November 2022 to minimize the omission of important basic studies from earlier years. The results were displayed in an Excel document that collated information extracted from reference managers in an organized way (author name, publication, publication date, volume, abstract, etc.). Through software deduplication, 528 “paper” and “review” publications were finally retained.

### 2.2. Analytical Methods

#### 2.2.1. Bibliometric Analysis

Bibliometric analysis refers to a research method based on bibliographic information as the research object and bibliometrics as the theoretical basis. It is a literature analysis tool that can objectively and quantitatively reveal the development pattern of academic research, and it has been widely used in various research fields [18]. This method emphasizes the use of mathematical and statistical methods to examine the external characteristics of the literature in order to describe, evaluate, and predict the current status and trends of research in an academic field. By analyzing the bibliographic information, such as year, author, journal, and content, it is possible to quantitatively reveal the development history, research focus, and future research direction of a certain academic field. Bibliometric analysis is currently regarded as an important tool for summarizing historical research results and revealing future research trends.

#### 2.2.2. CiteSpace

The mapping of knowledge domains originated from the discussion of social network analysis at the 2003 National Academy of Sciences Symposium [19]. After that, Price introduced some of the contents into the citation network analysis of scientific papers to show the relationship between the development process and structure of scientific knowledge [20]. Among them, CiteSpace developed by Chen Chaomei of Drexel University

in the United States is one of the most representative forms of information visualization software for drawing scientific knowledge maps. It investigates the knowledge structure in relevant knowledge fields, detects the research development trends and correlations, and identifies betweenness centrality between pivotal points in the scientific literature. The research frontier is represented by co-citation clustering [21]. It can be used to investigate the dynamics of a specialty using time-variant mapping from a research front to its intellectual base, which it then presents in the form of a color atlas. Keywords are a high-level summary and condensation of the research content by scholars and, to a certain, extent can reflect the research hotspots in the field. Using Citespace to generate a keyword co-occurrence network map, in this paper, we statistically analyzed the literature from both subjective judgment and objective measurement and attempted to sort out the research topics. In the generated keyword clustering map of CiteSpace, the color blocks of different colors represent the areas of clustering.

### 2.2.3. Setting of CiteSpace

The 528 selected articles were imported into CiteSpace, with each time slice set to 1 year. To more effectively highlight the important node features in the map [21], the top 20% of the citations in each time slice were selected, and the pathfinding network method was adopted to crop the merged network. The co-citation clustering view of PAEBR was generated with cited references as node types; the circle size reflected the number of nodes, and the connecting lines between the circles reflected the association strength of the nodes. As explained above, we selected the entire time period to provide research topics from the entire base following the keyword co-occurrence for screening. Research trending topics with strong timeliness were searched across the past 18 years (set from 1 January 2004 to 1 November 2022), and the remaining factors were set by default in the software. The nodes and lines in the figures are not fully rendered due to the clarity and visualization. The clustering effect was measured using modularity and silhouette. The Q value represents the degree of modularity;  $Q = 0.84$  indicates that the modularization of the network is significant, whereby a higher value of Q denotes a better clustering effect of the network. Silhouette (S) measures the homogeneity of networks;  $S = 0.93$  indicates that the result of clustering is reasonable, whereby a closer value of S to 1 denotes increased homogeneity of the network.

### 2.2.4. Paths of Analysis

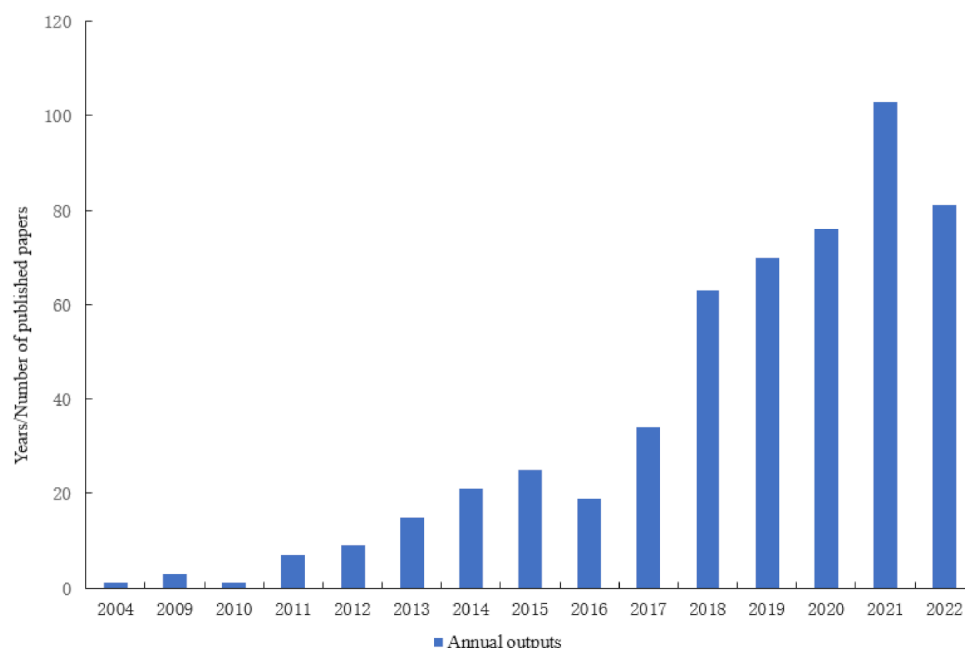
The bibliometric analysis of the publication's year, the research disciplines, the author, the geographical distribution of researchers, and the journal was one primary path of analysis that presented an overview of PAEBR. The co-occurrence analysis of keywords was another primary path of analysis, which was performed by utilizing CiteSpace. Combining the analysis of high-frequency and high-betweenness-centrality keywords, the intellectual base of PAEBR was determined. The time span of the analysis was from 2004 to 2022.

