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# Conceptual Analysis of Pro-Environmental Behavior: A Bibliometric Approach

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## Abstract

This study provides information on the conceptual and historical evolution of pro-environmental behavior (PEB) through bibliometric analysis. This study examines 4740 articles in the Web of Science (WOS) database published between 1981 and 2024. The development of the PEB examines using performance and science mapping techniques and co-authorship, co-occurrence, citation, and co-citation analysis using the VOSviewer program. When the PEB was evaluated, it was determined that the concept was first expressed as conservation behavior, and the term "pro-environmental" was used in different ways, such as environmentally friendly, environmentally responsible, sustainable, green, and recycling. It was observed that PEB was first used in the literature in 1981. It has also been determined that PEB has been discussed within the framework of different theories, including the Norm Activation Model, the Theory of Planned Behavior, and the Value-Belief-Norm Theory. However, there has been a gradual increase in publications since 1981, and the literature has been in a rapid growth phase in recent years. In this context, PEB is a widespread phenomenon that has attracted attention in the literature in recent years. Over the years, PEB has evolved into consumer engagement, corporate greening, corporate social responsibility, employee green behavior, environmental consciousness, environmental management, and environmental sustainability. Within the scope of the study, the conceptual evolution of PEB over the years has been evaluated and suggestions for future studies have been made.

**Key words:** Pro-Environmental Behavior; Conceptual Analysis; Bibliometric Analysis

**JEL Code:** M10, M11

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## 1. Introduction

The Industrial Revolution increased productivity but destroyed the environment through overuse of natural resources and increased consumption. Human actions cause many environmental problems, so researchers and policymakers believe promoting PEBs will reduce these problems (Shafiei & Maleksaeidi, 2020). Although the first research on environmental behavior began in the mid-1960s, the 1970s experienced a surge in interest in environmental psychology and assessing public concern for environmental quality. Research on environmental behavior has increasingly grown across various academic disciplines.Environmental behavior studies have gained insights from researchers in psychology, geography, environmental planning and design, natural resource management, sociology, anthropology, and political science.The development of environmental behaviors and attitudes became popular in the 1980s and 1990s (Li et al., 2019).

Many environmental problems caused by human activities can be addressed by influencing these activities. To achieve this, PEB was developed to intentionally encourage behaviors that reduce the negative impacts on the environment. Several theoretical models, such as the Value-Belief-Norm Theory, the Theory of Planned Behavior, and the Norm Activation Model, have been proposed to understand PEB due to its complexity. Current empirical research highlights the importance of social and personal factors affecting PEB. These factors can be divided into internal elements, like motivation, values, and environmental awareness, and external elements, such as economic, social, and institutional influences, including gender, age, and education. Typically, participant interviews are used to explore these issues. It's important to note that environmental decisions and actions are influenced not only by individual characteristics but also by the traits of the entire family or household. Therefore, when evaluating the decision-making process, the perspective of the whole household should be considered rather than just individual members (Mikuła et al., 2021).

In today's world, the promotion of PEBs has become a critical topic of discussion. With the growing awareness of environmental issues and the necessity for sustainable living, it is essential to understand current trends related to pro-environmental behavior (PEB). This study aims to provide a comprehensive overview using bibliometric analysis to highlight the main factors that encourage individuals and communities to engage in environmentally friendly practices. The contribution of this research is threefold. First, it seeks to explain PEB by exploring how pro-ecological behaviors are conceptualized in the literature, including terms such as environmentally significant behaviors, green consumer behavior, and ecological behavior. Second, bibliometric analysis forms a part of systematic review studies, allowing for a comprehensive evaluation of the field's development and historical evolution (Block & Fisch, 2020; Fisch & Block, 2018). This study offers an overview of the literature on PEB by employing bibliometric analysis. It

aims to guide future research directions in the PEB by examining its development over time and providing a comprehensive assessment of previous studies and their findings while highlighting key concepts related to this topic. This paper addresses a gap in the existing literature on PEB by conducting a bibliometric analysis. It aims to answer the following questions:

RQ1. How do PEB articles cluster, and what research streams emerge?

RQ2.Which research streams receive the most attention in terms of publication numbers?

RQ3. What are the future research questions related to PEB?

RQ4. Which channels, such as journals and country, are most effective in PEB research?

