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Connections between Environmental Education, Health and the Environment in the Context of Sustainable Development in Portugal

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ABSTRACT
Sustainable development, as a political and pedagogical project, requires a critical articulation between environmental education, health, and public policies, understood as inseparable dimensions of social and environmental justice. In the Portuguese context, this articulation has been progressively incorporated into normative and strategic frameworks, in line with global sustainability agendas. This article presents a narrative literature review of a descriptive and interpretative nature, aiming to critically analyze the articulation between education, health, and the environment, as well as its limits and potential as a field of educational and political intervention. The results reveal a significant discursive convergence in the recognition of the interdependence among these domains, although largely confined to the normative level. A persistent dissociation between institutional discourse and the practical implementation of public policies is observed, marked by sectoral fragmentation, weak intersectoral coordination, and territorial inequalities. Environmental education emerges as a central axis in promoting critical literacies and active citizenship; however, its insufficient integration into curricula and educational policies limits its transformative potential. The study underscores the need for integrated and critical approaches oriented toward social and environmental justice.
Keywords: society; environmental education; environment and health; socio-environmental justice; public policies; sustainability.

RESUMO
O desenvolvimento sustentável, enquanto projeto político e pedagógico, exige uma articulação crítica entre educação ambiental, saúde e políticas públicas, entendidas como dimensões indissociáveis da justiça social e ambiental. No contexto português, esta articulação tem vindo a ser progressivamente incorporada nos enquadramentos normativos e estratégicos, em consonância com agendas globais de sustentabilidade. O presente artigo apresenta uma revisão narrativa da literatura, de natureza descritiva e interpretativa, com o objetivo de analisar criticamente a articulação entre educação, saúde e ambiente, bem como os seus limites e potencialidades enquanto campo de intervenção educativa e política. Os resultados evidenciam uma convergência discursiva significativa no reconhecimento da interdependência entre estes domínios, embora maioritariamente circunscrita ao plano normativo. Verifica-se uma dissociação persistente entre o discurso institucional e a implementação prática das políticas públicas, marcada por fragmentação sectorial, fraca coordenação intersectorial e desigualdades territoriais. A educação ambiental emerge como eixo central na promoção de literacias críticas e de cidadania ativa, ainda que a sua integração insuficiente nos currículos e nas políticas educativas limite o seu potencial transformador. O estudo sublinha a necessidade de abordagens integradas e críticas orientadas para a justiça social e ambiental.
Palavras-chave: sociedade; educação ambiental; ambiente e saúde; justiça socioambiental; políticas públicas; sustentabilidade.

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Introduction

The intensification of socio-environmental crises in recent decades has made increasingly visible the structural limitations of hegemonic development models historically grounded in the logics of unlimited economic growth, intensive exploitation of natural resources, and the reproduction and deepening of social inequalities (Acselrad et al. 2004; Leff 2012). Far from constituting isolated or merely cyclical disturbances, these crises express a broader civilizational tension that challenges the sustainability of current production and consumption patterns, as well as the political and ethical foundations that sustain them. In this context, environmental degradation, climate instability, biodiversity loss, and socio-spatial inequalities cannot be understood as separate phenomena; rather, they are interconnected expressions of a development paradigm whose contradictions have become progressively more evident in both scientific debate and public policy arenas (Acselrad et al. 2004; Leff 2012).

This diagnosis has been reinforced by recent evidence that questions the viability of "green growth" as a sufficient response to the climate and ecological emergency. In particular, studies have demonstrated the insufficiency of decoupling economic growth from carbon emissions in high-income countries, thereby challenging the assumption that ecological sustainability can be achieved without deeper structural transformations in economic organization and collective ways of life (Vogel & Hockel 2023). In parallel, the consolidation of the post-growth agenda as a scientific and political field has expanded the horizon of debate by proposing alternative frameworks oriented toward human well-being, democratic participation, and ecological viability within planetary boundaries (Kalllis et al. 2025). These perspectives contribute to shifting the discussion from a predominantly technocratic search for efficiency toward a broader reflection on the social purposes of development, the distribution of environmental burdens and benefits, and the conditions required for a just and sustainable future (Vogel & Hockel 2023; Kalllis et al. 2025).

Within this broader debate, the concept of sustainable development, widely disseminated since the Brundtland Report (WCED, 1987), acquires a political and pedagogical density that transcends merely conciliatory or managerial interpretations. Rather than operating only as a normative formula capable of reconciling economic growth, environmental protection, and social cohesion, sustainable development has increasingly become a contested field in which questions of environmental justice, social equity, democratic participation, and intergenerational responsibility are brought to the forefront (Bessant et al. 2025; Santos 2007). Sustainability must therefore be understood not as a neutral or consensual concept, but as a space of symbolic and material disputes in which different societal projects, rationalities, and conceptions of well-being are confronted. In this sense, socio-ecological transitions are traversed by conflicts, asymmetries of power, and multiple forms of injustice, which require critical analytical approaches capable of revealing the political nature of environmental issues and of questioning dominant narratives of modernization and progress (Avelino et al. 2024).

