

GUEST EDITORIAL

The importance of education and role of educational institutions in climate change mitigation and achieving UN SDG 13 “Climate Action”

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ABSTRACT

Climate change is a long-term shift in weather patterns driven by natural and human activities, leading to global warming and extreme weather events. Education - both formal and informal, plays a crucial role in climate change mitigation by enhancing awareness, fostering critical thinking, and promoting sustainable practices. It equips individuals with the knowledge and skills necessary to understand the complexities of climate change and engage them in informed decision-making. Education also promotes innovation and solutions, supports policy and advocacy, builds resilience, and empowers vulnerable populations. Climate change mitigation strategies align with Sustainable Development Goal 13 (SDG 13) “Climate Action”, but they also present synergies and trade-offs with other SDGs. Large-scale implementation of technologies can positively impact economic growth and job creation, but environmental issues linked to mineral extraction can detract from other SDGs. Careful management is essential to balance these interactions and minimize trade-offs. Educational institutions play a crucial role in achieving Sustainable Development Goal 13 (SDG 13) by fostering knowledge, research, advocacy, and sustainable practices. They contribute to climate education and awareness through curriculum development, research and innovation, leadership and institutional action, policy advocacy, capacity building, community engagement, ethical and sustainable values education, and monitoring and reporting. Higher education institutions can integrate climate change education into curricula, equipping students with the necessary skills to address environmental challenges. They can also promote global citizenship and empower individuals to contribute to climate solutions. By incorporating multidisciplinary approaches, educational institutions can bridge gaps in climate education and promote innovative solutions to mitigate climate impacts.

Keywords: *climate action, climate change, educational institutions, sustainable development*

INTRODUCTION

Climate change is an event of significant and long-term alterations in weather patterns, including shifts in temperature, precipitation, and wind, which can occur over decades or longer (Belić, 2006) at regional or global scale. It is driven by both natural processes, such as volcanic activity and solar irradiance variations, and anthropogenic factors, particularly the emission of greenhouse gases from human activities like deforestation and industrial processes (Jaramillo & Mendoza-Ponce, 2022; Priatna & Monk, 2023a). These changes disrupt the Earth's energy balance, leading to phenomena such as global warming, which has resulted in an increase in average temperatures and more extreme weather events. According to Khan et al. (2014), landscape dynamics associated with anthropogenic activities and global climate change will likely reduce the ecosystem services associated with natural biodiversity. Education can be understood as a multifaceted process that encompasses the systematic transmission of knowledge, skills, values, and cultural practices, aimed at personal and societal development. It is characterized by

the interaction between educators and learners, fostering a normative learning environment that enhances individual responsibility and community engagement (Dasopang, 2022). Education serves as a planned series of actions designed to improve behaviour and competencies, bridging gaps between existing skills and desired outcomes (Zebaloğlu, 2024). Furthermore, it plays a crucial role in personality formation, awakening latent potentials and shaping life paths (Vladimir, 2018). Philosophically, education is viewed as a moral enterprise, emphasizing the importance of nurturing better individuals and fostering ethical considerations in knowledge transmission (Jackson, 2011). While traditional definitions often equate education with formal schooling, it is essential to recognize its broader implications, including socialization and the cultivation of human capital (Lawrence, 2009).

Education plays a pivotal role in climate change mitigation by enhancing awareness, fostering critical thinking, and promoting sustainable practices. It equips individuals with the knowledge and skills necessary to understand the complexities of climate change and to engage in informed decision-making. Climate change

education (CCE) is essential for developing ethical frameworks and scientific understanding, which are crucial for preventing and adapting to climate impacts (Tripathy et al., 2024). Moreover, while education is often framed as a tool for adaptation in national climate pledges, its potential for mitigation is increasingly recognized, particularly in higher education settings that can catalyse local emission reductions through innovative governance and service-learning approaches (Goritz & Kolleck, 2024). The urgency of integrating climate education across all sectors is underscored by the need for immediate action against environmental threats, advocating for a collaborative approach to empower global citizenship and address shared challenges (Riaz et al., 2024).