## 2. Literature Review

The term PEB encompasses a variety of intentional actions taken by individuals to lessen their negative impact on the environment. According to Li et al. (2019: 29), PEB is generally understood as purposeful actions to foster a healthier planet. Graves and Sarkis (2018) further elaborate that PEB includes a comprehensive array of environmental responsibilities, which involve not only enhancing one's understanding of ecological issues but also developing sustainable products and processes, as well as critically evaluating actions that may harm the environment (Foster et al., 2022: 2). At its core, PEB represents a commitment by individuals to engage in mindful practices that drive positive environmental changes while simultaneously addressing the detrimental effects of human negligence. Manifestations of PEB take many forms, including recycling—such as reusing materials like paper, plastic, glass, and containers—which helps divert waste from landfills. Additionally, individuals can conserve water by adopting simple habits, like minimizing water usage during showers or while washing hands. Another critical aspect of PEB is energy conservation; for instance, turning off lights in unoccupied rooms is a straightforward way to reduce electricity consumption. Reusing items, such as reusable containers instead of disposable ones, also contributes to sustainability efforts. Choosing alternative modes of transportation, such as using public transit, cycling, or even walking, reduces carbon emissions and promotes healthier lifestyles.Moreover, individuals play a critical role in environmental stewardship through responsible waste management, ensuring that non-recyclable materials are disposed of appropriately. Reducing paper usage, for example, by printing on both sides of a sheet, is another effective strategy for minimizing waste. Finally, making conscious choices to purchase and consume eco-friendly products signals a commitment to supporting sustainable practices (Yusliza et al., 2020: 2-3). Individuals can collectively foster a more sustainable and environmentally friendly future through these varied and impactful behaviors.

PEB refers to intentional actions taken to minimize negative impacts on the environment. This concept applies to both individuals and groups. PEB includes refraining from harmful activities (such as flying) and engaging in environmentally beneficial practices (such as recycling) (Mikuła et al., 2021). Essentially, PEB

encompasses any action that helps protect the environment and supports sustainability. Encouraging individuals to engage in various PEBs—such as recycling, garbage collection, staying on designated trails, and making donations—plays a crucial role in promoting sustainability in protected areas. These efforts can lead to improved environmental outcomes and help mitigate the severity of global environmental threats, ultimately contributing to a more sustainable society (Esfandiar et al., 2022).

PEBs are various actions taken to benefit the environment. These behaviors have been described in different ways in the literature, including as environmentally behaviors (Stern, 2000), green consumer behavior (Do Paco et al., 2019; Narula & Desore, 2016), ecological behavior (Otto & Pensini, 2017), and environmentally responsible actions (Cheng & Wu, 2015). Other terms used to describe PEBs include behaviors that support the environment (Ogiemwonyi et al., 2020), responsible environmental behaviors (Cheng et al., 2018; Wang et al., 2018), environmentally friendly behaviors (Liobikienė & Juknys, 2016), and low-carbon behaviors (Fu et al., 2017). PEB encompasses various operational behaviors, including recycling (Hansmann et al., 2006; Klöckner and Oppedal, 2011; Byrne and O'Regan, 2014; Zhang et al., 2016; Fu et al., 2017), transportation usage (Eriksson et al., 2008), waste management (Begum et al., 2009; Rigamonti et al., 2014; Sasaki and Araki, 2014; Lobato et al., 2015; Põldnurk, 2015; Liu et al., 2017), energy consumption (Tester, 1992; Berardi, 2017), and the purchase of green products (Ramayah et al., 2010) and energy-efficient electrical appliances (Shih, 2001; Aizawa et al., 2008).

Numerous studies have been conducted to identify different types of sustainable activities. However, these studies have primarily focused on reducing the negative impacts of human behavior on the environment (Foster et al., 2022). Researchers often use various terms to describe behaviors that aim to protect the environment, including environmentally related behaviors, environmentally important behaviors, environmentally responsible behaviors, and PEBs. PEBs are conscious actions taken by individuals to mitigate the negative effects of human activities on the environment or to enhance environmental quality (Sawitri et al., 2015).