At the same time, recent literature at the intersection of climate, health, and inequalities has highlighted that the impacts of the ecological crisis are unevenly distributed, affecting populations differently according to class, territory, race, age, and other structural markers of vulnerability (Deivanayagam et al. 2023). The climate crisis, in this sense, cannot be reduced to a merely environmental or technical problem; it is also a profoundly social and health-related issue, shaped by historical injustices and by unequal capacities of protection, adaptation, and political participation (Deivanayagam et al. 2023). Equity therefore emerges as a central dimension of public responses, requiring integrated approaches capable of recognizing how environmental degradation, health risks, and social exclusion are mutually reinforcing processes. This perspective is particularly relevant in contexts where vulnerable communities are more exposed to pollution, unsafe living conditions, weak infrastructure, and limited access to health-promoting environments, thereby revealing the inseparability of environmental and social justice (Deivanayagam et al. 2023).

It is precisely within this critical horizon that the articulation between education, health, and the environment emerges as a structuring axis for the construction of emancipatory alternatives in the face of socio-environmental injustice. These three domains should not be treated as autonomous or merely adjacent sectors, but rather as deeply interdependent dimensions of a broader public and political field concerned with the conditions of life, collective well-being, and democratic sustainability. Health must be understood beyond the biomedical sphere, as inseparable from social and environmental determinants; the environment must be recognized not only as the biophysical support of life, but also as a territory of dispute, inequality, and collective rights; and education must be conceived as a privileged space for the critical formation of subjects capable of interpreting these interdependencies and acting upon them. The articulation among these fields is therefore

indispensable for rethinking public policies and social practices in ways that are both ecologically responsible and socially just (Deivanayagam et al. 2023).

In this framework, education - and particularly critical environmental education - assumes a central role. Rather than being limited to the transmission of ecological information or the promotion of individual behavioural change, critical environmental education is understood as a political and ethical process of subject formation through which individuals and communities become capable of critically reading reality, questioning dominant development models, and participating consciously in social transformation (Freire 1996; Guerreiro et al. 2024). Its relevance lies in its potential to foster reflexive, participatory, and justice-oriented forms of citizenship, able to connect environmental concerns with questions of power, inequality, and democracy. Such an approach reinforces the idea that educational processes are never neutral, but are always implicated in broader struggles over knowledge, values, and the meaning of collective futures (Freire 1996; Guerreiro et al. 2024).

Recent production in environmental education has deepened this perspective by advancing proposals explicitly guided by multiple dimensions of justice -environmental, social, and epistemic - thereby strengthening the pedagogical role of curricula and educational practices in the critical reading of inequalities and in collective action (Miles et al. 2025; Soysal et al. 2025). These contributions have been particularly important in resisting depoliticized or instrumental conceptions of sustainability education, which often privilege adaptation, skills, or behavioural management while neglecting the structural causes of socio-environmental crises. By contrast, justice-oriented environmental education emphasizes the need to confront inequalities, pluralize forms of knowledge, and create pedagogical conditions for democratic participation and transformative engagement (Miles et al. 2025; Soysal et al. 2025). In this sense, education is not simply one more sector within sustainable development agendas; it is a constitutive arena in which meanings, conflicts, and possibilities for socio-environmental transformation are actively produced.

In the Portuguese context, this debate acquires particular relevance given the progressive incorporation of sustainability, environmental education, and health-related concerns into strategic and normative frameworks, albeit with persistent challenges in implementation, coordination, and territorial equity. The relationship between education, health, and the environment therefore requires critical examination not only at the level of discourse, but also in terms of its effective translation into public policies and educational practices capable of addressing contemporary socio-environmental challenges in an integrated and equitable way. This work, therefore, proposes to critically analyze the interdependence between these three domains in the Portuguese context through a narrative literature review of a descriptive and interpretative nature, seeking to contribute to the deepening of the political-pedagogical debate on sustainability, critical environmental education, and social emancipation.

Education, Health and Environment: an integrated approach to social and environmental justice

In the Portuguese context, the relationship between education, health, and the environment must be understood within a broader framework of socio-environmental transformation, in which sustainability is not reduced to a technical or managerial imperative, but is approached as a political, ethical, and pedagogical challenge. This perspective requires moving beyond compartmentalized readings of public action and recognizing that the promotion of collective well-being depends on the articulation of multiple domains that have historically been treated in a fragmented manner. Within this debate, environmental education has progressively gained visibility as a field capable of mediating the relationships between ecological awareness, citizenship, and social responsibility. Schmidt and Guerra (2013), as well as Ramos Pinto (2004), show that environmental education in Portugal has evolved from predominantly conservationist and naturalist orientations toward more integrative, participatory, and citizenship-oriented perspectives, although not without contradictions. This evolution reflects broader changes in the understanding of environmental issues themselves, which are no longer viewed merely as matters of preservation, but as deeply intertwined with social justice, democratic participation, and the redefinition of development models (Schmidt & Guerra 2013; Ramos Pinto 2004).

However, this broadening of the conceptual horizon has not always been accompanied by equivalent transformations in institutional practices. Recent evidence in higher education suggests that, although there is widespread concern among faculty regarding the climate and environmental crisis, the integration of sustainable development into curricular and pedagogical practices remains uneven, often fragmented, and insufficiently holistic (Leal et al. 2024). This indicates that the recognition of sustainability as a relevant educational principle does not automatically lead to its effective curricular mainstreaming. Rather, the incorporation of these themes

continues to depend on the existence of structured training, institutional commitment, and pedagogical frameworks capable of linking environmental issues with wider social, political, and ethical concerns (Leal et al. 2024). In this sense, the Portuguese case reveals both progress and limitation: progress, because sustainability and environmental education have become more present in public discourse and in some educational settings; limitation, because their transformative potential remains conditioned by the absence of stable institutional anchoring and by the persistence of sectoral and disciplinary boundaries.

