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**GREEN EDUCATION AND INSTITUTIONAL TRANSFORMATION:  
PROMOTING SUSTAINABLE DEVELOPMENT IN THE 21ST  
CENTURY**

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**ABSTRACT**

Educational institutions are being pressured to rethink their fundamental philosophies and how they approach teaching and learning due to the growing environmental crisis in the twenty first century. Green education has developed as a new model to integrate sustainable practices, ethics and institutional reform into the language of education. By creating a context for integrating sustainability throughout curricular development, governance, campus operations and the community, green education is an evolving approach to environmental education that offers an opportunity for transformation of educational institutions into sustainability-oriented ecosystems. The article reconceptualises green education as a mechanism for institutional transformation and sustainable development of society. In addition, the paper examines the philosophical foundations, purpose, dimensions and challenges to the implementation of green education, specifically in higher education and teacher education. The article argues that achieving sustainable development requires the restructuring of educational institutions into sustainability-oriented ecosystems. In the context of India, the article also discusses the impact of green education in promoting environmental literacy, sustainability competency, ethical conduct and responsible citizenship. Using substantial evidence from the existing literature, the article supports the assertion that green

education represents a pedagogical reform but rather an entire paradigm shift towards environmental justice and intergenerational equity.

**KEYWORDS:** Green Education, Institutional Transformation, Sustainable Development, Environmental Literacy, Teacher Education, Higher Education, Responsible Citizenship, Sustainability Competencies.

## INTRODUCTION

The twenty-first century faces several significant environmental problems, including climate change, loss of biodiversity, pollution on the environment, shortage of water and lack of sustainability in how people use their resources. The relationship between ecological degradation and human activity, economic systems and methods of development has been consistent in reports developed by international sustainability initiatives (Jorgenson, 2014 & UNECE, 2011). The urgent nature of the situation is further emphasised by the understanding that ESD (Education for Sustainable Development) does not simply involve adding climate change and other topics to study courses but also involves developing core skills of critical systemic thinking, collaborative decision making and being accountable for past and future generations (Leicht, Heiss & Byun 2018). As a result, the role of education as a key agent of sustainable change has become widely accepted. Green education has developed in response to the global environmental crisis and is broader than traditional environmental education, which usually consists of activities aimed at increasing awareness of the environmental crisis. Achieving sustainable development relies greatly on green education, as it facilitates societal and behavioural change through increasing awareness about the environment and sustainability literacy (Akinsemolu & Onyeaka, 2025). Green education tries to integrate sustainability principles into all aspects of education (Aithal & Rao, 2016) by restructuring educational institutions so that they teach about sustainability and demonstrate it through their operations, curricula, research activities and outreach to the local community.

Scholars have proposed that schools ought to change from being simply institutions that transmit knowledge, to being institutions that create positive changes for our planet (Jorgenson, 2014). As such, the term green education is closely associated with ESD (Education for Sustainable Development), which seeks to foster critical thinking, an ethical responsibility towards sustainability and an ecological balance that lasts over time (UNECE, 2011). Green education also advocates for the transformation of institutions and for institutions to operate sustainably (Alhussini, 2020). Given the variety of environmental

problems that plague India, including air pollution, groundwater depletion, debris accumulation from urban centres and susceptibility to climate change, green education is needed now more than ever. Rapid industrialisation and urbanisation have intensified ecological stress, thereby demanding educational reforms that align developmental goals with sustainability values (Aithal & Rao, 2016). The international community has acknowledged this urgency through the explicit incorporation of ED into the Sustainable Development Goals Target 4.7 Goal which intends to ensure all learners acquire the knowledge and ability to promote sustainable development and is considered an important means to achieving all other 16 SDGs (UNESCO, 2017). Educational institutions must therefore act as laboratories of sustainable practice and community transformation. Climate change, resource depletion and environmental degradation are global sustainability issues that have led to widespread, systemic change within all sectors and especially education, to promote a long-lasting ecological balance on a global scale (Sarkar, 2025).

