Original Article

Education in environmental health: scientific contributions of the last 20 years

Educación en salud ambiental: aportes científicos de los últimos 20 años

Walter Antonio Campos-Ugaz [1,*]
https://orcid.org/0000-0002-1186-5494
Miguel A. Saavedra-López [2,3]
https://orcid.org/0000-0003-4913-933X
Fernando Sierra-Liñan [4]
https://orcid.org/0000-0002-0687-3377
Rafael Garay-Argandoña [5]
https://orcid.org/0000-0003-2156-2291
Oscar Omar Álcazar Aguilar [6]
https://orcid.org/0000-0002-6430-122X
Ronald M. Hernández [7]
https://orcid.org/0000-0003-1263-2454
Martha C. Rodríguez-Vargas [8]
https://orcid.org/0000-0002-7986-8085

ABSTRACT

Man's attitudes about the environment have generated irreversible damage to the planet, emerging as an alternative to this problem Environmental Education, which aims to reorient social awareness towards a friendly and thoughtful culture. Through environmental education, we seek to make people aware of the problems of the natural and social environment from their school education in childhood to generate values, new attitudes, behaviors, and beliefs aimed at caring for the environment and learning new relationships between people. Likewise, to carry out these environmental education strategies, it is important to know some specific parameters, such as biological diversity and conservation, in addition to the conservation policies carried out by each nation. In this sense, in this work a bibliometric study was carried out based on high-impact scientific production and stipulated by ScienceDirect related to Environmental Education during a period of the last 20 years. The results were grouped into five clusters: "Environmental Education" OR "Education for Sustainable Development" OR "Education for Sustainability" OR "Education for Climate Change" OR "Eco citizenship". The union of all these clusters are connected and intertwined with each other. Them in a dependent way, which is a consequence of the study carried out.

Keywords: Environmental health, education, PRISMA, diversity, citizenship, citizen policy.

RESUMEN

Las actitudes del hombre sobre el medio ambiente han generado daños irreversibles al planeta, surgiendo como alternativa para esta problemática la Educación Ambiental, que tiene como finalidad reorientar la conciencia social hacia una cultura amigable y reflexiva. Mediante la educación ambiental se busca concientizar a las personas sobre los problemas del ambiente natural y social desde su formación escolar en la niñez para generar valores, nuevas actitudes, comportamientos y creencias orientadas al cuidado del medio ambiente y el aprendizaje de nuevas relaciones entre las personas. Asimismo, para lleva a cabo estas estrategias de educación ambiental, es importante conocer algunos parámetros específicos, como la diversidad biológica y conservación, además de las políticas propias de conservación llevada a cabo por cada nación. En ese sentido, en este trabajo se realizó un estudio bibliométrico basado en la producción científica de alto impacto y estipuladas por ScienceDirect relacionados con la Educación Ambiental durante un periodo de los últimos 20 años. Los resultados fueron agrupados en cinco clustes: "Environmental Education" OR "Education for Sustainable Development" OR "Education for Sustainability" OR "Education for Climate Change" OR "Eco citizenship". La unión de todos estos clústers se encuentran conectados y entrelados entre ellos de manera dependiente, lo cual es consecuencia del estudio realizado.

Palabras clave: *Salud ambiental, educación, PRISMA, diversidad, ciudadanía, política ciudadana.*

[1] Universidad Nacional Pedro Ruiz Gallo, Chiclayo, Perú.
[2] Universidad Continental, Cusco, Perú.
[3] Universidad Nacional de Tumbes, Tumbes, Perú.
[4] Universidad Privada del Norte, Lima, Perú.
[5] Universidad de San Martín de Porres, Lima, Perú.
[6] Universidad Continental, Lima, Perú.
[7] Universidad Católica Santo Toribio de Mogrovejo, Chiclayo, Perú.
[8] Universidad Nacional Mayor de San Marcos, Lima, Perú.

*Correspondence author: naneniwalter@gmail.com

Introduction

Man's attitudes about the environment have generated irreversible damage to the planet, emerging as an alternative to this problem, environmental education, which aims to reorient social awareness towards a friendly and thoughtful culture (Alagoz & Akman, 2016; World Economic Forum, 2019; Villanueva *et al*., 2020). Through environmental education, we seek

to make people aware of the problems of the natural and social environment from school education in childhood (Nada *et al*., 2021), to generate values, new attitudes, behaviors and beliefs aimed at caring for the environment and learning new relationships between people (Calixto, 2012; Díaz *et al*., 2021). Likewise, to carry out these environmental education strategies, it is important to know some specific parameters, such as biological diversity and conservation, in addition to the conservation policies carried out by each nation.

In recent decades, environmental education has become more relevant in educational institutions and in society, making people aware of the importance of having a new environmental ethic that is related to our behaviors, as well as our conception of knowledge and the world (Mayer, 1998; Pulido & Olivera, 2018), formulating various currents and trends (Molina-Motos, 2019), such as the naturalist or conservationist and others more linked to the social dimension of environmental realities; whose purpose is to learn about the link between science and context, where education and environmental health are related and complement each other (Sauvé, 2010).

The aforementioned information leads to the need to know about the scientific production that is carried out in high-impact journals on environmental health education and thus researchers and interest groups can propose strategies and alternatives for the corresponding citations. So the descriptors or clusters related to: "Environmental Education" OR "Education for Sustainable Development" OR "Education for Sustainability" OR "Education for Climate Change" OR "Eco citizenship" are a valid strategy that visualizes scientific production and identifies the way to go.

Therefore, knowing about the studies where scientific production is analyzed is essential to be able to assess the quality of scientific work, build national and international networks, and generate institutional collaboration between researchers (Hernández *et al*., 2021). Due to the above, the objective of the study was to describe the scientific production on environmental health education in the last 20 years.

Materials and methods

Retrospective descriptive study, analyzes the publications on environmental education during the last 20 years, during the period 2003 to 2022. For this, a systematic search was carried out in the ScienceDirect database, which included the fields Article Title, Abstracts, Keywords, using the descriptors "Environmental Education" OR "Education for Sustainable Development" OR "Education for Sustainability" in the search terms. " OR "Education for Climate Change" OR "Eco citizenship". With the documents found, a database was organized in Microsoft Excel with the following information: signing authors, title and type of publication, affiliation, journal of publication and country of publication. With the support of the VOSviewer software, a concurrency network was created with the main keywords, classified in clusters. Successively, from the number of keywords per cluster, they were selected by expertise to perform the search. In the next phase, the theme covered in each cluster was conceptualized, and the most relevant recoveries were selected to visualize the scientific contributions in the last 20 years.

