GREEN ECONOMICS
Vol.2, No.1, 2024, pp.102-111

EDUCATION FOR SUSTAINABLE DEVELOPMENT: A REVIEW

Gunay I. Hasanova[1*], Arzu J. Safarli[2]

[1]Department of Foreign Languages, University of Technology of Azerbaijan, Ganja, Azerbaijan
[2]Department of Research and Development, Azerbaijan Technical University, Baku, Azerbaijan

Abstract. Education stands as the paramount determinant shaping the trajectory of humanity's future, with its potential influence on both ecology and the economy serving as a pivotal criterion for ensuring a sustainable future. Within this context, Education for Sustainable Development (ESD) emerges as a crucial focal point for the unfolding era of scientific inquiry and research. The research undertook a comprehensive evaluation of Education for Sustainable Development (ESD) methods, primary objectives and their implications for global well-being within the broader context of education, providing a global perspective on these critical aspects. The indexes for educational and sustainable development goals (SDGs) were delineated with specialized criteria, emphasizing their unique roles in assessing and gauging progress within these crucial domains.

Keywords: *Sustainable development, education, ESD, SDGs, education management, green management.*

Corresponding Author: *Gunay Hasanova, University of Technology of Azerbaijan, Ganja, Azerbaijan, e-mail: g.hesenova@uteca.edu.az*

Received: *21 October 2023;* ***Accepted:*** *14 December 2023;* ***Published:*** *26 January 2024.*

1. Introduction

ESD constitutes a lifelong learning endeavor, providing individuals of all ages with the cognitive, socio-emotional, and behavioral dimensions essential for addressing interrelated global challenges like climate change, biodiversity loss, unsustainable resource utilization and societal inequality (UNESCO, 2023a). This educational framework, integral to quality education, empowers learners to make informed decisions and undertake collective action, emphasizing the integration of learning content, pedagogy and the learning environment to foster a holistic approach towards sustainable development. ESD is integral to the United Nations' Sustainable Development Goals (SDGs), representing a strategic approach that not only imparts knowledge but also cultivates a profound understanding of the interconnectedness between environmental, social and economic aspects. By deliberately incorporating ESD into the global development agenda, there is a recognition of its paramount importance in equipping individuals with the necessary skills and values to actively contribute to sustainable practices and societal progress. Addressing global warming to prevent catastrophic outcomes requires a holistic approach encompassing environmental, social and economic dimensions, a goal underscored by UNESCO's ESD for 2030 program, which seeks personal and societal transformations to redirect humanity towards sustainability. UNESCO's commitment to ESD is manifested through its targeted efforts across five pivotal domains, encompassing the advancement of policy, transformation of learning environments, capacity-building for educators, empowerment and mobilization of youth and the acceleration of sustainable actions at the local level (UNESCO, 2023b). As one

of the seventeen SDGs prioritized by the UN, particularly emphasizing quality education, this course gains heightened relevance at a pivotal juncture in human development. Factors such as the climate crisis and resource scarcity hindering progress, social inequalities causing societal strains and the challenges posed by a neoliberal economy worldwide and within nations underscore the pressing need for ESD.

The integration of sustainable development goes beyond current higher education frameworks, requiring a fundamental transformation of the entire educational system for comprehensive alignment with its principles and goals (Venkataraman, 2009). The concept of "transformative education" is gaining prominence in UNESCO's endeavors, particularly within the new framework of the SDGs, which officially replaced the Millennium Development Goals (MDGs) and Education for All (EFA) (Yoko, 2016). A fundamental transformation in the realm of global education is essential for the sustainable development of education across diverse societal spheres, enabling the adoption of green economic strategies and ensuring the attainment of universal well-being.

Various strategic domains play a pivotal role in scientific research on sustainable development, particularly in a world transitioning towards a new industrial revolution. Notably, fields such as artificial intelligence and robotics are significant and research within these domains holds special importance for ESD (Singh *et al*., 2023; Hassanien *et al*., 2020; Dias *et al*., 2005; Yatsun *et al*., 2004a; 2004b). Furthermore, the Green Tech Revolution is propelling innovation and sustainable solutions to counteract climate change, fostering the creation of a more environmentally aware world (Rustamov, 2023).

