



Global knowledge structure of eco-anxiety and climate action: a multidimensional bibliometric analysis

 Walter Manuel Hoyos-Alayo¹

¹Universidad Tecnológica del Perú, Chiclayo - Perú

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Abstract— Climate change has intensified the emergence of eco-anxiety, an emotional response characterized by distress, fear, and hopelessness in the face of the environmental crisis. This study aimed to map the evolution and characteristics of global scientific production on eco-anxiety and climate action. To this end, a bibliometric analysis was applied to 1,570 publications indexed in Scopus and WoS (2018–2025), processed with Bibliometrix (R) and VOSviewer, evaluating trends, authors, journals, institutions, countries, and thematic clusters. The results show an annual growth rate of 116.85%, with an average of 4.13 co-authors per article and 25.99% international collaboration. Notably, P. Pihkala (29 publications) and S. Clayton (22) stand out as leading authors; the Journal of Environmental Psychology and Sustainability as the main journals; and University College London (115 articles) as the most productive institution. Furthermore, four thematic clusters were identified: clinical-emotional dimension, climate action/activism, youth leadership, and climate justice/public policy. Gaps remain in sustainability, climate education, and intersectional analyses. It is concluded that the field exhibits high interdisciplinarity and rapid consolidation but requires diversification of geographical contexts and approaches to turn eco-anxiety into an effective, inclusive, and socially relevant driver of climate action.

Keywords: eco-anxiety, climate action, bibliometric analysis, interdisciplinary research, global trends.

I. INTRODUCTION

The climate crisis now operates as a measurable risk multiplier for health, livelihoods, and governance [1], [2]. The World Meteorological Organization reported that 2024 was likely the first calendar year with global mean temperature at $1.55 \pm 0.13^\circ\text{C}$ above the 1850-1900 baseline, alongside record ocean heat content and continued sea-level rise [3], [4]. In parallel, the UNEP Emissions Gap Report estimated global greenhouse gas emissions at 57.1 GtCO₂e in 2023 and projected around 3.1°C warming under current policies, with full implementation of unconditional and conditional Nationally Determined Contributions (NDCs) still leaving warming near 2.6°C and 2.4°C [5], [6], [7], [8]. These values define a persistent implementation gap between climate pledges and observed trajectories [9].

This acceleration has direct population-level consequences [10]. WHO estimates that 3.6 billion people already live in highly climate-vulnerable settings and projects about 250000 additional deaths per year between 2030 and 2050 from undernutrition, malaria, diarrhoeal disease, and heat stress [11]. The 2024 Lancet Countdown also reports escalating heat-related mortality in older adults and major economic disruption from heat exposure, including 512 billion potential labour hours lost globally in 2023 [12]. Climate change now imposes a linked burden on public health systems and labour productivity [13], [14], [15].

Nevertheless, the study of eco-anxiety faces epistemological and methodological challenges [2]. The absence of a unified definition and the lack of globally validated instruments for its measurement hinder cross-context comparisons and the development of reliable longitudinal indicators [16], [17]. Moreover, psychological and descriptive approaches predominate in high-income countries, while integrative and comparative analyses remain limited [18], [19]. In this regard, the most recent literature calls for intersectional approaches and comparative analyses that consider variables such as gender, age, territory, and socioeconomic status to fully understand inequalities in the experience and coping mechanisms of eco-anxiety [20], [21]. This situation underscores the need for innovative strategies to map the field's development, where bibliometric analysis, artificial intelligence, and network analysis have begun to revolutionize the understanding of trends, thematic clusters, and international collaborations [22], [23]. Bibliometric studies have also identified emerging thematic cores, mental health, environmental education, youth participation, and climate justice, which intersect the field of eco-anxiety and climate action at both international and regional levels [24], [25]. Furthermore, the field's genuine multidisciplinary stands out, bringing together contributions from psychology, sociology, education, political science, communication, and public health [26], [27].

Eco-anxiety affects diverse population groups in a cross-cutting yet non-homogeneous manner. International and Latin American studies show that young people, adolescents, women, and communities in high-risk areas perceive and experience eco-anxiety with greater intensity [28], [29]. In Latin America, the combination of high exposure to climate threats, structural inequalities, and limited access to effective public policies increases the prevalence of eco-anxiety and exacerbates its negative effects on mental health and collective well-being [15]. In many cases, this experience impacts everyday decision-making, young people's life prospects, family relationships, and future planning, illustrating the human and social dimensions of eco-anxiety [13], [14]. Nevertheless, eco-anxiety is not only a symptom of vulnerability but can also become a driver of ecological awareness, climate activism, and social transformation, provided there are adequate support systems, coping resources, and opportunities for participation [28], [30].

The relationship between eco-anxiety and climate action currently constitutes a priority research focus. Eco-anxiety can lead to states of distress, paralysis, or hopelessness, hindering the adoption of pro-environmental behaviors and weakening social cohesion [9], [31]. On the other hand, numerous studies have documented that when emotions associated with the environmental crisis are channeled through coping strategies, institutional support, and participation networks, eco-anxiety can be transformed into resilience, a sense of agency, and civic engagement [32], [33]. Therefore, this duality underscores the urgency of multidimensional approaches that integrate psychological, social, educational, cultural, and political variables to fully understand the mobilizing or limiting potential of eco-anxiety [34], [35].

At present, eco-anxiety has been progressively incorporated into the public agenda and the development of mental health and environmental education policies, particularly in countries that have recognized the need for psychosocial support strategies as part of climate governance [36]. However, significant knowledge gaps remain regarding how eco-anxiety may influence effective climate action, civic participation, public policy design, and social transformation, especially in regions with limited institutional adaptive capacity [37]. In this regard, evidence derived from bibliometric analysis is crucial for guiding the design of public policies and integrated strategies linking mental health and climate action, particularly in highly vulnerable contexts [38]. Accordingly, this study aims to provide a strategic and guiding perspective for both the international scientific agenda and the development of public interventions addressing current psychosocial and environmental challenges.