Results

With the 372 descriptors recovered, the grouping of five clusters is evident. Cluster 1 (red) includes the results of studies on public policies on environmental health. Cluster 2 (green) shows the different investigations on the conservation of species and their relationship with ecosystem management. Cluster 3 (blue) analyzes studies on education. Cluster 4 (yellow) presents the research that has been developed on the proposal to include education in sustainable development within the university curriculum. Cluster 5 (purple) represents studies on consumer behavior and environmental attitudes of citizens and the ecological footprint (Figures 1, 2).
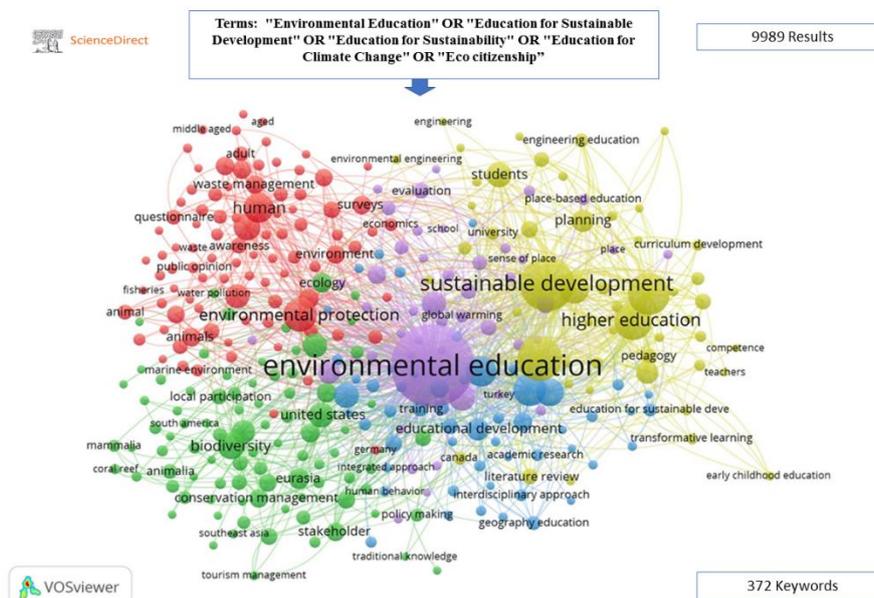

Figure 1. Search and concurrency network of environmental descriptors

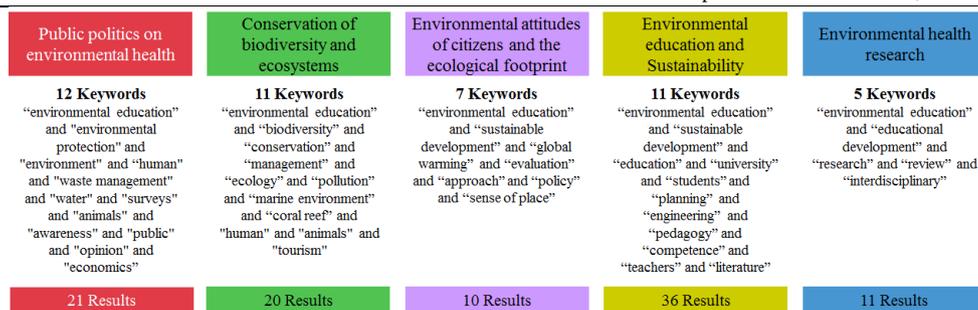| Public politics on environmental health	Conservation of biodiversity and ecosystems	Environmental attitudes of citizens and the ecological footprint	Environmental education and Sustainability	Environmental health research
12 Keywords "environmental education" and "environmental protection" and "environment" and "human" and "waste management" and "water" and "surveys" and "animals" and "awareness" and "public" and "opinion" and "economics"	**11 Keywords** "environmental education" and "biodiversity" and "conservation" and "management" and "ecology" and "pollution" and "marine environment" and "coral reef" and "human" and "animals" and "tourism"	**7 Keywords** "environmental education" and "sustainable development" and "global warming" and "evaluation" and "approach" and "policy" and "sense of place"	**11 Keywords** "environmental education" and "sustainable development" and "education" and "university" and "students" and "planning" and "engineering" and "pedagogy" and "competence" and "teachers" and "literature"	**5 Keywords** "environmental education" and "educational development" and "research" and "review" and "interdisciplinary"
21 Results	20 Results	10 Results	36 Results	11 Results

Figure 2. Results for the selected keywords by Clusters defined according to literature review

Table 1 collect some of the most innovative articles related to Public Policies on Enviroment health.

Table 1. Novel articles on Public Policies on Environmental Health

CLUSTER 1	**Public politics on environmental health:** Projects and activities that a State or organization designs and manages for the preservation of health and conservation of the environment, mediated by the interaction between human groups and the physical, chemical, biological and social factors found in the environment in which they live and which in turn is modulated by the social structure.		
Year	Authors	Tittle	Description
2014	Ramdas & Mohamed	Impacts of tourism on environmental attributes, environmental literacy, and willingness to pay: A conceptual and theoretical review	A conceptual and theoretical review was made on the interrelation between the impacts of tourism on the environmental requirements of small islands and environmental literacy with willingness to pay. The impacts of tourism on environments such as coral reefs, water, fisheries, and beaches are discussed.
2021	Sazzadul & Sharif	The need for an effective environmental engineering education to meet the growing environmental pollution in Bangladesh	The goal of this review article is to convey the need for major modifications to the existing engineering curriculum. Develop better environmental engineering. Curriculum and practice discussed extensively in conjunction with future directions that would focus on positive aspects of transformations
2020	George et al.	An evaluation of the environmental impact assessment practice in Uganda: challenges and opportunities for achieving sustainable development.	Environmental Impact Assessment (EIA) is a broad process that grew out of the National Environment Policy Act of 1970 in the US. The practice of EIA in Uganda was formally established through the National Environment Act of 1995. However, there is an increasing level of water pollution, especially Lake Victoria, rivers, streams, aquifers and soils. This research reviewed the institutional, legal and regulatory framework for EIA.
2022	Huang	Toxic Politics: China's Environmental Health Crisis and Its Challenge to the Chinese State	China's environmental problems, such as air and water pollution, are well known, as is its spectacular economic growth in recent years. These events of environmental degradation have been well established in Chinese national politics. Environmental topics have opened a window of opportunity in conventional Chinese politics, such as bureaucracy, the State-Society relationship, and authoritarian resilience.
2022	Kothari & Smith	Public Health Policymaking, Politics, and Evidence	It explores the gradient of public health engagement and relationships with politics and political science. On one hand, public health values evidence-informed decision-making based on orthodox hierarchies of evidence, while on the other, by the nature of the issues, there are challenges in obtaining this data and ignoring values and contextual considerations.
2022	Lui & Lo	Chinese environmental activism and the environmental politics of rumors	It is shown that rumors can foster a collective sense of urgency, recast a land rights protest into an environmental protest that is more likely to be politically successful, and undermine public trust in local authorities. The findings suggest that rumor mills are an important part of environmental politics in China due to their role in environmental activism.
2022	McKee	It was good while it lasted: politics is at the heart of public health but are we willing to engage?	This article reflects on the challenges for governance in a United Kingdom outside the European Union. Relying on Virchow's triad to address the political determinants of health, it describes a situation where the current government consistently shows contempt for state institutions and the principles on which they are based, such as honesty and the rule of law. It argues that this is a departure from the past and that it undermines the trust that is essential for effective public health policies that attract public support
2022	Cheatham et al.	Politics Spread COVID: Developing a Public Health Response	The assumptions that public health has been operating under for so long must now be deconstructed and checked in order to move forward and prevent necessary future deaths. To do this, we must better understand the influence of American politics and engage more effectively in politics at all levels.
2022	Eterovic & Buterin	Bioethical analysis of sanitary engineering: a critical assessment of the profession at the crossroads of environmental and public health ethics	It is argued that the bioethical perspective helps to show that these characteristics can be taken as a stimulating challenge. Furthermore, bioethics can illuminate how these characteristics can become an asset for health engineering in light of the growing need for holistic approaches.
2022	Przewozniak et al.	Tobacco, war and politics: A look at historical facts, political science and public health	Briefly review the available historical facts about the association between tobacco, war and politics and make an attempt to explain how war, political conflicts and their psychosocial and economic consequences influence tobacco consumption, smoking behaviors and attitudes and policies. of tobacco control.
2022	Binder et al.	Environmental Health Literacy as Knowing, Feeling, and Believing: Analyzing Linkages between Race, Ethnicity, and Socioeconomic Status and Willingness to Engage in Protective Behaviors against Health Threats	This study investigates relationships between environmental health literacy, people characteristics (race, ethnicity, and socioeconomic status) associated with health disparities, and people's willingness to engage in protective behaviors against health environmental threats. Environmental health literacy is a framework for capturing the continuous between knowledge of environmental impacts on public health and the skills and decisions needed to take health protective actions.

