

Environmental management and ecocentric governance in the context of sustainable development and environmental security

Viktor Zinchenko^{1,}, Oleksandr Polishchuk², Viktoriya Grygoryeva³, Mykola V. Iehupov⁴, Olga Gomilko⁵, Uliana Tokarieva⁶, and Oleksandr Galushko⁷*

¹Institute of Higher Education, National Academy of Educational Sciences of Ukraine, Kyiv, Ukraine

²Khmelnitsky Humanitarian and Pedagogical Academy, Khmelnytsky, Ukraine

³Mariupol State University, Kyiv, Ukraine

⁴National University of Ukraine on Physical Education and Sport, Kyiv, Ukraine

⁵H.Skovoroda Institute of Philosophy of the National Academy of Sciences of Ukraine, Kyiv, Ukraine

⁶Ternopil Volodymyr Hnatiuk National Pedagogical University, Ternopil, Ukraine

⁷Kyiv National University of Construction and Architecture, Kyiv, Ukraine

Abstract. This study provides a comprehensive philosophical and theoretical analysis of the role of environmental education and management in addressing the global environmental crisis. The relevance of this study stems from the need for mankind to transition from an anthropocentric model of domination over nature to a strategy of sustainable development. It has been proven that traditional economic and technological mechanisms are insufficient to resolve biospheric contradictions without a fundamental change in the worldview paradigm and the development of a new management culture. The purpose of this study is to justify the concept of environmental management as an integral component of the modern educational system. The methodological basis of the study is the dialectical method (analysis of contradictions within the “human–nature” system), the axiological approach (the study of the transformation of value orientations) and the systemic approach, which allows us to view the greening of education as a tool for national security. This paper explores the content of the environmental management as a philosophy of the responsible stewardship of the environment. This study analyzes the genesis of ecological ideas in Ukrainian and world pedagogical theory (from V. Monomakh to V. Sukhomlynskyi), confirming the continuity of the principles of harmony with nature. It has been determined that environmental education has two fundamental functions: the transmission of the “social gene pool” (preservation of culture) and the adaptation of the individual to new civilizational conditions. It has been proven that education-rather than coercive or purely technical methods - is the only evolutionary mechanism for the crisis-free transformation of the social system. The scientific novelty lies in defining environmental management as a strategic tool for making higher education more environmentally friendly, which allows to train a new type of a specialist – “eco-manager.” It has been concluded that the development of an environmental culture

* Corresponding author: vvzinchenko@ukr.net

through education is a key factor in ensuring national security and implementing a sustainable development strategy. The article offers practical recommendations on the content of environmental studies in higher education institutions.

1 Introduction

The dynamics of the 21st century are highlighting a fundamental transformation of the world order, in which globalization is firmly cementing the planet's status as a “global village.” In this new ontological reality, the interdependence of the subjects of international law and ethnic groups becomes not just a fact but an existential challenge. The integration of humanity into a single information and economic space inevitably leads to a collective responsibility for preserving the balance of the biosphere. Against the backdrop of these transformations, education becomes not only as an institution for the transmission of knowledge, but as a mechanism for adapting anthropological potential to the demands of the ecological imperative, which calls for a fundamental rethinking of the educational paradigm in the context of sustainable development.

The modern economy-centered model of the world, based on high-tech processes, demonstrates a direct correlation between the stability of nations and the intellectual capital of their citizens. In the post-industrial era, knowledge is becoming the central productive force. However, in the context of philosophical discourse, it is important to recognize that economic growth can no longer be an objective in itself. There is a need for environmental management as a specific form of ideological and administrative activity to harmonize technogenic development with environmental limits. Environmental management is viewed not merely as a set of administrative tools, but as a philosophy of responsible stewardship of the environment, in which education plays a key role in fostering an eco-centric mindset.