Generally, the review is intended to amalgamate existing research, identify essential aspects or perform a thorough analysis, contingent upon the particular objectives delineated for the review process.

2. Methodology

Rieckmann (2018) conducted an exploration into the principles and practices of transformative education and competence-based approaches within the context of sustainable development. Pandey & Vedak (2009) elucidated the significance of knowledge, education and educational institutions in the context of sustainable development, advocating for a 'mutual learning model' within their proposed framework. Zhang *et al*. (2020) introduced innovative hypotheses in the realm of sustainable development. These hypotheses encompass the pivotal role of the external environment in individual professional evolution, the necessity for systemic interaction in fostering professional knowledge and skills and the reciprocal relationship guiding the logic of professional evolution between the environment and individuals. Additionally, they underscored the interactive and mutually causal nature of professional evolution within the simulated educational ecosystem, emphasizing the simultaneous development of technological and behavioral competencies in the educational framework.

Incorporating the confluence of concepts related to social evolution and professional growth, the research methodology was enhanced through a comprehensive approach that underscores the vital importance of concurrently developing technical (hard) and behavioral (soft) competencies. Technical competencies encompass essential professional knowledge, skills and abilities necessary for proficient job performance, while behavioral competencies encompass cultural aspects of work, social habits and the intentional development of potential and personal aspirations, all integral for successful

professional activity and organizational advancement (Griffiths & Stotz, 2018). The preliminary version of the twelve key issues pertaining to ESD was drafted and presented in the form of a paper at the Copernicus Alliance Conference in Vienna in 2016 (Glavic, 2020).

The noteworthy insight gleaned from the study was the inherent motivation of ESD researchers to actively contribute to societal advancement. The results delineate a dual continuum in research activities, highlighting the necessity of embracing the demands and opportunities of environmental change while adhering to established standards of scientific rigor and validity. The first continuum underscores research as a knowledge repository informing just political and individual decisions, while the second continuum underscores the direct application of models and actions for necessary changes (Reunamo & Pipere, 2011). The study employed an inclusive review methodology, spanning an examination of literature providing a comprehensive overview of the principles and applications of ESD, coupled with an analysis of program evaluation studies. Additionally, a qualitative assessment of the Environmental Attitudes and Awareness toward Sustainable Development (EAATSD) scale was conducted among higher professional education students, involving in-depth interviews, one-on-one dialogues and classroom discussions.

3. Results

The Sustainable Development Goals (SDGs), a framework established by the United Nations, consist of 17 goals with the overarching mission to eliminate poverty, protect the environment and ensure universal peace and prosperity by the year 2030 (UN, 2015).

- SDG1: The primary objective of this goal is the eradication of extreme poverty and the reduction of inequality through the implementation of social protection systems and policies that facilitate both economic growth and job creation.
- SDG2: Concentrating on the elimination of hunger and malnutrition, this goal strives to achieve this objective by enhancing agricultural productivity and advocating for sustainable food systems.
- SDG3: The fundamental goal is to ensure good health and well-being for all ages, encompassing endeavors to diminish maternal and child mortality, combat communicable and non-communicable diseases and fortify health systems.
- SDG4: This goal aspires to provide inclusive and equitable quality education, nurturing lifelong learning opportunities for all. This encompasses guaranteeing access to early childhood development, primary and secondary education, as well as tertiary education.
- SDG5: The pivotal aim of this goal is to attain gender equality and empower women and girls by eliminating all forms of discrimination and violence against them. This entails promoting women's participation in decision-making and ensuring equal access to education, health care and economic opportunities.
- SDG6: Ensuring the availability and sustainable management of water and sanitation for all is the central focus of this goal, involving enhancements in water quality, increased water-use efficiency and the promotion of hygiene and water conservation practices.