While bibliometric analysis allows for a rigorous mapping of the evolution, trends, and gaps in the literature, it is important to acknowledge that an approach based exclusively on the Scopus and WoS database may exclude relevant contributions published in other sources, languages, or regional contexts. Moreover, eco-anxiety and climate action, as fields of study, require interdisciplinary conceptual frameworks that integrate insights from environmental psychology, climate justice, and intersectionality to fully understand impact gaps and the specific challenges faced by the most vulnerable territories at both global and regional scales [39].

Understanding the complexity of this phenomenon in order to inform interventions aimed at improving public policies and promoting more resilient societies first requires a broad and rigorous comprehension of theoretical and methodological advancements, as well as of the historical trajectory leading to the consolidation of eco-anxiety and climate action as fields of study. This perspective allows for the formulation of the following research questions: (i) How has scientific production on eco-anxiety and climate action evolved in literature indexed in Scopus and Web of Science? (ii) Who are the most prominent and impactful authors in research on these topics? (iii) Which journals are the most influential in disseminating literature on eco-anxiety and climate action? (iv) Which institutions and countries hold the greatest leadership and collaboration in the development of this field? (v) What types of publications predominate, and how are they distributed by subject area? (vi) What are the main areas of knowledge linked to the study of eco-anxiety and climate action? (vii) What is the level and structure of international and interdisciplinary collaboration around these topics? (viii) Which articles and seminal contributions have driven the conceptual and methodological consolidation of the field? (ix) What gaps, emerging trends, and future research perspectives can be identified from the global bibliometric mapping?

II. METHODOLOGY

Given the interest in understanding the scientific approach to eco-anxiety and climate action, the bibliometric mapping methodology was employed, understood as a mathematical and statistical method for analyzing scientific production and the various forms of academic communication surrounding emerging phenomena. Following the approach proposed by Luna-Morales et al. [40], the application of bibliometrics involves a series of systematic and rigorous steps, beginning with the formulation of research questions, the identification of the relevant database, the construction of the search equation, and the subsequent statistical and mathematical analysis of the retrieved metadata.

The approach adopted in this research falls within the quantitative domain and is positioned at the level of exploration and description of the process related to the scientific treatment of eco-anxiety and climate action. Likewise, for the development of the study, a non-experimental, longitudinal, and retrospective design was selected, aimed at identifying and analyzing the evolution of the literature from the emergence of the concept to the present [41], [42].

Based on the research question, we constructed a canonical search equation using the most representative descriptors of both constructs: (ALL ("eco-anxiety" OR "eco anxiety" OR "climate anxiety") AND ALL ("climate action" OR "climate change action" OR "environmental action")). This strategy was run in two multidisciplinary databases, Scopus and Web of Science (WoS), without a time limit, so the mapping covered the field from its earliest indexed contributions to the extraction date. The search was conducted in Scopus and Web of Science (WoS), selected for their broad multidisciplinary coverage and strict peer-review standards. The combined query yielded 2,641 scientific records as of 24 October 2025.

The Boolean strategy was developed through an iterative protocol based on two conceptual domains, eco-anxiety and climate action. Candidate descriptors were identified from seminal publications and indexed vocabulary in environmental psychology and climate governance studies, then tested in Scopus and Web of Science in pilot rounds. In each round, relevance precision was assessed through manual screening of ranked records, while recall was checked against a predefined seed set of key papers. Terms such as “solastalgia”, “ecological grief”, “environmental concern”, and “pro-environmental behaviour” were tested but excluded from the final equation when they increased thematic drift, reduced construct co-occurrence, or retrieved records outside the study scope. The final equation was retained for cross-database reproducibility and conceptual specificity.

As shown in Figure 1, the dataset was refined through sequential screening and eligibility steps. After removing 645 duplicates, 1,996 records were screened by title and abstract. Next, 1,904 full texts were assessed for retrieval, 15 were not retrieved, and 1,889 full texts were evaluated for eligibility. A total of 319 records were excluded under three predefined criteria, EC1, records lacking the simultaneous presence of eco-anxiety and climate action in title, abstract, or keywords, EC2, records with incomplete or inconsistent metadata that prevented integration into co-authorship, co-occurrence, and productivity analyses after metadata standardisation, and EC3, records outside the thematic and methodological scope of the study. The final corpus included 1,570 publications. Records were exported in CSV format and processed in Excel for curation and harmonisation prior to bibliometric analysis [43].

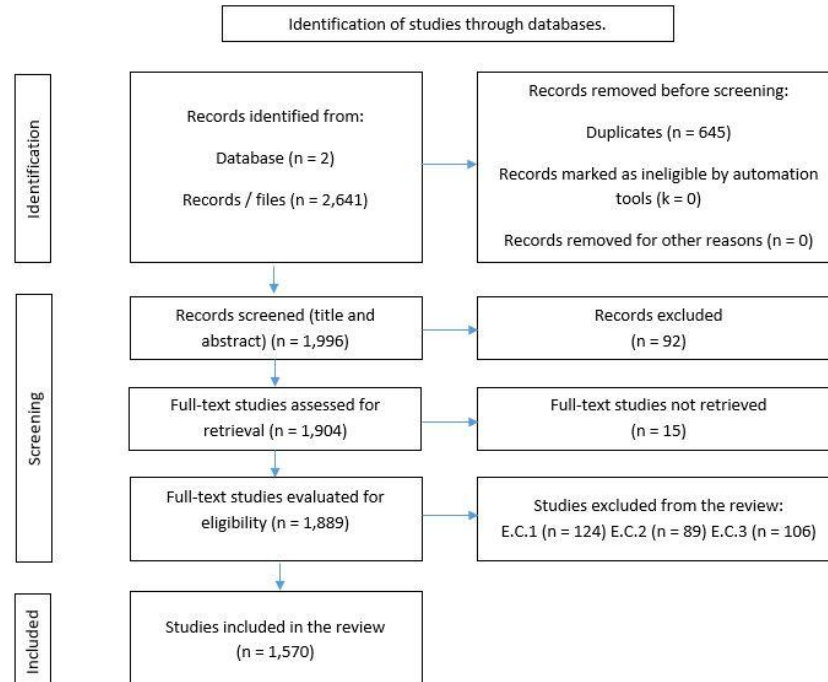


Figure 1: PRISMA flow diagram.
Source: Author's own elaboration.

