

Mapping University-Led Environmental Citizenship and Its Implications for Sustainable Entrepreneurship: A Bibliometric Analysis



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Abstract

Universities are increasingly expected to promote environmental values and civic responsibility while also serving as anchors of innovation and entrepreneurial ecosystems. Yet, research on university-led environmental citizenship and sustainability-oriented entrepreneurship has largely developed in parallel, limiting clarity on how citizenship-based values translate into entrepreneurial outcomes. This study maps the evolution and intellectual structure of university-led environmental citizenship scholarship and evaluates how far it engages with sustainability-oriented entrepreneurship, innovation, and SME development. A longitudinal bibliometric analysis was conducted on 98 peer-reviewed journal articles and review papers indexed in Scopus from 1985–2025. Using performance analysis and science-mapping techniques (co-authorship, co-citation, keyword co-occurrence, and thematic evolution), the study identifies publication trends, influential contributors, collaboration patterns, and dominant thematic clusters. Findings show three phases of development, with rapid expansion after 2011. The field is primarily anchored in environmental science and education, with a cohesive conceptual core around environmental/ecological citizenship, sustainability education, pro-environmental behaviour, and identity-based determinants. However, entrepreneurship-, innovation-, and economic transformation-related themes remain peripheral within dominant clusters. The results position environmental citizenship as an underutilised institutional foundation for sustainable entrepreneurship. Sustainability-oriented innovation and SME/start-up development can be strengthened by combining citizenship programs with entrepreneurship education and university incubation. This is especially important for Asian and emerging economies, where universities influence local entrepreneurial ecosystems.

Keywords: environmental citizenship, sustainable entrepreneurship, entrepreneurial ecosystems, SME development, bibliometric analysis

1. Introduction

Universities have also been more recognized as key institutional players in tackling the modern-day challenges of sustainability. What used to be considered part of their conventional functions of instruction and research, higher education institutions are currently anticipated to instill in the students and other stakeholders the values of environmentalism, civic minds, and social responsibility (Awad, 2025; Abreu and Grinevich, 2024). This is an extended role that has added to the increased academic attention on environmental citizenship as a concept that puts the rights, duties, and active engagement of the people in environmental protection in the context of society and institutions (Asilsoy and Oktay, 2018).

Universities' Environmental citizenship studies have emerged to the forefront together with agendas of global sustainability and education-for-sustainable-development. Universities are the structured spaces where the knowledge of the environment, behavioural standards, and civic practices intersect, enabling them to be compelling spaces of environmental responsibility and behavioral change (Adamou et al., 2021). Consequently, initiatives and

programs of sustainability education, campus environmental policies, and participatory engagement, primarily led by universities, have emerged as important tools to create environmental citizenship (Wu et al., 2023).

Simultaneously, universities are being more and more placed as sources of innovation and entrepreneurship. The entrepreneurial university idea emphasizes the significance of higher education institutions to answer the needs of start-ups, innovation ecosystems, and regional economic development (Ilie and Budac, 2023; Abreu and Grinevich, 2024). Later on, the view on this has shifted to sustainability-based and responsible forms of entrepreneurship, which is a consequence of the increasing need to integrate economic activity with environmental and social goals (Cai and Ahmad, 2023; Awad, 2025). Such similar developments pose significant questions as to how environmental citizenship developed in universities can contribute to the sustainability-related entrepreneurial results. Environmental citizenship studies in the higher education sector have mainly addressed the educational, behavioural, and civic aspects. Research has also investigated the role of environmental

education, participatory programs, and experiential learning in building environmental awareness, pro-environmental behaviour, and civic responsibility among the students (Adamou et al., 2021). The behavioural perspectives note that attitudes, values, and norms are some of the determinants of ecological citizenship, which focuses on the significance of institutional environments in influencing responsible environmental behaviour (Asilsoy and Oktay, 2018). Bibliometric and systematic reviews also show the conceptual grounding of environmental citizenship studies on sustainability education and social responsibility, and little involvement in other areas. Although these studies can form a robust ground on understanding the behaviour of citizenship, they hardly go any further by analyzing the economic or entrepreneurial outcome (Muo and Azeez, 2019). Simultaneously, an increasing body of literature makes universities key players in the entrepreneurial ecologies. Systematic reviews also highlight the fact that universities can support entrepreneurship by transferring knowledge, innovation support, incubation processes, and institutional programs (Patrício and Ferreira, 2022). The conceptual and empirical research also points to universities as the agents of linking education, innovation, and regional development (Maritz et al., 2024; Abreu and Grinevich, 2024). The more recent literature has broadened this approach by incorporating sustainability in its approach, suggesting the concept of the sustainable entrepreneurial university where the environmental responsibility and entrepreneurial activity are both simultaneously pursued (Cai and Ahmad, 2023). There is some empirical evidence that institutional practices related to sustainability may also affect entrepreneurial behaviour and innovation patterns in the context of higher education (Fanea-Ivanovici and Baber, 2022; Waris et al., 2022). Sustainable and green entrepreneurship research also demonstrates a role of environmental values and pro-environmental behaviour in influencing the entrepreneurial intentions and practices. Research has shown that pro-environmental behaviour and corporate social responsibility may mediate the results of entrepreneurship, especially in environmentally vulnerable industries (Jitrumluek et al., 2019; Adawiah, 2022). The relevance of green markets and sustainability-oriented innovation in facilitating sustainable development is also highlighted in the literature of green entrepreneurship (Lotfi et al., 2018; Muo and Azeez, 2019). Empirical research involving students and small business entrepreneurs demonstrates that the green and sustainable entrepreneurial intention is significantly predicted by environmental values, motivation of behaviour, and institutional support (Anghel and Anghel, 2022; Qazi et al., 2021; Yasir et al., 2021; Peng et al., 2021). Nevertheless, these

studies tend to consider the environmental behaviour to be the personal factor instead of the product of the institutionally structured citizenship procedures.