At the level of educational practices, recent studies with young people in Portugal reinforce the importance of pedagogical approaches that are contextualized, experiential, and inquiryled, particularly those that strengthen the relationship between learners and the natural world (Arroz et al. 2025; Rocha Silva et al. 2024). Place-based education, outdoor learning, and exploratory methodologies have been shown to promote curiosity, ecological sensitivity, and responsibility toward conservation, contributing to a more situated and meaningful understanding of environmental issues (Arroz et al. 2025; Rocha Silva et al. 2024). Such approaches are especially relevant insofar as they challenge abstract, decontextualized, or purely informational models of environmental education, allowing students to connect ecological concerns with lived experience, territory, and forms of collective belonging. Yet, while these practices demonstrate significant pedagogical value, they also tend to be localized and dependent on specific projects or actors, which limits their continuity and wider systemic impact (Arroz et al. 2025; Rocha Silva et al. 2024). This tension between innovation at the local level and fragility at the structural level is one of the central issues in the analysis of environmental education in Portugal.

This ambivalence is also evident in the normative and strategic frameworks that guide environmental education and sustainability policies. Documents such as the National Environmental Education Strategy 2020 (ENEA 2020) and the Environmental Education Framework for Sustainability represent important efforts to institutionalize environmental literacy, citizenship, and sustainability within Portuguese policy and educational discourse (DGE 2018; ENEA 2020). These instruments signal a relevant shift insofar as they recognize the educational dimension of sustainability and assign schools and other educational settings a role in the formation of environmentally responsible citizens (DGE 2018; ENEA 2020). Nevertheless, these advances coexist with important limitations. Sustainability is frequently operationalized in a predominantly normative and programmatic manner, often without a sufficiently explicit treatment of the power relations, structural asymmetries, and distributive conflicts that underlie socio-environmental crises. As a result, the educational discourse on sustainability may risk becoming depoliticized, emphasizing awareness and behavioural adaptation while underplaying the social conflicts and injustices embedded in ecological degradation (DGE 2018; ENEA 2020).

For this reason, recent literature in environmental education has increasingly insisted on the need for justice-oriented pedagogical frameworks capable of reconnecting sustainability with democratic critique and emancipatory practice (Miles et al. 2025; Soyal et al. 2025). These contributions argue that environmental education should not only foster ecological knowledge or pro-environmental behaviour but also equip learners to interpret the unequal distribution of environmental harms and benefits, to question dominant forms of knowledge and governance, and to participate critically in collective processes of transformation (Miles et al. 2025; Soyal et al. 2025). In this perspective, environmental education becomes a privileged space for linking environmental, social, and epistemic justice, thereby challenging narrow understandings of citizenship and opening room for more plural and reflexive educational practices. Such an approach is particularly relevant in the Portuguese context, where the institutionalization of sustainability discourse has advanced considerably, but where the critical and political depth of its pedagogical translation remains uneven.

Health, in turn, must be approached not merely as an individual or biomedical condition, but as a collective right deeply shaped by the social, economic, and environmental contexts in which people live. The framework of the social and environmental determinants of health has long demonstrated that living conditions, housing, work, territory, environmental quality, and access to resources play a decisive role in shaping health outcomes and well-being (Lalonde 1974; Wilkinson & Marmot 2003). In this sense, health cannot be dissociated from the environments in which life unfolds, nor from the inequalities that structure differential exposure to risk and differential access to protection. Environmental degradation, pollution, climate-related events, and territorial vulnerability are therefore not peripheral concerns, but central dimensions of public health. This perspective gains particular significance at a time when ecological crises increasingly affect daily life, social infrastructures, and the long-term conditions of habitability (Lalonde 1974; Wilkinson & Marmot 2003).

In Portugal, recent studies have reinforced this interdependence by characterizing environmental health as a multidisciplinary domain that necessarily involves the articulation of science, policy, and citizenship (Martins et al. 2024). This characterization is especially important because it challenges sectoral approaches that isolate

environmental management from health governance or reduce public health interventions to reactive and technical responses. Instead, it points toward the need for integrated and preventive frameworks capable of recognizing the environmental roots of many contemporary health challenges (Martins et al. 2024). Along similar lines, research on training related to climate change and public health highlights the relevance of equipping professionals with the conceptual and practical tools needed to address the health consequences of climate instability and ecological degradation (Viegas et al. 2023). This emphasis on training suggests that intersectoral integration is not only a matter of policy design, but also of epistemic and professional capacity-building, without which the complexity of current socio-environmental risks cannot be adequately addressed (Viegas et al. 2023).

The health impacts of the ecological crisis are also expressed in psychosocial dimensions that are increasingly relevant, especially among younger populations. Research conducted with Portuguese young adults has shown that eco-anxiety constitutes a meaningful expression of the emotional and psychological burden associated with environmental crisis, revealing how climate-related concerns extend beyond physical exposure and enter the realm of subjectivity, affect, and mental health (Sampaio et al. 2023). This finding broadens the scope of the debate by demonstrating that the articulation between health and environment cannot be restricted to epidemiological indicators or material risks alone. It must also account for the emotional, cultural, and existential dimensions through which socio-environmental instability is experienced (Sampaio et al. 2023). Such evidence reinforces the need for integrated educational, health, and environmental policies that are capable of addressing the full spectrum of effects produced by ecological disruption, including those that affect identity, hope, and perceptions of the future.