After retrieval, records from Scopus and Web of Science were merged in CSV format and processed using a reproducible two-stage cleaning protocol. First, duplicates were removed through deterministic matching by DOI and database identifiers, followed by rule-based matching of normalised title strings, first author, source, and publication year for records without persistent identifiers. Secondly, metadata were normalised to reduce fragmentation in collaboration and co-occurrence networks. Author names were standardised through ORCID, affiliation history, and co-authorship context, institutional names were harmonised using a controlled thesaurus of variants, and country names were unified under a single nomenclature. Ambiguous cases were manually reviewed and resolved by consensus before final analysis.

Given that the extracted records contained multiple relationships among metadata, including links between authors, institutions, countries, affiliations, journals, and funding bodies, scientific maps of semantic networks and co-authorships were developed [44]. This mapping and visualization process was carried out using specialized, open-access software, specifically Bibliometrix (developed in R) and VOSviewer.

Bibliometrix enables advanced statistical analyses and the generation of bibliometric graphs and is supported by the R Foundation for Statistical Computing [45].

In turn, VOSviewer, developed by Leiden University (The Netherlands), is designed to construct and visualize bibliometric networks of journals, authors, or publications, using relationships such as citation, bibliographic coupling, co-citation, and co-authorship. It also offers text mining capabilities for building co-occurrence networks of key terms [46], [47].

To strengthen analytical robustness, we also computed additional structural indicators: corpus h-index, co-citation network metrics, bibliographic coupling intensity, and node centrality measures (degree and betweenness). These indicators were used to identify intellectual concentration, bridge nodes, and the consistency of the field's knowledge architecture beyond publication counts.

This methodological combination enabled a comprehensive understanding of the field of study, highlighting both the most significant advances and the future research opportunities related to eco-anxiety and climate action at the international and regional levels.

III. RESULTS AND DISCUSSION

The search strategy developed for the bibliometric analysis identified a collection of 1,570 documents published between 2018 and 2025, encompassing a total of 788 sources indexed in the selected database. In the preparation of these works, 5,072 authors participated, of whom 275 contributed to single-authored articles. This reflects a notable level of scientific collaboration, evidenced by 25.99% international co-authorship and an average of 4.13 co-authors per document. The annual growth rate of scientific production was particularly remarkable, reaching 116.85%. In addition, the bibliographic collection includes 3,225 author-provided keywords and a total of 104,645 cited references. The documents have an average age of 1.33 years, indicating the recent and current nature of research in the area, and have received an average of 13.25 citations per article, demonstrating a relevant level of recognition within the scientific community (see Figure 2).

These bibliometric indicators reflect a period of effervescence and consolidation in research on eco-anxiety and climate action, as evidenced by the rapid increase in publications and the high level of international and multidisciplinary collaboration. This dynamism not only responds to the global recognition of the phenomenon but also to the urgency of understanding its psychosocial implications in the face of advancing climate change. Nevertheless, the field's recent and rapidly expanding nature poses significant challenges, including conceptual and methodological fragmentation and the need for stronger theoretical integration [48], [49].

At the same time, the quantitative growth and internationalization of scientific production may mask inequalities in the participation of underrepresented regions and communities, reinforcing the importance of promoting more inclusive and context-specific research agendas. Therefore, the main challenge lies in channeling this bibliometric momentum toward greater theoretical depth, interdisciplinary integration, and social relevance, ensuring that scientific progress effectively contributes to understanding and addressing eco-anxiety in diverse contexts [50], [51].



Figure 2: Main bibliometric information for the collection on eco-anxiety and climate action (Scopus and WoS, 2018–2025). Source: Summary of main information generated in Bibliometrix, based on metadata extracted from Scopus and WoS.

Figure 3 shows the annual evolution of scientific production on eco-anxiety and climate action between 2018 and 2025, revealing exponential growth starting in 2020 and peaking at 560 publications in 2024. This trend reflects the transition of eco-anxiety from a marginal concern to a central topic in the global research agenda [52], [53]. The sustained increase during the 2020–2024 period suggests that the academic community has responded to the growing social and media urgency surrounding climate change and its emotional impacts, consolidating eco-anxiety as a priority object of analysis [54], [55]. Although 2025 shows a slight decrease in the number of articles (451), this figure remains well above pre-pandemic levels, indicating a trend of maturation and expansion in the field.

A determining factor in this surge was the COVID-19 pandemic, which highlighted the interconnection between environmental crises, mental health, and collective vulnerability [52], [56]. During 2020 and 2021, there was a significant increase in studies examining how the uncertainty and fear generated by the pandemic intertwined with ecological anxiety, leading to new theoretical and methodological approaches [57]. This context fostered a more holistic view of eco-anxiety, encouraging research that not only explores the psychological impact of climate change but also social resilience and the need to strengthen coping capacities in scenarios of multiple uncertainties [58], [59].

Particularly noteworthy is the growing focus on youth, a group that emerges as one of the most affected by eco-anxiety, but also as a central actor in social mobilization and climate activism [60], [61]. Recent studies have documented how adolescents and young adults, in addition to experiencing high levels of environmental distress, are positioning themselves as drivers of the climate agenda, demanding institutional responses and the incorporation of mental health into public policies [18], [53], [62]. This shift has led various governments and international organizations to recognize eco-anxiety as a legitimate phenomenon, progressively integrating it into environmental education, public health, and civic participation strategies [57], [59]. Thus, the bibliometric evolution reflected in Figure 2 is indicative not only of a scientific field in expansion but also of the growing social and political relevance of eco-anxiety in the design of public policies aimed at sustainability and the well-being of future generations [63].