Ecologically oriented and directed education should provide real opportunities to be guided in one's own environmental activities by the analysis of examples of world practice with the aim of using them for a positive solution of environmental problems. All this convincingly indicates the need to substantiate the regularities and specifics of the implementation of environmental education by pedagogical science and practice not only at the informative level, but also at the creative and search level, which is based on the awareness of cause-and-effect relationships in the process of environmental education, which students acquire at the stage of studying natural science disciplines.

Environmental education, as a holistic phenomenon that includes the processes of learning, upbringing, and personal development, should be aimed at the formation of an ecological culture as a component of the system of national and public education of all segments of the population (including through environmental education with the help of public environmental organizations), the greening of academic disciplines and training programs, as well as professional environmental training through basic environmental education. The subject of environmental pedagogy is the problem of environmental education and education, and the subject of cultural ecology is the problem of the influence of nature on culture, in a narrow sense – the issue of preserving the cultural environment. Environmental pedagogy and cultural ecology are an important link in the education of professional personnel, because they help to form the continuity and reproducibility of environmental knowledge.

At the same time, most of them in their future professional activities will directly or indirectly deal with natural resources, their use, processing, which affects the environment through production processes. Therefore, each graduate must clearly imagine the local,

national and planetary significance of environmental problems and consciously and competently approach their solution in the process of working in their specialty.

At the same time, an analysis of the state of environmental education in vocational and higher educational institutions shows that there are significant shortcomings in this area, in particular, in most of them the emphasis is on educational and informational aspects and due efforts are not made to transform knowledge into specific beliefs and actions; the possibilities of greening subjects of general education and vocational and technical cycles are not sufficiently used; students' environmental knowledge has insufficient professional orientation, which leads to a gap between the study of theoretical material and practice. Therefore, environmental education in vocational and technical educational institutions of all levels and profiles requires scientific justification and a set of educational and educational measures.

The moral and ethical dimension of the interaction between a man and the environment reveals the profound unity between natural wealth and the inner world of an individual. Nature is not only a resource, but the outer limit of human consciousness. Throughout history, the collective consciousness has always appealed to love and the preservation of life, contrasting them with an exploitative attitude. At the same time, current monitoring of ecosystems reveals a significant gap between institutional efforts and the actual state of the biosphere. Environmental deterioration continues even when production slows down, indicating a crisis not only in technology but also in the management system itself. This leads to a transition from the simple accumulation of knowledge to the development of a new way of life – a shift from a consumerist model to an ethic of moderation and rational self-control within the limits of the biosphere's capacity [3].

The purpose of the study is to provide a philosophical and theoretical justification for the role of environmental management in the modern education system as a strategic factor in ensuring the sustainable development of society and the formation of ethical principles of human interaction with the environment.

The research methodology is based on a comprehensive combination of several approaches: a systemic approach has made it possible to view environmental management and education as interrelated components of a unified framework for global development; a dialectical method was used to analyze the contradictions between mankind's growing needs and the limited capacity of natural resources; an axiological method served as the basis for studying the transformation of value orientations from anthropocentrism to ecocentrism; a comparative analysis was used to compare traditional educational models with the latest strategies aimed at implementing the concept of sustainable development.

2 Discussion

The crisis of modern civilization is not so much technological or economic as it is anthropological and ideological. Our conclusions correlate with the fundamental ideas of the Club of Rome's "Limits to Growth" concept [9], however, we are changing the emphasis from purely quantitative restrictions on consumption to a qualitative transformation of consciousness through the use of environmental management mechanisms.

It is worth noting that in Western academic discourse (particularly in the works of W. Steffen, Paul J. Crutzen, J. R. McNeill, K. Ridcharson, Timothy M. Lanton, and J. Rockström [8] the theory of "planetary boundaries" is currently the subject of active discussion. Our study adds a philosophical dimension to this approach: we claim that adherence to these boundaries is possible only if environmental management is implemented as a comprehensive educational strategy. This helps overcome the current dualism in higher education between liberal arts education and pragmatic professionalism.