## 3. Overview of Place Attachment and Environment-Related Behavior Research

### 3.1. Analysis of Annual Publication Volume

The statistical results showed an overall increasing trend in the amount of research literature on PAEBR over the study period, which could be roughly divided into two phases (Figure 1). From 2004 to 2016, the number of publications grew slowly, and the phenomenon of zero articles appeared for many years, with a total of 101 publications, accounting for 19.13%, with an average annual increase of about 38.70% and an average increase of about 11 publications per year. From 2017 to 2022, the number of publications expanded, with a total of 427 publications, accounting for 80.87%, with an average annual increase of about 15.57% and an average increase of about 71 publications per year. It is worth noting that the annual number of papers published in PAEBR has increased year by year since 2011, reaching 70 papers published in 2019 and maintaining more than 70 papers

per year since then, indicating that the research entered a period of rapid development after 2019.



**Figure 1.** Annual outputs of the place attachment to environment-related behavior research (PAEBR).

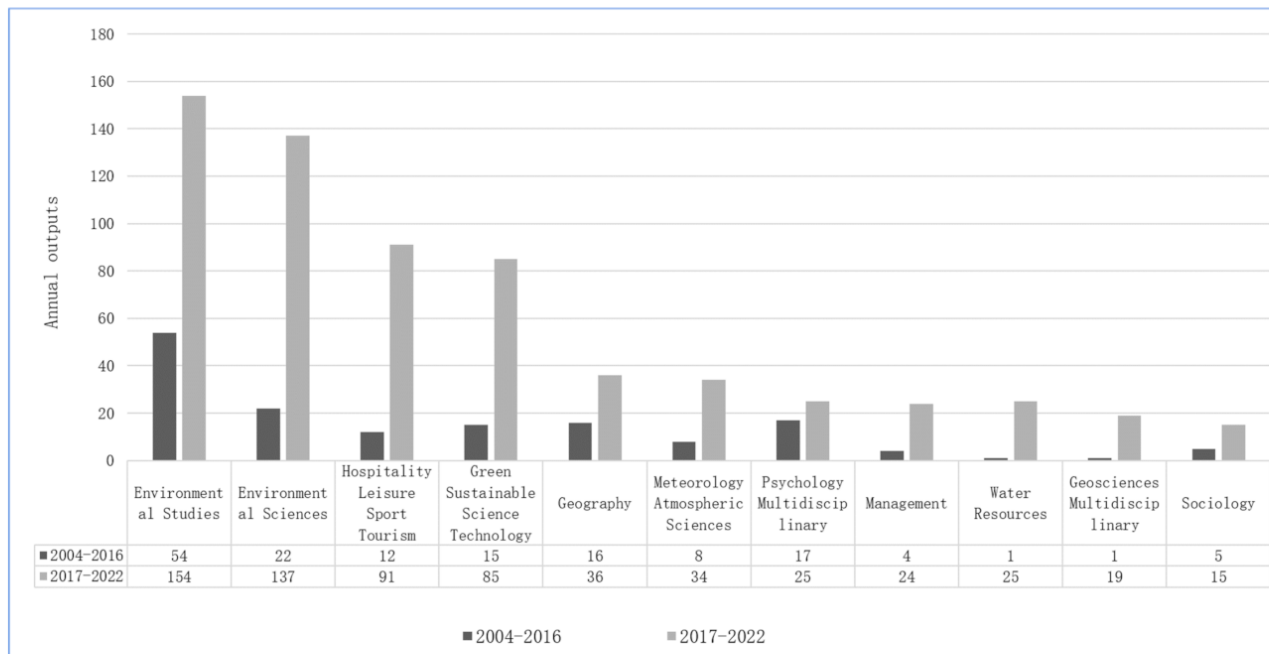
Overall, the change in the amount of PAEBR is closely related to the development of applied research on PA. From the introduction of place theory in the 1960s and 1970s, PA studies began to develop slowly. Growing concern for the environment led scholars to examine the role of larger, naturalistic settings on human behavior [22]. The existence of a place is no longer a mere spatial scale, with the social activities of people giving it a special meaning and making it more valuable. By the 1990s, PA began to become a research hotspot, and place transcended the concept of spatial geography to become a cultural cognitive unit, while the relationship between people and place became an important expression of spatial and spatial political organization [23]. Since 2010, the research has continued to gain momentum, and the deepening of practical applications has prompted research to expand in the direction of environment-related research, with PAEBR becoming a hot topic of research.