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Table 2 evaluates some of the most recent articles related to the Conservation of Biodiversity and Ecosystems.

Table 2. Conservation of biodiversity and ecosystems

CLUSTER 2	Conservation of biodiversity and ecosystems: Conservation of species and their relationship with ecosystem management are a fundamental part of the sustainable development of biodiversity, which is affected by climate change, having effects on the cycles of vector and zoonotic diseases		
Year	Authors	Tittle	Description
2022	Ward et al.	Safeguarding marine life: conservation of biodiversity and ecosystems	A foresight/hindsight is performed to consider two plausible futures towards 2030: a business as usual (i.e. continuation of current trends) and a more sustainable but technically achievable future in line with the UN Sustainable Development Goals
2022	Kleemann et al.	Priorities of action and research for the protection of biodiversity and ecosystem services in continental Ecuador	Ecuador belongs to the megadiverse countries of the world. However, the great diversity of species, ecosystems and their services are threatened by changes in land use, invasive species, overexploitation, pollution and climate change. There is a need to monitor, manage, protect and enhance biodiversity and ecosystem services (BES) in Ecuador
2022	Scherer-Lorenzen et al.	Pathways for cross-boundary effects of biodiversity on ecosystem functioning.	A basic concept is presented and three pathways of transboundary effects of biodiversity on ecosystem processes are outlined and an agenda for assessing such effects is proposed, focusing on terrestrial and aquatic linkages to illustrate the case. This transboundary perspective on the relationships between biodiversity and ecosystem functioning presents a promising frontier for biodiversity and ecosystem science with implications for the conservation, restoration, and management of biodiversity and ecosystems from local to global scales. scenery.
2022	Rosenfield et al.	Increasing cover of natural areas at smaller scales can improve the provision of biodiversity and ecosystem services in agroecological mosaic landscapes.	The proportion of land use types in land cover for each site is assessed and, using field measurement, we analyze its association with the following parameters: plant species richness (biodiversity), aboveground carbon stocks (regulation climate), atmospheric temperature (local climate regulation), and various parameters for the regulation of water quality.
2022	González-García et al.,	Biodiversity and ecosystem services mapping: Can it reconcile urban and protected area planning?	To meet this important challenge, it has been claimed that integrated territorial planning can better reconcile the interests between nature conservation and urban planning, and mapping of Ecosystem Service (ES) supply and demand can be a useful tool for such purposes. In this study, we quantitatively map the biodiversity and supply and demand of eight SEs along an urban-rural gradient in the Madrid region (Spain).
2022	Inkotte et al.,	Linking soil biodiversity and ecosystem function in a Neotropical savanna	It was speculated that the specific need to decompose woody litter may be associated with a greater need for diversity than an abundance of epigeal soil fauna. The work highlights the role of rainfall seasonality in biodiversity and soil physicochemistry, which is also closely related to the production and decomposition of litter. This study advances the understanding of the mechanisms that govern nutrient cycling in savanna ecosystems on nutrient-poor soils, with implications for achieving sustainable conservation and restoration goals.
2021	Perovic et al.	Chapter Three - Broadening the scope of empirical studies to answer persistent questions in landscape-moderated effects on biodiversity and ecosystem functioning	Emphasis is placed on the need for studies that empirically test the mechanisms underpinning moderate landscape effects on biodiversity and ecosystem function and link them to the provision of ecosystem services. This approach is facilitated by outlining the empirical investigations that will lead to a better understanding of biodiversity patterns and ecosystem functioning at landscape scales, and we highlight statistical approaches to support these different sampling approaches.
2022	Dotson & Pereira	From antagonistic conservation to biodiversity democracy in rewilding	The importance of conservation is matched by its potential to provoke controversy, especially for reconstruction. Treating rural peoples as biodiversity 'problems' has given way to seeing them as 'solutions', but what is most needed is a turn towards biodiversity democracy, resolving conservation conflicts and balancing rural-urban interests despite conflicts. knowledge and value disagreements.
2022	Montagnini et al.	Introduction. Biodiversity Islands: Strategies for Conservation in Human-Dominated Environments	This chapter serves to conceptualize, identify and promote the implementation of the framework tool that we call islands of biodiversity: ecological havens where plants and animals can thrive without further interference from human activity, thereby providing ecological, economic, and social benefits at ecosystem, landscape, and global levels
2022	Cavender-Bares et al.,	Integrating remote sensing with ecology and evolution to advance biodiversity conservation	Five key issues in biodiversity science that can be advanced by integrating remote sensing with in situ data collection from field sampling, experiments, and laboratory studies are examined to benefit conservation. Reducing the barriers to bringing these approaches together will require collaboration on a global scale.

Table 3 represents some of the most relevant articles present in the year 2022 in terms of Environmental Attitudes of Citizens and Ecological Footprint.

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Table 3. Environmental attitudes of citizen and the ecological footprint

	Environmental attitudes of citizens and the ecological footprint: Patterns of resource consumption and waste production of a given population related to the impact exerted by humanity on the environment and climate change, its repercussions on environmental health and the occurrence of diseases

