Green Schools and Green Education: Towards a Sustainable Future

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Introduction

Human activities have been a factor influencing the environment since ancient times. Initially, this impact was small, and the environment was able to eliminate it through its own natural mechanisms. Today, the negative impact of the rapidly increasing human population on the environment is clearly observable. In recent years, various parts of the world have been facing natural disasters as a result of climate change, including droughts, floods, rising sea levels, severe winds, and deadly summer heatwaves. These events have led to an incalculable loss of both life and property. If the current indifference to environmental protection continues, it is highly likely that humanity will face many more disasters. Recognizing that there is no time to lose and that they bear a responsibility, many educational leaders have prioritized conservation and environmental awareness. As a result of the relationship between education and the environment, the concept of green schools has emerged. This section will discuss the concept and importance of green schools, green school designs, green school practices, and the topic of environmental education.

The Concept and Importance of Green Schools

In the early stages of settled life, humans, who recognized the resources provided by the Earth, benefited from these resources and were able to maintain balance, lost this equilibrium with the Industrial Revolution, which can be regard as another pivotal moment in the course of history. With the production, industrial and urbanization activities in the light of technological developments, the use of exhaustible resources and fossil fuels has increased unconsciously and the destruction of the natural environment and the earth has become a universal problem (Özdemir, 2023). Due to the destruction caused by these problems, the living space of our world and the quality and nutritional value of many products, from the air we breathe to the food we eat and drink, are decreasing. The evident emergence of the traces of this change has compelled humanity to take action and finally feel the necessity to do something (Bulut & Çakmak, 2018). The concept of sustainable development emerged when politicians, international social society organizations, scientists, artists and other people who could make their voices heard by large masses frequently raised this problem. The concept of sustainable development, defined in the United Nations' Brundtland Report as "meeting the needs of the present without compromising the ability of future generations to meet their own needs," emphasizes the conscious and responsible use of natural resources and the preservation of the balance between humanity and nature. It underscores the importance of planning development to meet the needs of both present and future generations. This requires responsible and conscious use of natural resources while maintaining the balance between humanity and the environment(BM, 1987). Sustainable development stands out as a key effort to address today's most critical global issues. This concept entails using current resources while considering environmental, social, and economic factors in an integrated manner, with an emphasis on meeting the needs of future generations. The most important thing to be done in order to realise these goals is to raise conscious individuals by creating a conscious society. Thus, education is a crucial determining factor for the realization of sustainable development, as schools serve as societal institutions responsible for the education of individuals. (Atıcı, 2019).

Education should be recognized as a process through which individuals and societies can achieve their highest potential, including formal education, public awareness and educational programs. Education is essential for promoting sustainable development and enhancing individuals' capacity to provide solutions to environmental and development issues.

Basic education provides a foundation for all types of environmental and development education, while the integration of environmental and development education as an essential part of learning is necessary. Both formal and informal education are essential for changing individuals' attitudes, enabling them to assess and solve sustainable development problems. (BM, 1993; Gough, 2020). The concept of "Education for Sustainable Development" (ESD) first emerged in United Nations documents during the latter half of the 20th century. Its development is closely tied to the implementation of key policy frameworks adopted by the global community at the 1992 Rio de Janeiro Conference on Environment and Development. At this summit, world leaders emphasized that education is one of the key factors in achieving sustainable development and a better, more secure future, and that it is a decisive element in driving change (Bulut & Çakmak, 2018). In this regard, green schools emerge as institutions that contribute to achieving sustainable development goals by integrating the principles of environmental, social, and economic sustainability into educational processes, benefiting both individuals and communities (**Figure 1**).