Within the educational field, this interrelationship is further strengthened by recent national findings showing that environmental health literacy can play an important role in promoting both adolescent well-being and sustainable behaviours (Matos et al. 2025). This suggests that the educational domain may contribute not only to ecological awareness, but also to health promotion, especially when environmental knowledge is linked to critical participation, social responsibility, and the recognition of inequalities in exposure and opportunity (Matos et al. 2025). The notion of literacy, in this context, must be understood expansively: not as the mere acquisition of information, but as the development of the capacity to interpret, evaluate, and act upon complex socio-environmental realities. From this perspective, schools and educational institutions can become important sites for fostering integrated competencies that connect environmental responsibility with health-conscious and socially engaged citizenship (Matos et al. 2025). Complementarily, the planetary health agenda has advanced curricular proposals designed to prepare future health professionals to recognize the environment as a determinant of health and to integrate sustainability and justice into their professional competencies (Pais Rodrigues et al. 2024). This contribution is particularly relevant because it extends the educational challenge beyond compulsory schooling and into professional formation, thereby reinforcing the systemic character of the changes required (Pais Rodrigues et al. 2024).

The environment, as the biophysical support of life, occupies a central place within these discussions, but it cannot be understood in purely naturalistic or neutral terms. It is simultaneously a material condition of existence, a space of political conflict, and a terrain in which socio-environmental inequalities are produced and reproduced (Acselrad 2010). The degradation of ecosystems, the loss of biodiversity, the intensification of climate change, and the growing pressure on natural resources do not affect all territories and populations equally; rather, they interact with historical, social, and economic asymmetries, producing differentiated vulnerabilities and unequal capacities for response (Acselrad 2010; Leff 2010). For this reason, environmental questions must be approached not only as matters of management or conservation, but as issues of justice, rights, and democratic governance. The reconfiguration of the relationships between society and nature therefore implies an ethical and political challenge that requires rethinking institutions, development priorities, and forms of collective participation (Leff 2010).

In Portugal, initiatives such as the Eco-Schools programme and the broader framework of the Sustainable Development Goals (SDGs) have contributed to increasing the visibility of sustainability-related concerns and to fostering a culture of environmental awareness in educational and public settings (Loureiro 2012; ONU 2015; Schmidt & Guerra 2013). These initiatives have played an important role in disseminating sustainability language and in creating institutional opportunities for environmental engagement. However, several authors warn that such frameworks may also favour standardized, managerial, or insufficiently transformative interpretations of sustainability, especially when implementation privileges indicators, certification logics, or symbolic adherence over critical reflection and structural change (Loureiro 2012; ONU 2015; Schmidt & Guerra 2013). This warning is crucial because it points to the risk of reducing sustainability to an administrative or pedagogical consensus, thereby obscuring the conflicts, inequalities, and power relations that constitute

socio-environmental reality. As such, the challenge is not simply to multiply sustainability initiatives, but to ensure that they are grounded in critical, participatory, and justice-oriented approaches.

From this perspective, sustainable development cannot be conceived as a mere exercise in technical conciliation between sectors. On the contrary, it must be understood as a critical and contested process that requires the integrated articulation of education, health, and the environment within a framework explicitly oriented toward social and environmental justice (Miles et al. 2025; Soysal et al. 2025). Such articulation implies recognizing that ecological crises are simultaneously educational, political, and health-related crises; that public policies must move beyond institutional fragmentation; and that democratic participation is indispensable for building responses that are both effective and equitable. In this sense, education is not simply a support mechanism for environmental or health policies, but a constitutive dimension of the broader social capacity to understand crises, deliberate collectively, and transform conditions of injustice. Health, likewise, cannot be protected without attention to environmental quality, territorial equity, and social determinants. The environment, finally, cannot be governed adequately without confronting the inequalities and exclusions that shape access to resources, exposure to risk, and the capacity to influence decision-making. The integrated reading of these three domains therefore constitutes a necessary pathway for advancing more coherent, democratic, and sustainable forms of public action in the Portuguese context (Miles et al. 2025; Soysal et al. 2025).

In order to make this articulation less abstract, the Portuguese context may be read through concrete examples that connect environmental exposure, health outcomes, and educational intervention. Studies on air pollution in Lisbon, wildfire-related PM2.5 exposure, heat-related mortality in Alentejo, and health risks in buildings during extreme weather events show that environmental risks have measurable public-health implications and are not distributed evenly across territories or social groups (Abe et al. 2022; Barbosa et al. 2024; Silva et al. 2024). At the same time, research on eco-anxiety among Portuguese young adults and on environmental health literacy among adolescents demonstrates that environmental crises also affect emotional well-being, perceptions of the future, and capacities for informed action (Matos et al. 2025; Sampaio et al. 2023). These examples reinforce the need to treat environmental education not only as awarenessraising, but also as a field for critical interpretation of risk, prevention, participation, and health promotion.

Materials and Methods

This study adopts a qualitative, theoretical-interpretative approach, operationalized through a narrative literature review supported by a structured and transparent search protocol. Although it does not constitute a systematic review or meta-analysis, the methodological design sought to ensure rigor in the definition of the documentary corpus, the selection criteria, the analytical procedure, and the explicit acknowledgment of the review's limitations.