- SDG7: This goal strives to guarantee access to affordable and clean energy for all. This entails augmenting the share of renewable energy in the global energy mix, enhancing energy efficiency and expanding energy infrastructure and technology.
- SDG8: The objective of this goal is to foster sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. This includes the enhancement of labor rights, improvement of working conditions and the promotion of entrepreneurship and innovation.
- SDG9: Focused on industry, innovation and infrastructure, this goal aims to develop resilient infrastructure, encourage inclusive and sustainable industrialization and foster innovation through investments in research and development, technological upgrades and international cooperation.
- SDG10: The overarching goal of this goal is to reduce inequalities within and among countries by empowering and advocating for the social, economic and political inclusion of all individuals, irrespective of demographic factors.
- SDG11: This goal endeavors to create inclusive, safe, resilient, and sustainable cities and human settlements. This involves improvements in urban planning and management, the provision of affordable housing and basic services and the promotion of sustainable transport and green public spaces.
- SDG12: The central focus of this goal is to ensure responsible consumption and production patterns by endorsing sustainable lifestyles, reducing waste and pollution and enhancing resource efficiency and sustainable management of natural resources.
- SDG13: The objective of this goal is to urgently address climate change and its impacts by enhancing resilience and adaptive capacity to climate-related hazards, integrating climate change measures into national policies and fostering education, awareness and institutional capacity on climate change mitigation and adaptation.
- SDG14: This goal seeks to preserve and sustainably use oceans, seas and marine resources for sustainable development. This encompasses initiatives to reduce marine pollution, safeguard marine and coastal ecosystems and promote sustainable fisheries and aquaculture.
- SDG15: The ultimate goal of SDG15 is to protect, restore and promote the sustainable use of terrestrial ecosystems. This involves the sustainable management of forests, combating desertification, halting and reversing land degradation and preventing biodiversity loss.
- SDG16: Focused on peace, justice, and strong institutions, this goal aims to promote peaceful and inclusive societies, provide access to justice for all and build effective, accountable and inclusive institutions at all levels. This involves efforts to reduce violence, corruption, illicit financial and arms flows, strengthen the rule of law and promote human rights and democratic participation.
- SDG17: The overarching objective of this goal is to strengthen the means of implementation and revitalize the global partnership for sustainable development. This includes enhancing international cooperation, increasing the availability of data and information and fostering multi-stakeholder partnerships for sustainable development.

The highlighted goals underscore the central importance of both economic and ecological considerations. Particularly noteworthy is the emphasis within SDG4, which specifically addresses the role of education in influencing the dynamics between the eco-economy and sustainable development. Education emerges as an essential and pivotal tool in the pursuit of a sustainable future, playing a fundamental role in shaping

individuals and societies to address the challenges and complexities inherent in achieving long-term environmental, social and economic sustainability (Hopkins & McKeown, 2001).

The evolution from the twelve principles of ESD to the twelve key issues involves the incorporation of diverse criteria, spanning eco-economic factors to institutional settings. These provisions hold significance in defining the strategic roadmap for ESD, serving as integral guidelines for its formulation and implementation (Glavic, 2020b).