CLUSTER 3

Year	Authors	Tittle	Description
2022	Moros-Ochoas *et al.*	Forecasting Biocapacity and Ecological Footprint at a Worldwide Level to 2030 Using Neural Networks.	The constant environmental deterioration is a problem widely addressed by multiple international organizations. However, given current economic and technological limitations, alternatives that have an immediate and significant impact on environmental degradation negatively affect contemporary development and lifestyle. Therefore, rather than limiting the population's consumption patterns or developing sophisticated and very expensive technologies, the solution to environmental degradation lies more in the progressive transformation of production and consumption patterns.
2022	Subires-Mancera & Delgano-Peña	The Role of Environmental Journalism and Documentaries as a Means of Informal Education for Environmental Citizenship.	This work is one of the most used genres in Environmental Journalism to inform, educate and raise awareness among citizens about the conservation and defense of the environment. The objective of this article is to analyze the role of documentaries as tools for Informal Environmental Education, through case studies, to examine how they can contribute to Environmental Citizenship. The main conclusions that can be highlighted are that the in-depth treatment of the issues, showing the images that reflect the attacks against nature and using expert scientific sources make the public aware of the problems, reflect on them and develop a critical awareness.
2022	Boukhelkhal	Impact of economic growth, natural resources and trade on ecological footprint: do education and longevity promote sustainable development in Algeria?	The current study provides several recommendations for better management of the country's human and natural resources, which could help policymakers put the country on the path to sustainable development.
2022	Dembińska *et al.*	The impact of space development structure on the level of ecological footprint - Shift share analysis for European Union countries	The impact of the spatial development structure at the level of the ecological footprint is an important element of the sustainable development policy, determining not only its directions, but also indicating the way to respect environmental principles. The objective of the research is to evaluate the impact of the spatial development structure at the ecological footprint level.
2022	Lee *et al.*	Assessing the impacts of formal and informal regulations on ecological footprint	This research applies the Moment Quantile Regression (MQR) method to probe the effects of formal (market and non-commercial) and informal ([ER] education [EDU] and green technology [TEC]) environmental regulations on the six components of the ecological footprint (EF). We investigated whether ERs are feasible tools to decrease environmental degradation by examining the ER-induced environmental Kuznets curve (EKC) hypothesis.
2022	Stergiou & Armakolas	Ecological Footprint and Sustainable Behavior: The Role of Education, Information, and Lifestyle.	The objective of this article is to evaluate the effects of environmental education, knowledge, information and lifestyles on ecological behavior and sustainability goals. More specifically, the emergence of a possible relationship between environmental education and sustainability and the correlation of lifestyle and individual attitude with ecological behavior constitute the research questions of our study. The researchers performed a quantitative analysis by collecting data from 116 questionnaires. The results indicate a lack of dissemination of knowledge about the environment from schools, while although people's emotional commitment and attitude towards the environment increase significantly, their ecological behavior is erratic on particular occasions.
2022	Yang & Arhonditsis	What are the primary covariates of environmental attitudes and behaviours in Canada? A national-scale analysis of socioeconomic, political, and demographic factors	There is considerable ambiguity around the importance of demographic and socioeconomic characteristics that catalyze pro-environmental behaviors. These factors are generally considered responsible for environmental skepticism, such as the degree of trust in social institutions, the fundamental opinions of individuals (for example, religiosity and political ideology), and competing priorities. Against this background, the present study analyzed a comprehensive survey response dataset to discern the most reliable predictors of Canadians' environmental attitudes related to activism, lifestyle, home practices on air quality, waste disposal, energy and water conservation. To achieve this goal, we leveraged the wealth of publicly available data from surveys conducted by Statistics Canada's Household and Environment Survey.
2022	Lima *et al.*,	Development of Scientific Literacy and the Impact of Environmental Attitudes of Citizens in a Geological Natural Space.	Intends to evaluate the impact of an environmental education action on citizens, as a process to be explored for the development of scientific literacy among the general public. Through the implementation of a pedestrian route in a natural environment (that is, with relevant geological aspects), the acquisition of skills and knowledge was promoted, which favor the development of the scientific culture of citizens.
2022	Genta *et al.*,	Quantitative assessment of environmental impacts at the urban scale: the ecological footprint of a university campus	This article explores the consumption-based ecological footprint method and its application with the objective of a quantitative evaluation of the sustainability of a university campus. The objective is to inform the planning decision-making process and evaluate the sociotechnical solutions implemented in local urban environments to reduce energy consumption, decrease environmental impacts and improve the quality of life of the inhabitants of the campus.
2022	Mehmood *et al.*,	The assessment of environmental sustainability: The role ofresearch and development in ASEAN countries	Considering the objectives established by the Association of Southeast Asian Nations (ASEAN) to increase research and development (R&D) expenditures, this study investigates the causal and long-term association between renewable energy (RE), renewable energy non-renewables (NRE), economic growth (GDP), and ecological footprints (EF) in the context of the environmental Kuznets curve (EKC)

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Table 4 represents some articles of the year 2022 related to Environmental Education and Sustainability

Table 4. Environmental education and Sustainability

CLUSTER 4	**Environmental education and Sustainability:** formation of individuals who are aware of and responsible for their ecological environment, endowed with the knowledge, skills and attitudes necessary to understand and solve environmental and sustainability problems		
Year	Authors	Tittle	Description
2006	Tilbury	Environmental Education for Sustainability: defining the new focus of environmental education in the 1990s.	This article is an attempt to start the discussion about what constitutes this new approach to environmental education and how it may differ from conventional approaches to environmental education.
2022	Eliades *et al*.	Carving out a Niche in the Sustainability Confluence for Environmental Education Centers in Cyprus and Greece	The findings of this study provide a deeper understanding of the implications that arise as a result of the absence of effective environmental education, as well as the importance of a holistic approach through the Center for Environmental Education. In addition, it offers the research community a solid framework for future innovations in citizen participation and training.
2022	Merritt *et al*.	A systematic literature review to identify evidence-based principles to improve online environmental education	Many environmental educators have switched to online programs amid the COVID-19 pandemic. A systematic review of the literature is conducted to identify program characteristics of digital environmental education experiences that are associated with one or more elements of environmental literacy.
2022	van de Wetering *et al*.,	Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis	The finding demonstrates the potential of environmental education to improve students' environmental knowledge, attitudes, intentions, and behavior. They also reveal methodological challenges for the field. Future research priorities include the identification of effective environmental education components and approaches.
2022	Kalsoom *et al*.	Collaborative reflection on environmental practices: a vehicle for environmental education in teacher education	The findings indicated that collaborative reflection on environmental issues and practices promotes pro-environmental practices among the participants. The study suggests the use of collaborative reflection on environmental issues and practices as a pedagogy for environmental education in teacher training.
2022	Mónus	Environmental education policy of schools and socioeconomic background affect environmental attitudes and pro-environmental behavior of secondary school students	Measuring environmental attitudes and pro-environmental behaviors in schools is crucial to assess how pedagogical work in schools copes with expectations to change students' attitudes and behaviors related to sustainability towards more pro-environmental ones. These changes in student attitudes and behaviors are among the main possibilities that can lead societies towards the transition towards sustainability.
2022	Yadav *et al*.	Chapter 19 - Environmental education for sustainable development	Environmental degradation is an alarming issue on the planet. The main reasons behind the problem are the industrial revolution and population explosion and the high demand for luxury items in life. At present, the lack of proper education, awareness, knowledge and approach of people towards the environment degrades nature and its resources.
2022	Sprague *et al*.	Green vs. Screen: Exploring the Outcomes of an In-Person and Virtual Nature-Based Environmental Education Intervention for Low-Income Children	The onset of the COVID-19 pandemic in 2020 forced a rapid transition to virtual learning. During the pandemic, many nature-based environmental education (NBEE) interventions switched to virtual formats. In this study, the impacts of a virtual NBEE intervention were compared with its in-person NBEE counterpart.
2022	Wakhidah & Erman	Examining environmental education content on Indonesian Islamic religious curriculum and its implementation in life, Cogent Education.	Damage to the natural environment (floods, pollution) and social environment (decrease in customs) becomes the focus of education to reduce its bad impact. The prevention of damage to the natural environment through learning biology, but the application of environmental education through religious subjects, so the two plan of study are expected to synergize with each other to protect the environment and the harmonization of social life.
2022	Moustairas *et al*.	Exploring factors that affect public acceptance of establishing an urban environmental education and recycling center	The empirical findings of this study also show that acceptance levels will increase with an emphasis on local development, improving urban infrastructure and creating new jobs. Finally, according to the questioned sample, the old Megara Railway Station (OSE) is considered the appropriate area for the proposed Center for Environmental Education and Recycling.