The pace of making education more environmentally friendly remains a matter of debate. Unlike “radical ecologists”, who call for an immediate rejection of anthropocentrism, we justify the need for an evolutionary transition. Combining the experience of classical pedagogy (K. Ushynskiy, V. Sukhomlynskyi) with modern distance learning methods makes it possible to create a sustainable educational ecosystem that does not undermine traditional cultural codes but enriches them with eco-centric content.

In this discussion, special attention should be paid to the role of education as an alternative to social upheaval. In the context of contemporary theories of the “risk society” (U.Beck) [2], we suggest considering environmental education as a preventive mechanism of social management. This helps minimize the risk of revolutionary changes caused by environmental degradation by teaching future managers the skills of systems analysis and long-term planning.

Thus, the integration of environmental management into the educational process is not just an update to the curriculum, but the formation of a new social order. Our study reveals prospects for further research into the development of specific methods for measuring efficiency of the environmental culture of higher education graduates, which is relevant to the improvement of higher education standards in Ukraine and around the world.

3 Environmental management and the educational paradigm: from awareness to strategic management

On the threshold of the third millennium, environmental education has evolved from a supporting discipline into a fundamental foundation for the harmonious and safe existence of civilization. The guiding principles of the landmark forum in Rio de Janeiro (1992), actually laid the foundation for understanding that environmental education and professional training are not merely a humanitarian mission, but a core responsibility of environmental management at the global level. Today, this idea is reflected in strategic international reports, particularly in the context of implementing the “Agenda 21”, where environmental education is viewed as a key instrument of public administration and a cornerstone of national security.

In contemporary discourse, the concept of environmental education is gaining the status of a fundamental government document. The goal is to train a new generation of professionals whose work is based on the principles of ecosophy: not domination over nature, but co-evolutionary coexistence with it [10]. A high level of environmental awareness catalyzes the integration of ethical standards into practical models of environmental management, simultaneously resolving urgent socio-economic and biospheric conflicts.

However, the current state of higher education reveals an ontological difference: on the one hand, we advocate a holistic, humanistic educational paradigm, while on the other hand, we confront the inertia of traditional subject-based systems. The fragmented nature of knowledge, which stems from outdated approaches, hinders the development of a new type of specialist – eco-manager – who is capable of systemic analysis and takes a values-based approach to their professional activities. Bridging this gap requires a shift from a simple accumulation of facts to fostering a professional culture in which environmental responsibility is an intrinsic personal value.

The priority objectives of environmental education in the context of sustainable natural resource management in Ukraine are to develop cognitive and emotional models of interaction with the environment. This requires every citizen to have a deep understanding of the connection between quality of life and the effective implementation of resource-saving technologies. Thus, education serves as the intellectual foundation of environmental management, where practical activities of young people reflect the new national strategy – the creation of a society that operates within the framework of an environmental imperative. Current socio-political transformations only reinforce the need to develop new theoretical

and methodological foundations for such training, making it an integral part of global sustainable development.

4 Systematic greening of education: from informative discourse to administrative actions

In today's world, environmentally-driven education must evolve into an effective mechanism that enables learners not only to acquire the best global practices but also to apply them in their own professional work to constructively address environmentally destructive problems. This highlights the need for a scientific justification of new patterns in the implementation of the educational process. We affirm that education must go beyond a purely descriptive (informative) level and advance into the realm of creative and research activity. This approach is based on a deep understanding of the cause-and-effect relationships within the "human–society–nature" system, which are taught as soon as students begin studying the natural sciences.

Considering environmental education as a holistic, liminal, and cultural phenomenon, it is important to emphasize its focus on fostering an environmental culture as an integral part of national education. In this context, environmental pedagogy and environmental culture emerge as interdependent vectors: while the former focuses on educational methodology, the latter focuses on the axiological impact of the natural environment on the development of human civilization and the preservation of cultural space. Their synthesis in professional training ensures the continuity of knowledge, transforming it into a foundation for future professional activity.