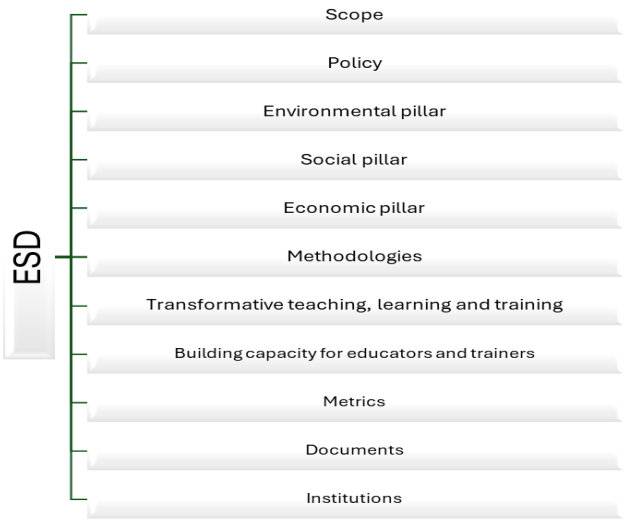


Figure 1. 12 key issues of ESD
Source: Glavic, P

While each criterion holds distinct importance, the transformation in education, economic considerations, and environmental issues stand out as particularly crucial for sustainable development. It is essential for universities, institutes and other research centers to actively pursue innovation, ensuring that education is not only aligned with modern standards but also fundamentally grounded in the principles of sustainability. Establishing a crucial balance between the global economy and ecology is imperative for fostering sustainable development, where economic progress is intricately linked with environmental preservation (Hasanov, 2023a). By embracing sustainable strategies, organizations can substantially mitigate their environmental impact, cultivate a positive reputation among stakeholders and secure a foundation for long-term sustainability (Hasanov & Safarli, 2023). Numerous scholarly works by various scientists are recommended for exploration on this highly significant research topic (Munasinghe, 1993; Barrier, 2017; Baghirov, 2021; Hasanov, 2023b).

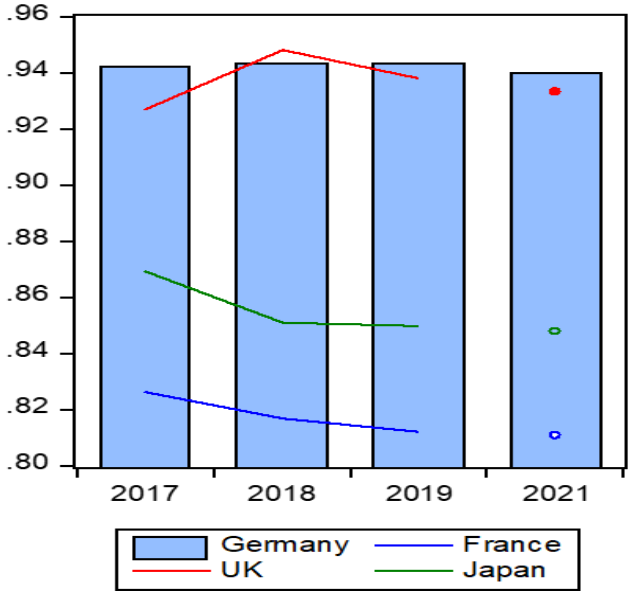
There are ongoing and inconclusive discussions concerning the objectives of ESD, fueled by critiques of the broader discourse on sustainable development and the embedded instrumentalism within ESD. The qualitative evaluation indicated that the Environmental Attitudes and Awareness Toward Sustainable Development (EAATSD) scale is adept at assessing both anthropocentric and ecocentric attitudes in higher education students. These findings highlight the scale's effectiveness in revealing critical insights into the paradoxes and challenges inherent in the diverse goals of sustainable development, particularly among students in higher education (Kopnina & Meijers, 2014). Amidst the backdrop of globalization and increasing complexity, Higher Education

for Sustainable Development (HESD) endeavors to cultivate individuals' competencies. This extends beyond the conventional acquisition and generation of knowledge, emphasizing the vital capacity to reflect on the intricacies and interconnections of behavior and decision-making within a future-oriented and global perspective (Adomssent & Michelsen, 2006). A multitude of global initiatives in HESD undertaken by universities worldwide has been meticulously documented through a compendium of case studies, prominently featured in esteemed books and scholarly journals. These case studies span main strategic categories, notably delving into examinations of universities' sustainability performances and ecological footprints. Furthermore, exploration extends to the integration of sustainability within curricula, covering both holistic approaches and specialized academic programs, such as engineering courses. Insights into universities' approaches for embedding sustainability within on-campus practices and the dynamics of on-campus university or student-led sustainability initiatives are also provided. Inquiries into students' environmental or sustainability literacy, facilitated through one-time surveys and pre- and post-surveys primarily designed to gauge the impact of specific programs, courses or field trips on students' sustainability literacy, constitute an integral part of this diverse array of case studies. This collection offers a comprehensive and nuanced overview of the multifaceted landscape of HESD initiatives within higher education institutions on a global scale.