### **Concept of Green Education**

Green education is a multidimensional educational philosophy that integrates ecological awareness, sustainability ethics and systemic institutional reform. It extends beyond environmental education by embedding sustainability principles across educational policies, curricula, institutional culture and community engagement (Aithal & Rao, 2016). Green education includes teaching people ecological principles, (Ardoin et al., 2020) educating them about environmental problems such as climate change and biodiversity loss, promoting sustainable practices and encouraging responsible environmental behaviours (Shin et al., 2022; Akinsemolu & Onyeaka, 2025). UNESCO defines education in this way as empowering learners with the knowledge and skills necessary to make informed, responsible choices for the long-term viability of communities and/or a healthy eco-system while respecting the diversity of cultures, (UNESCO 2018).

### ***From Environmental Education to Green Education***

Environmental education historically focused on awareness of ecological problems and conservation practices. However, research indicates that awareness alone does not necessarily translate into behavioural change (Alhussini, 2020). Green education addresses this gap by integrating cognitive, affective and behavioural domains of learning, thereby promoting long-term sustainability-oriented actions. While environmental education concentrates on ecological knowledge, green education emphasises:

- Value formation
- Ethical responsibility
- Systems thinking
- Institutional accountability
- Community participation

(Jorgenson, 2014; UNECE, 2011)

Thus, green education is transformative rather than merely informative. Additionally, green education has a substantial impact on sustainability literacy. This helps students learn about and become actively involved in achieving the Sustainable Development Goals (SDGs) (Akinsemolu & Onyeaka, 2025).

### ***Green Education as Institutional Transformation***

Green education recognises that educational institutions are microcosms of society. Universities and teacher education institutions influence not only learners but also policy, research and community norms (Jorgenson, 2014). Therefore, sustainability must be embedded within:

- Governance structures
- Campus infrastructure
- Resource management systems
- Curriculum frameworks
- Research agendas

(Aithal & Rao, 2016; Alhussini, 2020)

In order to transform an institution, it must adopt renewable energy systems, utilise waste management systems, reduce its carbon footprint and incorporate a set of sustainability metrics within its evaluation processes. Similarly, green campuses serve as a context in which experiential learning can occur.

### **Philosophical and Theoretical Foundations**

A foundation for green education lies in philosophical traditions that support ecological balance and moral responsibility. The following four philosophies illustrate this support:

#### ***1. Environmental Ethics:***

The understanding of ethical responsibility toward the natural environment and future generations through the concept of environmental ethics challenges anthropocentric views,

advocates for ecological justice, supports the promotion of respect for biodiversity, conservation and inter-generational equity.

### ***2. Humanistic Philosophy:***

Humanistic education promotes the holistic development of individuals (intellectually, emotionally, socially and morally). Using this philosophy as a basis for green education provides individuals with the opportunity to develop a sense of empathy for nature and to live their lives in a sustainable manner (Alhussini, 2020).

### ***3. Systems Thinking:***

Systems thinking enables an individual to see the interconnectedness of ecological systems (i.e. ecosystem, economy and society to solve ecological problems (e.g. climate change). Educators who provide students with critical thinking skills can link what they do locally to the global consequences of their actions (Jorgenson, 2014).

### ***4. Sustainable Development Paradigm:***

The Sustainable Development Paradigm is endorsed by all global education policy; it enables the ability to meet the needs of present and future generations without compromising the ability of future generations to meet their own needs (UNECE, 2011). Green education embodies the Sustainable Development Paradigm, by aligning the educational objectives with achievement of sustainability competencies.

### ***5. Feminist Planetary Consciousness:***

This theoretical foundation of feminist planetary consciousness is the most recent and critical; in other words, the expression of values which are leading to the degradation of the natural world by supporting its exploitation because of the values of domination and extraction are also at the base of oppressing groups that are vulnerable or marginalised (such as girls and women). Hence, creating feminist planetary consciousness is to build awareness about the impacts of power and patriarchy, colonialism and racism on both human systems and natural systems, thereby informing the development of global and planetary citizenship (Russell and Bell, 1996; Moraes and Freire, 2017; Kwauk & Casey, 2021).