In Table 5, you can see some articles from the year 2022 with the theme of Environmental Health Research

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Table 5. Environmental health research

CLUSTER 5	**Environmental health research:** Generation and transmission of knowledge on environmental health to citizens and decision makers, which covers the environmental risk factors for health that influence the health-disease process, both at the individual and collective level; the understanding of the injury mechanisms of pollutants in the organism; current regulations on environmental health, as well as information and strategies; in addition to the implementation and evaluation of prevention and control programs for environmental risk factors through interdisciplinary and multidisciplinary teamwork.

Year	Authors	Tittle	Description
2022	Whaley *et al*.	Biological plausibility in environmental health systematic reviews: a GRADE concept paper	"Biological plausibility" is a concept frequently referred to in environmental and public health when researchers assess their confidence in the results and inferences of a study or evidence review. Biological plausibility is not, however, a domain of one of the most widely used approaches to assessing the certainty of the evidence (CoE) that underpins the findings of a systematic review, the Grading of Recommendations Assessment, Development and Evaluation CoE Framework (GRADE). Whether the omission of biological plausibility is a potential limitation of the GRADE CoE Framework is a topic that is regularly discussed, especially in the context of environmental health systematic reviews.
2022	McAlister *et al*.	Systems Thinking for Effective Interventions in Global Environmental Health	There is a need and an opportunity to engage in critical reflection on the dominant paradigms in the global environmental health community, including how they affect decision-making and collective learning. These paradigms must be adapted as necessary for the integration of diverse perspectives and the adoption of systems thinking.
2022	Navas *et al*.	The role of working-class communities and the slow violence of toxic pollution in environmental health conflicts: A global perspective	Analyzing a sample of 3033 environmental conflicts around the world, we compared conflicts that reported no human health impacts with those that reported toxic pollution-related health impacts.
2022	Binder *et al*.	Environmental Health Literacy as Knowing, Feeling, and Believing: Analyzing Linkages between Race, Ethnicity, and Socioeconomic Status and Willingness to Engage in Protective Behaviors against Health Threats	This study investigates relationships between environmental health literacy, people characteristics (race, ethnicity, and socioeconomic status) associated with health disparities, and people's willingness to engage in protective behaviors against environmental health threats.
2022	Liu *et al*.	The effects of MDR-TB Treatment Regimens through Socioeconomic and Spatial characteristics on Environmental-Health Outcomes: Evidence from Chinese Hospitals	This study examines socioeconomic and spatial factors and their influences on environmental health outcomes across "multidrug-resistant tuberculosis" (MDR-TB) treatment regimens in China. For this purpose, a survival analysis is performed by applying the "multivariate Cox proportional hazards model" on secondary data starting from 2010 to 2019.
2022	Ghasemi *et al*.	Toward Carbon-Negative and Emission-Curbing Roads to Drive Environmental Health	Road infrastructures are exposed to ultraviolet (UV) solar radiation during their useful life. UV rays generate free radicals that diffuse deep into the bituminous layers, accelerating the aging and degradation of bituminous compounds. It is hypothesized that carbonaceous particles grafted by bioderived molecules such as amines and amides may serve as free radical scavengers, delaying the aging of bituminous compounds.
2022	Dogan	Process mining based on patient waiting time: an application in health processes	This work aimed to present a process mining framework to measure the state of environmental health in institutions. The methodology developed a new software-based index, namely the Institutional Environmental Health Index (IEHI) that was integrated from Multi-Criteria Group Decision Making models based on ontologies based on the principles of fuzzy modeling and consensus evaluation.
2022	Grieger & Cummings	Informing environmental health and risk priorities through local outreach and extension	Based on responses from 66 study participants representing half of North Carolina's 100 counties, water pollution, flooding, natural resource management, and stakeholder engagement were found to be topics of highest priority in all matters of risk and environmental health.
2022	Dai *et al.,*	The dynamic impacts of environmental-health and MDR-TB diseases and their influence on environmental sustainability at Chinese hospitals	The purpose of this study is to identify the extent to which multidrug-resistant tuberculosis (MDR-TB) diseases affect environmental health problems in selected Chinese hospital provinces. In the survival analysis approach, this study employs the Cox proportional hazards model (CPM) to incorporate the duration of the event, the probability of occurrence of an event, and the issue of correct censoring.
2022	Shi	Environmental health perspectives for low- and middle-income countries	In recent decades, the ecological environment has been increasingly challenged by the development of global industrialization and urbanization throughout the world, even as global attention to health has increased dramatically.

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Discussion

Sustainability and environmental education is a fundamental issue of modern times due to climate change. The environmental actions of the general public are mainly changing the climate. These variations influence not only the emission of carbon but also the loss of ecological biodiversity. Consequently, researchers and practitioners emphasize changing environmental behavior as a crucial element in addressing this problem. Es así, que el constante deterioro y la corrupción del medio ambiente ha llamado la atención del mundo sobre el vínculo hombre-medio ambiente y la conservación del mismo. Human actions have a great influence on the environment, and the human-nature connection has shifted to one of coexistence and sustainable development (Clement & Lochan, 2020). Williamson *et al*., (2018) stated that two-thirds of global emissions are linked to both direct and indirect emissions from human consumption behavior, government policy changes, and industry. Changes at the level of individuals, households and communities are generally of greater importance than what is appreciated by people. Human behavior plays a fundamental role in achieving sustainability (Farrukh *et al*., 2022).

In recent years, research on Environmental Education (EA) has experienced great growth. In the past, the literature has endeavored to describe specific issues related to AE, such as its scope, context, objectives, antecedents, and consequences. Although there were few attempts to review the literature on AD, these reviews did not provide a comprehensive perspective on the literature on AD. Bibliometric analysis is a useful tool for profiling the environment of EA because it allows objectivity of the investigated area on the literature review (Farhan & Iqbal, 2021). It also serves to identify networks between academic groups such as universities, countries and journals in a particular area of research, as well as the descriptors or clusters of a particular topic.

Considering the aforementioned, this study carried out a bibliometric analysis for EE based on the data registered in ScienceDirect, which included the fields Article Title, Abstracts, Keywords, using the descriptors "Environmental Education" OR "in the search terms. Education for Sustainable Development" OR "Education for Sustainability" OR "Education for Climate Change" OR "Eco citizenship". Figure 1 shows the description of 372 descriptors recovered in five clusters: Public Policies on Environmental Health, Conservation of Species and their Relationship with Ecosystem Management, Environmental Education, Research on Curriculum Inclusion and Environmental Attitude and Ecological Footprint. For all these clusters, different keywords were determined: twelve (12) for Public Policies on Environmental Health, eleven (11), Conservation and Biodiversity, seven (7), Environmental Fitness of Citizens and Ecological Footprint, eleven (11) Education Environmental, and five (5) on Environmental Health Research. All these clusters are connected and intertwined with each other in a dependent manner, which is a consequence of the study carried out: Environmental Education. Tables 1 to 5 show some current references related to the topic of interest: Public Policies on Environmental Health, Conservation and Biodiversity, Environmental Aptitude of Citizens and Ecological Footprint, Environmental Education, and Research on Environmental Health. In all these clusters it is possible to relate it to the central theme of research such as Environmental Education. Therefore, it is important to highlight the bibliometric study and its interpretation with the data obtained during 20 years of studies.