The 2030 Agenda for Sustainable Development emphasizes the necessity of incorporating the tenets of ESD throughout the entire educational spectrum. Acknowledged as an essential component of high-quality education, ESD holds the potential to cultivate competencies in sustainability across a variety of educational contexts, ranging from early childhood education to higher education and extending to nonformal and informal educational settings. This specialized edition, titled "Competencies in Education for Sustainable Development," responds to this imperative by elucidating recent advancements in the field, encompassing systematic literature reviews, curriculum developments, meta-analyses and the examination of evaluation tools and processes for sustainability competencies (Cebrián *et al*., 2020). Numerous projects have been executed across various educational facilities, and their impact has been particularly evident. In Slovenia, for example, students attending schools actively engaged in the eco-schools project exhibit a more profound understanding of the environment compared to their counterparts in schools not participating in the initiative (Krnel & Naglic, 2009). The research conducted in Turkey produced results that diverge from findings by other scholars. It was identified that participation in the eco-school program in Turkey did not yield significant cognitive effects. However, a noteworthy observation was the heightened intention for pro-environmental behavior among participants. A substantial limitation of these studies lies in their reliance on samples often limited to just a few schools, raising concerns about the generalizability of their results to a broader context of schools engaged in the certification program (Ozsoy *et al*., 2012).

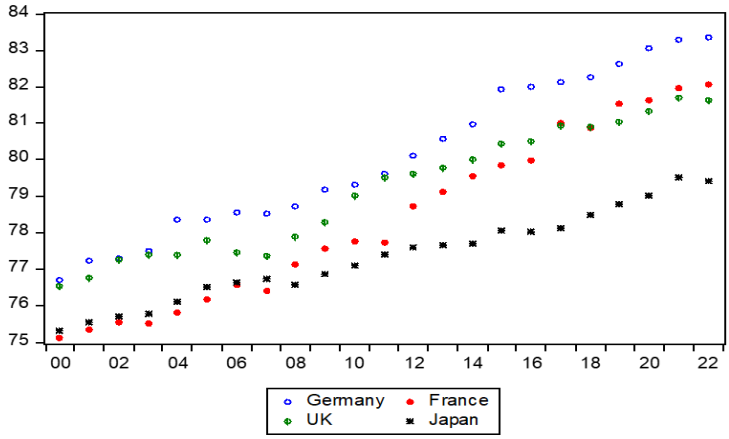
In highly developed countries characterized by elevated education levels, there is a notable correlation with higher per capita consumption rates. Consequently, ESD must undergo a critical reorientation, emphasizing a reduction in consumption, advocating for de-growth and instigating a revolutionary shift in lifestyles within these developed countries. The economic advancement of these nations can be attributed to advancements in science and education. Presently, countries that are forward-thinking in shaping the future of humanity are actively engaging in research to develop sustainable eco-economic models.

The Education Index functions as a gauge for evaluating the educational quality within a country, incorporating factors like literacy rates, enrollment rates and years of schooling. Significantly, it serves as a crucial indicator of a nation's progress in aligning with the SDGs, particularly emphasizing SDG4: Quality Education. A higher Education Index is positively associated with improved health outcomes, increased income levels, and greater gender equality. The Education indexes of some countries actively engaged in sustainable development strategies exhibit positive trends. Accurately assessing and monitoring the average level of education across countries presents inherent challenges. To address this, the United Nations Development Program (UNDP) consistently publishes a Human Development Index (HDI) that incorporates an Education Index (WPR, 2024).