The concept of PEB is readily understood, but the literature includes similar terms such as protection, sustainability, efficiency, environmental protection, and preservation. Identifying behaviors that are considered pro-environmental has proven to be quite challenging. Firstly, the standards for what qualifies as pro-environmental are constantly evolving, and behaviors deemed pro-environmental today may potentially harm the environment in other contexts. This variation means that PEB is viewed through cultural and historical lenses. Secondly, the impact of any behavior on the natural environment must be evaluated for other actions. Hence, the term "pro-environmental" is relative. While all human actions have some effect on the environment, some have a more significant impact. For instance, breathing, driving a bus, and driving a car emit carbon dioxide. However, walking

to work produces fewer carbon emissions than taking a bus, which has a lower per-person carbon footprint than driving. Driving a car may be considered pro-environmental compared to taking a private jet. The key takeaway is that pro-environmental behavior should be assessed with other possible actions, and there is no absolute standard for determining what is genuinely pro-environmental (Schultz & Kaiser, 2012).

PEBs are categorized into two types: public PEBs and private PEBs. Public PEBs include pro-environmental laws and policies that encourage individuals to engage in environmentally friendly activities and address environmental issues. In contrast, private PEBs involve personal actions, like purchasing, using, and disposing of goods and services (Foster et al., 2022). In the private sector, PEBs consist of tangible actions individuals can take to help protect the environment. These include recycling, conserving water and electricity, and sorting trash. On the other hand, activities that indirectly benefit the public sphere are classified as public sphere PEBs. Examples include filing lawsuits to defend the environment, reporting contamination, and participating in campaigns promoting environmental protection. Both public and private initiatives significantly positively reduce resource extraction and minimize environmental harm (Riaz et al., 2023). In this vein, considering the fragmented nature of PEB research and its dynamic evolution over the years, it is essential to identify key points in the literature on PEB and thoroughly examine its development. In this study, the evolution of the PEB literature was examined using bibliometric analysis methods, and responses were sought for the developed research questions.

## 3. Methodology

Bibliometric analysis is a statistical method used to evaluate research in various scientific fields quantitatively (Yu et al., 2020). Also known as scientometrics, this method summarizes the current state of a research topic by examining an array of literature about authors, keywords, references, journals, and countries (Hall, 2011; Kuzior & Sira, 2022; Zhu et al., 2021). Bibliometric research provides insight into the nature and development of a discipline, as reflected in the existing literature (Osareh, 1996). Researchers classify bibliometric methods into two categories: performance analysis and science mapping. Performance analysis focuses on measuring the total output of a scientific subject through various indicators, such as the number of publications, citations, the most cited documents, and the contributions of productive authors, countries, and universities. In contrast, science mapping assesses the co-occurrence of author keywords, the co-citation of sources, authors, and documents, and the interactions among different facets of the research field using network analysis (Suban, 2023).

This study examines the concept of PEB using performance indicators and science mapping techniques. The bibliometric analysis assessed performance indicators based on the total number of publications and citations. Concurrently, the science mapping method was analyzed with the VOSviewer software (version 1.6.20). VOSviewer is a tool that facilitates the analysis of co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation links (Van Eck &

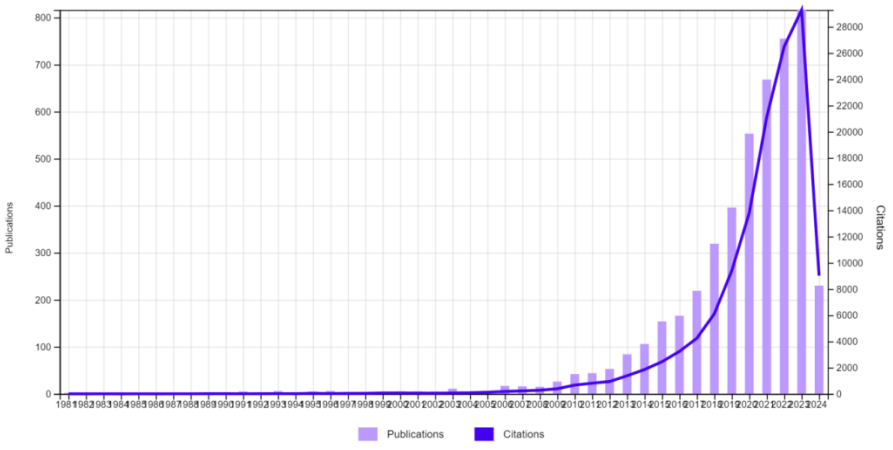
Waltman, 2023). It utilizes datasets from various databases, such as Web of Science, Scopus, and Google Scholar, to analyze scientific journals, researchers, research organizations, countries, and keywords. VOSviewer has gained popularity in recent studies within the business field (Cao et al., 2023; Ding & Yang, 2022; Dubyna et al., 2022; Luckyardi et al., 2022; Martínez-López et al., 2020). This study employed science mapping to evaluate the development of the PEB concept through co-authorship, co-occurrence, citation, and co-citation analyses using the VOSviewer program.