On the other hand, in a work carried out by Si *et al*., (2019) a similar bibliometric study was carried out but in the area of Environmental Sciences, the Scopus and Web of Science search engines were taken into account. A comparison by Vieira & Gomes, (2009) revealed that Scopus provides 20% more coverage than the Web of Science. A comparison by Vieira & Gomes, (2009) revealed that Scopus provides 20% more coverage than the Web of Science. The subject area was limited to "Environmental Sciences" determining 13 subfields, including ecological modeling; ecology; enviromental chemistry; Environmental engineering; environmental science (miscellaneous); general environmental science; global and planetary change; health, toxicology and mutagenesis; management, monitoring, policy and legislation; nature and landscape conservation; pollution, waste management and disposal; and water science and technology. As reported by Si *et al*., (2019), the study exhaustively analyzed 531 articles on the application of the Theory of Planned Behavior to Environmental Sciences in the last 25 years using bibliometric and content analysis, specifically, interdisciplinarity. Situations and source newspapers were analyzed quantitatively, and the most productive countries and regions were revealed through co-authorship analysis, as well as their network distribution. More importantly, based on the co-occurrence of keywords and manual classification, this study elaborated the main research themes, extended factors, integrated theories, main methods, specific groups and control variables of the Theory of Planned Behavior applied to the field of the Environmental Sciences.

Conflict of interests

No conflict of interest is reported.

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References

Alagoz, B., & Akman, O. (2016). A study towards views of teacher candidates about national and global environmental problems. International Journal of Research in Education and Science, 2(2), 483-493. Available in: https://files.eric.ed.gov/fulltext/EJ1110264.pdf (Access february 2022).

Binder, A. R., May, K., Murphy, J., Gross, A., & Carlsten, E. (2022) Environmental Health Literacy as Knowing, Feeling, and Believing: Analyzing Linkages between Race, Ethnicity, and Socioeconomic Status and Willingness to Engage in

Boletín de Malariología y Salud Ambiental. Volumen LXII. Septiembre-Octubre, 2022. ISSN:1690-4648

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Protective Behaviors against Health Threats. International Journal of Environmental Research and Public Health, 19(5), 2701. https://doi.org/10.3390/ijerph19052701

Binder, A. R., May, K., Murphy, J., Gross, A., & Carlsten, E. (2022) Environmental Health Literacy as Knowing, Feeling, and Believing: Analyzing Linkages between Race, Ethnicity, and Socioeconomic Status and Willingness to Engage in Protective Behaviors against Health Threats. Int. J. Environ. Res. Public Health, 19, 2701. https://doi.org/10.3390/ijerph19052701

Boukhelkhal, A. (2022) Impact of economic growth, natural resources and trade on ecological footprint: do education and longevity promote sustainable development in Algeria?, International Journal of Sustainable Development & World Ecology. https://doi.org/10.1080/13504509.2022.2112784

Calixto, R. (2012). Investigación en educación ambiental. Revista mexicana de investigación educativa, 17(55), 1019-1033. Available in: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-66662012000400002&lng=es&tlng=es (Access february 2022).

Cavender-Bares, J., Schneider, F. D., & Santos, M. J. (2022). Integrating remote sensing with ecology and evolution to advance biodiversity conservation. Nature Ecology & Evolution, 6, 506–519. https://doi.org/10.1038/s41559-022-01702-5

Cheatham, M., Hancher-Rauch, H., Brookins-Fisher, J., Blavos, A., & Thompson, A. (2022) Politics Spread COVID: Developing a Public Health Response. Health Promotion Practice. https://doi.org/10.1177/15248399221118012

Clement, C., & Lochan, D. R. (2020). Green competencies: insights and recommendations from a systematic literature review, Benchmarking: An International Journal. http://dx.doi.org/10.1108/BIJ-11-2019-0489

Dai, Z., Sadiq, M., & Kannaiah, D. (2022). The dynamic impacts of environmental-health and MDR-TB diseases and their influence on environmental sustainability at Chinese hospitals. Environmental Science and Pollution Research, 29, 40531–40541. https://doi.org/10.1007/s11356-022-19593-1

Dembińska, I., Kauf, S., Agnieszka, T., Katarzyna, S. D., Łukasz, M., & Giuseppe, I. (2022). The impact of space development structure on the level of ecological footprint - Shift share analysis for European Union countries. Science of The Total Environment, 851(2), 157936. https://doi.org/10.1016/j.scitotenv.2022.157936

Díaz, G., Camarena, B., Gonzáles, D., & Mirón, C. (2021). A Structural Model of the Teaching Practice and Pro-Environmental Behavior in Elementary Mexican Students. International Electronic Journal of Environmental Education, 11(1), 42-57. https://doi.org/10.18497/iejeegreen.781808

Dogan, O. (2022). Process mining based on patient waiting time: an application in health processes, International Journal of Web Information Systems, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/IJWIS-02-2022-0027

Dotson, T. P., & Pereira, H. M. (2022) From antagonistic conservation to biodiversity democracy in rewilding. One Earth, 5(5), 469. https://doi.org/10.1016/j.oneear.2022.04.014

Eliades, F., Doula, M. K., Papamichael, I., Vardopoulos, I., Voukkali, I., & Zorpas, A. A. (2022) Carving out a Niche in the Sustainability Confluence for Environmental Education Centers in Cyprus and Greece. Sustainability, 14(14), 8368. https://doi.org/10.3390/su14148368

Eterovic, I., & Buterin, T. (2022) Bioethical analysis of sanitary engineering: a critical assessment of the profession at the crossroads of environmental and public health ethics. Ethics in Science and Environmental Politics, 22, 13-24. https://doi.org/10.3354/esep00199

Farhan, M., & Iqbal, M. K. (2021). Twenty years of sustainable supply chain: past trends and future research suggestions. International Journal of Business and Psychology, 3(1)1-16. Available in: https://ijbpsy.com/wp-content/uploads/2021/06/Farhan-M.pdf (Access february 2022).

Farrukh, M., Raza, A., Mansoor, A., Khan, M. S., & Lee, J. (2022). Trends and patterns in pro-environmental behaviour research: a bibliometric review and research agenda. Benchmarking: An International Journal. Available in: https://www.emerald.com/insight/1463-5771.htm (Access february 2022).