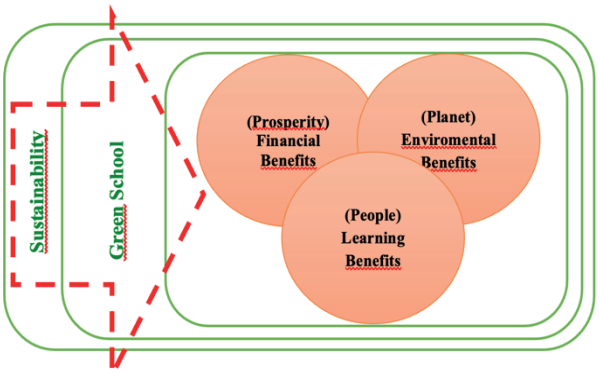

Figure 1. Green schools in the context of the sustainability movement adapted by Kensler (2012)

Green schools represent one of the ways in which the education sector responds to and engages with the sustainability movement. Green schools are educational environments that prepare students to become leaders and individuals equipped with the knowledge, values, and skills necessary to act effectively based on an understanding of how the natural world functions, recognizing patterns that connect human activities to nature. A green school is much more than a curriculum or a building made of brick and mortar; it is a social responsibility and a lifelong process. Green schools are institutions that work directly with teachers, students, administrators, officials, and various communities to create programs that transform all schools into healthy learning environments. The importance of these practices and the observed positive effects of green initiatives on students have led to the rapid spread of the green school movement worldwide. The concept of a green school was first introduced in Europe in the early 1990s with developments in environmental education and sustainability in order to promote sustainable educational practices, and continued with the idea of an Ecological School proposed by the The Foundation of European Environmental Education (FEEE) in 1994. Its aim is to gradually adapt environmental education into all areas of school management and establish a comprehensive environmental management system for schools. However, Europe's green campus plan was initially limited to environmental education in primary and secondary schools, and to sustainability education in colleges and universities (Zhao et al., 2015). In the following years, alongside various studies on green schools, the United States Green Building Council (USGBC), as the world's largest developer of environmental and building technologies, advanced its efforts to provide all

students with access to green schools by establishing the Green Schools Center in 2010. This initiative was supported by the LEED (Leadership in Energy and Environmental Design) rating system, which certifies buildings. The Green Schools Centre supports schools to reduce their environmental impact, achieve energy efficiency and create healthy learning environments, while at the same time promoting students' environmental awareness and education on sustainability (https://www.usgbc.org/press/about-center-green-schools, 20.10.2024). FEEE and USGBC are two major leading international 'green' non-governmental organisations, with FEEE Global focusing on the educational aspects of green schools and USGBC focusing on the building and environmental aspects of green schools. Today, FEEE runs the Eco-School programme, which claims to have 49,000 school participants in 64 countries. Until 2001, its name was 'European Foundation for Environmental Education, FEEE' because its projects were implemented only in European countries; in 2001, at the General Assembly held in Copenhagen, Denmark, the name was changed to 'International Foundation for Environmental Education, FEE' when South Africa became a member (TURÇEV, 2024). The origins of the green school movement in architecture and education are outlined below (Iwan & Rao, 2017).

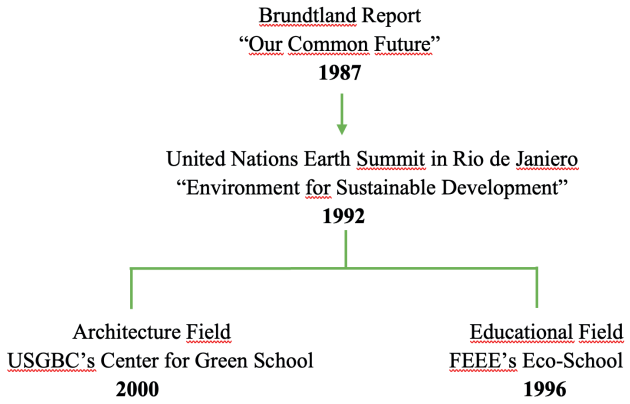

Figure 2. The origins of green schools related movements (Iwan & Rao, 2017)