It is worth acknowledging that most graduates of higher education institutions will inevitably encounter the use or distribution of natural resources at some point in their professional careers. Therefore, every specialist must possess environmental management skills and recognize the global impact of local production decisions. However, an analysis of the current state of education reveals a significant contradiction: the dominance of the informational aspect over the praxeological one. Knowledge often remains abstract, failing to transform into sustainable environmental beliefs or specific management actions. Inadequate environmental education in general and specialized subjects creates a gap between theoretical training and the actual demands of a labor market oriented toward sustainable development.

Making education more ecological is not merely a matter of supplementing curricula, but rather the systematic integration of environmental knowledge into all levels of education [6]. Today, there are two main strategies: an extensive approach (introducing a separate course on "Ecology") and an intensive approach (integrating environmental issues throughout the entire curriculum). We believe that comprehensive environmental education is a key factor in the humanistic renewal of education, enabling young people's environmental activities to reach a qualitatively new, strategic level.

Active government policy, based on the following priorities is needed to overcome the inertia of this process: institutionalization (improving the legal basis and establishing standards for environmental education); innovation (widespread implementation of distance and interactive learning methods, and the creation of modern environmental laboratories); integration (promoting informal education by engaging the scientific and creative elite, as well as actively participating in international environmental projects); strategic management (the development of a scientifically grounded national program in which environmental management in education will serve as the foundation for fostering an eco-centric national consciousness).

Only through a combination of academic fundamentals and practical focus environmental education can fulfill its primary mission – to prepare people to live responsibly in the face of today’s global challenges.

5 A retrospective and strategic guidelines for environmental culture as part of the national security system

It would be a mistake to structure the framework of modern ecology exclusively based on anthropocentric interests. At the heart of ecological knowledge lies the fundamental principle of the interaction between all living things and their environment. Man is not an external observer, but an integral part of the biosphere, whose physical and mental health depends directly on the integrity of natural ecosystems [4].

Awareness of the illusion of human domination over nature is a key step in the development of an environmentally conscious individual. It is environmental education that makes it possible to change unplanned consumption into a conscious strategy of environmental management at both the personal and professional levels, transforming “technogenic civilization” into a harmonious society committed to sustainable development.

The genesis of the environmental component of education in Ukraine has deep historical roots. Even Volodymyr Monomakh’s “Instruction” (1117) can be interpreted as the first attempt to establish the principles of environmental culture and responsible use of natural resources. John Amos Comenius developed this idea in “The Great Didactic”, where he proclaimed the principle of conformity to nature, asserting the unity of the laws of nature and society. Ukrainian pedagogical tradition, represented by K. Ushynskyi and V. Sukhomlinskyi, continued this approach, insisting that the logic of nature is the highest school of thought, and that a caring attitude toward the environment is formed only through concrete practical activities – from creating “nature corners” to active participation in environmental projects.

Today, the primary objective of environmental education is to foster a comprehensive environmental culture that includes a system of knowledge, values, and practical skills. In the context of training professionals in higher education institutions, special attention should be paid to the introduction of courses that cover: landscape assessment and biodiversity conservation (Red Data Book); analysis of technogenic transformations and forecasting their environmental impacts; eco-management and alternative approaches to the natural resource use based on national traditions; the correlation between the state of the environment and public health, and the promotion of an environmentally friendly lifestyle [5].

The effectiveness of these measures is impossible without the creation of a comprehensive system of environmental information and the active involvement of media resources. Unfortunately, the lack of systematic environmental education in Ukraine remains a major barrier to overcoming the environmental crisis. The development of an individual – the primary participant in the social and historical process – demands that modern educators find a balance between socio-political realities and their ethical responsibility toward future generations.

The continuity of environmental education requires the constant access to relevant information, which contributes to the moral and physical well-being of the nation. Considering the systemic nature of environmental threats, we assert that Ukraine’s environmental security strategy is an integral part of the country’s national security. This policy is based on the fundamental human right to a safe environment, which is guaranteed by political, legal, and humanitarian mechanisms.

In conclusion, it should be noted that democratic reforms and the transition to a market economy have only highlighted the seriousness of environmental problems, without ensuring that they would be solved automatically. The core of the environmental crisis lies in a lack

of understanding of the essence of our interaction with nature. Therefore, environmental education is not merely an educational process, but a crucial factor in protecting the environment and a guarantee of the nation's survival in the face of global transformations [1].