Genta, C., Favaro, S., & Sonetti, G. (2022) Quantitative assessment of environmental impacts at the urban scale: the ecological footprint of a university campus. Environ Dev Sustain 24, 5826–5845. https://doi.org/10.1007/s10668-021-01686-5

Ghasemi, H., Yazdani, H., Rajib, A., & Fini, E. H. (2022). Toward Carbon-Negative and Emission-Curbing Roads to Drive Environmental Health. ACS Sustainable Chemistry & Engineering 2022 10 (5), 1857-1862. https://doi.org/10.1021/acssuschemeng.1c07356

González-García, A., Palomo, I., González, J. A., García-Díez, V., García-Llorente, M., & Montes, C. (2022). Biodiversity and ecosystem services mapping: Can it reconcile urban and protected area planning?. Science of the Total Environment, 803, 150048. https://doi.org/10.1016/j.scitotenv.2021.150048

Grieger, K., & Cummings, C. L. (2022) Informing environmental health and risk priorities through local outreach and extension. Environment Systems and Decisions, 42, 388–401. https://doi.org/10.1007/s10669-022-09864-0

Boletín de Malariología y Salud Ambiental. Volumen LXII. Septiembre-Octubre, 2022. ISSN:1690-4648

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Hernández, R., Saavedra-López, M., Wong-Fajardo, E., Campos-Ugaz, O., Calle-Ramírez, X., & García-Pérez, M. (2021). Producción científica iberoamericana sobre TIC en el contexto educativo. Propósitos y Representaciones, 9(3), e1443. http://dx.doi.org/10.20511/pyr2021.v9n3.1443

Huang, X. (2022). Toxic Politics: China's Environmental Health Crisis and Its Challenge to the Chinese State. Cambridge University Press, 280 p. Available in: https://www.cambridge.org/core/journals/perspectives-on-politics/article/abs/toxic-politics-chinas-environmental-health-crisis-and-its-challenge-to-the-chinese-state-by-yanzhong-huang-cambridge-cambridge-university-press-2020-280p-8999-cloth-2999-paper/EFB7A90243EE78B8C56427C0C6EDD6E1 (Access february 2022).

Inkotte, J., Bomfim, B., da Silva, SC., Bruno, M., Valadão, X., Gonçalves da Rosa, M., Viana, R. B., Rios, P. D., Gatto, A., & Pereira, R. S. (2022). Linking soil biodiversity and ecosystem function in a Neotropical savanna. Applied Soil Ecology, 169, 104209. https://doi.org/10.1016/j.apsoil.2021.104209

Kleemann, J., Koo, H.,Hensen, I., Mendieta-Leiva, G., B.Kahnt, B., & Kurze, C. (2022). Priorities of action and research for the protection of biodiversity and ecosystem services in continental Ecuador. Biological Conservation, 265, 109404. https://doi.org/10.1016/j.biocon.2021.109404

Kothari, A., & Smith, MJ. (2022). Public Health Policymaking, Politics, and Evidence. In: Fafard, P., Cassola, A., de Leeuw, E. (eds) Integrating Science and Politics for Public Health. Palgrave Studies in Public Health Policy Research. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-98985-9_4

Lee, C. C., Chen, M. P., & Xu, W. (2022). Assessing the impacts of formal and informal regulations on ecological footprint. Sustuinable Development, 30(5), 989-1017. https://doi.org/10.1002/sd.2295

Lima, D., Noronha, F., & Lima, A. (2022). Development of Scientific Literacy and the Impact of Environmental Attitudes of Citizens in a Geological Natural Space. In: Vasconcelos, C., Calheiros, C.S.C. (eds) Enhancing Environmental Education Through Nature-Based Solutions. Integrated Science, vol 4. Springer, Cham. https://doi.org/10.1007/978-3-030-91843-9_7

Liu, J., & Lo, K. (2022). Chinese environmental activism and the environmental politics of rumors. Political Gography, 95, 102593. https://doi.org/10.1016/j.polgeo.2022.102593

Liu, Y., Cao, D., Cao, X., Jain, V., Chawla, C., Shabbir, M. S., & Ramos-Meza, C. S. (2022). The effects of MDR-TB Treatment Regimens through Socioeconomic and Spatial characteristics on Environmental-Health Outcomes: Evidence from Chinese Hospitals. Energy & Environment, 0958305X221079425. https://doi.org/10.1177/0958305X221079425

Mayer, M. (1998). Educación ambiental: de la acción a la investigación. Enseñanza de las ciencias, 16 (2), 217-231. Available in: https://raco.cat/index.php/Ensenanza/article/view/21530 (Access february 2022).

McAlister, M. M., Zhang, Q., Annis, J., Schweitzer, R. W., Guidotti, S., & Mihelcic, J. R. (2022) Systems Thinking for Effective Interventions in Global Environmental Health. Environmental Science & Technology, 56(2), 732-738. https:doi.org/10.1021/acs.est.1c04110

McKee, M. (2022). It was good while it lasted: politics is at the heart of public health but are we willing to engage? Journal of Public Health, fdac069. https://doi.org/10.1093/pubmed/fdac069

Mehmood, U., Askari, M. U., & Saleem, M. (2022). The assessment of environmental sustainability: The role ofresearch and development in ASEAN countries. Integrated Environmental Assessment and Management, 18(5), 1313–1320. https://doi.org/10.1002/ieam.4569

Merritt., E. G., Stern, M. J., Powell, R. B., & Frensley, T. (2022) A systematic literature review to identify evidence-based principles to improve online environmental education, Environmental Education Research, 28 (5), 674-694. https://doi.org/10.1080/13504622.2022.2032610

Molina-Motos, D. (2019). Ecophilosophical Principles for an Ecocentric Environmental Education. Education Sciences, 9(1), 37. https://doi.org/10.3390/educsci9010037

Montagnini, F., Levin, B., & Berg, K. E. (2022). Introduction. Biodiversity Islands: Strategies for Conservation in Human-Dominated Environments. In: Montagnini, F. (eds) Biodiversity Islands: Strategies for Conservation in Human-Dominated Environments. Topics in Biodiversity and Conservation, vol 20. Springer, Cham. https://doi.org/10.1007/978-3-030-92234-4_1

Mónus, F. (2022) Environmental education policy of schools and socioeconomic background affect environmental attitudes and pro-environmental behavior of secondary school students, Environmental Education Research, 28(2), 169-196. https://doi.org/10.1080/13504622.2021.2023106

Moros-Ochoa, M. A., Castro-Nieto, G. Y., Quintero-Español, A., & Llorente-Portillo, C. (2022). Forecasting Biocapacity and Ecological Footprint at a Worldwide Level to 2030 Using Neural Networks. Sustainability, 14(17), 10691. https://doi.org/10.3390/su141710691

Boletín de Malariología y Salud Ambiental. Volumen LXII. Septiembre-Octubre, 2022. ISSN:1690-4648

1076

Moustairas, I., Vardopoulos, I., Kavouras, S., Zorpas, A. A., & Salvati, L. (2022). Exploring factors that affect public acceptance of establishing an urban environmental education and recycling center. Sustainable Chemistry and Pharmacy, 25, 100605. https://doi.org/10.1016/j.scp.2022.100605

Nada, H. N., Fajarningsih, R. U., & Astirin, O. P. (2021). Environmental education to build school members' character. Jurnal Pendidikan Biologi Indonesia, 7(1), 43-52. https://doi.org/10.22219/jpbi.v7i1.14283