## **Objectives of Green Education**

Green education is designed to bring about changes that will produce certain results through established learning objectives that include

1. Developing understanding about ecological systems and environmental issues (UNECE, 2011).

2. Cultivating of values related to sustainability such as environmental stewardship, moral obligation and social justice (Arnold, 2007).
3. Empowering students to be active participants in the creation of sustainable communities (Jorgenson, 2014).
4. Transforming educational institutions into environmentally responsible entities (Aithal & Rao, 2016).
5. Encouraging sustainable consumption and environmental responsibility in personal behaviour through the development of alternate lifestyle patterns (Alhussini, 2020).
6. Creating opportunities for interdisciplinary research and innovation which can help solve environmental problems (Jorgenson, 2014).
7. Developing sustainability competencies that are defined in the four areas: systems thinking (i.e., being able to see relationships & complexity), anticipatory competency (i.e., being able to see various futures/ evaluate multiple futures), normative competency (i.e., being able to reflect on your own underlying norms/ values) and strategic competency (i.e., collectively creating innovative actions that will help achieve sustainability) (Rieckmann, 2018).

Green pedagogy is instrumental in achieving a number of Sustainable Development Goals, such as (SDG 4) Quality Education, (SDG 3) Good Health and Well-Being, (SDG 7) Affordable and Clean Energy and (SDG 8) Decent Work and Economic Growth by enhancing the quality of learning environments, promoting the acquisition of green skills and encouraging individuals to engage in sustainable behaviours (Akinsemolu & Onyeaka, 2025). In order to be involved in sustainable development, individuals must learn how to understand the complex environment they inhabit and how to manage uncertainties, trade-offs, risks and rapid societal (global) changes. They will need to be able to collaborate, advocate and act for positive change in the World (UNESCO, 2015). Individuals can be identified as ‘sustainability citizens’ (Wals, 2015; Wals & Lenglet, 2016).

### **Dimensions of Green Education**

Green education operates across multiple interconnected dimensions.

#### ***1. Curricular Dimension:***

Sustainability themes are integrated across disciplines including science, social sciences, humanities and professional education (Aithal & Rao, 2016). Curriculum frameworks incorporate:

- Climate change education
- Biodiversity conservation
- Renewable energy studies
- Sustainable urban development
- Environmental policy analysis

(UNECE, 2011)

Teacher education programmes play a crucial role in disseminating sustainability pedagogy (Alhussini, 2020).

## ***2. Institutional Dimension:***

Green institutions implement:

- Energy-efficient infrastructure
- Waste segregation systems
- Rainwater harvesting
- Solar energy installations
- Sustainable procurement policies

(Aithal & Rao, 2016)

Such initiatives model environmental responsibility and reinforce experiential learning. Institutions are using what is called a "whole-institution approach", where they have rethought their entire institutions in regards to their curriculum, campus operations, organizational culture, ways students are involved, leadership and the community in which they operate, in order to turn themselves into both a model institution and a model for practical learning for sustainable development (UNESCO, 2018).

## ***3. Pedagogical Dimension:***

Green education promotes participatory and experiential learning strategies, including:

- Project-based sustainability tasks
- Community environmental surveys
- Service-learning initiatives
- Field-based ecological studies

(Jorgenson, 2014)

These approaches enhance critical thinking and civic engagement. Active learning approaches are integral to transformative green pedagogy as they play an important role in

enabling students to link their learning with tangible environmental issues that they can develop sustainable solutions for through interdisciplinary engagement and critical reflection (Sarkar, 2025). The use of "action-oriented transformative pedagogy" is an example of a learner-centred approach (Barth, 2015) with action-oriented learning to help students engage in real projects and reflect on the process and transformative learning that provide opportunities for learners to question their perceptions of the world and make changes in how they view and approach their world (Mezirow, 2000; Slavich and Zimbardo, 2012).

#### ***4. Community and Social Dimension:***

Schools and colleges partner with their local communities (including NGOs and government agencies) to raise awareness about the environment and work together to take action (UNECE, 2011). Community involvement helps build a culture of sustainability that extends beyond the walls of an educational institution.

#### **Green Education in Teacher Education**

The successful implementation of green education is largely dependent on teacher education institutions. As instrumental agents of change, teachers impact student attitudes and values towards the environment. Green education in teacher education focuses on preparing future teachers to use sustainability in their professional practice (Aithal & Rao, 2016). Teacher education programs can use green education as part of their curriculum, institutional practices and community engagement. Teaching sustainability-oriented initiatives to pre-service teachers exposes them to developing environmental consciousness and ethical responsibility (Alhussini, 2020). By preparing pre-service teachers as role models and advocates for environmental sustainability, they can use their knowledge and skills to demonstrate environmental sustainability in their school environments. Professional development programs should include the following:

- Sustainability literacy modules
- Environmental ethics seminars
- Green pedagogy workshops
- Action research on sustainability

(Alhussini, 2020).