### 3.2. Analysis of Research Fields

Environmental studies, environmental sciences, and hospitality leisure sport tourism occupied the top three positions in the top 10 research categories (Figure 2), accounting for 39.39%, 30.11%, and 19.51% of the total number of publications, respectively. Also ranking high were green sustainable science technology and geography, accounting for 18.94% and 9.85% of the total number of publications, respectively. The results showed that environmental studies, environmental sciences, and hospitality leisure sport tourism were the three major research categories for PAEBR, while meteorology atmospheric sciences, management, and water resources also paid particular attention to PAEBR.

In terms of dynamic changes, the research category with the highest number of PAEBR publications from 2004 to 2016 was environmental studies, accounting for 53.47%. Environmental sciences and psychology multidisciplinary ranked second and third in terms of the number of publications with selected categories, accounting for 21.78% and 16.83%, respectively. From 2017 to 2022, environmental studies and environmental sciences still ranked first and second, accounting for 36.07% and 32.08%, respectively, while hospitality leisure sport tourism replaced psychology multidisciplinary and became the third largest research area, accounting for 21.31% of the total number of publications. A significantly increased

number of articles related to green sustainable science technology was published. This expansion of the research direction reflects that the current PAEBR is gradually developing toward a diversified research system.



**Figure 2.** Top 10 categories of the PAEBR.

### 3.3. Analysis of Core Authors

The number of first-author publications of 528 papers was counted, involving a total of 453 first authors (Table 1). If the first author published one academic publication that was considered as exploratory academic research, 88.30% of the first authors had an exploratory academic research status, 8.61% of the first authors who published two academic publications had an in-depth academic research status, 1.99% of the first authors who published three academic publications had a pursuit academic research status, and 1.10% of the first authors who published four or more academic publications had a status of long-term academic research.

**Table 1.** List of first authors and papers published in PAEBR.

| Number of First-Authored Publications | Total Number of Publications | Percentage of Total Publications | Total Number of First Authors | Percentage of the Total Number of First Authors |
|---------------------------------------|------------------------------|----------------------------------|-------------------------------|---|
| 1                                     | 400                          | 75.77                            | 400                           | 88.30   |
| 2                                     | 78                           | 14.77                            | 39                            | 8.61  |
| 3                                     | 27                           | 5.11                             | 9                             | 1.99  |
| 4                                     | 12                           | 2.27                             | 3                             | 0.66  |
| ≥5                                    | 11                           | 2.08                             | 2                             | 0.44  |
| Total                                 | 528                          | 100.00                           | 453                           | 100.00  |

Core authors are the backbone of building the academic system, guiding the academic influence and competitiveness of journals, and promoting academic innovation and development [24]. The number of core authors was determined according to Price's law [25]:

$$M = 0.749\sqrt{N_{max}},$$



where  $N_{max}$  is the highest number of first-author publications, and  $M$  is the number of papers, i.e., the range of core authors can be determined as a function of the number of publications by the most prolific authors in the research area. Of the 528 first-author publications, the author with the highest number of publications was T. H. Lee with a total of six publications. Substituting 6 into the above equation yields  $M = 1.83$ , rounded to  $M = 2$ . This indicates that first authors of three or more publications comprised the core group of authors in the research area. The total number of first authors with two or more publications was 53, including 43 first authors with 2–4 publications, and only two first authors with five or more publications. The number of core authors accounted for 11.70% of the total number of first authors, and their total number of published academic papers was 128, accounting for 24.24% of the total number of papers, far less than the 50% stipulated in Price's law [20]. This indicates that the authors of PAEBR were more dispersed and have not yet formed a truly core group of authors.

### 3.4. Analysis of Countries of Articles' Origin and Research Institutions

The geographical distribution of researchers is a concentrated expression of research strength and academic cooperation and exchange. The authors of the 528 papers were from 65 countries and regions and 770 research institutions. The statistics of the top 20 countries and regions (Table 2) and research institutions (Table 3) show that the United States ranked first with 144 articles (27.27%), with the University System of Georgia, the University of North Carolina, Cornell University, and the University of Georgia ranking ninth, 13th, 15th, and 19th, with a total of 35 articles accounting for 6.63% of the total literature. The University of Exeter, the Commonwealth Scientific Industrial Research Organisation Csiro, and the University of Johannesburg were in the top three, with 10 or more articles. Australia ranked second with 86 articles (16.29%), and the top 10 rankings included the Commonwealth Scientific Industrial Research Organisation Csiro, James Cook University, the University of Melbourne, and the University of Queensland, with a total of 53 articles, occupying a significant position. It is, thus, clear that European countries, as the major publishing countries, are involved in the main academic discourse on PAEBR. On the one hand, it is encouraging to see that China, South Africa, South Korea, and India were among the top 20 countries and regions in terms of the number of publications, and their academic contributions and influence are increasing year by year. On the other hand, this confirms that the academic coverage of PAEBR is growing, and the research prospects are promising, with an increasing number of non-English speaking countries emerging in the arena of PAEBR, increasing their ability to engage in dialogue with international mainstream institutions. This also shows that the academic community of PAEBR in the context of globalization has been developing worldwide.