Graph 1. Educational Index indicator in a number of developed countries.
Source: World Population Review

The Sustainable Development Goals (SDGs) Index emerges as a pivotal indicator, providing a comprehensive evaluation of a country's overall performance on the 17 SDGs, with each goal accorded equal importance. The resulting score positions the country on a scale ranging from the worst possible outcome (score of 0) to the target (score of 100). The database of the Sustainable Development Report (SDR) 2023 comprehensively includes the rankings, overall scores, spillover scores, dashboards, and trends for all 17 Sustainable Development Goals (SDGs), incorporating over 100 indicators (SDR, 2023a). The individual SDG Dashboards play a crucial role in consolidating available data for each goal, visually contrasting it against performance thresholds through color labeling, specifically categorizing goals as green, yellow or red. These dashboards effectively pinpoint areas where a country needs substantial progress to achieve the Goals by 2030 (SDR, 2023b).



Graph 2. SDGs index in a number of developed countries.
Source: Sustainable Development Report 2023

Both indexes offer a nuanced overview of the intricate interplay between education and sustainable development, presenting an opportunity to forge novel pathways for advanced scholarly inquiry in this domain.

4. Conclusion

ESD undeniably plays a pivotal role in nurturing sustainability competencies across diverse educational landscapes. While promising initiatives like eco-schools are on the horizon, there is a pressing need for a fundamental shift towards degrowth and transformative lifestyle changes in developed nations. The research comprehensively examined the international strategies, goals and perspectives of Education for Sustainable Development (ESD) operating under the United Nations. The logical analysis conducted in the study reveals a positive correlation between education and the sustainable development of developed countries. The use of assessments grounded in Education and SDGs indexes serves as a discerning tool, shedding light on areas requiring improvement as we navigate towards an innovative and sustainable future.

References

Adomssent, M., Michelsen, G. (2006). German Academia heading for sustainability? Reflections on policy and practice in teaching, research and institutional innovations. *Environmental Education Research, 12*(1), 85-99. DOI: 10.1080/13504620500527758

Baghirov, H. (2021). Theoretical foundations of sustainable development of Azerbaijan. *Studies of Applied Economics, 39*(6).

Barrier, E.B. (2017). The concept of sustainable economic development. In *The Economics of Sustainability*, 87-96. Routledge.

Cebrián, G., Junyent, M. & Mulà, I. (2020). Competencies in education for sustainable development: Emerging teaching and research developments. *Sustainability, 12*(2), 579. https://doi.org/10.3390/su12020579

Dias, M.B., Mills-Tettey, G.A. & Nanayakkara, T. (2005). Robotics, education, and sustainable development. In *Proceedings of the 2005 IEEE International Conference on Robotics and Automation*, 4248-4253. IEEE. DOI: 10.1109/ROBOT.2005.1570773

Glavič, P. (2020a). Sustainability Transformation of Science Systems. Parallel Interactive Session I, The 12 Key Issues of Education for Sustainable Development. Outcomes 1–3,

Copernicus Alliance Conference, Vienna, Austria, 14–15 September 2016. Available online: https://copernicus-alliance.org/programme/ineractive-sessions#a3

Glavič, P. (2020b). Identifying key issues of education for sustainable development. *Sustainability, 12*(16), 6500. DOI:10.3390/su12166500

Griffiths, P., Stotz, K., Nicholson, D.J. & Dupre, J. (2018). Developmental Systems Theory as a Process Theory. In *Everything Flows: Towards a Processual Philosophy of Biology*. Oxford University Press: Oxford, 225–245.

Hasanov, R.I. (2023a). Towards a sustainable future in aluminium production: environmental and economic benefits of revolutionary inert anode technology. *Journal of Sustainability Science and Management, 18*(10), 176-186.

Hasanov, R.I. (2023b). Promoting sustainability in azerbaijan's energy sector: a green policy evaluation and future outlook. *Green Economics, 1*(1), 62-69.

Hasanov, R.I., Safarli, A.J. (2023). New structural design for green supply chain management: The case of the aluminum industry. *New Design Ideas, 7*(2), 343-355.

Hassanien, A.E., Bhatnagar, R. & Darwish, A. (Eds.). (2020). *Artificial İntelligence for Sustainable Development: Theory, Practice and Future Applications*, 912. Springer Nature.