Although there is an increasing literature on environmental citizenship and sustainable entrepreneurship, these two research streams have experienced a lot of separation. The scholarship on environmental citizenship as a field has been largely education- and behaviour-based in its focus, and the scholarship on entrepreneurship with little focus on the foundation of citizenship. Current literature recognizes the institutional contribution of universities to sustainability education and the development of entrepreneurship, but little systematic knowledge has been obtained regarding how university-based environmental citizenship research has changed with time, the intellectual organization of it, and its relationship with the sustainability-oriented entrepreneurial discourse. Specifically, bibliometric evidence on the intersection of environmental citizenship in universities and sustainable entrepreneurship also does not reveal comprehensive evidence, which generates disjointed insights and underresearched relationships.

As a means of filling this gap, the current research paper will conduct a longitudinal bibliometric review of environmental citizenship studies carried out by universities from 1985 to 2025. The proposed study will address the following research questions: (1) chart the temporal development and change in the research on the environmental citizenship topic in the context of the university; (2) uncover intellectual structure and prevailing themes groups of the body of research; (3) investigate disciplinary, geographic, and institutional patterns of knowledge production; and (4) evaluate the extent to which the research on environmental citizenship incorporates the sustainability-oriented entrepreneurial activity, innovation, and the SME development, thus making the unexplored intersections, and future research perspectives apparent. By repositioning university-led environmental citizenship as an institutional capability rather than solely an educational outcome, this study advances sustainable entrepreneurship research by identifying how citizenship-based values embedded in universities can shape entrepreneurial orientation, sustainability-driven innovation, and SME development within emerging entrepreneurial ecosystems.

2. Methodology

2.1 Research Design and Rationale

The research design used in this study is a longitudinal bibliometric research design to map the evolution of the research on university-led environmental citizenship in terms of intellectual structure and thematic development of the research in the period between 1985 and 2025. Bibliometric

analysis allows an objective and reproducible synthesis of extensive and multidisciplinary sets of academic work and determines the patterns of publication, the contributors, the structure of collaboration, and the conceptual tendencies. Bibliometric methods are more transparent and analytically consistent in the investigation of the knowledge development over long time periods as compared to the narrative or a traditional systematic review. The bibliometric approach is especially relevant in this study because it is necessary to evaluate the advancement of the environmental citizenship research in the context of university settings and the role of this body of knowledge in the general discourse in terms of sustainability-based innovation, institutional responsibility, and environmentally responsible entrepreneurial systems. The methodology thus incorporates an interdisciplinary approach that incorporates sustainability, higher learning, and institutional research.

2.2 Data Source and Temporal Scope

To retrieve bibliographic data, one of the largest international academic databases, Scopus one known to have a total coverage of peer-reviewed literature in the fields of environmental studies, education, management, and social sciences, was used. The database was chosen as the metadata of its citations are trustworthy, and it is useful in terms of advanced bibliometric and science-mapping analyses. The time frame of the review is 1985-2025, which allows the longitudinal study of the emergence, development, and consolidation of the research on university-led environmental citizenship. This prolonged time frame will help to determine the contributions made, the times of increased scholarship, and the current thematic trends as the sustainability agendas evolve.

2.3 Search Strategy and Document Selection

A structured search strategy was employed to ensure the comprehensive retrieval of relevant literature. The search queries combined keywords related to environmental citizenship and sustainability-oriented behaviour (such as *environmental citizenship*, *pro-environmental behaviour*, and *sustainability behaviour*) with terms associated with universities and higher education institutions (including *university*, *higher education*, and *campus sustainability*). To capture the entrepreneurship dimension, the search strategy also incorporated keywords related to sustainable and green entrepreneurship, including *sustainable entrepreneurship*, *green entrepreneurship*, *entrepreneurial intention*, and *entrepreneurial behaviour*.

The inclusion criteria limited the sample to peer-reviewed journal articles and review papers that directly covered environmental citizenship or other

sustainability behaviors in the university or higher education setting, which included studies of the themes in relation to entrepreneurship or innovation. Publications that were not in English, as well as publications beyond 1985 and 2025, were excluded. Articles that had editorial content, book reviews, conference abstracts, and studies that were not explicitly focused on an institutional or higher education focus were left out. A filtered dataset was then obtained after the application of a screening criterion and the elimination of duplicates to use in further bibliometric analysis.

2.4 Data Cleaning and Standardization

To facilitate the analysis, the dataset underwent a form of systematic data-cleaning and standardization before the actual analysis to ascertain the accuracy and consistency in the analysis. The names of authors, institutional affiliations, and keywords were standardized to eliminate the inconsistencies due to spelling differences, abbreviations, and similar words. Duplication records were discovered and eliminated, and relevance screening that was done based on the titles and abstracts of the articles was made to ensure that they were appropriate to the research focus of the study. Besides this, keyword harmonization was conducted to combine conceptually similar sets of words and thus increase the accuracy of the keyword co-occurrence and theme analysis. The preprocessing steps that were undertaken were to make sure the bibliometric indicators and network visualization reflected the knowledge structure of the research field.

2.5 Bibliometric Analysis Procedures

The bibliometric analysis has been performed with the help of performance analysis and science-mapping techniques, which enabled the author to obtain both descriptive and structural information regarding the research field.

2.5.1 Performance Analysis

To measure the impact and the productivity of the existing literature, performance analysis was used. The major categories of indicators included the annual publication patterns, patterns of citation, authors who are most productive and influential, journals and publication outlets, leading institutions, and countries that made a contribution to the field. In combination, these signs give a macro-level depiction of the way studies concerning university-led environmental citizenship have transformed and propagated through disciplines and geographical locations.

2.5.2 Science-Mapping and Network Analysis

In order to investigate the intellectual and conceptual organization of the field, several science-mapping methods were used. Some of them were co-

authorship analysis to investigate collaboration patterns between researchers and institutions, co-citation analysis to determine influential publications and clusters of foundational knowledge, and keyword co-occurrence analysis to reveal dominant, emerging, and peripheral research themes. Moreover, the thematic analysis of evolution was done to follow the changes in the focus of the research over various periods. Together, these methods demonstrate that the concept of environmental citizenship research in the context of universities has developed and that the thematic backgrounds of this kind of research overlap with the views of sustainability and institutional responsibility in general.

2.6 Analytical Tools

All bibliometric analyses and visualizations were done with reliable bibliometric software that was developed to analyse networks and map sciences. The tools facilitated building citation networks, keyword maps, and thematic evolution diagrams, which assisted in making a structured and reproducible interpretation of the data.