**Table 2.** Top 20 countries and regions in terms of publications.

| No. | Countries/Regions | Count | No. | Countries/Regions | Count |
|-----|-------------------|-------|-----|-------------------|-------|
| 1   | USA               | 144   | 11  | The Netherlands   | 22    |
| 2   | Australia         | 86    | 12  | South Korea       | 20    |
| 3   | England           | 84    | 13  | Portugal          | 18    |
| 4   | China             | 81    | 14  | Italy             | 16    |
| 5   | Canada            | 34    | 15  | Spain             | 14    |
| 6   | Taiwan            | 31    | 16  | New Zealand       | 13    |
| 7   | Germany           | 26    | 17  | Sweden            | 13    |
| 8   | Norway            | 24    | 18  | Switzerland       | 13    |
| 9   | France            | 23    | 19  | India             | 9     |
| 10  | South Africa      | 23    | 20  | Denmark           | 8     |

**Table 3.** Statistics of top 20 research institutions in total articles published.

| No. | Affiliations   | Count | No. | Affiliations                                      | Count | No. | Affiliations                       | Count |
|-----|--|-------|-----|---|-------|-----|------------------------------------|-------|
| 1   | University of Exeter   | 25    | 8   | Centre National De La Recherche Scientifique Cnrs | 10    | 15  | Cornell University                 | 8     |
| 2   | Commonwealth Scientific Industrial Research Organisation Csiro | 20    | 9   | University System of Georgia                      | 10    | 16  | Kyung Hee University               | 8     |
| 3   | University of Johannesburg                                     | 14    | 10  | National Yunlin University Science Technology     | 9     | 17  | Udice French Research Universities | 8     |
| 4   | James Cook University  | 11    | 11  | Sun Yat Sen University                            | 9     | 18  | University of Derby                | 8     |
| 5   | Uit The Arctic University of Tromso                            | 11    | 12  | University of London                              | 9     | 19  | University of Georgia              | 8     |
| 6   | University of Melbourne  | 11    | 13  | University of North Carolina                      | 9     | 20  | University of Western Australia    | 8     |
| 7   | University of Queensland                                       | 11    | 14  | Australian National University                    | 8     |     |                                    |       |

### 3.5. Analysis of Major Journals

According to the analysis report retrieved from the core collection of WoS, 195 kinds of publications have published PAEBR-related literature. The top 10 journals in the total number of articles were statistically sorted (Table 4). Firstly, 40 studies, representing the largest number of studies in the literature, were published in Sustainability, accounting for 7.58% of the total. By analyzing the literature published in Sustainability, it was found that there were 25 columns of literature, accounting for 62.50% of the total literature. Twelve articles were published in 2021, and 11 were Special Issues. The columns were mainly in the direction of tourism, climate change, and environmental protection. Examples of this research include applications of new technologies in tourism activities, tourism, and sustainability: combining tourist's needs with destinations' development; sustainable directions in tourism; sustainable management in tourism, hospitality, etc.; urban mitigation and adaptation to climate change; the role of coastal residents in adapting to climate change: social, political, cultural, and economic dimensions; climate change and sustainable development policy, sustainable tourism, and climate change: impact, adaptation, mitigation, etc.; pro-environmental behavior—social and cultural aspects; relationships between place attachment and pro-environmental behavior: social and educational perspectives in pro-environmental behavior. Secondly, research was published in the Journal of Sustainable Tourism, Journal of Environmental Psychology, Global Environmental Change Human and Policy Dimensions, International Journal of Disaster Risk Reduction, and other journals, which represented the main publishing journals on PAEBR. As an important journal of tourism, the Journal of Sustainable Tourism published 12 pieces of research regarding environmentally responsible behavior, accounting for 41.38%. The Journal of Environmental Psychology was the core journal of PA research [2], and an area of significant development in PAEBR is its application to various contexts and environmental challenges, which responds to the critical challenges in contemporary society, such as global climate change. These challenges indicate that PA has been applied to the study of natural resource management, community responses to the siting of renewable energy technologies, pro-environmental behavior, and responses to disasters.