Data were gathered from the Web of Science (WOS) Core Collection database, commonly used in bibliometric studies to identify key research themes in the literature on PEB (Ortigueira-Sánchez & Risco-Martínez, 2023; Qiu et al., 2023; Wang et al., 2023). A total of 5,411 studies related to PEB were identified in the WOS database. Research articles were selected as the unit of analysis because they typically provide the most advanced and current information in their respective fields (Nova-Reyes et al., 2020). Consequently, book sections, book reviews, conference proceedings, and editorial materials were excluded from the analysis. Various keyword combinations associated with it were identified within the literature to trace the development of the PEB concept. Using a Boolean search, the following keyword combinations were used in the search: "pro-environmental behavior," "environmentally friendly behavior," "green behavior," "conservation behavior," "environmentally responsible behavior," "sustainable behavior," and "recycling behavior," all searched as part of the TOPIC. Additionally, the search was restricted to articles published in English, as it is the universal language in international literature. Following these inclusion and exclusion criteria, the final analysis included 4,740 articles published on PEB between 1981 and 2024.

## 4. Result and Discussion

Figure 1 shows the number of publications by year and the number of citations by year obtained from the WOS database regarding PEB studies.

**Figure 1.** Number of publication and citation



When the number of publications on PEB is evaluated, it is seen that the first study on this subject was published in 1981. These studies are based on Heslop et al. (1981) and Larson et al. (1981). Heslop et al. (1981) defined the concept as conservation behavior and presented an exploratory study. Therefore, Larson et al. (1981) were the first to conceptualize the concept of PEB. However, 66 studies were conducted on the concept between 1981 and 2002. Accordingly, the development of the concept was limited until 2002 (max. six studies per year). This stage can be defined as the budding phase, as Lu et al. (2021) stated. Since 2003, the number of studies on the concept has increased, and 316 studies have been published until 2013. The period between 2003 and 2013 can be characterized as the exploratory phase. After 2013, the PEB literature continued to develop over the years, and 4355 studies were included until this review (2024, May). Accordingly, this phase is the rapid growth phase for PEB. In order to present the historical development course of the PEB concept in more detail, its conceptual analysis is presented in Table 1.

**Table 1.** Conceptual analysis

| Year Range | Conceptual Development Phase | Article Number | Concepts |
|---|---|---|---|
| 1981-2002 | Budding Phase | 73 | conservation behavior<br>self-reported behavior<br>environmental behavior<br>environmental conservation behavior<br>environmental friendly behavior<br>environmental responsible behavior<br>sustainable behavior<br>recycling behavior<br>green behavior<br>pro-environmental behavior |
| 2003-2013 | Exploratory Phase | 248 | conservation behavior<br>sustainable behavior<br>recycling behavior<br>green behavior<br>pro-environmental behavior |
| 2013-2024 (May) | Rapid-Growth Phase | 4419 | conservation behavior<br>sustainable behavior<br>environmental friendly behavior |

ecofriendly behavior

green behavior

pro-environmental behavior

When the conceptual development of the PEB literature is evaluated, it is seen that the literature has a more fragmented appearance in the budding phase, conceptualization has become more visible in the Exploratory Phase, but the concept is still not clear in the literature. In the Rapid-Growth Phase, it was determined that the concept of PEB was used in 3043 articles out of 4419 studies in the literature on the concept. Accordingly, at this stage, the concept has been clarified as PEB in the literature. In addition, the behavior part of the PEB concept is included in the literature in different forms such as norm, belief, attitude, knowledge, concern. Accordingly, within the scope of RQ1, it can be said that the concept of PEB is at the stage of maturation in the literature. In order to determine the impact of the articles on the field over the years, the most influential authors in the field are given in Table 2.