Navas, G., D'Alisa, G., & Martínez-Alier, J. (2022). The role of working-class communities and the slow violence of toxic pollution in environmental health conflicts: A global perspective. Global Environmental Change.73, 102474. https://doi.org/10.1016/j.gloenvcha.2022.102474

Perovic, D. J., Gámez-Virués, S., Landis, D. A., Tscharntke, T., Zalucki, M. P., Saura, P., Furlong, M. J., Desneux, N., Sciarretta, A., Balkenhol, N., Schmidt, J. M., Trematerra, P., & Westphal, C. (2021). Chapter Three - Broadening the scope of empirical studies to answer persistent questions in landscape-moderated effects on biodiversity and ecosystem functioning. Advances in Ecological Research, 65, 109-131. https://doi.org/10.1016/bs.aecr.2021.10.003

Przewozniak, K., Cedzynska, M., Przepiórka, I., & Koczkodaj, P. (2022). Tobacco, war and politics: A look at historical facts, political science and public health. Tobacco Prevention & Cessation, 8(Supplement), A60. https://doi.org/10.18332/tpc/151009

Pulido, V., & Olivera, E. (2018). Aportes pedagógicos a la educación ambiental: una perspectiva teórica. Revista de Investigaciones Altoandinas, 20(3), 333-346. https://dx.doi.org/10.18271/ria.2018.397

Rosenfield, M. F., Miedema, L., & Anand, B. M. (2022). Increasing cover of natural areas at smaller scales can improve the provision of biodiversity and ecosystem services in agroecological mosaic landscapes. Journal of EnvironmentalManagemen. 303, 114248. https://doi.org/10.1016/j.jenvman.2021.114248

Sauvé, L. (2010). Educación científica y educación ambiental: un cruce fecundo. Enseñanza de las ciencias: revista de investigación y experiencias didácticas, 28(1), 5-18. Available in: https://raco.cat/index.php/Ensenanza/article/view/189092 (Access february 2022).

Scherer-Lorenzen, M., Gessner, M. O., Beisner, B. E., Messier, C., Paquette, A., Petermann, J. S., Soininen, J., & Nock, C. A. (2022). Pathways for cross-boundary effects of biodiversity on ecosystem functioning. Trends in Ecology & Evolution. 37 (5), 454-467. https://doi.org/10.1016/j.tree.2021.12.009

Shi, X. (2022). Environmental health perspectives for low- and middle-income countries. Global Health Journal, 6(1), 35-37. https://doi.org/10.1016/j.glohj.2022.01.003

Si, H., Shi, J-g., Tang, D., Wen, S., Miao, W., & Duan, K. (2019). Application of the Theory of Planned Behavior in Environmental Science: A Comprehensive Bibliometric Analysis. International Journal of Environmental Research and Public Health. 16(15),2788. https://doi.org/10.3390/ijerph16152788

Sprague, N. L., Sachs, A. L., & Ekenga, C. C. (2022) Green vs. Screen: Exploring the Outcomes of an In-Person and Virtual Nature-Based Environmental Education Intervention for Low-Income Children. Sustainability. 14(19),12600. https://doi.org/10.3390/su141912600

Stergiou, E., & Armakolas, S. (2022). Ecological Footprint and Sustainable Behavior: The Role of Education, Information, and Lifestyle. International Journal of Smart Education and Urban Society (IJSEUS), 13(1), 1-15. http://doi.org/10.4018/IJSEUS.29706

Subires-Mancera, M. P., & Delgado-Peña, J. J. (2022) The Role of Environmental Journalism and Documentaries as a Means of Informal Education for Environmental Citizenship. Environmental Sciences Proceedings, 14(1), 12. https://doi.org/10.3390/environsciproc2022014012

Tilbury, D. (2006). Environmental Education for Sustainability: defining the new focus of environmental education in the 1990s. Environmental Education Research, 1(2), 195-212. https://doi.org/10.1080/1350462950010206

van de Wetering, J., Leijten, P., Spitzer, J., & Thomae, S. (2022) Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. Journal of Environmental Psychology, 81, 101782. https://doi.org/10.1016/j.jenvp.2022.101782

Vieira, E., & Gomes, J. (2009). A comparison of Scopus and Web of Science for a typical university. Scientometrics, 81, 587–600. https://doi.org/10.1007/s11192-009-2178-0

Villanueva, H., Medina, O., & Sánchez, A. (2020). Estudio documental: importancia de la educación ambiental en la educación básica. Revista Iberoamericana Ambiente & Sustentabilidad, 3(1), 6-14. https://doi.org/10.46380/rias.v3i1.4

Wakhidah, N., & Erman, E. (2022). Examining environmental education content on Indonesian Islamic religious curriculum and its implementation in life, Cogent Education, 9, 1. https://doi.org/10.1080/2331186X.2022.2034244

Ward, D., Melbourne-Thomas, J., Pecl, G. T., Evans, K., Green, M., McCormack, P. C., Novaglio, C., Trebilco, R., Bax, N., Brasier, M. J., Cavan, E. L., Edgar, G., Hunt, H. L., Jansen, J., Jones, R., Lea, M. A., Makomere, R., Mull, C., Semmens,

Boletín de Malariología y Salud Ambiental. Volumen LXII. Septiembre-Octubre, 2022. ISSN:1690-4648

1077

J. M., Shaw, J., & Layton, C. (2022). Safeguarding marine life: conservation of biodiversity and ecosystems. Reviews in fish biology and fisheries, 32(1), 65–100. https://doi.org/10.1007/s11160-022-09700-3

Whaley, P., Piggott, T., Morgan, R. L., Hoffmann, S. K., Schwingshackl, L., Ansari, M. T., Thayer, K. A., & Schünemann, H. J. (2022). Biological plausibility in environmental health systematic reviews: a GRADE concept paper. Environment International, 162, 107109. https://doi.org/10.1016/j.envint.2022.107109

Williamson, K., Satre-Meloy, A., Velasco, K., & Green, K. (2018). Climate Change Needs Behavior Change: Making the Case for Behavioral Solutions to Reduce Global Warming, Rare, Arlington, VA. Available in: https://rare.org/wp-content/uploads/2019/02/2018-CCNBC-Report.pdf (Access february 2022).

World Economic Forum. (2019). World Economic Forum Annual Meeting 2019, Davos: World Economic Forum. Available in: https://nationalfund.org/overheard-in-davos-the-right-message-but-now-lets-see-some-action/?gclid=Cj0KCQjwhY-aBhCUARIsALNIC04QX8XmxQCwuijiDrqCwl5HrtLBlfec61iEaWYPgmVpSJuIaYenPXsaAkvoEALw_wcB (Access february 2022).

Yadav, S. K., Banerjee, A., Jhariya, M. K., Meena, R. S., Abhishek Raj, A., Khan, N., Kumar, S., & Sheoran, S. (2022). Chapter 19 - Environmental education for sustainable development. Natural Resources Conservation and Advances for Sustainability, 415-431. https://doi.org/10.1016/B978-0-12-822976-7.00010-7

Yang, C., & Arhonditsis, G. B. (2022) What are the primary covariates of environmental attitudes and behaviours in Canada? A national-scale analysis of socioeconomic, political, and demographic factors. Ecological Informatics, 69, 101661. https://doi.org/10.1016/j.ecoinf.2022.101661