The review includes scientific literature, public policy documents, legislation, national strategies, and institutional reports concerning the articulation between environmental education, health, and the environment in Portugal. The search was conducted in Portuguese and English in Scopus, Web of Science, PubMed, ERIC, SciELO, RCAAP, institutional repositories, and Google Scholar, and was complemented by targeted searches on the official websites of national and international organizations.

Combinations of terms were used, including "environmental education", "education for sustainable development", "educação ambiental", "educação para o desenvolvimento sustentável", "health", "public health", "saúde", "saúde pública", "environmental determinants of health", "determinantes ambientais da saúde", "planetary health", "saúde planetária", "sustainability", "sustainable development", "sustentabilidade", "desenvolvimento sustentável", "environmental justice", "justiça ambiental", "public policies", "políticas públicas", "Portugal", and "Portuguese context".

Publications from 2010 to 2025 were prioritized, while earlier foundational works were retained when theoretically relevant. The inclusion criteria comprised: relevance to at least one of the three analytical axes - education, health, and environment; theoretical, empirical, institutional, or policy relevance to sustainable development and socio-environmental justice; full-text availability; and direct relevance to Portugal or transferability to the Portuguese context. Duplicate records, texts lacking substantive analytical content, exclusively technical documents with no educational, health-related, or social implications, and sources with unclear methodological or institutional foundations were excluded.

The screening process comprised four stages. First, 94 records and documents were identified. After duplicates and irrelevant items had been removed, 72 records were screened by title and abstract. Of these, 49 full texts were assessed for eligibility, resulting in the retention of 46 sources for the manuscript. From this

corpus, 12 documents were selected for the coding matrix because they enabled comparison across at least two of the three analytical axes and highlighted relationships between policy discourse, educational practice, environmental exposure, and health outcomes.

To strengthen analytical robustness, the corpus included three types of sources: normative and strategic public policy documents, peer-reviewed empirical studies, and conceptual or theoretical works. Source quality was appraised according to clarity of aims, relevance to the research question, methodological or institutional transparency, credibility of data, and contribution to the analytical axes. When applicable, empirical studies were classified according to methodological design, including qualitative, quantitative, longitudinal, modelling, and mixed-method approaches.

The analysis followed the principles of thematic content analysis. The documents were read in full, inductively coded, and organized into three analytical axes: political and strategic frameworks for sustainable development in Portugal; environmental education as a pedagogical practice and instrument of social emancipation; and relationships between environment, health, and socio-environmental inequalities. The coding matrix enabled the comparison of contributions, identification of gaps, clarification of levels of evidence, and avoidance of overgeneralization. Figure 1 summarizes the methodological flow adopted in the review.

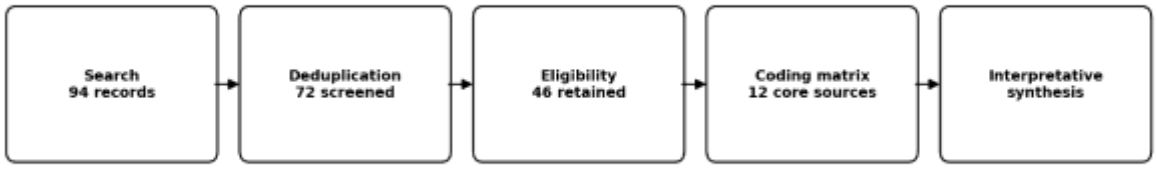


Figure 1. Methodological flow of the narrative literature review.

Results

The analysis of the documentary corpus identified four main findings: strong normative convergence around the interdependence between education, health, and the environment; limited translation of this convergence into operational mechanisms for governance, curriculum, and monitoring; growing empirical evidence on the health impacts of environmental factors in Portugal; and persistent gaps in the systematic integration of environmental health literacy and socio-environmental justice into educational practices. Table 1 summarizes the strategic documents, institutional reports, and scientific studies analyzed, highlighting the diversity of the corpus, their main contributions, and their articulation with the central analytical axes of the study.

Table 1. Studies and documents analyzed: Summary.

Analytical axis	***Document / Study***	***Source type***	***Main contributions***	***Associated SDGs*** [1]	***Reference***
Public policies and sustainability	National Environmental Education Strategy (ENEA 2020)	National strategic document	Structures priorities and lines of action for environmental literacy and citizenship, promoting links between education, sustainability and well-being.	Health, education, climate action, environmental sustainability	Agência Portuguesa do Ambiente, Direção-Geral da Educação. (2017). ENEA 2020.

[1] SDGs presented by thematic alignment

Public policies and health	National Health Plan 2030 (PNS 2030)	National strategic document	Defines health-policy guidelines until 2030, emphasizing determinants of health, including environmental factors, and intersectoral action.	Health, social equity, environmental action	Portugal. Presidência do Conselho de Ministros. (2023). Resolução do Conselho de Ministros n.º 93/2023.
Environmental education	Environmental Education Framework for Sustainability	Educational guidance document	Guides the integration of environmental education into educational contexts from preschool to secondary education, reinforcing literacy and citizenship.	Education, environmental sustainability	Direção-Geral da Educação. (2018). Referencial de Educação Ambiental para a Sustentabilidade.
Education and sustainability	Education for Sustainable Development Goals: Learning Objectives	International report	Defines transformative learning objectives for education for sustainable development and supports the alignment of curricula with SDGs.	Education crossing all other dimensions	UNESCO. (2017). Education for Sustainable Development Goals: Learning Objectives.
Climate risks and public policy	European Climate Risk Assessment	Institutional report	Identifies major climate risks for Europe, including threats to health, infrastructures, ecosystems and social well-being, supporting strategic policy responses.	Climate action, health, resilience, territorial equity	European Environment Agency. (2024). European Climate Risk Assessment.
Environment and health (Portugal)	National Action Plan for Environment and Health (PNAAS) 2008-2013	Public policy document	Frames the relationship between environment and health and proposes action guidelines for prevention of environmental risks.	Health, urban environment, environmental action	Portugal. Presidência do Conselho de Ministros. (2008). RCM n.º 91/2008.
Educational practices	Views of environmental education educators for sustainable development	Scientific article	Analyzes practices and perceptions of environmental educators, highlighting potential for	Education, environmental action, citizenship	Rios, Neilson & Menezes. (2023). Revista Portuguesa de Educação.