**Table 2.** Most-cited publication in dataset

| Authors | Source Title | Publication Year | Total Citations | Average per Year |
|---|---|---|---|---|
| Vermeir, I., Verbeke, W. | Journal of Agricultural & Environmental Ethics | 2006 | 1328 | 69,89 |
| Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., Griskevicius, V. | Personality and Social Psychology Bulletin | 2008 | 1037 | 61 |
| Lindenberg, S., Steg, L. | Journal of Social Issues | 2007 | 772 | 42,89 |
| Spence, A., Poortinga, W., Pidgeon, N. | Risk Analysis | 2012 | 769 | 59,15 |
| Yadav, R., Pathak, G. S. | Journal of Cleaner Production | 2016 | 718 | 79,78 |
| Tanner, C., Kast, S.W. | Psychology & Marketing | 2003 | 651 | 29,59 |
| Schultz, P.W., Gouveia, V.V., Cameron, L.D., Tankha, G., Schmuck, P., Franek, M. | Journal of Cross-Cultural Psychology | 2005 | 647 | 32,35 |
| Han, H. | Tourism Management | 2015 | 640 | 64 |
| De Leeuw, A.,Valois, P., Ajzen, I., Schmidt, P. | Journal of Environmental Psychology | 2015 | 581 | 58,1 |
| Yadav, R., Pathak, G. S. | Ecological Economics | 2017 | 562 | 70,25 |
| Dumont, J., Shen, J., Deng, X. | Human Resource Management | 2017 | 555 | 69,38 |
| Bowen, F.E., Cousins, P.D., Lamming, R.C., Faruk, A.C. | Production and Operations Management | 2001 | 547 | 22,79 |
| Robertson, J. L., Barling, J. | Journal of Organizational Behavior | 2013 | 510 | 42,5 |
| Barr, S. | Environment and Behavior | 2007 | 506 | 28,11 |
| Clark, C.F., Kotchen, M.J., Moore, M.R. | Journal of Environmental Psychology | 2003 | 468 | 21,27 |
| Frick, J., Kaiser, F.G.,Wilson, M. | Personality and Individual Differences | 2004 | 464 | 22,1 |

When evaluating the distribution of the most influential authors in the field of PEB, it is evident that the most significant publications have emerged since 2003, coinciding with the exploratory phase of PEB. The most cited publication in the

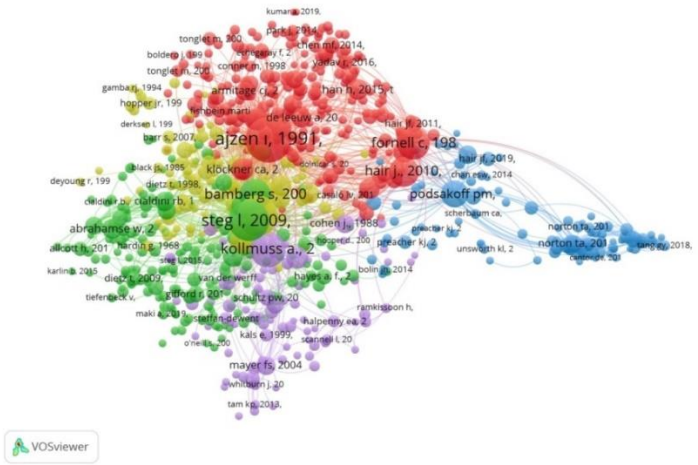
existing literature was published in 2006, and the articles produced during the rapid growth phase are among the most referenced in the field. It was found that the most influential authors in the field were Vermeir, Verbeke, and Nolan et al. Additionally, the most prominent journals included the Journal of Agricultural & Environmental Ethics and the Personality and Social Psychology Bulletin. Additionally, it has been observed that the concept of PEB has been explored across various disciplines, including agriculture, ecology, management, psychology, marketing, organizational behavior, tourism, and economics.