Green Education is a form of teacher development that enhances an in-service teacher's ability to teach children about the environment and sustainability through ongoing professional development programs that provide opportunities for educators to learn what is

currently known about environmental literacy and sustainability (Jorgenson, 2014). As a result, by helping teachers develop a deeper understanding of sustainable practices, green education will also enhance the quality of education provided to students and help make that education more applicable to 21st-century society.

### **Green Education in Higher Education**

Institutions of higher education share a large stake in the promotion of green education because of their function as creators of knowledge, trainers for professional careers and as leaders for all people. Colleges & universities that have established a green education framework are able to include sustainability in their academic programmes, research activities and campus operations (Aithal & Rao, 2016). Higher education institutions that practice green education foster interdisciplinary research & learning on environmental issues. Through this fusion of learning and research, students gain a broad and deep understanding of the challenges to sustainable living, thereby equipping them for professional placement within diverse fields of work (UNECE, 2011). Research in environmental sustainability will foster evidence based policy and increase awareness of environmental issues among the public. There is a significant role for Higher Education Institutions to play in continuing the advancement of sustainability through innovation, research and policy. (Jorgenson, 2014). Green Higher Education refers to the following:

- Interdisciplinary sustainability research
- Green campus initiatives
- Carbon-neutral policy adoption
- Community sustainability outreach

(UNECE, 2011; Aithal & Rao, 2016)

Institutions that include sustainability in their efforts to provide governance can be accountable for their actions. Additionally, the integration of sustainable practices into higher education institutions can result in those institutions serving as examples of sustainability by implementing initiatives for creating a green campus. Institutions use green campus initiatives to show their dedication to sustainability, while also providing hands-on learning experiences for students (Alhussini, 2020).

### **Green Education and Institutional Transformation**

Green education, as a conceptual framework for institutional reform, requires a shift from instruction in classrooms to the entire educational system structure. Institutional

transformation means reorienting governance, policy, physical infrastructure, culture and accountability systems toward sustainability objectives (Jorgenson, 2014; Aithal & Rao, 2016). Green education is inherently a multidisciplinary approach that incorporates all three aspects of sustainability: social, economic and environmental; thus, green education transforms students into agents of social change (Parry & Metzger, 2023).

### ***1. Governance and Policy Integration***

Embedding environmental responsibility into mission statements, strategic plans and quality assurance systems is essential for achieving institutional sustainability. The incorporation of sustainability goals into:

- Institutional vision & mission
- Annual development plans
- Budget allocations
- Accreditation criteria
- Performance indicators

Research indicates that to make sustainability integration effective, there must be active support from institutional leaders (Alhussini, 2020). Failure to achieve alignment at the policy level often results in green initiatives being regarded as mere symbolism or being fragmented at the institutional level. The transformation process involves the establishment of sustainability committees, green audit systems and campus environmental monitoring units (Aithal & Rao, 2016) as systematic means of ensuring long-term implementation and continuity of green practices.

### ***2. Green Campus as a Living Laboratory***

The "Green Campus" initiative is a real-world example of what it means to transform an institution. A Green Campus uses ecological principles in its physical and operational systems, including:

- Renewable energy sources
- Rainwater harvesting systems
- Waste segregation and recycling
- Sustainable landscaping
- Energy-efficient building design

(Jorgenson, 2014)

When students see these sustainability initiatives at their college or university and can participate in them, the concept of sustainability is no longer just an idea but something that they can experience. That experience will help to further their understanding of ecological consciousness and behavioural commitment (UNECE, 2011). Colleges and universities can be living laboratories for testing, evaluating and refining sustainable practices. The ongoing interaction between theory and practice provides additional support to the transformative potential of green education. An international example of this is the Green School in Bali, Indonesia, which has been built entirely of bamboo, generates its own hydroelectricity and solar power, utilizes compostable toilets and produces organic crops through the school's own food garden. The Green School uses its very existence and day-to-day operations as a "living laboratory" to provide an immersive learning environment for students while they learn sustainability (Green School Bali, 2017).