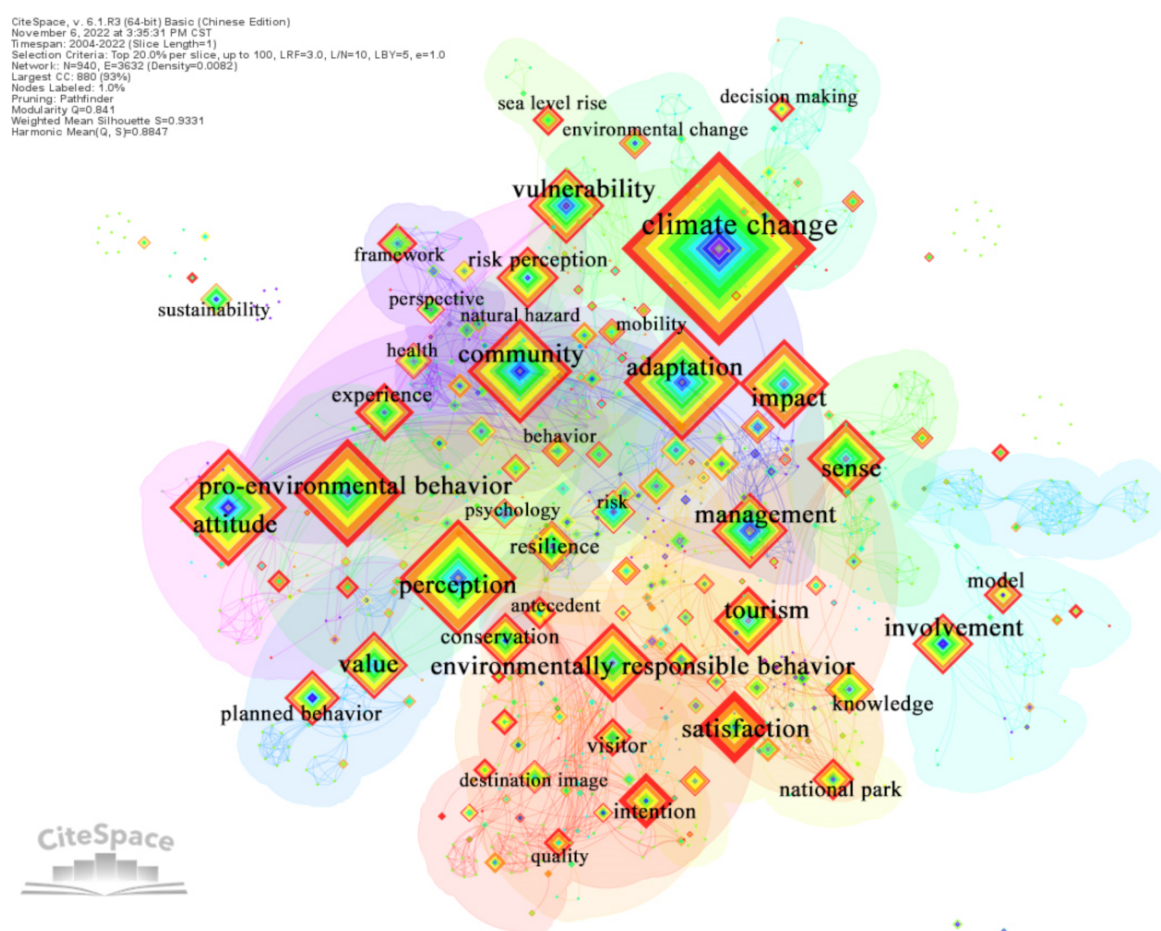
**Table 4.** Top 10 journals in terms of publication volume.

| No. | Journals' Name  | Count |
|-----|---|-------|
| 1   | Sustainability  | 40    |
| 2   | Journal of Sustainable Tourism                                    | 29    |
| 3   | Journal of Environmental Psychology                               | 20    |
| 4   | Global Environmental Change Human and Policy Dimensions           | 14    |
| 5   | International Journal of Disaster Risk Reduction                  | 14    |
| 6   | Frontiers in Psychology   | 13    |
| 7   | Asia Pacific Journal of Tourism Research                          | 9     |
| 8   | Ecology and Society   | 9     |
| 9   | International Journal of Environmental Research and Public Health | 9     |
| 10  | Environmental Science Policy                                      | 8     |



#### 4. Trending Topics of Place Attachment and Environment-Related Behavior Research over the Years

In the generated keyword co-occurrence map (Figure 3), climate change being the largest node in the figure reflected that climate change was the main research context for PAEBR. The community was the main research space in the research, and the high-frequency words of attitude and perception were important clues to the nature of the research. The close connection between keywords and the intensive co-citation relationship between the research topics indicates that the turnover of research hotspots is based on the expansion of earlier research, with a certain academic heritage, and the research topics follow social development and global topics.



**Figure 3.** Co-occurrence distribution of keywords in PAEBR.

Specific manifestations were as follows: the terms climate change, adaptation, impact, vulnerability, and risk perception were closely linked, indicating that the attention paid toward climate change is increasing day by day, and an increasing number of scholars recognized the profound impact of climate change on the relationship between people and landscape and tried to explain it theoretically or reveal the rules. The high association of the terms pro-environmental behavior, value, conservation, resilience, and antecedent implied that scholars were increasingly focusing on the role of emotion in environmental conservation and continuously exploring the relationship between PA and pro-environmental behavior. The terms tourism, environmentally responsible behavior, satisfaction, management, and involvement had a high degree of correlation, forming the tourism direction of PA research. The terms experience, health, natural hazard, mobility, and risk revealed that PA acted both as a mediating and moderating variable between risk perception and coping and played a more significant role in environmental risk management.