2.7 Analytical Framework

The research will take the analytical approach that combines both bibliometric performance analysis and Science-Mapper to analyze how environmental citizenship research led by universities has been developed and how it is structured in the broader institutional and sustainability-oriented setting. The outline of the concept is meant to be able to encompass the quantitative growth of the discipline as well as the conceptual basis behind it. The first level involves the performance analysis, which focuses on the growth of publications, disciplinary composition, and geographic dispersion, which gives one an idea of how the environmental citizenship research has grown and traversed through university locations as time goes by. In the second level, the collaboration patterns, intellectual influences, and prevailing thematic

cluster patterns in the literature are identified using science-mapping techniques, such as co-authorship, co-citation, and keyword co-occurrence techniques. On level three, thematic evolution analysis provides the tracking of change of research focus since the past, showing how behaviour- and awareness-based research has yielded to more deeply institutionalized sustainability views. Combined, this framework allows for approaching the way university-driven environmental citizenship research manifests itself in wider processes of institutional change and sustainability-focused innovation in a systematic manner. The framework can offer a consistent starting point in terms of discussing the implications of sustainability-oriented entrepreneurship by identifying prevailing themes and underresearched intersections on the subject of institutional responsibility and environmentally responsible economic activity, without involving analytical rigor and methodological neutrality.

3. Results

3.1 Overview of the Bibliometric Dataset

The bibliometric analysis will be carried out on a final sample of 98 peer-reviewed journal articles and review articles published between 1985 and 2025, collected in Table 1. The data is centred on the studies that concern University Citizenship Behaviour (UCB), Environmental Citizenship Behaviour (ECB), ecological citizenship, sustainability behaviour, and pro-environmental actions. All the publications were located in the Scopus database and constitute a diverse but thematically relevant set of publications discussing the topic of citizenship and environmental responsibility in the context of higher education. The presentation of the data reveals the interdisciplinary character of the discipline and reveals the basis of the further examination of the publication trends, focus areas, geographical distribution, authorship, and thematic patterns in the publications.

Table 1. Overview of the 98-Study Dataset

Item	Value
Total publications	98
Years covered	1985–2025
Document type	Peer-reviewed journal articles and review articles
Core themes	UCB, ECB, ecological citizenship, sustainability behaviour
Database	Scopus

3.2 Annual Publication Growth

Table 2 shows the temporal distribution of publications, and Figure 1 shows the same in a graphic form. The output of research can be divided into three phases. The initial period (1985-2000) is marked by little publication, and this is because the conceptualization of environmental and university citizenship research is still in its early stages. The second period (2001-2010) demonstrates that the scholarly output has been increasing gradually, and sustainability education appeared and started to gain academic attention to the issue of civic responsibility. The third wave (2011-2025) has the largest number of publications and indicates a steep and sustained increase in the

rates of research. This growth indicates an increased concern for environmental sustainability, climate change, and the role universities play in ensuring that citizens are environmentally conscious.

Table 2. Annual Publication Growth by Time Period (1985–2025)

Period	Publications	% of Total	Description
1985–2000	5	5.1%	Early stage; minimal environmental focus
2001–2010	20	20.4%	Growth driven by sustainability education
2011–2025	73	74.5%	Strong rise due to ECB, climate discourse

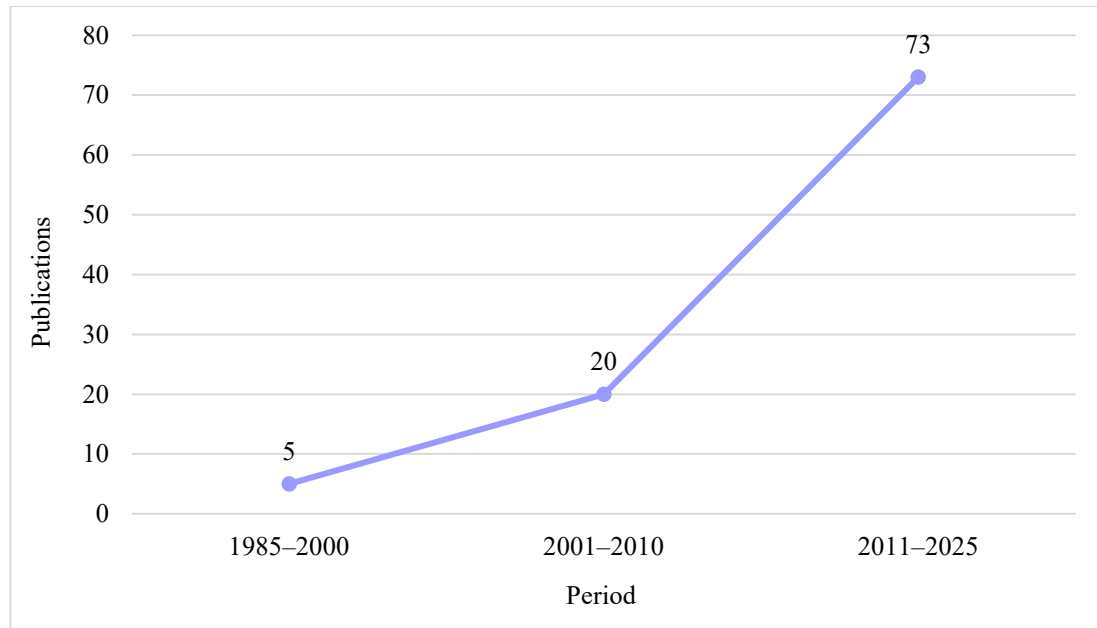


Figure 1. Annual Publication Trend (1985–2025)

3.3 Distribution by Subject Area

Table 3 and Figure 2 summarize the disciplinary distribution of the analyzed publications and represent it, respectively. The output of research is highly concentrated in the spheres of Environmental Science and Education, which occupy over half of the entire publications. Social Sciences have also made their contributions to the civic, cultural, and societal aspects of citizenship study. Other contributions by

Psychology serve to emphasize the role of attitudes, norms, identity, and behavioural intention in forming environmental citizenship, although Management and other disciplines are a lower percentage of the literature. The given distribution highlights the interdisciplinary format of UCB and ECB research, as they are heavily grounded in environmental and educational research.