### ***3. Research and Innovation for Sustainability***

In addition to transforming institutions, they must also develop a strong research agenda. As sources of knowledge and innovation, universities sharply influence public policy and societal behaviour through their research agendas (Jorgenson, 2014). Green education promotes interdisciplinary research to address the following key sustainability issues:

- Climate resilience
- Sustainable agriculture
- Renewable energy technologies
- Environmental governance
- Sustainable urban planning

(Aithal & Rao, 2016)

By developing research that supports sustainability challenges, institutions of higher education directly contribute to achieving the UN's Sustainable Development Goals (SDGs). Furthermore, integrating sustainability research into the teaching process strengthens the academic relevance and societal contributions of institutions.

### **Green Education and Sustainable Development in India**

There are a number of different types of environmental problems affecting India, including air pollution from large cities, depletion of groundwater, deforestation, improper disposal of waste and climate change vulnerability. All of these issues are compounded by poverty, urbanisation and expansion of industry. The current pace of global policy changes suggests

that there is a sense of urgency to include girls in developing solutions for addressing climate change, since analyses of the 160 Nationally Determined Contributions (NDCs) submitted to the Paris Agreement indicate that only 4 of the contributions specifically mentioned girls, 2 mentioned girls' education and none referred to the potential benefits of supporting girls' education and gender equality on achieving NDCs. Green education in countries such as India provides a tremendous opportunity to advance this agenda (Kwauk, Cooke, Hara, & Pegram, 2019). Therefore, education about sustainability is extremely important.

### ***1. Alignment with National Educational Goals***

Integrating sustainability into the curriculum as part of an overall system of holistic and values-based education is consistent with India's national goals for education and its focus on developing and implementing national strategy in a holistic and value-based way. The recent reforms in education place increasing emphasis on teaching environmental awareness and ethical responsibility as fundamental components of national progress (Aithal & Rao 2016).

The potential impact of green education on Indian youth is significant in terms of:

- Building capacity for young people to be environmentally literate
- Encouraging responsible consumerism
- Promoting sustainability initiatives at the community level
- Promoting awareness of climate change adaptation

(UNECE, 2011)

In India, teacher training institutions in geographic areas where the environment is under stress can play a vital role in providing education about sustainability to students and their families throughout the school system.

### ***2. Community Engagement and Grassroots Impact***

In India, grassroots participation is necessary for achieving sustainability in addition to institutional reforms. Green education focuses on working together with local communities and educational institutions (Jorgenson, 2014). Examples of community engagement include:

- Environmental awareness campaigns
- Tree plantation drives
- Waste reduction initiatives
- Water conservation projects
- Sustainable agriculture awareness programmes

(Aithal & Rao, 2016)

These projects build civic responsibility and develop community resilience.

### ***3. Teacher Education as a Strategic Lever***

Institutions that prepare teachers are key to spreading sustainability values. When pre-service teachers are taught through green education frameworks they have the ability to include environmental themes across areas of study in their schools, impacting students for future generations (Alhussini, 2020).

Professional development programmes should emphasise:

- Sustainability pedagogy
- Environmental ethics
- Climate change education
- Community-based sustainability projects

(UNECE, 2011)

When teachers embrace sustainability values, they become agents of substantial transformative change.

### **Framework for Implementing Green Education**

To operationalise green education effectively, a structured implementation framework is necessary.

#### ***1. Policy-Level Integration***

- Incorporate sustainability goals in institutional vision documents.
- Establish green audit systems.
- Create sustainability committees.

(Jorgenson, 2014)

This requires looking beyond "green jobs" or simply technical skill sets. There needs to be an overarching policy framework that integrates three overlapping agendas:

1. Skills for green jobs (rather than just specific skills),
2. Green life skills (e.g., generic skills such as critical thinking, empathy),
3. Skills for transforming our society towards sustainable practices (i.e., the capacity to challenge socio-economic injustices).

## ***2. Curriculum Reform***

- Integrate sustainability themes across disciplines.
- Introduce interdisciplinary sustainability courses.
- Promote experiential and project-based learning.

(UNECE, 2011)

## ***3. Capacity Building***

- Conduct workshops for teachers and administrators.
- Develop sustainability literacy modules.
- Encourage action research on green practices.