**Table 3.** Most-productive authors in the PEB field

| Author | Documents | Total Citations |
|---|---|---|
| Kaiser, F.G. | 14 | 1053 |
| Lange, F. | 17 | 543 |
| Otto, S. | 13 | 337 |
| Han, H. | 53 | 2969 |
| Tam, K-P. | 14 | 808 |
| Brick, C. | 13 | 373 |
| Liobikiene, G. | 15 | 331 |
| Steg, L. | 21 | 1969 |
| Wang, S. | 13 | 898 |
| Reese, G. | 14 | 191 |
| Ramkissoon, H. | 14 | 739 |

Table 3 lists the most influential authors in the field of Pro-environmental Behavior (PEB). Our dataset includes 12394 authors from a total of 4,740 articles. This table focuses on authors who have published 13 or more articles in the literature. The most prominent author is Han, with 53 publications and 2,969 citations. Steg ranks second, having published 21 articles and received 1,969 citations. Both Han and Steg are recognized as the most active contributors to this field, and their studies often involve multiple authors, indicating that PEB literature is well-structured. To provide a deeper understanding of the PEB literature, we present a co-citation analysis in Figure 2. Co-citation analysis evaluates clusters of co-cited publications in any scientific field (Kraus et al., 2012). The key findings from the co-citation analysis in PEB literature are detailed below.

**Figure 2.** Co-citation analysis



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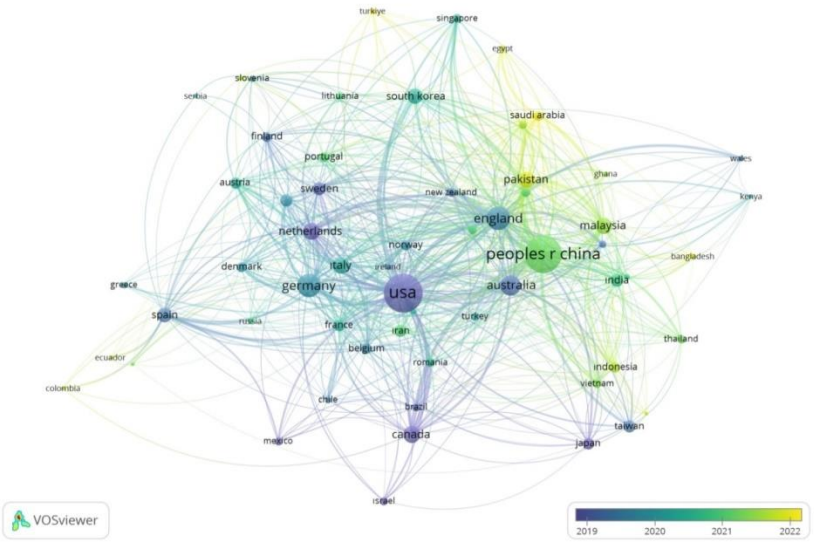
The co-citation analysis of the literature on PEB can be divided into four main clusters. The first cluster (red) is based on the studies conducted by Ajzen (1991), which focus on the Theory of Planned Behavior. The second cluster (green) draws on the work of Steg and Vlek (2009) and examines PEB through the lens of Value Belief Norm Theory. A third cluster (purple), based on the research of Mayer and Frantz (2004), emphasizes the psychological aspects of PEB by evaluating it through the perspective of altruism and applying belief theory. This cluster is associated with Norm Activation Theory. Finally, the fourth cluster (blue), which includes studies by Podsakoff et al. (2014) and Norton et al. (2015), explores PEB from the standpoint of altruism as well, but distinguishes itself by suggesting that these behaviors should be viewed through three different frameworks: Attitudinal Theories, Normative Theories, and Situational Theories (Koçak & Baş, 2022). Co-citation analysis indicates that in the context of RQ2, the PEB text predominantly relies on the Theory of Planned Behavior. Additionally, a co-authorship analysis was conducted to identify key publication groups within the PEB literature. This analysis utilizes various attribution tools to trace the development of the field and examine its dissemination (Bernatović et al., 2022). The study evaluated the origins and distribution of PEB research on a country-by-country basis.

**Figure 3.** Co-authorship analysis




The study indicates that the literature on PEB has experienced rapid growth, originating primarily in the USA. By 2019, interest in PEB had spread to countries such as the Netherlands, Sweden, Canada, and Australia. Between 2019 and 2021, the PEB literature expanded further into European nations, including the UK, Germany, Italy, Denmark, and France. In recent years, however, PEB has also gained traction in several Eastern countries, such as China, Pakistan, South Korea, Indonesia, Singapore, and Turkey. While PEB originated in Western countries, it has increasingly attracted attention in Eastern nations in recent years.