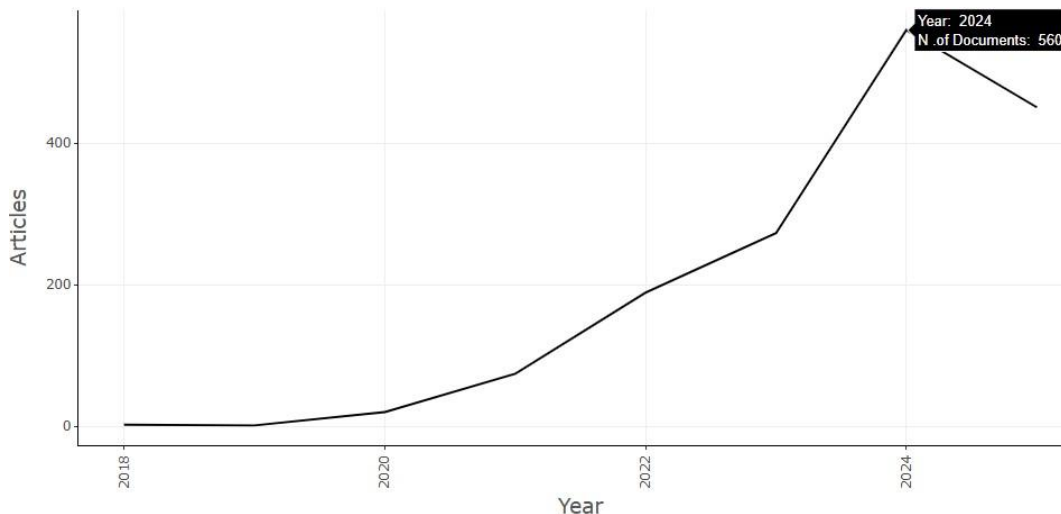


Figure 3: Annual scientific production.
Source: Prepared in Bibliometrix, based on metadata extracted from Scopus and WoS.

Figure 4 presents the ranking of the most prolific authors in the field of eco-anxiety and climate action between 2018 and 2025, highlighting P. Pihkala from the University of Helsinki, Finland; S. Clayton from The College of Wooster, United States; S.K. Stanley from the University of New South Wales, Australia; and M. Ojala from the University of Oulu, Finland, as the researchers with the highest number of publications (29, 22, 20, and 14 documents, respectively). This authorship pattern indicates the consolidation of academic leaders who have made decisive contributions to the conceptualization, operationalization, and international visibility of eco-anxiety [64]. Furthermore, the concentration of output among a small group of authors suggests the existence of consolidated research hubs and an active collaboration network, which has facilitated knowledge accumulation and the establishment of priority research agendas in the field.

Beyond publication volume, the relevance of these authors lies in their ability to introduce innovative approaches, interdisciplinary frameworks, and methodological proposals that have shaped the global discussion on eco-anxiety [61]. The diversity of affiliations and contexts among the most cited authors underscores the internationalization of the field, although the challenge remains to expand regional and cultural representation [62], [65]. The presence of authors from psychology, education, and the social sciences highlights the cross-cutting nature of the phenomenon, as well as the integration of perspectives ranging from mental health to climate justice and environmental education [66]. This panorama suggests that the future development of the field will depend not only on the leadership of established figures but also on openness to new voices, emerging approaches, and interregional collaborations—particularly those from contexts historically underrepresented in the international literature [67].

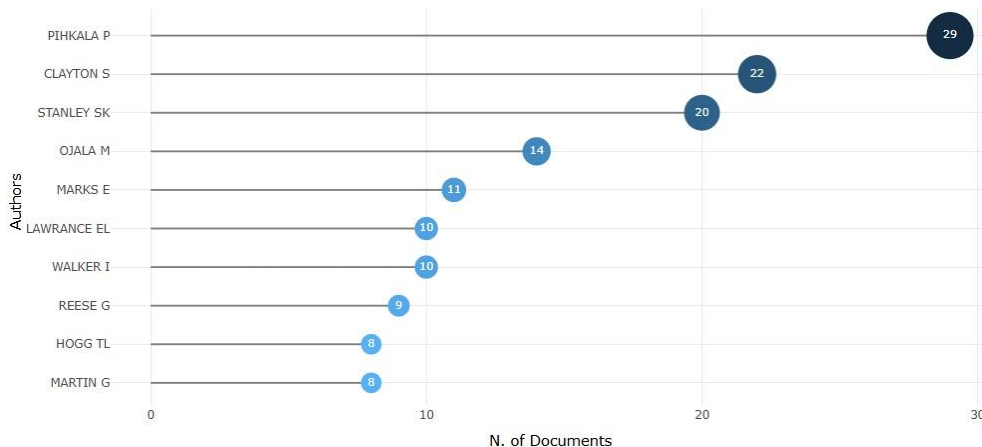


Figure 4: Most relevant authors.
Source: Prepared in Bibliometrix, based on metadata extracted from Scopus and WoS.

Figure 5 shows the scientific journals with the highest number of publications on eco-anxiety and climate action between 2018 and 2025, with the Journal of Environmental Psychology (64 documents) and Sustainability (Switzerland) (63 documents) standing out, followed by Frontiers in Psychology, Environmental Education Research, and the Journal of Climate Change and Health. This pattern highlights the

relevance of psychological and environmental sciences as structuring axes of the field and underscores the centrality of mental health and sustainability in contemporary academic debate [50].

The diversity of sources, which includes journals in psychology, environmental education, global health, and climate change, demonstrates the inherently interdisciplinary nature of eco-anxiety [68], [69]. The leadership of environmental psychology publications suggests that the phenomenon has initially been approached as a subjective experience linked to the perception and coping with ecological threats, while the growing presence of journals focused on sustainability and public health indicates an expansion toward structural, collective, and political issues [70], [71]. It is also noteworthy that high-impact journals in global health and climate change are increasingly integrated into this body of literature, evidencing the institutional recognition of eco-anxiety as a cross-cutting challenge requiring responses from multiple fields of knowledge [57], [64]. Therefore, the editorial configuration reflected here is indicative of a rapidly evolving field, open to disciplinary convergence and capable of attracting the attention of diverse scientific communities.