(Alhussini, 2020)

## ***4. Campus Sustainability Initiatives***

- Implement renewable energy systems.
- Establish waste management programmes.
- Promote water conservation measures.

(Aithal & Rao, 2016)

## ***5. Monitoring and Evaluation***

- Develop sustainability indicators.
- Conduct periodic environmental audits.
- Evaluate behavioural change outcomes.

(Jorgenson, 2014)

## **Challenges in Implementing Green Education**

Despite its transformative promise, green education faces several structural and operational challenges.

### ***1. Fragmented Curriculum Integration***

Environmental education is often restricted to dedicated courses within many educational institutions rather than being incorporated across all courses and disciplines; this fragmentation produces limited connections and will undermine a holistic understanding of the topic (Aithal & Rao, 2016). Institutional policies and supportive frameworks need to exist to create cross-disciplinary curriculum reform and support a more comprehensive approach to green education (UNECE, 2011).

## ***2. Limited Institutional Commitment***

Sustainability efforts and policies do not typically receive continued support on a higher administrative level. Budget constraints, competing priorities and no leadership commitment are hindering factors for long-term successful implementation (Jorgenson, 2014). Institutional transformation requires long-term strategies as opposed to singular environmental activities.

## ***3. Teacher Preparedness and Capacity Gaps***

Many teachers do not possess adequate training to teach sustainability. Teachers will be less likely to incorporate environmental themes into their lesson if they have not had a professional development program concerning the environment (Alhussini, 2020). Therefore, capacity-building programs should accompany curriculum implementation. The success of pilot programs training teachers in developing green curricula in Bulgaria, Romania and Serbia is an illustration of the power of capacity building. When surveyed, prior to training and mentoring they were typically rated between 0 and 10 (5.0) on their ability to develop their own green learning activities. Following eight hours of teacher training and mentoring, teacher confidence was increased by more than 50%. In the case of Serbia, the increase was over 60%. This evidence clearly illustrates that structured professional development for teachers is essential to closing the capacity gap (Afrikanov, 2023).

## ***4. Assessment and Evaluation Constraints***

Traditional assessment systems primarily measure cognitive outcomes and academic performance; however, in order to determine effectiveness and value of a green education, the development of sustainability assessment frameworks to measure values, attitudes and behavioural changes needs to be developed (UNECE, 2011).

## ***5. Socio-Economic and Infrastructure Limitations***

Institutions in developing contexts are facing limited resources to implement green practices (Aithal & Rao, 2016). Institutions will require creative, low-cost sustainability solutions.

## ***6. Resistance to Transformative Agendas***

An often overlooked, but substantial challenge to implementing this transformative model of education (Approach Three in the new green learning agenda) is the resistance met through the existing political and cultural institutions of society at large (e.g., government). Confronting power and patriarchy and breaking down unjust economic structures has the potential to be seen as "too political" for the classroom. Therefore, it becomes a potentially

unappealing option to teachers; a target of a lobbying campaign by traditionalists; and, consequently, deep structural changes are more difficult to achieve (Sterling, 2011).

## CONCLUSION

Green education is an emerging educational philosophy and practice. It is much broader than environmental education; it incorporates sustainability into all aspects of formal teaching and learning, such as curriculum, governance, research and community outreach, as supported through academic literature. Place-based pedagogy and institutional transformation, both of which are supported by an analysis of the literature, provide the basis for transforming how to educate environmentally responsible citizens and develop sustainable communities. In India, where environmental issues are shaped by socio-economic issues, green education creates a strong foundation for developing responsible citizens and sustainable development. Teacher preparation and higher education institutions have an important role in advancing green education. While challenges exist in implementing green education by integrating with curriculum, developing institutional support and commitment, preparing teachers to teach green education and developing assessment systems, the ultimate impact of green education in transforming individuals and society is tremendous. To build ecologically responsible societies, green education can effectively develop environmental literacy, ethical behaviour related to sustainable development and institutional accountability. Therefore, transforming institutions through green education is critical to achieving ecological justice and intergenerational sustainability in the 21st century. The transformative power of green education is its ability to change how people view and behave, establishing education as a driver for producing sustainable and resilient futures.

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