			empowerment and institutional constraints.		
Higher education and sustainability	Sustainable development in Portuguese higher education institutions from the faculty perspective	Scientific article	Shows that sustainability integration in higher education remains uneven and dependent on institutional commitment and pedagogical frameworks.	Higher education, sustainability, institutional change	Leal, Azeiteiro & Aleixo. (2024). Journal of Cleaner Production.
Environment and health	Health impact assessment of air pollution in Lisbon, Portugal	Scientific article	Quantitatively assesses the health impacts of air pollution and implications for public policy in an urban context.	Health, urban environment, environmental action	Abe, Rodrigues & Miraglia. (2022). Journal of the Air & Waste Management Association.
Wildfires, pollution and health	Health and economic burden of wildland fires PM2.5-related pollution in Portugal; A population under smoke	Scientific articles	Provide recent evidence on wildfire-related air pollution, health burden and the need for prevention and adaptation policies.	Health, climate action, risk prevention	Barbosa et al. (2024); Miraglia et al. (2025).
Heat, buildings and vulnerable territories	Historical and future heat-related mortality in Portugal's Alentejo region; CLIMAEXTREMO risk indicator	Scientific articles	Connect extreme heat and built-environment conditions with health risks, particularly in vulnerable regions and indoor environments.	Health, climate adaptation, territorial equity	Neto & Bastos Araújo (2024); Silva et al. (2024).
Environmental health literacy and mental health	Environmental health literacy among adolescents; Eco-anxiety in Portuguese young adults	Scientific articles	Show that environmental crises affect knowledge, behaviour, emotional well-being and perceptions of the future, reinforcing the educational-health link.	Education, health, sustainability, youth participation	Matos et al. (2025); Sampaio et al. (2023).

Source: own elaboration.

As shown in Table 1, normative and strategic documents, namely the National Environmental Education Strategy 2020, the National Health Plan 2030, the Framework for Environmental Education for Sustainability, and the National Environment and Health Action Plan, reveal a shared orientation toward the promotion of sustainability, environmental citizenship, health equity, and intersectoral action. These documents provide institutional legitimacy for the articulation between education, environmental, and health policies, aligning with

the Sustainable Development Goals, particularly in the areas of health, education, climate action, and territorial equity.

However, the comparative analysis shows that this convergence remains largely discursive and programmatic. Although strategic documents recognize the importance of integrating education, health, and the environment, their translation into operational mechanisms, monitoring indicators, institutional continuity, and systematic curricular integration remains limited.

The empirical studies included in Table 1 add a complementary analytical dimension by demonstrating the concrete effects of environmental factors on population health and well-being. Research on air pollution, exposure to fine particulate matter associated with wildfires, heat-related mortality, climate risks, and youth mental health reinforces the centrality of environmental determinants of health in the Portuguese context. These studies also show that environmental risks are not evenly distributed, disproportionately affecting specific territories, age groups, and populations facing greater social, climatic, or housing-related vulnerability. To further develop this analysis, Table 2 presents the coding matrix used in the review, specifying each source's contributions, identified gaps, synergies between education, health, and the environment, approaches to socio-environmental justice, and corresponding level of evidence.

Table 2. Coding matrix for the studies and documents analyzed.

Document / Study	***Main contributions***	***Identified gaps***	***Synergies between education, health and the environment***	***Social and/or environmental justice approach***	***Level of evidence***
ENEA 2020	Integrated vision of environmental education as a cornerstone of citizenship and sustainability.	Weak operationalization; limited systematic monitoring and evaluation indicators.	Environmental education mediates environmental policies, education and well-being.	Environmental justice addressed implicitly through intergenerational equity and citizenship.	Normative / strategic
PNS 2030	Recognizes social and environmental determinants of health.	Limited pedagogical translation and weak connection with school-based environmental education.	Potential integration between public health, environmental action and social policy.	Social justice explicit through equity in health.	Normative / strategic
Referencial DGE	Defines environmental education as a cross-cutting dimension and promoter of citizenship.	Guidance nature; weak curricular requirement and limited monitoring.	Education bridges environment, health and sustainable practices.	Environmental justice approached pedagogically but not always operationalized.	Normative / pedagogical
UNESCO (2017)	Provides transformative learning objectives for ESD.	Generic approach; requires contextualization to Portugal.	Education operates as integrating axis of social, environmental and health dimensions.	Social and environmental justice as structuring principles.	Normative / conceptual
EEA (2024)	Identifies climate risks for Europe, including health and infrastructure risks.	European scale requires local and national translation.	Supports alignment between climate adaptation, health protection and education for risk literacy.	Justice implicit through vulnerability and adaptation needs.	Institutional risk assessment
PNAAS	Establishes direct relationship between environment and health.	Outdated document and weak political continuity.	Potential link between environmental and health policies.	Indirect environmental justice through protection of vulnerable groups.	Normative / political
Rios et al. (2023)	Highlights critical and reflective environmental education practices.	Small-scale and context-dependent evidence.	Environmental education as a space for citizen engagement and empowerment.	Social justice explicit through critical emancipation.	Empirical qualitative
Leal et al. (2024)	Shows faculty concern with sustainability in	Integration remains uneven, fragmented and	Higher education may connect professional	Justice present indirectly through transformative education.	Empirical survey / quantitative