Table 3. Subject Area Distribution of the 98 Articles

Subject Area	Articles	% Total	Key Focus
Environmental Science	34	34.7%	Ecological citizenship, pro-environmental behavior
Education	28	28.6%	Student citizenship, sustainability education
Social Sciences	19	19.4%	Civic participation, identity
Psychology	9	9.2%	Attitudes, norms, behavioural intention
Management and Others	8	8.1%	Institutional responsibility

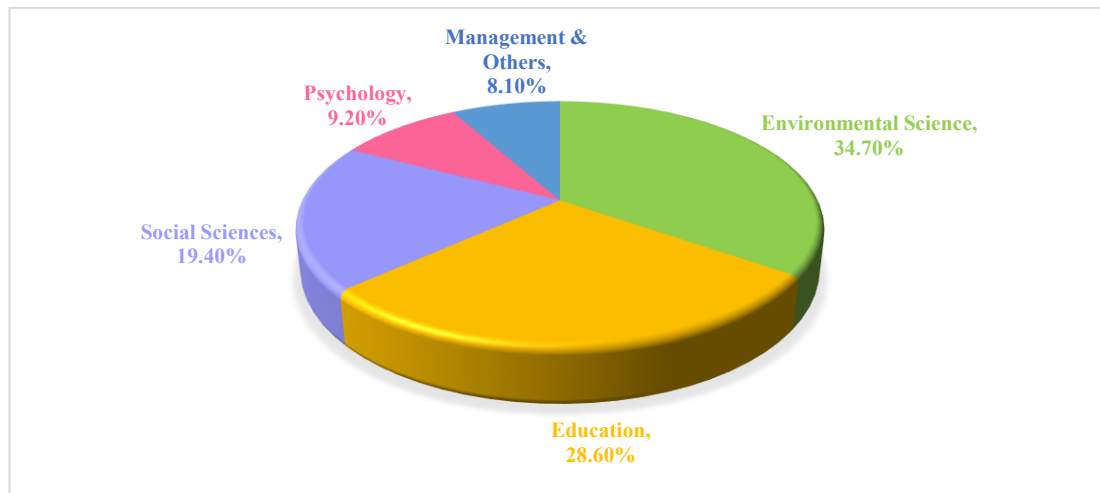


Figure 2. Subject Area Distribution of UCB/ECB Publications (N = 98)

3.4 Country and Institutional Productivity

Table 4 and Figure 3 provide geographic patterns of research output, respectively. The findings indicate that academic contributions are highly centralized in a few countries, with the United States, United Kingdom, Australia, and China developing into the highly productive contributors. The share of publications in these countries is large and makes up

a significant part of the literature on environmental citizenship, showing both an initial and a consistent institutional interest in this study. Meanwhile, input in other parts of the world suggests both the growing global involvement and the diffusion of environmental and university citizenship studies into the various academic and policy settings, though gradually.

Table 4. Most Productive Countries

Country	Publications	Contribution Characteristics
United States	22	Environmental behaviour, sustainability education
United Kingdom	17	Ecological citizenship, civic engagement
Australia	14	Sustainability literacy
China	9	Environmental responsibility
Others	36	Mixed environmental and educational themes

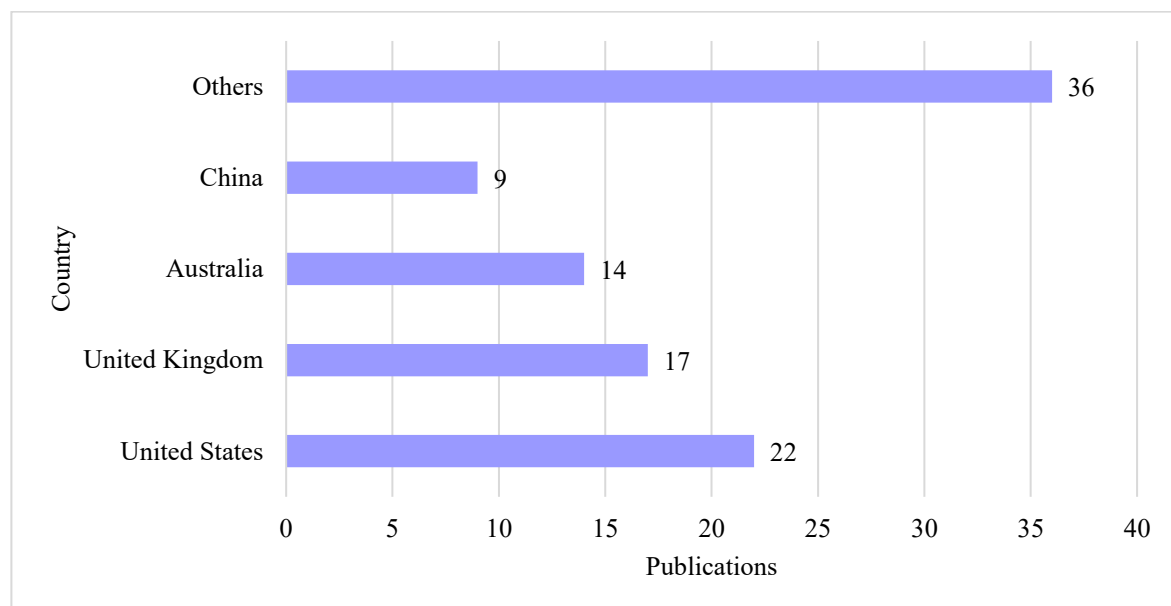


Figure 3. Country Productivity in UCB/ECB Research

3.5 Leading Journals and Publication Outlets

Table 5 summarizes the distributions of publications in journals, and Figure 4 illustrates them. The

number of journals is a small group that contributes a large percentage of the overall production. Journals like Sustainability, Environmental Education

Research, and Higher Education Research and Development become the most fruitful sources, which are associated with a high orientation of the direction on sustainability education, environmental behaviour, and higher education research. The

preference of publications in those journals suggests an interdisciplinary nature of UCB and ECB research at the meeting point of environmental studies, education, and social sciences.