Hopkins, C., McKeown, R. (2001). Education for Sustainable Development. *Forum for Applied Research and Public Policy, 93*(1), 25–28.

Kopnina, H., Meijers, F. (2014). Education for sustainable development (ESD): Exploring theoretical and practical challenges. *International Journal of Sustainability in Higher Education, 15*(2), 188-207. https://doi.org/10.1108/IJSHE-07-2012-0059

Krnel, D., Naglic, S. (2009). Environmental literacy comparison between eco-schools and ordinary schools in Slovenia. *Science Education International*, 20, 5-24.

Munasinghe, M. (1993). *Environmental Economics and Sustainable Development*, 3. World Bank Publications.

Ozsoy, S., Ertepınar, H. & Saglam, N. (2012). Can eco-schools improve elementary school students' environmental literacy levels?. *Asia-Pac. Forum Sci. Learn. Teach.,* 13, article 3.

Pandey, N., Vedak, V. (2010). Structural transformation of education for sustainable development. *International Journal of Environment and Sustainable Development, 9*(1-3), 3-15. https://doi.org/10.1504/IJESD.2010.030063

Reunamo, J., Pipere, A. (2011). Doing research on education for sustainable development. *International Journal of Sustainability in Higher Education, 12*(2), 110-124. https://doi.org/10.1108/14676371111118183

Rieckmann, M. (2018). Learning to transform the world: Key competencies in Education for Sustainable Development. *Issues and Trends in Education for Sustainable Development*, 39, 39-59.

Rustamov, T. (2023). Dynamics of global economic inflation and temperature anomalies: a theoretical-experimental modeling approach. *Green Economics, 1*(2), 137-143.

SDR (2023). The SDG Index and Dashboards. Part 2. https://dashboards.sdgindex.org/chapters/part-2-the-sdg-index-and-dashboards

SDR (2023a). Overall score. 2000-2022. https://dashboards.sdgindex.org/explorer?visualization=line

Singh, A., Kanaujia, A., Singh, V.K. & Vinuesa, R. (2023). Artificial intelligence for Sustainable Development Goals: Bibliometric patterns and concept evolution trajectories. *Sustainable Development*. https://doi.org/10.1002/sd.2706

UN (2015). Department of Economic and Social Affairs, Sustainable Development. The 17 Goals. https://sdgs.un.org/goals

UNESCO (2023a). What you need to know about education for sustainable development. https://www.unesco.org/en/education-sustainable-development/need-know

UNESCO (2023b). What you need to know about education for sustainable development. https://www.unesco.org/en/education-sustainable-development/need-know

Venkataraman, B. (2009). Education for sustainable development. *Environment: Science and Policy for Sustainable Development, 5*1(2), 8-10. https://doi.org/10.3200/ENVT.51.2.08-10

WPR (2024). Education Index by Country 2024. World Population Review. https://worldpopulationreview.com/country-rankings/education-index-by-country

Yatsun, S.F., Loktionova, O.G. & Safarov, D.I. (2004a). Modeling of multicomponent granular media under vibration influences. In *Mechanics of inhomogeneous deformable bodies: methods, models, solutions: mater. Intl. scientific-technical Conf*. Orel: Publishing House Orel State Technical University, 76-79. (In Russian).

Yatsun, S.F., Safarov, D.I., Mishchenko, V.Ya. & Loktionova, O.G. (2004b). *Vibration Machines and Technologies Baku*. (In Russian).

Yoko, M. (2016). Educating for Transforming Our World: Revisiting International Debates Surrounding Education for Sustainable Development. *Current Issues in Comparative Education, 19*(1), 109-125. https://eric.ed.gov/?id=EJ1128155

Zhang, T., Shaikh, Z.A., Yumashev, A.V. & Chłąd, M. (2020). Applied model of E-learning in the framework of education for sustainable development. *Sustainability, 12*(16), 6420. https://doi.org/10.3390/su12166420