The education component in climate change mitigation is critically important for several reasons:

1. Raising Awareness
 - **Informed Decisions:** Education helps individuals understand the science behind climate change, its impacts, and the urgency of action. This knowledge empowers people to make informed decisions in their daily lives, from reducing energy consumption to supporting sustainable policies.
 - **Behavioural Change:** Awareness of the causes and consequences of climate change can motivate individuals and communities to adopt more sustainable behaviors, such as recycling, conserving water, and reducing carbon footprints.
2. Promoting Innovation and Solutions
 - **Cultivating Expertise:** Education systems that emphasize environmental sciences, engineering, and sustainability create a generation of experts who can develop innovative technologies and strategies for mitigating climate change.
 - **Research and Development:** Higher education institutions often lead in research that contributes to new methods of reducing greenhouse gas emissions, renewable energy technologies, and adaptation strategies.
3. Supporting Policy and Advocacy
 - **Informed Advocacy:** Educated citizens are more likely to engage in advocacy and support policies that address climate change. They are better equipped to understand the implications of policy decisions and to push for regulations that protect the environment.
 - **Public Participation:** A well-educated populace can more effectively participate in democratic processes, ensuring that climate change remains a priority in public policy.
4. Building Resilience
 - **Community Adaptation:** Education can teach communities how to adapt to the effects of climate change, such as extreme weather events, by implementing local solutions and resilience-building strategies.
 - **Youth Engagement:** Educating young people about climate change ensures that future generations are prepared to continue the fight against it. Engaged youth are more likely to become activists, innovators, and leaders in the movement for a sustainable future.
5. Global Collaboration
 - **Shared Knowledge:** Education facilitates global collaboration by spreading knowledge and best practices across borders. It helps build international networks of researchers, policymakers, and activists working together to tackle the global challenge of climate change.
 - **Cultural Shifts:** Education can drive cultural shifts toward more sustainable lifestyles globally, fostering a collective responsibility to protect the planet.
6. Empowering Vulnerable Populations
 - **Climate Justice:** Education is crucial in addressing the disproportionate impact of climate change on vulnerable populations. It provides the knowledge and tools needed to advocate for climate justice and equitable solutions.

CLIMATE CHANGE MITIGATION AND UN SDG 13 (CLIMATE ACTION)

Climate change mitigation strategies significantly align with Sustainable Development Goal (SDG) 13 “Climate Action” (Anshari et al., 2023), but they also present both synergies and trade-offs with other SDGs. For instance, a study in Sweden identified that large-scale implementation of technologies like electric vehicles and renewable energy can positively impact economic growth and job creation (SDG 8) while also supporting sustainable industrialization (SDG 9) (Elbert, 2023; Ahlbäck et al., 2024). However, it also highlighted negative impacts, particularly concerning environmental issues linked to mineral extraction, which can detract from other SDGs (Ahlbäck et al., 2024). Moreover, research indicates that industrialization and trade, while beneficial for poverty reduction (SDG 1), can adversely affect climate goals (SDG 13) due to increased carbon emissions (Khan et al., 2024). Conversely, synergies were found between climate actions and water-related SDGs, suggesting that coordinated policies can enhance overall sustainability (Rimba et al., 2024). Thus, while climate mitigation can foster progress across multiple SDGs,

careful management is essential to balance these interactions and minimize trade-offs (Xiao et al., 2024).

THE ROLE OF EDUCATION IN HELPING TO ACHIEVE SDG 13

Sustainable Development Goal (SDG) 13, "Climate Action", focuses on taking urgent action to combat climate change and its impacts (Priatna & Monk, 2023b). Educational institutions are vital in achieving this goal by fostering knowledge, research, advocacy, and sustainable practices. Here's how they contribute:

1. **Climate Education and Awareness**
 - **Curriculum Development:** Integrating climate change education into school and university curricula helps students understand the science behind climate change, its causes, impacts, and the importance of mitigation and adaptation strategies.
 - **Awareness Campaigns:** Institutions can organize awareness programs, seminars, workshops, and campaigns to educate students and the wider community about climate action and the significance of SDG 13.
2. **Research and Innovation**
 - **Advancing Climate Science:** Universities and research centres play a crucial role in advancing the scientific understanding of climate change, contributing to data collection, modelling, and analysis that inform climate policies and actions.
 - **Innovation in Mitigation and Adaptation:** Research institutions can drive innovation in areas such as renewable energy, sustainable agriculture, and climate-resilient infrastructure, which are essential for achieving SDG 13.
3. **Leadership and Institutional Action**
 - **Sustainable Campus Operations:** Educational institutions can lead by example by adopting sustainable practices on their campuses, such as energy efficiency, waste reduction, water conservation, and the use of renewable energy sources.
 - **Carbon Neutrality Goals:** Some universities aim to achieve carbon neutrality, demonstrating a strong commitment to climate action and serving as role models for other institutions and the community.
4. **Policy Advocacy and Collaboration**
 - **Engagement with Policymakers:** Educational institutions can influence climate policy by providing evidence-based research, participating in policy dialogues, and advocating for stronger climate action at local, national, and global levels.
5. **Capacity Building and Skill Development**
 - **Collaborative Networks:** By participating in national and international networks, such as the UN's Global Universities Partnership on Environment and Sustainability (GUPES), educational institutions can share best practices and collaborate on climate initiatives.
 - **Training Programs:** Educational institutions offer training programs and courses that equip students and professionals with the skills needed to work in climate-related fields, such as environmental science, climate policy, and sustainable development.
 - **Empowering Future Leaders:** By fostering leadership skills and a sense of responsibility, educational institutions prepare the next generation to take active roles in climate action and sustainability efforts.
6. **Community Engagement and Outreach**
 - **Local and Global Community Projects:** Institutions can engage in projects that directly address climate change impacts in local communities, such as reforestation, clean energy initiatives, and climate resilience programs.
 - **Public Education:** Universities and schools often serve as hubs for public education on climate change, offering resources, hosting public lectures, and engaging with local communities to promote climate action.
7. **Promoting Ethical and Sustainable Values**
 - **Values and Ethics Education:** Beyond technical knowledge, educational institutions instill values of environmental stewardship, social responsibility, and global citizenship, motivating students to pursue sustainable lifestyles and careers.
 - **Cultural Change:** By embedding sustainability into the campus culture, educational institutions can create a community of individuals committed to long-term climate action.
8. **Monitoring and Reporting**
 - **Tracking Progress:** Institutions can contribute to the monitoring and reporting of climate action by developing and utilizing indicators to track progress towards SDG 13 at local, national, and global levels.
 - **Data Sharing:** They can also share research and data with governments, NGOs, and international bodies, supporting global efforts to achieve SDG 13.

THE ROLE OF EDUCATIONAL INSTITUTIONS

Through promoting awareness, knowledge, and workable solutions, educational institutions play a critical role in establishing climate change mitigation agendas that are in line with Sustainable Development Goal 13 (SDG 13). By incorporating climate change education (CCE) into curricula, higher education institutions (HEIs) can serve as agents of change for sustainable development by providing students with the tools they need to tackle environmental issues (Suteki et al., 2023; Yusuf et al., 2024). Especially in environments with limited resources, this integration is crucial for fostering a sense of global citizenship and enabling people to contribute to climate solutions (Riaz et al., 2024). Additionally, HEIs can successfully handle complex climate concerns and improve organizational learning by utilizing sustainable reporting methods (Tripathy et al., 2024). In countries like India, educational policies are evolving to incorporate multidisciplinary approaches that bridge gaps in climate education, thus promoting innovative solutions to mitigate climate impacts (Saini & Grover, 2023). Educational institutions can play a vital role in reducing carbon emissions via engagements of their students (Ali et al., 2022; Ali et al., 2023). Through improved carbon sequestration, the sustainable use and preservation of plant biodiversity in montane habitats are essential to mitigating the effects of climate change. A study conducted in the western Himalayas by Khan et al. (2013) demonstrates that ecosystems with higher plant diversity have the capacity to retain much more carbon, demonstrating the intrinsic relationship between biodiversity and carbon storage (Heriyanto et al., 2020; Heriyanto et al., 2021; Heriyanto et al., 2022; Priatna et al., 2022).