Table 5. Most Productive Journals Publishing UCB/ECB Research

Journal	Articles	Orientation
Sustainability	16	Environmental behavior and sustainability
Environmental Education Research	11	Ecological citizenship
Higher Education Research and Development	9	Student citizenship
Journal of Environmental Psychology	6	Environmental attitudes
Others	56	Interdisciplinary

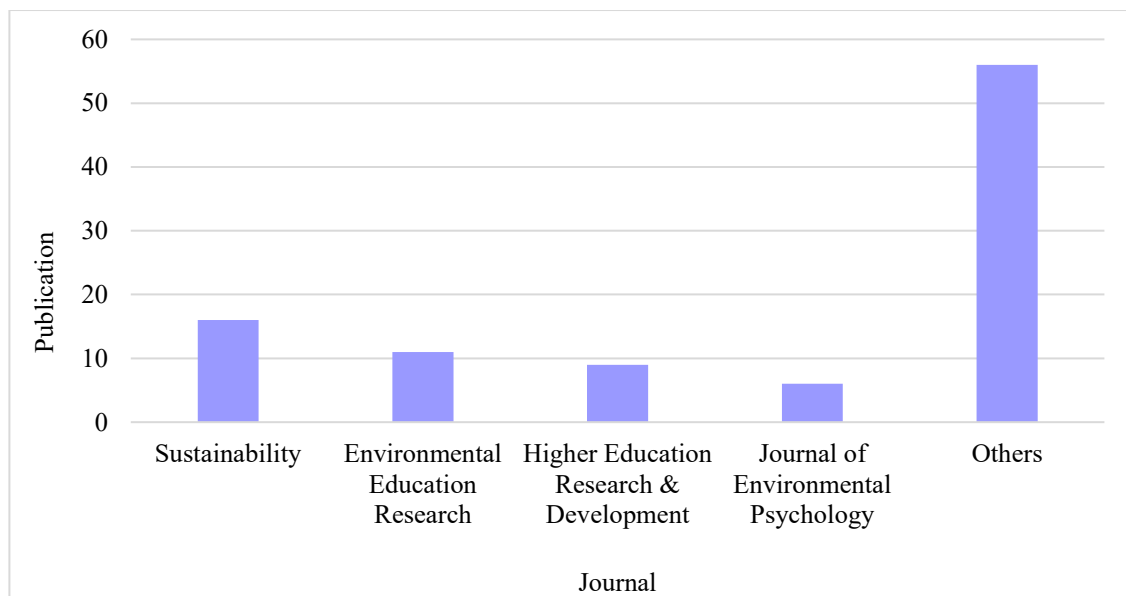


Figure 4. Journal Productivity

3.6 Author Productivity Patterns

The data on author productivity in the dataset is summarized in Table 6 and presented in Figure 5. The findings show that some of the authors have written several articles, whereas most researchers have written only one article. This trend indicates that there is a small group of key contributors to the intellectual sphere in the field through the years, and a general and varied group of contributors. An interdisciplinary research area is likely to have such a distribution, which is growing but not controlled by a limited circle of authors.

Table 6. Most Productive Authors in UCB/ECB Research

Rank	Author	Documents	Research Focus
1	A. C. Hadjichambis	3	Environmental citizenship education, environmental literacy, and sustainability pedagogy
2	Y. Georgiou	2	Environmental citizenship, sustainability awareness
2	D. Paraskeva-Hadjichambi	2	Citizenship education, environmental literacy
2	D. Hadjichambi	2	Environmental responsibility, sustainability competencies
2	B. Asilsoy	2	Ecological citizenship, sustainability behavior
3	All others	1 each	Single-contribution authors across ECB/UCB domains

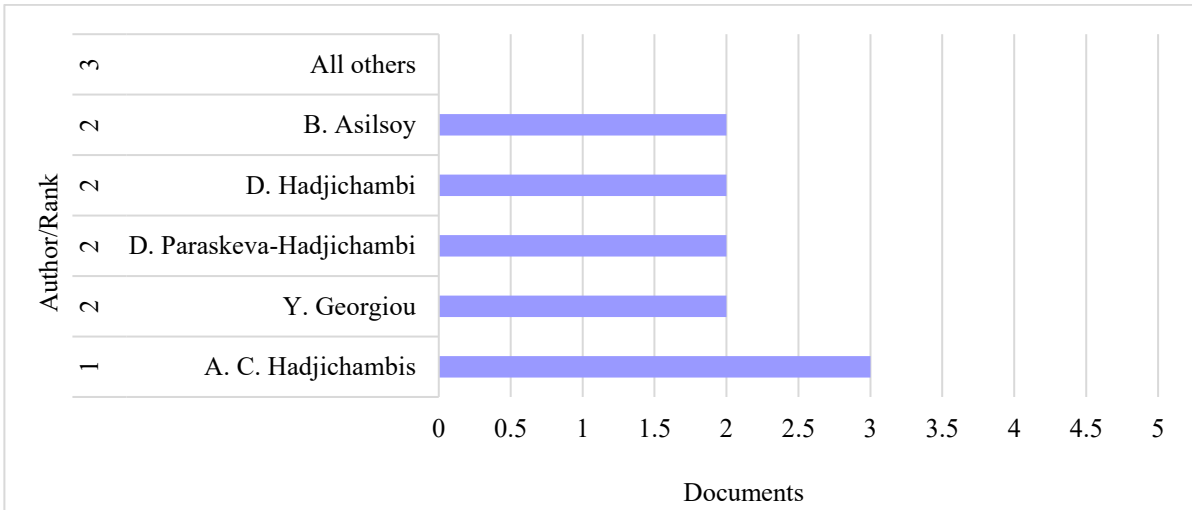


Figure 5. Most Productive Authors

3.7 Authorship and Collaboration Structures

Author patterns and collaboration patterns are given in Table 7 and represented in Figure 6. The dataset is composed primarily of multi-authored publications, which means that the UCB and ECB researchers are highly collaboratively oriented. The research on environmental citizenship and sustainability is interdisciplinary and multi-institutional, which

explains the prevalence of multiple-researcher-studies over single-researcher-studies. These collaboration patterns underline the collaborative character of the knowledge production in the given sphere, as it refers to the knowledge that is collected by means of the experience of various disciplines and institutional settings.