The PEB literature acknowledges that, although there is no universally accepted definition of the concept, it is essential to identify its antecedents and consequences to understand its developmental trajectory (Lu et al., 2021). A co-occurrence analysis was conducted to address the research questions and provide a thorough analysis of the evolution of PEB. This analysis helps create a standard word map that represents the intellectual content of the field, highlighting cognitive themes and their interrelationships (Tijssen & Van Raan, 1994). Figure 4 illustrates the network of prominent PEB field concepts organized by year.

**Figure 4.** Co-occurence analysis

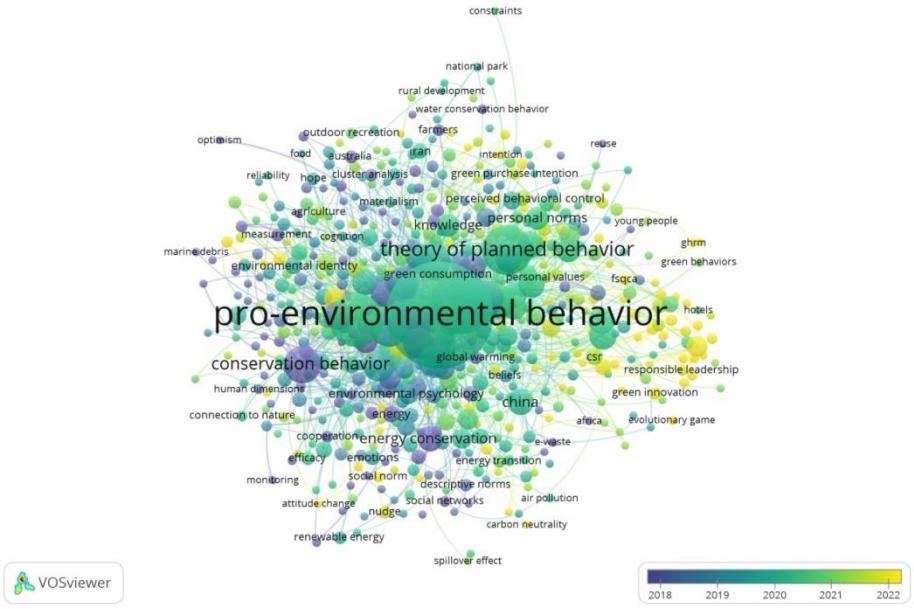



Figure 4 presents the results of the co-occurrence analysis of the literature on PEB using an overlay visualization. The analysis reveals that the PEB literature is divided into 17 clusters. However, the study focuses on the main clusters that show strong network connections. Regarding RQ3, an examination of the PEB literature over the years indicates that the concept was first addressed as conservation behavior between 2018 and 2019. It further evolved to include terms such as sustainable behavior, environmentally responsible behavior, and green behavior from 2019 to 2020, with the term pro-environmental behavior becoming prevalent after 2021. Despite this progression, a review of recent studies suggests that the literature on PEB remains unclear. It appears that the concept is still in its developmental stage.When the clusters in the co-occurrence analysis of the concept of PEB are evaluated according to years, it is seen that PEB is associated with studies based on the Theory of Planned Behavior in 2019-2020, studies based on the Norm Activation Theory between 2020-2021 and Value-Belief-Norm Theory between 2021-2022. Considering that all three theories are used in the current PEB literature and different conceptualizations of the concept in the literature such as behavior, attitude and belief, it can be suggested that PEB should be evaluated from a holistic perspective.

When examining the various concepts related to PEB within the context of RQ3, PEB is analyzed about several key themes: consumer engagement, corporate greening, corporate social responsibility, emotional intelligence, employee green behavior, environmental commitment, environmental consciousness, environmental management, environmental passion, environmental performance, environmental sustainability, environmental-specific servant leadership, ethical leadership, environmental communication, environmental knowledge, environmental values, green human resource management, green leadership, green behavior, green attitude, green culture, green values, organizational citizenship behavior, organizational culture, organizational commitment, organizational support, organizational identification, psychological green climate, innovation, intrinsic motivation, responsible leadership, spiritual leadership, and transformational leadership. These concepts can be viewed as antecedents to PEB (Afsar et al., 2016; Afsar et al., 2018; Faraz et al., 2021; Hayyat et al., 2023; Nasir et al., 2023; Omarova & Jo, 2022; Zientara & Zamojska, 2018). When evaluating PEB in terms of its outcomes, it is associated with various outcomes such as performance, satisfaction, well-being, subjective well-being, green innovation, environmental education, sustainable development, and sustainable resource management. In this context, PEB contributes to individual well-being and life satisfaction. Conversely, it leads to sustainability-related outcomes such as resilience, political orientation, performance, and impacts on climate change at the organizational and societal levels.