6 Education as a fundamental resource for global security and sustainable development

In today's global context, environmental education is seen not only as a didactic element, but as a key factor in the protection of human civilization. The transformation of society requires a fundamentally new educational paradigm, in which an understanding of the cognitive links between human activities and biospheric processes becomes an intellectual core. A strategy for general education should be developed precisely on the basis of the ecological imperative, such education can raise citizens who have a renewed hierarchy of values [1].

This naturally raises the question: why does the international community view education and not technology or economic levers as the primary instrument of sustainable development? The answer lies on two different levels. First, only education can bring about a radical transformation of the worldview paradigm; without it, any technological innovation will remain trapped in a consumerist mindset. Second, there is a paradoxical yet indisputable truth: the path to sustainable development is fundamentally unreachable through purely technical or financial measures alone without a qualitative transformation of human capital.

In the post-industrial world, knowledge is becoming a key resource for production. Global challenges – from resource depletion to the threat of terrorism and environmental disasters – are the result of a mismatch between the power of human activity and the lack of rational, ethical management of that power. In this context, environmental management in education serves as a mechanism for the social system's optimal transition to new states. Historically, radical transformations have occurred through social revolutions – often as a consequence of a lack of knowledge about how to achieve development without crisis. Today, education should become a tool for evolutionary progress, since in the face of global threats, coercive methods are becoming self-destructive for humanity.

Modern environmental education faces strategic challenges: reviewing the world map (redefining man's place in the universe not as a master but as a responsible agent); ethical accentuation (an increased sense of moral responsibility for every managerial and everyday decision); preventive training (developing an individual's ability to adapt to an uncertain future) [9].

The main purpose of such activities is to foster a harmonious personality that combines high professional standards with environmental ethics. Education is becoming the cornerstone of a new social order that harmonizes economic interests with the needs of the biosphere. Globalization brings us to a major choice: either we develop a new paradigm by reforming our educational systems, or we experience a collapse of civilization.

The greening of education is generally understood as a system of measures aimed at ensuring in-depth environmental knowledge and its practical application in the educational process of all levels of education (primary, secondary, higher). Currently, in the field of education, during the implementation of the greening program, the question of the effectiveness of the relevant measures is acute. This is primarily related to the problem of methodological organization of environmental education. Two approaches are used: either introducing a separate subject "ecology" into the content of educational training at different educational levels (which is most often implemented), or greening all educational subjects. Therefore, comprehensive greening of education is a factor in increasing the effectiveness of teaching and humanitarian education of both pupils and students. After all, it is envisaged to expand and improve the system of environmental protection activities and training of youth,

transferring it to a qualitatively new level. It can be noted that the process of greening education at all levels is not very effective and accelerated.

Therefore, first of all, active state actions are necessary to provide environmental education with development priorities, the most important of which are: improving the legislative framework for environmental education of the population; developing a scientifically sound state strategy for the development of environmental education of the population and a program for its implementation; taking organizational measures aimed at creating an effective infrastructure for environmental education and upbringing; state and public support for environmental education and dissemination of environmental information; international cooperation in the field of environmental education. In addition, the following tasks should be put forward in the field of greening education: implementing the provisions of the Law on Environmental Education into practice; finalizing and approving standards in the field of environmental education; widespread implementation of new distance forms of environmental education (including through Internet services); active development of informal environmental education with the involvement of leading ecologists, artists, and writers; preparing and publishing standard programs on environmental disciplines, manuals and textbooks on ecology for schools and universities; creation of modern environmental laboratories at all levels of education; development of regional, state environmental programs with mandatory provision for issues of environmental education and upbringing.