	Portuguese higher education.	insufficiently holistic.	training, sustainability and institutional change.		
Abe et al. (2022)	Provides robust quantitative evidence of air-pollution impacts on health in Lisbon.	Limited educational dimension and urban focus.	Demonstrates need for environmental policies with measurable health impact.	Environmental justice through unequal exposure to risk.	Empirical quantitative
Barbosa et al. (2024); Miraglia et al. (2025)	Demonstrate health and economic burden of wildfire-related PM2.5 and severe pollution episodes.	Need stronger connection with education, prevention and community preparedness.	Links climate adaptation, public health and risk communication.	Justice through territorial vulnerability and differential exposure.	Empirical longitudinal / environmental health
Neto & Bastos Araújo (2024); Silva et al. (2024)	Show relevance of heat-related mortality and extreme-weather risk indicators in Portugal.	Need further integration with educational and local policy responses.	Supports preventive education, building resilience and health protection.	Justice through vulnerability of regions, older populations and building occupants.	Empirical modelling / risk indicator
Matos et al. (2025); Sampaio et al. (2023)	Connect environmental-health literacy and eco-anxiety with youth well-being and environmental action.	Need longitudinal evidence and translation into school curricula and health promotion.	Integrates education, mental health, citizenship and sustainability behaviours.	Justice through attention to youth agency, emotional well-being and unequal opportunities.	Empirical quantitative

Source: own elaboration.

Table 2 shows that public policy documents are stronger in defining priorities, guiding principles, and normative frameworks, but weaker in terms of operationalization, assessment, and monitoring. In particular, limitations are observed in the definition of indicators, effective intersectoral coordination, and the translation of strategic orientations into sustained educational and community-based practices.

Quantitative, longitudinal, and modelling-based empirical studies provide relevant evidence on environmental exposure, disease burden, climate risk, and territorial vulnerability. However, they tend to establish only limited links with education, public literacy, and community preparedness. Conversely, studies focused on environmental education, sustainability in higher education, environmental health literacy, and eco-anxiety highlight the pedagogical potential of sustainability, while also revealing weaknesses related to institutional fragmentation, study scale, and the absence of systematic curricular integration.

The coding matrix therefore reveals an asymmetry across three levels: the normative level, where the integration of education, health, and the environment is widely acknowledged; the empirical level, where evidence on the health impacts of environmental factors is increasingly consolidated; and the pedagogical-operational level, where gaps persist in translating such evidence into continuous, place-based, and justice-oriented educational practices. This gap between political recognition, scientific evidence, and educational implementation constitutes one of the main findings of the review.

Another relevant finding concerns the treatment of socio-environmental justice. Although this dimension is present across several sources, it often appears implicitly or indirectly, associated with health equity, territorial vulnerability, the protection of exposed groups, and environmental citizenship. Only some studies and documents explicitly address justice as a critical dimension of environmental education and public health. This suggests that socio-environmental justice remains an emerging field in the Portuguese context, requiring stronger articulation between public policies, empirical research, and transformative pedagogical practices.

In summary, the results indicate that Portugal has a relevant political and scientific framework for integrating environmental education, health, and sustainability. Nevertheless, weaknesses persist in moving from strategic orientation to institutional, curricular, and community-based practice. Tables 1 and 2 show that consolidating this articulation depends on strengthening intersectoral governance, systematically integrating environmental health literacy into educational settings, and explicitly incorporating socio-environmental justice into public policy instruments and pedagogical practices.

Discussion

The systematization and critical analysis of documents and studies, through the coding matrix, enabled an in-depth reading of the dynamics of articulation between education, health, and the environment in the Portuguese context, revealing both conceptual advances and structural limitations that condition the realization of sustainable development as a political and pedagogical project (Abe et al., 2022; Costa et al. 2025; Lea et al. 2024). A more concrete reading of the Portuguese evidence helps to clarify the tensions identified in the results. Studies on air pollution in Lisbon, wildfire-related PM2.5 pollution, heat-related mortality in Alentejo, and risks associated with buildings during extreme weather events demonstrate that environmental degradation produces differentiated health impacts across urban, rural, and vulnerable territories (Abe et al. 2022; Barbosa et al. 2024; Silva et al. 2024). These findings are consistent with recent European and global assessments showing that climate-related risks increasingly threaten health, infrastructures, ecosystems, and social well-being, requiring urgent adaptation and mitigation strategies (EU 2024; Romanello et al. 2024). In this sense, the Portuguese case should not be read as an isolated national problem, but as part of a broader European and global challenge in which climate vulnerability, health inequalities, and public policy capacity are deeply interconnected.