#### 4.1. Climate Change

Climate change, as a global environmental issue, has received widespread attention from the academic community, but the response of human emotions to climate change has always been ignored. When Tuvalu's residents expressed deep sadness and discomfort because of the sea-level rise caused by climate change [26], people realized that affective encounters can be significant in climate change decision making [27]. Climate change not only affects the natural environment, such as continents and oceans, but also has an impact on individuals' perceptions, emotions, and behaviors, which can lead to changes in the environment in which people work and live [28].

Strong PA is critical to an individual's or group's attitudes and behaviors in adapting to climate change. There is a need to analyze the pros and cons of PA and climate change adaptation and mitigation, as well as link PA to adaptation responses at the political level [29]. For example, Devine Wright [30] investigated the role of PA in explaining public responses to a tidal energy converter in Northern Ireland. The research results showed that the importance of PA in understanding public response emerged as a substantial, positive predictor of project acceptance. Devine Wright [31] investigated the links between attachments and collective actions, particularly 'NIMBY' resistance to adaptation and mitigation strategies, revealing that, due to the strong PA of residents, even with the strong support of many environmental protection policies, people were more likely to oppose when PA conflicted with local environmental protection. Manzo and Perkins [32] pointed out that PA could motivate collective action in a place and that more attention should be paid to the local political context and the different ways in which different people communicate the meaning of place, legitimately advancing or opposing relevant local development policies to adapt to and mitigate climate change.

Climate change can alter not only the physical characteristics of places, but also their associated meanings, identities, and emotional bonds [33]. Hess et al. [34] observed that the effects of climate change differ in specific locations. PA was also important for understanding how people directly respond to environmental changes (such as rises in sea level) and indirectly address or prevent harmful environmental changes (such as resource conservation or the management of coastal zone adjustments). It is worth noting that studies of PA tend to ignore the role played by the climate. Research has shown that people with high PA were more sensitive to climate change than those with low PA. Climate change would destroy people's sense of continuity about the past, especially that related to childhood memories [35].

In recent years, research on climate change and PA has shifted from a small spatial scale to a larger spatial scale. Devine-Wright et al. [36] and Devine-Wright and Batel [37] examined the relationship between PA at the local, national, and global levels by surveying people's perceptions of climate change in Australia and the United Kingdom. The results suggested an inverse relationship between national and global attachments related to climate change, with individuals with stronger national attachments being less likely to view climate change as a human-made phenomenon compared to global attachments. PA can extend to more distant spatial scales with symbolic landmarks, and PA in areas vulnerable to climate change can contribute to a greater role in global stewardship [38].

#### 4.2. Pro-Environmental Behavior

As emotion plays an important role in people's perception and response to environmental changes, does it also play a role in environmental decision making and policies and affect pro-environmental behavior? Pro-environmental behavior refers to individual behaviors that sacrifice personal interests for the long-term interests of the collective and the environment, including voluntarily simple lifestyles, such as a low-carbon diet, low-carbon living, low-carbon travel, and green consumption.

With the increasing emphasis on the role of emotions in environmental conservation, research has found a link between PA and pro-environmental behavior. For example, Kaltenborn [39] conducted an early empirical study on the relationship between PA and pro-

environmental behavior by applying Shamai's single-dimensional scale of PA to residents in Norway and confirmed the facilitative effect of PA on the pro-environmental behavior of residents. Stedman [40] found that PA had a separate impact on property owners' willingness to act in ways that preserve or improve the environment's valued characteristics.

In terms of the positive effects of PA on pro-environmental behavior, on the one hand, it tends to create a tendency for local protection, which leads to spontaneous interest and concern for the environment [41]. On the other hand, the higher the attachment level, the more likely it is to contribute to wellbeing through action [42]. That is, PA serves as a predictor of environmental behavior, and people who are strongly attached to a place are more likely to protect their homes, engage in civic activities that benefit the local environment, protect the natural resources in their daily lives, and be more resilient to environmental risks. In addition, PA based on the natural environment is more likely to produce pro-environmental behavior than PA based on the city. People with nature-based PA considered the natural environment as important and took pride in the scenery of the place, which led to more pro-environmental behaviors. People with PA based on the urban environment did not value the natural environment but the usability of the place; hence, it did not produce much pro-environmental behavior compared to PA based on nature [43].

However, PA can either promote pro-environmental behaviors or be a hindrance that limits the occurrence of pro-environmental behaviors [44]. Individuals with stronger attachments are more likely to hold opposing views if pro-environmental behavior has a constraining effect on their economy and residence. For example, Devine-Wright [31] found that, even with strong support from many environmental policies, British residents still opposed the construction of wind farms in their local area because they were attached to the natural landscape. When people's attachment to place was against local environmental protection, people would abandon local environmental protection.