Table 7. Authorship Distribution

Category	Number of Publications	%	Description
Single-authored	28	28.6%	Independent scholarly work
Two authors	24	24.5%	Small collaborative teams
Three authors	22	22.4%	Medium-sized collaborations
Four or more authors	24	24.5%	Large interdisciplinary teams

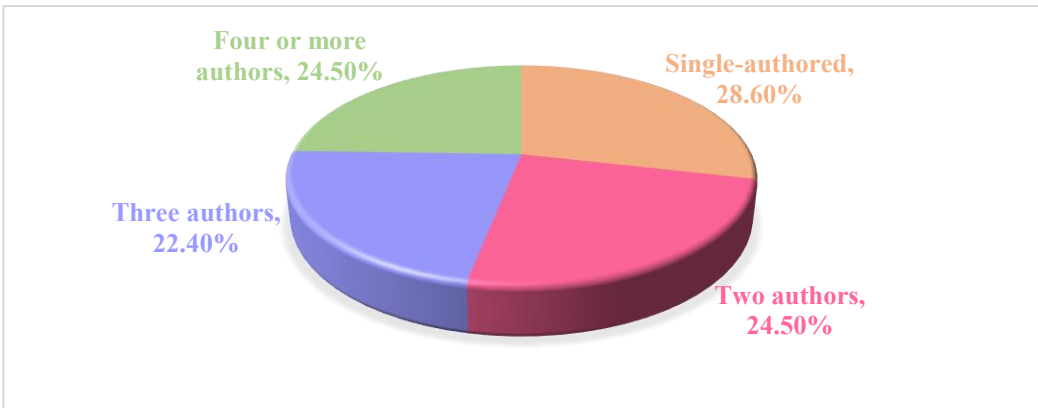


Figure 6. Author Collaboration Frequency

3.8 Keyword Co-Occurrence and Thematic Structures

Keywords co-occurrence analysis is used to analyze the intellectual and conceptual organization of the literature. The key thematic clusters that have been identified in the dataset are summarized in Table 8, whereas Figure 7 provides the visualization of a network of keywords. These give way to four powerful groups: environmental citizenship and sustainability behaviour; university citizenship and student engagement, behavioural determinants and identity, and sustainability education and civic development. Such clusters represent the conceptual foundations of UCB and ECB research, which emphasize the incorporation of behavioural, educational, and institutional perspectives of understanding environmental citizenship in the context of universities.

Table 8. Summary of Keyword Clusters

Cluster	Major Terms	Core Theme
1	Environmental Citizenship, Ecological Citizenship	Environmental Sustainability
2	Student Citizenship, Engagement	University Citizenship
3	Identity, Norms, Attitudes	Behavioral Determinants
4	Literacy, Sustainability Education	Civic Development

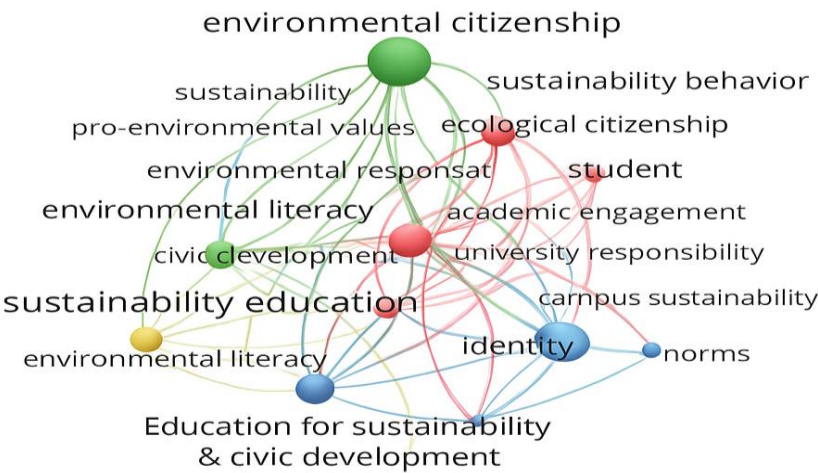


Figure 7. Keyword Co-Occurrence Network

3.9 Citation Patterns and Influential Themes

Patterns of citations throughout the data will be illustrated in Figure 8, which will indicate the strongest thematic regions in the literature. The study of ecological citizenship, pro-environmental behaviour, and sustainability literacy forms a higher citation visibility, which suggests that they occupy

the most prominent place in forming scholarly discourses. These themes are prominent, which illustrates the long-term academic concern on dissecting how environmental values, knowledge, and identity are converted into responsible citizenship behaviours.