According to the U.S. Green Building Council (USGBC), a green school is a building or facility designed to foster a healthy learning environment while conserving energy, resources, and money. According to UNESCO, the term "Green School" is defined as an approach to Education for Sustainable Development (ESD). This definition emphasizes the importance of schools becoming both safe and resilient learning spaces, while also being innovative centers where students and local communities are equipped with the knowledge, skills, values, and attitudes necessary to cope with the effects of climate change (UNESCO, 2024). Gordon defines a green school as the physical outcome of a process in which the planning, design, and construction phases are carried out together, considering the performance of a building throughout its 50 to 60-year life cycle (Gordon, D.E. 2010). In another definition, a green school is described as "a school building that saves energy, resources, and money while creating a healthy environment that supports learning." (Bademcioğlu, 2017). Each country generally defines green schools in its own way, as there is no universally accepted standard definition. In the current trend, terms such as "green," "eco," "healthy," "sustainable," and "high-performance" are often used interchangeably (Warju et al., 2017; Zuraini 2017; Kara 2024). Despite different definitions of green schools, the goal is the same; green schools are educational institutions that aim to make our world sustainable by creating a community of learners who understand how nature works, who can see how human activities are connected to nature, and who prepare students to become leaders and citizens with the knowledge, values and skills to act effectively based on this understanding (Center for Ecoliteracy, 2010). Green schools serve the purpose of having positive environmental and social characteristics by providing a healthy, safe, comfortable, functional physical environment that supports the health and development (physical, social and intellectual) of all those who interact with the school,

especially students and teachers (Demir, 2012). At the same time, eliminating toxic substances, using resources sustainably, creating green school gardens and buildings, providing healthy food and creating active learning-teaching environments can be counted as the aims of the green school (http://www.greenschools.net/section.php-id=10.html) 25. 10.2024). The fundamental framework of a green school is shown in **Fig. 3**.

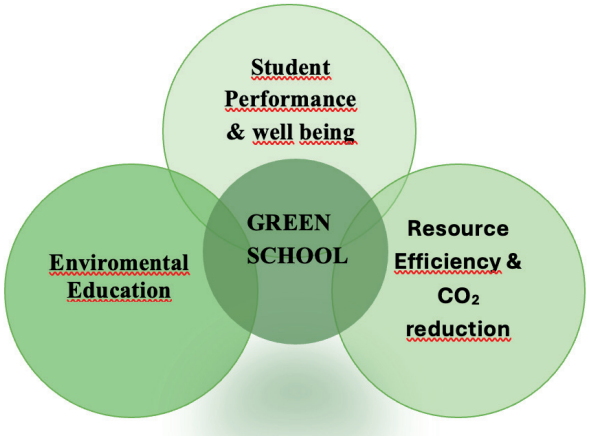

Figure 3. The basic framework of green school (Zhao et al., 2015)

According to the Green School Centre USGBC, the general characteristics that a school that can be considered green should have are listed as follows:

- Conserve energy and natural resources.
- Improve indoor air quality.
- Remove toxic substances from children's places of learning and play.
- Utilise daylighting strategies and improve classroom acoustics.
- Reduce the burden on water and wastewater treatment.
- Promote waste management efforts for the entire community.
- Protect clean drinking water and help manage stormwater runoff.
- Encouraging recycling.
- Promote the protection of habitats.
- Reduce demand on local landfills (Zhao et al., 2015; Ramli et al., 2012).

As a result, green schools are educational institutions that adopt environmentally friendly practices in many different areas from energy to water, from waste to natural materials, providing students with sustainability awareness and providing significant benefits both environmentally and economically. Green schools not only create a healthy and efficient learning environment for students but also promote a sustainable lifestyle and environmental awareness within the broader community. For these reasons, green schools are becoming increasingly important as a cornerstone of future education systems. Investments in this field are critically significant for both the present and the future of our world. In this context, the importance of eco-friendly approaches and building designs applied in the design of green schools is increasing. Green building designs play a critical role for these schools to achieve their sustainability goals and offer various innovative methods to increase the efficiency of school buildings with environmentally friendly features.