Proposing more sustainable or adaptive approaches to environmental management at the level of policy interventions to respond to environmental change is a further expansion of research on environmentally capable conservation and PA. Inclusive governance and participatory processes are critical to the social, cultural, and economic sustainability and adaptability of environmental policies [45]. Resident-based environmental policies are more likely to have higher levels of consensus and public support. When environmental policies are compatible with personal attachments or identities, people may be more willing to comply with those policies. On the contrary, environmental policies that conflict with the attachment and identity of individuals and groups may face the risk of being misunderstood or even rejected, resulting in less sustainable and adaptable policies [46].

#### 4.3. Tourism

The environment is an important factor in pulling tourism activity and contributes significantly to the attractiveness of a destination; moreover, it is an indispensable asset for the tourism industry, making tourism (especially natural resource-based tourism) highly dependent on the environment. The uncivilized behavior of tourists, intentional or unintentional, may cause damage to the ecological environment of tourist places. The irrational economic activities of residents and the misuse of resources by managers in a hurry for quick profits may also lead to the deterioration of the ecological environment of tourist places. Therefore, how to reduce the negative impact of tourism on the environment has received widespread attention.

For a long time, the study of PA, which directly addresses the human–place relationship and focuses on the humanistic and social environment, has provided a broad arena for knowledge spillover from the field of tourism. PA is a common value that transcends the boundaries of class, race, age, and gender. It can increase the individual's sense of responsibility for the place and, thus, affect the environmentally responsible behavior (ERB) of a specific place. ERB is active behavior taken by residents and tourists to protect the environment of destinations, and it is also an important issue of sustainable tourism

destination management. Therefore, the concept of PA has been introduced into the context of tourism research to explore the impact of PA on tourists' ERB.

ERB refers to behavior in which individuals spontaneously and consciously implement the impact on the environment from their sense of responsibility and values. Pruneau et al. [47] interpreted environmental behavior as an individual's use of self-awareness to minimize its negative impact on the natural environment, aiming to reduce negative environmental impacts and promote sustainable resource use. The current research focuses on the relationship between tourists' PA and ERB. On the one hand, there was a significant positive correlation between PA and tourists' ERB, i.e., an increase in tourists' PA could significantly improve their ERB [48]. For example, Cheng et al. [49] found that PA played a mediating role between destination attraction and ERB. The local attraction would significantly and positively affect tourists' PA, while PA would significantly and positively affect their ERB. Ramkissoon and Mavondo [50] found that tourists' PA would affect their ERB, which then would affect their tourists' satisfaction. Cheng and Wu [51] revealed that tourists' environmental knowledge positively affected their environmental sensitivity, environmental sensitivity positively affected PA, and PA affected ERB. PA mediated the relationship between tourists' environmental sensitivity and their ERB. On the other hand, tourists' PA helps to increase their satisfaction with interpretation services. By building tourists' PA and increasing interpretation satisfaction, tourists can gain more interpretive information about natural resources during a tour, which can drive ERB [52]. For example, Chow et al. [53] investigated Nanling National Forest Park and Dinghushan National Nature Reserve in China and found a significant positive relationship between PA and service satisfaction. Littlejohn et al. [54], when investigating tourist satisfaction with marine tourism interpretation, found that interpretation satisfaction was associated with a normative action model which promoted ERB.

Most of the current research focuses on the study of tourists' PA and ERB but neglects the study of the PA and ERB of residents of tourist destinations. It is very necessary to study the ERB of residents in tourist destinations. Improving residents' awareness of environmental protection will help residents participate in the planning and construction of tourist destinations and promote the development of local tourism. Moreover, most studies tended to consider PA as an antecedent of benefit and cost perception, confirming that relatively stable PA has a positive impact on the attitude toward tourism development. However, when the environment changes, attachment also adjusts. When residents perceive the benefits of tourism development, they are more likely to have strong attachment. Therefore, when the external environment changes, PA will also change, which indicates that PA is in a dynamic process. Then, when residents perceive the positive impact of tourism development, they can strengthen their attachment, and, when they perceive the negative effects such as traffic congestion and price increase due to tourism, whether the PA will also be weakened is worthy of further study.

#### 4.4. Environmental Threat

When people are increasingly exposed to environmental threats, the research on the relationship among PA, environmental risk perception, and environmental coping responses is becoming more and more important. When one is exposed to risk and the resulting sentiments of threat, danger, and uncertainty of one's place, a strange condition occurs that calls for consideration of human–land relationships. Since PA and the experiential quality of a place can be crucial to how individuals respond to places in general and may also be essential for responses to environmental hazards [55], the importance of PA must be acknowledged. PA should be a significant predictor of environmental risk response since it has been found to have several stable effects on emotion and wellbeing [16]. Individuals with a higher degree of PA are more aware of the environmental risks around them. For example, Bernardo [56] compared different categories of risk in Portugal and found that residents with a higher degree of PA perceived higher risk in the case of frequent occurrences. However, many studies have also shown that PA can negatively affect the intention



to adapt to environmental threats. This means that higher PA leads to lower risk perception and awareness. The place to which an individual is attached may be perceived as a haven of safety in times of threat and risk. For example, Bonaiuto et al. [16] found that members of rooted communities refused to take the initiative to deal with threats or even to cope with threats by evacuating seriously threatened areas.