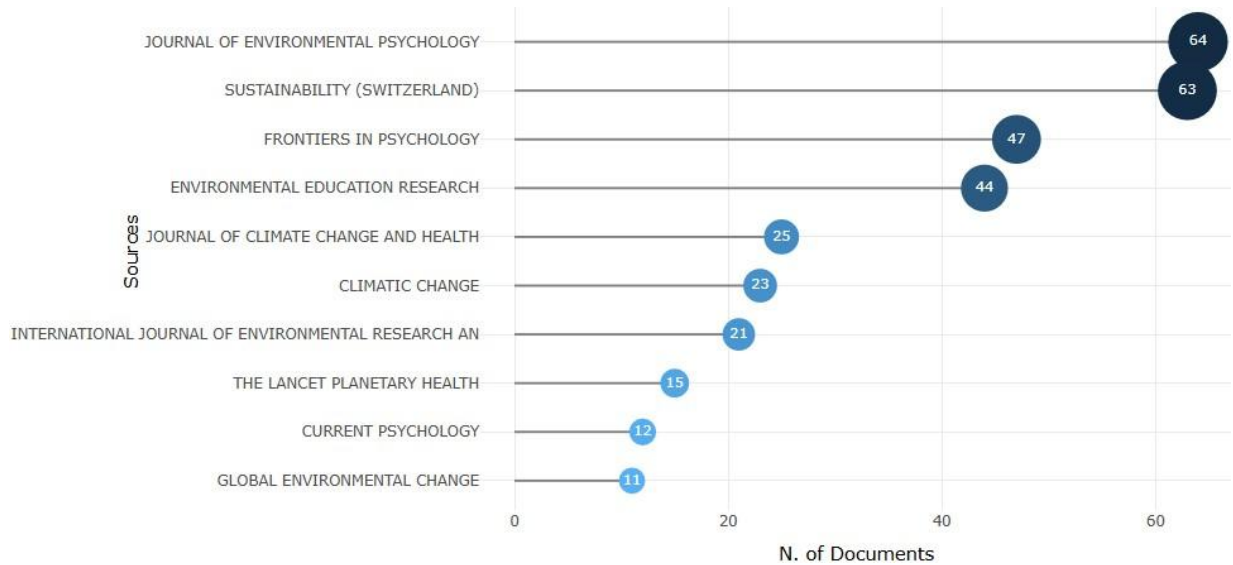


Figure 5: Leading journals.
Source: Prepared in Bibliometrix, based on metadata extracted from Scopus and WoS.

Figure 6 identifies the leading institutions in scientific production on eco-anxiety and climate action for the period 2018–2025, with University College London in the United Kingdom (115 articles), Deakin University (80), and Australian National University (66), both in Australia, standing out. These are followed by a diverse group of universities from Australia, the United Kingdom, Canada, the United States, and Finland. This distribution reveals the concentration of research in the Global North, particularly in English-speaking countries, as well as the consolidation of academic clusters that have promoted the institutionalization of the field.

However, the prominence of these affiliations also underscores structural challenges, such as the limited representation of institutions from the Global South or from socio-environmental contexts with high climate vulnerability [72], [73]. The leadership of internationally recognized universities has contributed to the scientific legitimization of eco-anxiety, attracting funding and fostering interdisciplinary collaboration networks [74]. Nevertheless, to strengthen the impact and social applicability of the knowledge generated, it is imperative to diversify the contexts of scientific production and promote the inclusion of voices and perspectives from regions traditionally underrepresented in the literature [75], [76]. Such an effort would not only enrich the understanding of eco-anxiety in global contexts but also contribute to the formulation of more equitable, culturally relevant responses aligned with the specific challenges of each territory [77], [78].

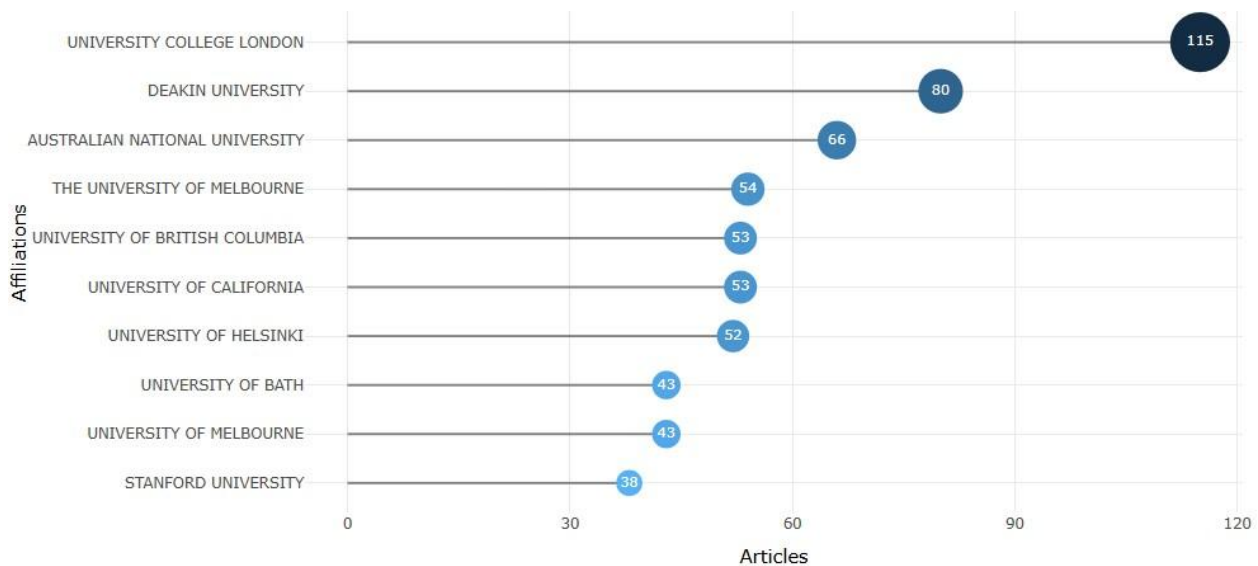


Figure 6: Institutional affiliations.
Source: Prepared in Bibliometrix, based on metadata extracted from Scopus and WoS.