The main goal of environmental education is the development *of the ecological culture* of the individual. In its structure, one can distinguish ecological knowledge, ecological value relations (worldview) and ecological activity. These are the main components of ecological culture. In specialized ecology courses for universities, in addition to general environmental issues that form the basis of ecological knowledge, the following should be considered:

- the state of ecological systems and landscapes, the presence and habitat of rare and endangered species, plants and animals listed in the Red Book;
- technogenic factors of influence and transformation of nature, their ecological consequences and trends of further development;
- environmental protection measures, their adequacy and possible alternative approaches based on national traditions of nature management;
- the presence, area and condition of protected natural territories and natural monuments, natural objects of special cultural, scientific, historical or recreational significance, their sufficiency for the implementation of the goals of protecting the gene pool of plant populations and animals;
- comprehensive environmental programs and territorial schemes for comprehensive nature protection and rational use of its resources;
- issues of public health in connection with specific environmental situations, forms and means of supporting and promoting a healthy lifestyle that is not harmful to either humans or nature;
- ways to stabilize and improve the current environmental situation, if it is unfavorable, and identifying opportunities for everyone to directly participate in this process.

It is possible to consolidate positive steps in the field of environmental education only if environmental information available to the population, and primarily to students, is widely used, which can be achieved by actively involving the media in environmental education and upbringing.

In addition to its innovative function, environmental education plays a crucial role in preserving the “social gene pool”. It preserves the most sustainable cultural traditions and experiences, ensuring continuity of generations. At the same time, its adaptive function allows individuals to respond creatively to changes, transforming accumulated experience into a foundation for innovations. Thus, environmental education provides new generations

with the resources they need to take action, which is the only guarantee of social progress and environmental sustainability in the 21st century.

7 Students' ecological culture in the system of spatial development and territorial management

The formation of higher education students' ecological culture cannot be confined solely to the theoretical acquisition of ecosophical knowledge; it possesses a distinct praxeological dimension that is directly extrapolated onto the tools of territorial management. Within a systems approach, any territorial unit (from a local community to a region) is viewed as a complex socio-ecological-economic system, where the anthropogenic landscape exists in a state of permanent interactive exchange with the natural environment. Students, as the most dynamic and intellectually capable segment of society, emerge as key actors in future spatial design. The level of their ecological culture determines their ability to transform traditional, often destructive territorial administration into a strategy of sustainable spatial development aimed at preserving landscape diversity and optimizing the ecological framework of urban and rural areas.

The axiological coordinate of future professionals' ecological culture directly shapes the methodology of managerial decision-making in land use, urban planning, and environmental management. The shift from anthropocentric exploitation to ecocentric partnership demands that every spatial project be evaluated through the prism of the ecological imperative and the concept of "planetary boundaries" at the local level, rather than short-term economic gain. Students possessing a highly developed ecological culture implement innovative eco-oriented models within their future professional trajectories. These include "Smart City" concepts with a minimized carbon footprint, innovative technologies for the revitalization of industrial brownfields, and strategies for preserving local ecosystems by expanding nature conservation areas within specific territorial communities.

The institutional vehicle for integrating ecological culture into the architecture of higher education is the modernization of educational and professional programs (EPPs) across all levels of study. Within the framework of quality assurance and institutional accreditation requirements, contemporary EPPs must transcend the formal inclusion of isolated environmental disciplines, focusing instead on developing cross-cutting ecological competencies. This entails incorporating integrated modules on spatial planning, territorial environmental auditing, and biosphere risk assessment into both mandatory and elective components of the curricula. Consequently, this aligns program learning outcomes with the practical demands of external stakeholders, such as local self-government bodies and eco-responsible businesses. Thus, EPPs transform from mere regulatory documents into strategic platforms for training "eco-managers," where every professional skill of a future specialist is aligned with the principles of the ecological imperative and rational territorial management.

In the face of contemporary socio-political and eco-destructive challenges in Ukraine, territorial management requires the forward-looking preparation of local government leaders capable of implementing environmental policy as an essential component of national security. The practical greening of the higher education environment enables students to engage directly in territorial management during their studies. This involvement takes place through designing spatial planning projects for communities, conducting environmental monitoring of landscapes, participating in strategic environmental assessments (SEA) of regional development programs, and implementing circular economy principles at the municipal level. Such a praxeological synthesis bridges the existing gap between abstract environmental awareness and the actual needs of decentralized communities, turning the student's ecological culture into an effective, strategic resource for the balanced spatial

development of the state. It is this aspect that highlights the necessity of a detailed analysis of the research results.