On the basis of recent research, the relationship between the typology of environmental threat response and the specific PA style was linked by environmental psychologists. Sullivan and Young [57] believed that, when facing environmental threats, responses should change according to the attachment style of the place which includes place inherited style, place discovered style, and place relativity style. In particular, the place relativity style is predicted by the mobile lifestyle and short living time living in a place. Individuals with a high place relativity style may be less threatened because they are exposed to disasters for a short time and may choose to leave [58]. When examining relocation and returning actions and mobility, attachment individuals related to the location are observed. Mobility is a key concept to understanding the impact of extreme events on individuals and society and reflects the important aspects of environmental vulnerability, resilience, and sustainability. As Cresswell [59] said, mobility is understood as physical movement, expression with shared meaning, and embodied practice with rich experience. Mobility itself can have an immediate and indirect impact on the physical environment, causing environmental threats. Fried [5] investigated the reactions of Boston residents to forced relocation during the so-called urban renewal project in the West End and observed that people exposed to forced relocation would experience grief. PA is closely intertwined with the local economy, as well as natural and social capital [60]. The study observed that the discomfort with the new environment caused the forcibly relocated group to find themselves in a weaker social relationship with a loss of attachment [61]. To achieve a safe, resilient, and equitable environment, it is necessary to fully understand how different population groups respond to environmental crises and how this response further shapes our society in further research [62].

## 5. Conclusions

With gradual improvements in the theory and application of PA, different research traditions influence PA, and, in turn, research regarding PA influences the development of other subdisciplines. Disciplinary and interdisciplinary perspectives on PA are where scholars borrow freely across disciplines to support a specific construct in their PA. This is a reaction to a larger social landscape and major social–environment developments such as globalization and environmental change. Across the interdisciplinary landscape, PAEBR represents one of the main branches of the PA literature through time as interconnected and cross-influenced, and it represents the progression of PA to meet evolving research interests. The main conclusions that can be drawn from this work are presented below.

At present, the research prospect of PAEBR is still very broad. As the mainstream research fields of PAEBR, environmental studies, environmental sciences, and hospitality leisure sport tourism have driven the growth of other fields such as meteorology atmospheric sciences, management, and water resources. Although PAEBR has stimulated the research enthusiasm of many scholars, it shows a generally scattered characteristic, and the core authors who published two or more papers as first authors only accounted for 24.24% of the first authors; hence, a core group of authors has not yet been formed. Several of the more established research teams are still centered in the United States, linking research institutions in European countries, as well as Australia, the United Kingdom, and Canada. In recent years, China, South Africa, South Korea, India, and other countries have also continuously joined the research field. Sustainability, the Journal of Sustainable Tourism, and the Journal of Environmental Psychology are the main publishing journals in PAEBR. Sustainability attaches great importance to PAEBR by publishing a wealth of Special Issues to solicit contributions regarding the research content of PAEBR. The diversity of topics in PAEBR has been arguably the most successful aspect of the literature over the years. It is an

opportunity to hear from a variety of researchers and practitioners who use PA concepts in their work and demonstrate how research, policy, and design practice may be influenced by an understanding of people's attachment to place. In connection to environmental concerns, the relevance of PA to environmental change shows that PA can enable or constrain both adaptation and mitigation depending on the interactions between attachment bonds and the meanings associated with particular places impacted.

Future research should be used to pay more attention to the cooperation and communication between English and non-English-speaking countries and put research achievements into various social, cultural, and economic backgrounds. The exchange and cooperation between the core authors are also worthy of attention, which is conducive to the further development of research. Whether the research can attract more attention and publication in journals is also the driving force for the development of PAEBR. Research topics ranging from climate change to pro-environment behavior, tourism, and environmental threat are closely related to the current context of sustainable development and deeply reflect the needs of society. Continued research can help improve environmental management theory at the humanitarian level, identify the links between PA and related behaviors, and prompt scholars to re-examine the meaning of human–landscape relations. The question of how we can more effectively understand the inter-relationship between PA and climate change beyond the focus on localism is a continuing direction for future research, and further exploration of PA at different scales, from home, community, city, and country to global, is needed. New methods and perspectives are needed to dynamically capture the corresponding behavioral measures arising from climate change and to explore how PA changes over time. To examine the association between pro- and anti-environmental behaviors and PA under different cultural backgrounds, it is also necessary to compare the influence of PA on environmental protection measures under different environmental and cultural values and to refine the role of differences in PA on pro-environmental behaviors among different populations. The questions of how to strengthen the perception of tourists on the overall intention of a place, further optimize the environmental attributes, coalesce the core values of a place, and build an emotional bond between people and place to enhance the attachment of people to a place are still the directions for future research. Both natural and non-natural risks depend on people's perception, which requires people's decision making and actions. The research on the relevance between PA and environmental threats has a great impact on health and wellbeing. Future research needs to closely link PA with different types of risks, refine and expand the research on PA, and extend the research on the correlation between PA and environmental risks to a wider range of disciplines to form a diversified research system to support the further development of research.

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