Figure 7 presents the geographical distribution of scientific production, highlighting the clear dominance of the United States (389 documents), the United Kingdom (297), and Australia (210), which together account for the majority of publications in the field. Germany (154) and Canada (150) occupy intermediate positions, while Italy (78), Sweden (67), Finland (62), Spain (59), and the Netherlands (59) show significant but considerably lower representation. This configuration reflects the institutional capacity, availability of funding, and research infrastructure prevalent in Northern Hemisphere countries, particularly in English-speaking contexts [79]. The three most productive countries accounted for 57.07% of the corpus (896/1,570), while the top five reached 76.43% (1,200/1,570). The top ten countries represented 97.13% (1,525/1,570), indicating a highly concentrated geography of scientific production.

However, the concentration of production in these regions reveals significant asymmetries in the construction and circulation of knowledge on eco-anxiety, limiting the inclusion of perspectives, experiences, and issues from the Global South or from countries with high climate vulnerability [51], [80]. This geographical bias may restrict the global applicability and relevance of the findings, particularly in contexts where eco-anxiety takes on specific nuances linked to structural inequalities, differential access to information, and public policy frameworks [18], [81]. Therefore, it is a priority to promote more inclusive internationalization strategies, strengthen interregional cooperation, and bring visibility to emerging research from underrepresented regions, in order to achieve a more diverse and contextually grounded understanding of the phenomenon within the international scientific agenda [55], [82].

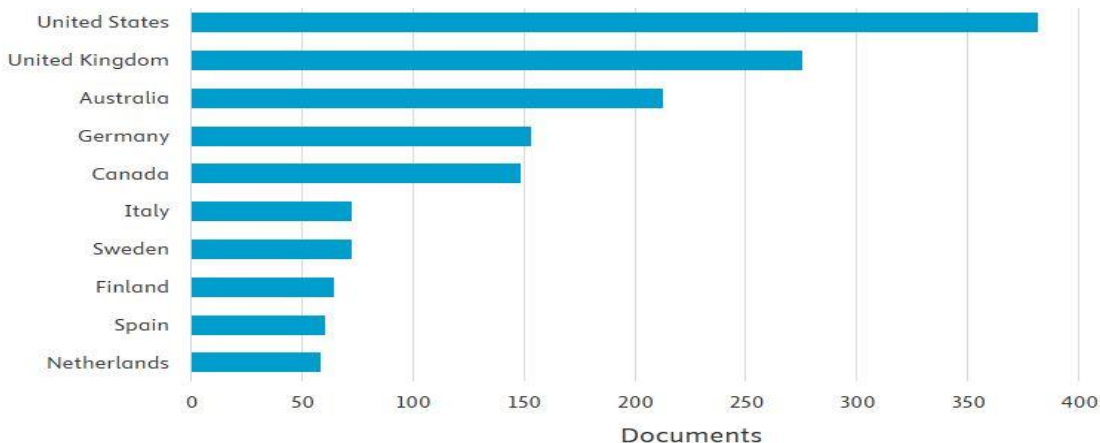


Figure 7: Production by country.
Source: Taken from Analyze results in Scopus and WoS.

Figure 8 shows the cumulative temporal evolution of the most frequent terms in the literature, with climate change being the most predominant, reaching 722 occurrences in 2025—well above the rest. It is followed by article (345), humans (266), female (246), male (234), adult (223), anxiety (213), mental health (199), adolescent (186), and human (186). The sustained growth of these terms reflects thematic diversification, with an emphasis on demographic and mental health dimensions.

The marked predominance of climate change as the central axis confirms that eco-anxiety is studied primarily in close relation to the psychosocial effects of climate change [83], while the increasing frequency of terms such as anxiety and mental health evidences the consolidation of interdisciplinary approaches linking psychology, public health, and environmental studies [84]. Likewise, the significant presence of demographic categories (female, male, adult, adolescent) suggests a growing interest in analyzing differences and specificities in the experience of eco-anxiety by gender and age group, an aspect that could enrich future intersectional studies [53], [85], [86]. The evolution observed in Figure 7 therefore indicates a shift from a descriptive approach centered on the phenomenon toward an increasingly complex research agenda, one that recognizes the plurality of subjects, contexts, and psychosocial factors involved in the human response to the climate crisis [87].