8 General conclusions of the study

The study substantiates that, in the context of the global transformations of the 21st century, environmental education is no longer a narrowly specialized field of knowledge but it is evolving into the foundation of a new civilizational paradigm. A philosophical rethinking of the interaction between man and the biosphere leads to the conclusion that overcoming the ecological crisis is possible only through a transition from anthropocentric domination to an ecocentric partnership, in which environmental management is seen not only as a management technology, but as a holistic worldview.

It has been proven that the systematic greening of higher education is a strategic tool for national security. It ensures the training of a new type of specialist – “eco-manager” – who is capable of integrating the principles of sustainable development into the professional activities. This involves overcoming the fragmentation of knowledge and moving from a purely informative model of learning to a praxeological one, based on a personal responsibility and ethical imperatives.

A retrospective analysis of domestic and global pedagogical thought shows that the ideas of living in harmony with nature and coexisting harmoniously with the environment have deep roots; however, it is exactly today that they have become an existential choice for humanity. Education is defined as the only non-crisis, evolutionary mechanism for the transformation of society, capable of ensuring the continuity of the “social gene pool” and man’s adaptation to the uncertainties of the future.

Thus, the development of an effective environmental management system in the educational sector is a cornerstone for the creation of a new social order. Only through the proactive training and formation of a strong environmental awareness, we can achieve the strategic goals of sustainable development, preserve our natural resources, and ensure a secure future for both the Ukrainian state and the global community as a whole.

References

1. S. Ankareddy, G. Dorfleitner, L. Zhang, Y. S. Ok, Environmental sustainability and education-related transformation, *Cleaner Environmental Systems* **17**, 100279 (2025). DOI: 10.1016/j.cesys.2025.100279.
2. U. Beck, *Risk Society: Towards a New Modernity* (SAGE Publications, 1992).
3. J. Hickel, *Less is more: How degrowth will save the world* (William Heinemann, 2020).
4. L. A. Holt, Environmental futures and transformation of human-nature relations, *Futures* **133**, 102821 (2021).
5. J. Garcia, I. I. Berchin, G. A. A. Zimmer, M. E. M. Silveira, W. S. Amorim, S. S. Neiva, J. B. S. O. A. Guerra, Environmental education in higher education institutions: an analysis of the strategies of the University of Southern Santa Catarina to promote environmental education, in: *Handbook of Theory and Practice of Sustainable Development in Higher Education* (2017). DOI: 10.1007/978-3-319-47868-5_22.
6. A. Gkargkavouzi, G. Halkos, Greening education for climate resilience: strategies, implementation, and curriculum integration, MPRA Paper No. 125668 (2025).
7. K. Higgs, A brief history of the limits to growth debate, in: *Sustainability and the New Economics*, pp. 123–136 (2022). DOI: 10.1007/978-3-030-78795-0_8.

8. W. Steffen, J. Rockström, K. Richardson, T. M. Lenton, Trajectories of the Earth System in the Anthropocene, *Proceedings of the National Academy of Sciences* **115(33)**, 8252–8259 (2018). DOI: 10.1073/pnas.1810141115.
9. Suárez-Perales, J. Valero-Gil, D. I. Leyva-de la Hiz, P. Rivera-Torres, C. Garcés-Ayerbe, Educating for sustainability and environmental responsibility, *Journal of Cleaner Production* **321**, 128972 (2021). DOI: 10.1016/j.jclepro.2021.128972.
10. C. Xiangzhan, Creating with nature: Ecosophy C as an ecological rationality for healing the Earth community, in: *Ecological Wisdom*, pp. 59–68 (2019). DOI: 10.1007/978-981-13-0571-9_4.