Recent studies conducted from 2014 to 2024 have shown that Pro-environmental Behavior (PEB) is in a rapid growth phase. These studies primarily explore PEB at a micro level, linking it to concepts from organizational behavior and social psychology, including psychological contract breach, job satisfaction, organizational identification, perceived organizational support, anthropocentric values, mindfulness, and well-being (both subjective and social). Additionally, PEB has been examined at the meso level (between groups) in relation to leadership styles such as responsible leadership, transformational leadership, and spiritual leadership. At the macro level, research has focused on green management tools, including green transformational leadership, green human resource management, green self-image, green self-efficacy, green ambidexterity, sustainable organizational performance, and green knowledge sharing.

## 5. Conclusions

In recent years, factors such as global warming and the rapid deterioration of the natural environment have drawn increasing attention from researchers regarding the concept of PEB. Research on resource conservation, recycling, and PEB has significantly increased in developed and developing countries (Li et al., 2019). PEB is any action that does not harm the environment and contributes to environmental sustainability (Bamberg & Möser, 2007; Esfandiar et al., 2022). It is often viewed as a rational decision-making process and a moral perspective supported by various theoretical frameworks. Numerous social-psychological models, including the norm activation model (Schwartz, 1977), the theory of

reasoned action (Ajzen & Fishbein, 1980), the model of responsible environmental behavior (Hines et al., 1987), the theory of planned behavior (Ajzen, 1991), and the value-belief-norm theory (Stern, 2000), have emerged to study PEBs. These models have been instrumental in identifying the antecedents of PEBs (Kaiser et al., 2005; Moghimehfar & Halpenny, 2016) and have highlighted various factors influencing the intention to engage in PEBs in different contexts (Esfandiar et al., 2022).

Accordingly, this study aims to examine the focal points of the PEB concept and its conceptual and historical development. A comprehensive perspective is presented through a performance and science mapping analysis of 4,740 articles in the Web of Science (WOS) database, utilizing bibliometric methods to analyze word clusters related to PEB. The performance analysis revealed that PEB first appeared in the literature in 1981, and there has been a continuous increase in publications since then. As of May 2024, interest in PEB is rapidly growing. Over the years, the concept of PEB has been conceptualized in various ways, and recent evaluations within multiple frameworks have made its conceptual diversity more apparent. Thus, the concept of PEB has started to mature within the literature. Although PEB is discussed across several disciplines, including management, environmental studies, psychology, and ecology, sustainability emerges as an overarching discipline.

In the scope of science mapping, analyses such as co-citation, co-authorship, and co-occurrence were conducted. The co-citation analysis revealed four main clusters about the concept of PEB, examined through different theories such as the norm activation model, the theory of planned behavior, and the value-belief-norm theory. Influential authors in the PEB literature include Han and Steg, while the USA has emerged as a prominent country based on co-authorship analysis. In recent years, PEB publications have expanded to Eastern countries, such as the People's Republic of China. Co-occurrence analysis shows that PEB has been linked to numerous concepts in the literature, with an increasing number of studies investigating its antecedents, consequences, and influencing factors. Disciplines such as management, marketing, and operations management are gaining prominence in the PEB literature, and the concept has evolved into pro-environmental work behavior. Future research could further explore the details of pro-environmental work behavior.

As with all scientific studies, this one has limitations. It presents the results of a bibliometric analysis based solely on data from the WOS database; different databases, such as Google Scholar and Scopus, might yield different results. The analysis evaluated PEB within the scope of bibliometric methods, suggesting the need for further examination using systematic literature reviews, meta-analyses, and scoping reviews, especially since the concept of PEB is still evolving.

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