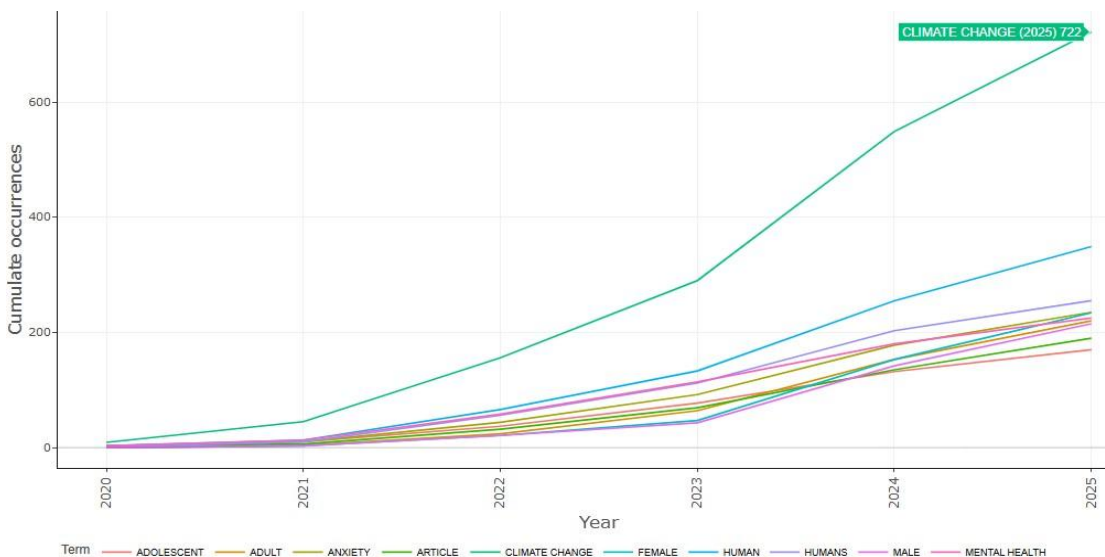


Figure 8: Word frequency over time.
Source: Prepared in Bibliometrix, based on metadata extracted from Scopus and WoS.

Figure 9 illustrates the thematic distribution of scientific production, with the social sciences (24.9%) as the most represented area, followed by environmental sciences (16.9%), psychology (13.2%), and medicine (11.3%). Other areas are also represented, though to a lesser extent, including arts and humanities (5.1%), energy (4.5%), earth and planetary sciences (4.5%), business and management (3.5%), computer science (3.1%), agricultural and biological sciences (2.3%), and other fields (10.7%).

This configuration highlights the marked interdisciplinarity of the field, where the social and environmental sciences serve as structuring axes, enabling eco-anxiety to be addressed from perspectives that integrate social, cultural, ecological, and psychological factors [88], [89], [90]. The significant presence of psychology and medicine indicates the institutional recognition of eco-anxiety as a phenomenon linked to mental and public health (Segala et al., 2024), while the inclusion of humanities, energy, and technology reflects an interest in understanding the ethical, communicative, and structural dimensions associated with the climate crisis [76]. However, the relatively lower participation of applied sciences, technology, and agricultural studies underscores the need to foster research that explores eco-anxiety from even more cross-cutting approaches, linking scientific and technological development, social innovation, and sustainable resource management in future research agendas [77], [91].

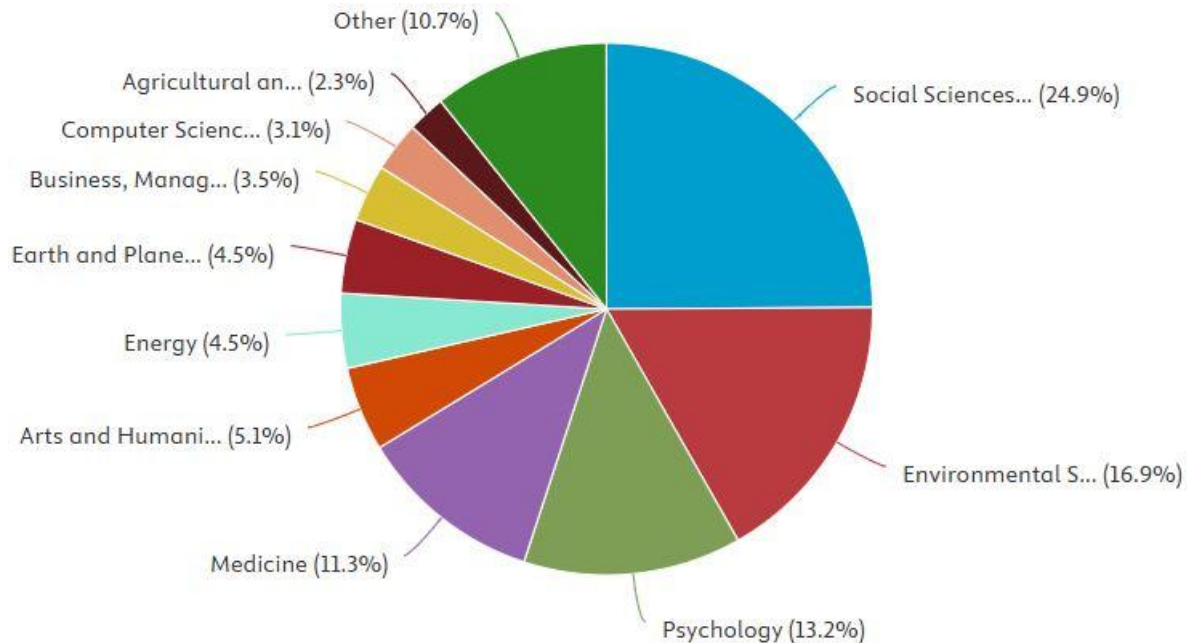


Figure 9: Publications by subject area.
Source: Taken from Analyze results in Scopus and WoS.

Figure 10 shows the keyword co-occurrence map generated from the analysis of 3,225 terms extracted from Scopus and WoS metadata between 2018 and 2025. In this semantic network, four main thematic clusters are identified, differentiated by color, which allow the visualization of the conceptual areas structuring the field of research on eco-anxiety and climate action. The most prominent nodes, in terms of size and centrality, are eco-anxiety, climate change, climate anxiety, mental health, youth, and climate action, indicating their pivotal role in the scientific literature.

The red cluster focuses on the emotional and clinical dimension of the phenomenon, including terms such as anxiety, mental health, psychological distress, coping strategies, and trauma, suggesting a strong influence of the psychological approach in characterizing eco-anxiety [61]. The green cluster is linked to climate action dynamics, encompassing concepts such as climate activism, agency, education, and pro-environmental behavior, reflecting a growing interest in understanding how eco-anxiety translates (or not) into forms of individual and collective mobilization [92]. The blue cluster focuses on specific social groups, with key terms such as youth, adolescents, students, children, and vulnerability, confirming the field's sensitivity to age-related factors and the prioritization of youth as a key population [93]. Finally, the yellow cluster addresses the political and structural dimension, with terms such as climate justice, policy, risk perception, and sustainability, pointing to a growing articulation between eco-anxiety and debates on environmental justice and climate governance [66], [82].