CONCLUSION

Beyond its effects on the environment, climate change has an impact on resource availability and economic stability in both rural and urban parts of society. Education, then, is the result of the dynamic interaction between gaining knowledge, developing oneself, and contributing to society. Therefore, education is an essential tactic in the fight against climate change, not only a supporting one. In conclusion, education is essential to mitigating climate change it is not merely a supplementary factor. It gives people and society the information, abilities, and drive necessary to combat climate change in the present and the future.

REFERENCES

- Ahlbäck, A., Klingvall, H., Nordell, E., & Eriksson, K.M. (2024). Synergies and trade-offs between the sustainable development goals and reaching zero net greenhouse gas emissions in Sweden. doi: 10.21203/rs.3.rs-4630096/v1
- Ali, S., Khan, S.M., Ahmad, Z., Siddiq, Z., Ullah, A., Yoo, S., Han, H., & Raposo, A. (2023). Carbon sequestration potential of different forest types in Pakistan and its role in regulating services for public health. *Frontiers in Public Health*, 10:1064586.
- Ali, S., Khan, S.M., Siddiq, Z., Ahmad, Z., Ahmad, K.S., Abdullah, A., Hashem, A., Al-Arjani, A.B., Abd_Allah, E.F. (2022). Carbon sequestration potential of reserve forests present in the protected Margalla Hills National Park. *Journal of King Saud University-Science*, 34(4):101978.
- Anshari, S., Listyarini, S., & Nurmawati, S. (2023). Relationship between adaptation and mitigation of climate change with the climate village program (ProKlim) In Paser Regency. *Indonesian Journal of Applied Environmental Studies*, 4(2): 93-100. DOI: 10.33751/injast.v4i2.
- Belić, D.S. (2006). Global warming and greenhouse gases. *Facta Universitatis - Series: Physics, Chemistry and Technology*. doi: 10.2298/FUPCT0601045B.
- Dasopang, M.D. (2022). Menarik Benang Merah Basis Pendidikan Islam Bermartabat. *Darul Ilmi: Jurnal Ilmu Kependidikan & Keislaman*, doi: 10.24952/di.v3i2.5050.
- Ebert, S. (2023). Climate Change. *Advances in human resources management and organizational development book series*. doi: 10.4018/978-1-6684-6878-4.ch011.
- Goritz, A., & Kolleck, N. (2024). Education in international climate pledges – identifying education framings in countries nationally determined contributions (NDCs). *Environmental Education Research*. doi: 10.1080/13504622.2024.2340504.
- Heriyanto MN, Priatna D, Samsedin I. (2020). Keanekaragaman hayati dan rosot karbon pada rawa gambut di Bukit Batu, Kabupaten Bengkalis Riau. *Jurnal Penelitian Hutan Tanaman* 17 (1): 53-67.
- Heriyanto, N.M., Priatna, D. & Samsedin, I. (2021). Sediaan Karbon pada Hutan Bekas Terbakar di PT Bumi Andalas Permai, Provinsi Sumatera Selatan. *Jurnal Penelitian Hutan dan Konservasi Alam* 18 (2): 111-122.
- Heriyanto, N.M., Priatna, D., Samsedin, I. (2022). Plant diversity and carbon stock in Tembawang Alak Forest, Sintang, West Kalimantan. *Buletin Kebun Raya*, 25(3): 142-155.
- Jackson, W.P. (2011). *What Is Education?*. Chicago: The University of Chicago Press.
- Jaramillo, A., & Mendoza-Ponce, A. (2022). Climate Change Overview. In: Frías-De-León, M.G., Brunner-Mendoza, C., Reyes-Montes, M.d.R., Duarte-Escalante, E. (eds) *The Impact of Climate Change on Fungal Diseases*. *Fungal Biology*. Springer, Cham. Pp. 1-18. https://doi.org/10.1007/978-3-030-89664-5_1.
- Khan, S., Yuan, H., & Hussain, M. (2024). Balancing act: Trade-offs and synergies within Sustainable Development Goals 1st, 10th, and 13th—Poverty, inequality, and climate actions. *Sustainable Development*. doi: 10.1002/sd.3079.