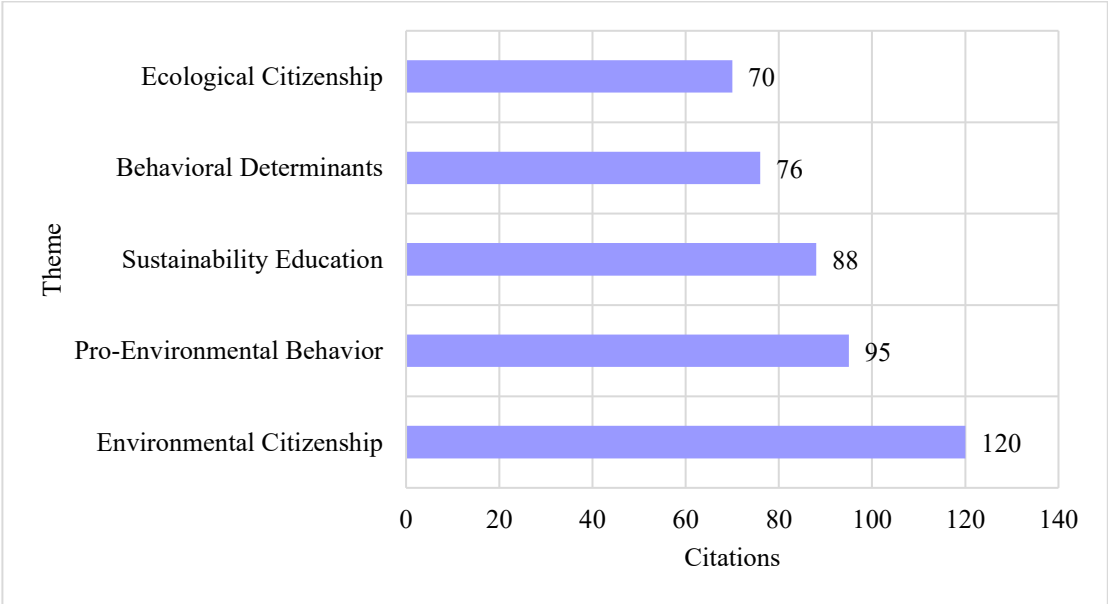


Figure 8. Citation Frequency by Theme

3.10 Evolution of Research Themes Over Time

Figure 9 shows the longitudinal changes and development of the themes of research. The findings showed a development of the initial research that placed a major focus on general academic citizenship and environmental consciousness to more comprehensive models that unite environmental citizenship, sustainability education, and institutional responsibility. Such a change in the theme is indicative of the maturity of the field and its growing consistency with larger sustainability goals in higher education.

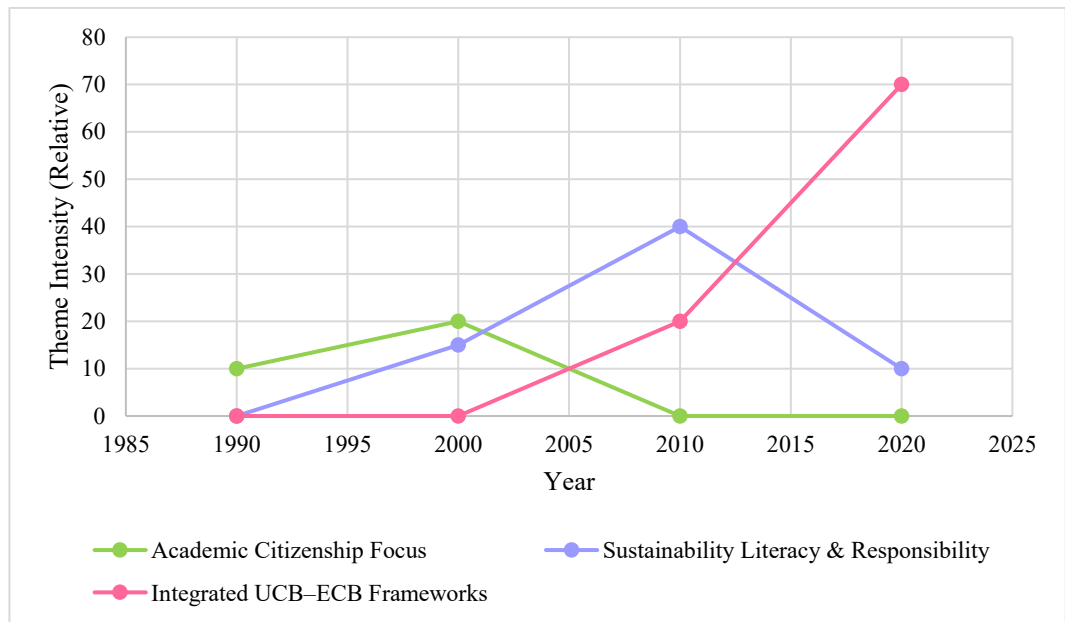


Figure 9. Thematic Evolution (1985–2025)

3.11 Dominant Keywords and Conceptual Emphasis

A word cloud representing the most frequently occurring keywords is shown in Figure 10. Prominent terms include *environmental citizenship*, *sustainability*, *pro-environmental behavior*, *ecological citizenship*, and *student engagement*, alongside related concepts such as *environmental literacy*, *identity*, and *campus sustainability*. These keywords remain recurrence patterns, and they reflect the conceptual centrality of UCB and ECB study and support the thematic trends found in the co-occurrence and development analyses of keywords.



Figure 10. Word Cloud of Dominant Keywords

3.12 Structural Patterns and Research Gaps

Collectively, the findings provided in Tables 1-8 and Figures 1-10 reveal that the study of environmental citizenship led by universities has built a robust educational and institutional base alongside an unbroken increase in publications, research collaboration, and a coherent organization of themes. It is deeply rooted in environmental science, education, and research of behaviour, and is growing progressively more global. Nevertheless, the concepts related to do with innovation, entrepreneurship, and economic sustainability are still marginal to the prevailing conceptual clusters.

The tendency shows that even though universities are generally considered as major players in creating environmental citizenship, little scholarly emphasis has been placed on how the values of citizenship can be applied to sustainability-driven innovation and entrepreneurial action. Such a gap creates a clear ground on which further interpretation and discussion in the future may be made.

4. Discussion

This bibliometric analysis shows that there is an evident and consistent increase in scholarship on university-led environmental citizenship in the

period between 1985 and 2025. Preliminary literature was small in size and breadth, with the majority of the research having been performed on environmental consciousness and academic citizenship in universities. The significant rise in the number of publications since 2010 speaks to what is happening globally in terms of making sustainability-oriented policies and the readiness to view universities as institutional actors that have social and environmental responsibilities. This institutional role is supported by the disciplinary distribution of the literature. The research is firmly based on environmental science, education, and social science, and focuses on learning processes, behavioural change, and civic engagement at the university. Psychological approaches are an add-on to this background and focus on attitudes, norms, and identity formation. These strands, when taken together, put environmental citizenship in a socially located and institutionally framed construction, and not individual behaviour. Geographically, the research activity is highly concentrated in a few countries, more specifically, in the United States, the United Kingdom, Australia, and China. This trend is a demonstration of the initial institutionalization of sustainability agendas in higher education. Meanwhile, the growing input of other areas is an indication of a gradual spread of environmental citizenship studies across a variety of educational and socio-economic backgrounds.

Patterns of authorship and collaboration indicate a profession of joint knowledge production. The prevalence of multi-authored sources suggests that the study of environmental citizenship often entails the impact of interdisciplinary and cross-institutional cooperation. This framework is consistent with the complicated character of the sustainability issues that demand the combined insights of various scholarly fields. The journal-level trends are yet another support of this interdisciplinary placement. The high density of publications on sustainability and education-oriented journals demonstrates the pedagogical and behavioural principles of the sphere. Although this emphasis has helped in conceptual convergence, it has equally led to the low involvement of entrepreneurship- and innovation-oriented journals, which has also assisted in defining the frontiers of the existing scholarship.