This semantic map confirms that eco-anxiety has become consolidated as a cross-cutting phenomenon that not only engages diverse disciplines but also serves as a meeting point between clinical, sociopolitical, educational, and ecological approaches [94], [95]. Unlike earlier stages of the field, in which psychopathological frameworks predominated, the current co-occurrence network reveals a more complex and interconnected structure, in which emotions are understood as social and historical responses to the climate crisis [49], [68]. This epistemological shift opens new possibilities for the development of integrative studies, with greater emphasis on the analysis of contexts, inequalities, and action strategies [96]. Moreover, the emergence of nodes such as activism, collective efficacy, environmental concern, and well-being points to a trend toward more hopeful approaches, in which eco-anxiety is seen not only as a symptom but also as a catalyst for change [97].

Overall, although the field presents consolidated thematic cores, there remain underdeveloped or disconnected areas, particularly those related to sustainability, climate education, and social inequalities. Therefore, the current challenge is to integrate these foci into a research agenda that is not only interdisciplinary but also capable of generating knowledge applicable to real and diverse contexts [89], [104]. Such integration would make it possible to overcome thematic fragmentation and advance toward a holistic understanding of eco-anxiety as a complex, situated, and transformative psychosocial phenomenon [58], [98].

The co-occurrence and thematic structures indicate conceptual fragmentation around eco-anxiety. The corpus uses adjacent constructs, including climate anxiety, ecological grief, solastalgia, and environmental concern, with partial overlap and uneven operational boundaries. This heterogeneity limits comparability across studies, inflates thematic dispersion, and may affect trend interpretation. Future updates should apply a controlled thesaurus and explicit construct boundaries at screening stage to improve conceptual consistency [66], [82].

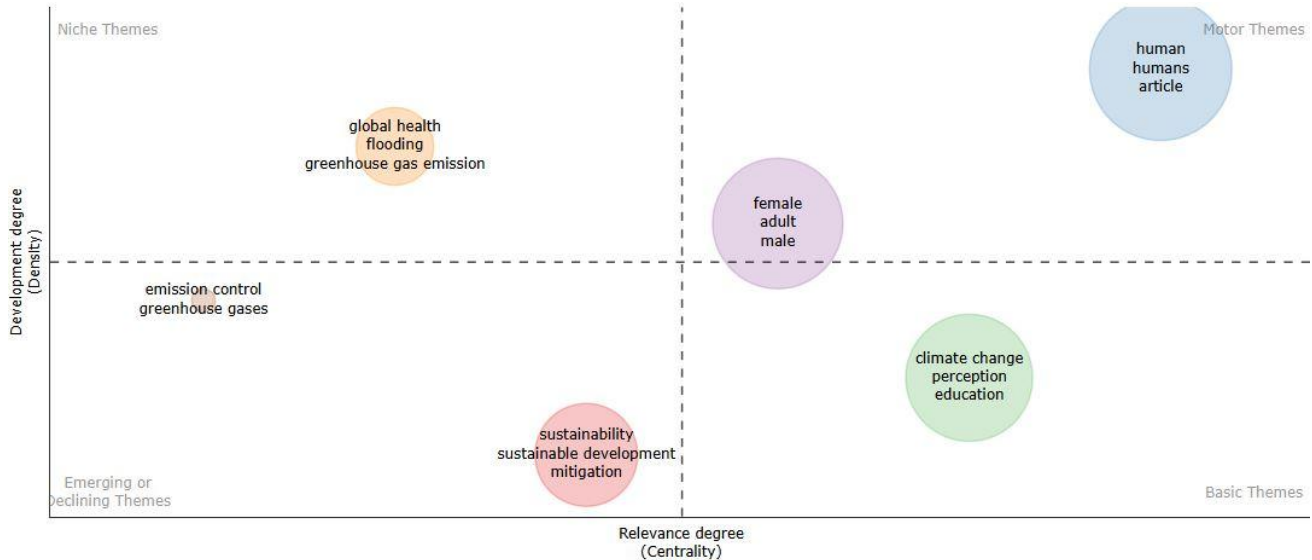


Figure 11: Thematic map.

Source: Prepared in Bibliometrix, based on metadata extracted from Scopus and WoS.

IV. CONCLUSIONS

The global bibliometric analysis of 1,570 publications indexed in Scopus and WoS between 2018 and 2025 shows an annual growth rate of 116.85%, with an average of 4.13 co-authors per article and 25.99% international collaboration, confirming the rapid consolidation and interdisciplinarity of this research domain.

Regarding the evolution and volume of scientific production, there is a clear shift from a marginal phenomenon to a priority area on the global academic agenda, with a marked boost following the COVID-19 pandemic. Among the most influential authors, P. Piñkalla, S. Clayton, S.K. Stanley, and M. Ojala stand out for their contributions in defining key conceptual and methodological frameworks. In terms of journals, the prominence of the *Journal of Environmental Psychology*, *Sustainability*, and *Frontiers in Psychology* reflects the centrality of environmental psychology, sustainability, and public health. The leading institutions, University College London, Deakin University, and Australian National University, and the geographical concentration in the Global North reveal a structural bias that limits representation from the Global South.

The thematic analysis identified four main clusters: (i) the clinical and emotional dimension of eco-anxiety, (ii) links with climate action and activism, (iii) youth leadership, and (iv) intersections with climate justice and public policy. Underdeveloped areas remain, such as the explicit integration of sustainability, climate education, and intersectional variables (gender, age, territory), as well as an insufficient connection between technical approaches and psychosocial dimensions.

Overall, the findings provide a reproducible empirical baseline on the growth, structure, and thematic configuration of research on eco-anxiety and climate action. Interpretative and policy-oriented implications should be treated as conditional on the documented biases of language, indexation, and geographical concentration, and should be strengthened through future comparative analyses with broader regional coverage and standardised construct definitions.

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