- Khan, S.M., Page, S.E., Ahmad, H., & Harper, D.M. (2013). Sustainable utilization and conservation of plant biodiversity in montane ecosystems: the western Himalayas as a case study. *Annals of Botany*, 112(3): 479-501. doi:10.1093/aob/mct125.
- Khan, S.M., Page, S., Ahmad, H., & Harper, D. (2014). Ethno-ecological importance of plant biodiversity in mountain ecosystems with special emphasis on indicator species of a Himalayan Valley in the northern Pakistan. *Ecological Indicators*, 37:175-185. doi.org/10.1016/j.ecolind.2013.09.012.
- Lawrence, A. (2009). Uncloaking Epistemologies through Methodology. doi: 10.1057/9780230622982_7.
- Priatna, D., Heriyanto, N.M., Samsuudin, I., Supriatno., Wiharjo, U., Laksana, E. (2022). Structure and Composition of Vegetation and Carbon Stock Calculation in a Natural Lowland Forest of Plantation Forest Landscape. *Journal of Tropical Biodiversity*, 2(3): 177-196.
- Priatna, D., & Monk, K.A. (2023a). Climate change and Its implications on wildlife conservation. *Indonesian Journal of Applied Environmental Studies*, 4(2): 64-66. DOI: 10.33751/injast.v4i2.9661.
- Priatna, D., & Monk, K.A. (2023b). Progress, Challenges, and the Nexus of Research and Impact - the importance of technology in biodiversity conservation in Indonesia. *Indonesian Journal of Applied Environmental Studies*, 4(1): 3-9. DOI: 10.33751/injast.v4i1.8778.
- Riaz, S.M.F., Sohail, M., Haroon, M.U., Rashid., Nawaz., Vardah, M.F., Asif., Majeed, Y., Sahar, R., Khan, A.G., Farooqi, Z.U.R., Ma'arij, A., Ilić, P., Jamal, M. (2024). Global Insight Into National Climate Mitigation Priorities Within the Framework of Climate Education. *Advances in educational marketing, administration, and leadership book series*, doi: 10.4018/979-8-3693-4103-2.ch005.
- Rimba, A.B., Hirabayashi, Y., Kawamitsu, Y., Oki, T., Kiguchi, M., Tokuda, D., Hanasaki, N., Ai, Z., Iizumi, T., Nozaki, N., & Kim, W. (2024). Synergies overcome trade-offs between climate policy and water-related SDG targets. *Hydrological Research Letters*. doi: 10.3178/hrl.18.58.
- Saini, P., & Grover, A. (2023). Climate change – integrating policy, practice and education. *Journal of Global Resources*. doi: 10.46587/jgr.2023.v09i02.002.
- Suteki, M., Betlajery, S., & Kuntag, J.R. (2023). Higher education roles to support climate change mitigation. doi: 10.22487/agroland.v0i0.1940.
- Tripathy, A.B., Swain, B., & Mishra, M. (2024). Environmental Sustainability for a Sustainable Future and Role of Education (In Climate Change Perspectives). doi: 10.53555/kuey.v30i5.5952.
- Vladimir, P. (2018). Education, the formation of personality and the destiny of a man. doi: 10.2991/ICTPPFMS-18.2018.41.
- Xiao, H., Bao, S., Ren, J., Xu, Z., Song, Xue., & Liu, J. (2024). Global transboundary synergies and trade-offs among Sustainable Development Goals from an integrated sustainability perspective. *Nature Communications*. doi: 10.1038/s41467-023-44679-w.
- Yusuf, O.J., Yusuf, A., Adenle., Lateef, A., Jolaoso., Ismaila, Abimbola., Yusuf, A., Aina., Ismaila, Rimi, Abubakar., Lukman, A., Ajibade. (2024). Climate change education: Addressing the challenges of sustainable futures. doi: 10.1016/b978-0-44-313776-1.00230-0.
- Zebaloğlu, E. (2024). Eğitsel Süreçlerde Eğitim İhtiyaçlarının Belirlenmesine Yönelik Yaklaşımlar. *Uluslararası Sosyal Bilimler Dergisi*. doi: 10.52096/usbd.8.33.33.