The thematic coherence as revealed in the co-occurrence of keywords and analysis of thematic development is a manifestation of a unified intellectual heart based on environmental citizenship, sustainability education, pro-environmental behaviour, and institutional responsibility. The literature has developed over time, and the awareness and attitudes at the individual level have been transformed into more unified systems that focus on universities as a place where collective values and civic engagements are

developed. Although this is consolidated, a significant gap occurs. Themes in the area of innovation, entrepreneurship, and economic change continue to be marginal in the prevailing clusters. This implies that although there has been repeated examination of universities as the domain where environmental citizenship can be realized, the role of universities in transforming the citizenship values to sustainability-based entrepreneurial deliverables has been under-examined. Instead of pointing at a weakness, this gap shows a poorly explored point of intersection with a lot of potential to develop interdisciplinary research.

The previous research has highlighted the contribution of universities to the development of environmental citizenship via education, civic engagement, and sustainability, further supporting the educational focus followed in the current analysis (Adamou et al., 2021; Asilsoy and Oktay, 2018). Similar findings are demonstrated by bibliometric reviews of pro-environmental behaviour studies, where behavioural and attitudinal views are predominant (Farrukh et al., 2023). Conversely, studies on entrepreneurial ecosystems identify universities as central participants in promoting innovation, a start-up, and local growth (Ilie and Budac, 2023; Maritz et al., 2024). Systematic reviews also show that institutional forces in universities are the key drivers of entrepreneurship (Patrício and Ferreira, 2022). Nevertheless, few of these studies explicitly interact with environmental citizenship as a more fundamental process mediating wider institutional consequences. Previous studies point out that environmental citizenship within higher education is not merely a factor of what is taught at school, but also how, as well as the organizational culture and perceptions of the teachers about their civic role (Georgiou et al., 2021; Hadjichambis and Paraskeva-Hadjichambi, 2020). Collectively, these understandings highlight the importance of considering environmental citizenship as an institutionally constituted process that has the potential to provide a vital value-based basis on which sustainability-oriented entrepreneurial mindsets and practices can be established in the university ecosystems.

The sustainable and green entrepreneurship studies are more and more inclined towards the significance of environmental values and pro-environmental behaviour in the entrepreneurial intentions (Anghel and Anghel, 2022; Jitrumluek et al., 2019). The empirical research on sustainable entrepreneurial intention in higher education students also shows the impact of institutional support and sustainability education (Qazi et al., 2021; Sharma et al., 2024). However, these contributions usually view environmental behaviour as a personal rather than an institutional citizenship process characteristic. The conceptual frameworks of sustainable

entrepreneurial universities suggest better assimilation of sustainability, innovation, and entrepreneurship in the institutions of higher learning (Cai and Ahmad, 2023; Fanea-Ivanovici and Baber, 2022). Although these views are consistent with the institutional patterns, as identified in this research, they are loosely related to the environmental citizenship literature, which supports the disjointed evolution of the two research streams. The current experience of the newer Asian economies confirms that environmentally based entrepreneurship is one of the key factors in promoting sustainable green development and enhancing corporate social responsibility towards the environment (Wei et al., 2023; Sadiq et al., 2022). In such circumstances, universities may serve as an institutional space of criticality that intersects with environmental citizenship, access to sustainability-oriented financing, and entrepreneurial potential in helping to establish green SMEs and resilience-based entrepreneurship ecosystems in Asia.

The findings of the present bibliometric review suggest that universities contribute to the formation of environmental values and civic responsibility on a very fundamental level; the aspect of translating these values into sustainability-oriented entrepreneurial practice is yet to be investigated. Current literature largely defines environmental citizenship as an educative or behavioural phenomenon, and little has been done to explore how environmental citizenship affects entrepreneurial intentions and innovation processes, as well as SME development. The future studies should thus go beyond the individual level views and focus on the interaction between environmental citizenship and institutional entrepreneurship, incubation systems in universities, and sustainability-based innovation systems in the future. This integrative approach would allow a more thorough insight into how universities can become agents of sustainable entrepreneurship through instilling environmental values in entrepreneurial ecosystems. This point of view applies especially to the emerging and transitioning economies, when the primary focus of the economic development is put on SMEs and family-owned enterprises. By facilitating the relationship between environmental citizenship and entrepreneurship scholarship, future research will be able to assist in the further development of theory as well as the creation of feasible strategies that will facilitate sustainability-driven entrepreneurship and institutional change.

5. Conclusion

This paper has conducted a longitudinal bibliometric analysis of the development of literature on university-led environmental citizenship between 1985 and 2025 in a systematic mapping of the research literature. According to the dataset of 98

peer-reviewed journal articles and review papers found by Scopus, the results demonstrate that the field follows an evident maturation curve, i.e. the first formative phase (1985 to 2000) is followed by the phase of consolidation (2001-2010), and the expansion phase after 2011 is obvious. The intellectual framework of the literature is based largely on Environmental Science, Education, and the Social Sciences, since there has been a long-standing focus on sustainability education, pro-environmental behaviour, and institutional responsibility in higher education settings. Thematic evolution and the keyword co-occurrence analysis illustrate that there is a consistent conceptual core based on the focus on environmental citizenship, ecological citizenship, identity and normative dimensions, along with sustainability education. In addition to its contribution to the environmental citizenship literature, the present study enhances the knowledge on the institutional underpinnings of sustainable entrepreneurship. The findings support the strategic role of higher education institutions in promoting sustainability-based economic development by identifying environmental citizenship as a value-based tool with which universities can impact entrepreneurial behaviour, innovation pathways and the sustainability of SMEs. The major contribution of this review is that it has revealed an unexploited intersection of research. Such themes as entrepreneurship, innovation, and economic sustainability are still peripheral to the mainstream thematic clusters, although an increasing number of people view universities as agents of sustainability change. Such a gap points to the necessity of further intertwining the fields of environmental citizenship and sustainable entrepreneurship studies, especially to address the question of how the values of citizenship developed at universities are then converted into entrepreneurship intentions, innovation process, and sustainability ecosystem-wide results.

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