The results reveal a significant convergence at the discursive and normative level, particularly in national and international strategic documents, which recognize the interdependence between environmental education, environmental determinants of health, and sustainability policies (DR 2023; UNESCO 2017). However, this convergence remains, to a large extent, circumscribed to the programmatic level. The analysis highlights weak intersectoral operationalization, marked by the coexistence of sectoral strategies with differentiated levels of implementation and monitoring, which translates into institutional fragmentation that limits the effective impact of public policies. This dissonance between strategic intention and concrete practice emerges as one of the main challenges identified in the analyzed literature (Costa et al. 2025).

In this context, environmental education assumes a central role as a mediator between the domains of health and the environment, being valued in normative and pedagogical documents as an instrument of literacy, awareness, and the formation of critical citizens (Leal et al. 2024; Rios et al. 2023; Rocha Silva et al. 2024). However, its centrality is often symbolic, given that the absence of structuring curricular integration and the dependence on local or individual initiatives weaken its transformative potential and its long-term sustainability (Leal et al. 2024; Rios et al. 2023).

The educational implications of these findings are significant. Environmental education can be operationalized through curriculum mapping across disciplines, project-based and place-based learning, outdoor and inquiry-led methodologies, school-health partnerships, and explicit links between environmental quality, risk prevention, and well-being. Recent evidence on environmental health literacy among Portuguese adolescents suggests that knowledge, social norms, and participation are associated with more sustainable behaviours, while planetary health education highlights the importance of preparing future professionals to integrate ecological determinants into health practice (Matos et al. 2025; Pais Rodrigues et al. 2024). International guidance on greening curricula further reinforces the need for climate and sustainability education to become comprehensive, justice-oriented, age-appropriate, and embedded across learning areas rather than confined to isolated initiatives (UNESCO 2024).

From a policy perspective, the review points to the need for a governance model capable of linking ministries, municipalities, schools, health services, environmental agencies, and civil society. The OECD analysis of policy coherence in Portugal emphasizes that SDG implementation depends not only on strategic alignment, but also on coordination mechanisms, monitoring, stakeholder engagement, and the translation of national priorities into operational instruments (OECD 2025). For this reason, future public action should include shared indicators for environmental-health literacy, systematic evaluation of environmental education programmes, territorial prioritization of vulnerable communities, and mechanisms that connect scientific evidence with local decision-making.

The analysis also highlights the robustness of empirical evidence regarding the relationships between environment and health, particularly in studies that demonstrate direct impacts of environmental degradation on public health, especially in socially vulnerable populations (Barbosa et al. 2024; Silva et al. 2024). Despite this, an asymmetry persists between the production of scientific knowledge and its translation into structural policies aimed at equity, with predominantly technical approaches prevailing that do not always explicitly incorporate the social and territorial dimensions of socio-environmental inequalities (Costa et al. 2025). Finally, we found that social and environmental justice, although present in the analyzed documents, appears mostly implicitly in the normative frameworks, lacking a more consistent problematization of power relations and structural inequalities. In contrast, qualitative empirical studies attribute greater centrality to this dimension,

mainly through the valorization of education as an emancipatory practice (Rios et al. 2023). In short, the results point to the need to reinforce truly intersectoral approaches, capable of integrating education, health, and the environment in a coherent and sustainable way, recognizing environmental education not only as a pedagogical tool, but as a fundamental political device for the promotion of equity and social justice (Costa et al. 2025; DR 2008, 2023; Leal et al. 2024; Rios et al. 2023).

Conclusion

This study critically examined the articulation between education, health, and the environment in the Portuguese context, showing that a significant discursive and normative convergence has emerged around sustainable development and the Sustainable Development Goals. Nevertheless, this convergence has not yet been fully translated into consistent, coordinated, monitored, and territorially equitable public action. The analysis indicates that the interdependence between these domains is now relatively well established at the strategic level, but its operationalization remains constrained by institutional fragmentation, weak intersectoral coordination, discontinuities in implementation, and insufficient monitoring indicators.

Environmental education emerges as a structuring axis of this transformation. Its relevance lies not only in raising awareness, but also in promoting environmental-health literacy, critical thinking, democratic participation, and the capacity to interpret how environmental risks are connected with social inequalities and public health. For educators, this implies the need to integrate environmental education across curricula, link classroom learning with local territories, develop project-based and place-based methodologies, strengthen school-community partnerships, and connect sustainability topics with health promotion, citizenship, and justice.

For policymakers, the findings point to four practical recommendations: (i) create intersectoral governance mechanisms that connect education, health, environment, municipalities, and civil society; (ii) establish shared monitoring indicators for environmental education, environmental-health literacy, and territorial equity; (iii) prioritize vulnerable territories and populations in environmental-health prevention and climate adaptation strategies; and (iv) translate scientific evidence on pollution, heat, wildfires, eco-anxiety, and environmental literacy into educational resources, public-health planning, and local policy instruments.

The review also suggests directions for future research. Further empirical studies should examine how schools and health services operationalize environmental-health literacy, how curricular integration varies across regions and educational levels, and how young people participate in local sustainability and health-promotion initiatives. Mixed-method and longitudinal research would be particularly useful to evaluate whether environmental education programmes produce durable changes in knowledge, behaviours, civic participation, and perceptions of environmental justice.

These conclusions should be interpreted in light of the methodological nature of the study. As a narrative literature review focused on published sources and on the Portuguese context, this work does not aim at statistical representativeness or broad generalizability. Its contribution lies in offering a transparent, theoretically grounded, and critically oriented synthesis that can support future research, inform public policies, and guide educational strategies capable of responding to contemporary socio-environmental challenges in a more integrated, democratic, and just way.

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