Green School Designs

School buildings are places where students come together to learn various types of knowledge, develop essential skills, and receive education to become productive members of society. For students who spend most of their time in school, the educational structures are of significant importance in terms of health and comfort. In this regard, the desire to leave healthier, safer, more efficient, and livable spaces for future generations makes it essential for educational buildings to possess sustainable features (Tavşan&Yanılmaz, 2019; National Research Council 2007). A school building that provides a healthy environment conducive to learning while also saving energy, resources, and costs is defined as a green school building (Bademcioğlu, 2017). Green school buildings are not only physical spaces for education but also sustainability-focused environments that instill environmental awareness in students. With the advancement of eco-friendly technologies and design approaches, green schools play a significant role as the educational structures of the future. The design of green schools is influenced by factors such as environmental considerations, building placement, climate conditions, seasons, natural light utilization, and energy efficiency. Additionally, sustainable material selection, water management systems, maintenance, repair, cleaning practices, as well as interior design factors such as humidity, ventilation, and acoustics, play a crucial role. All these factors contribute to the environmental performance of the school, providing a healthy learning environment that enhances the health, productivity, and overall well-being of students and teachers (**Figure 4**). To maintain the balance of nature, it is essential to raise individuals who are aware of sustainability and to construct buildings that cause as little harm to the environment as possible throughout their life cycle (Evran, 2012).

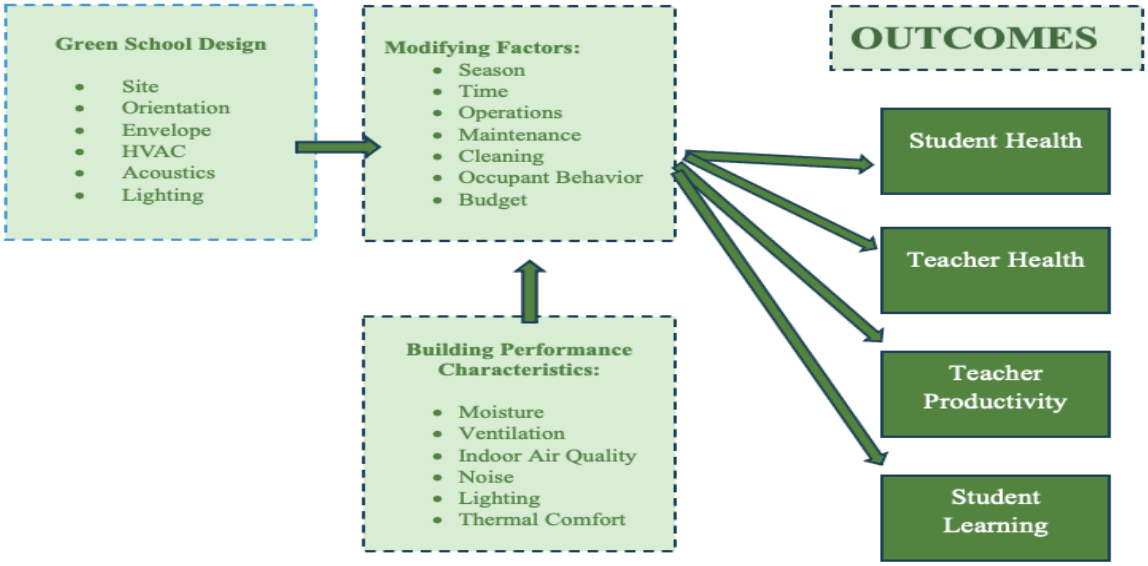

Figure 4. The relationship between green school design, learning, health, and productivity. (National Research Council, 2007)

Sustainability criteria in green school buildings aim to design more efficient, healthy, and long-lasting structures by balancing environmental, economic, and social factors. These criteria not only focus on reducing environmental impacts but also aim to make educational environments healthier and more efficient. It is important that schools aiming to gain sustainable development goals have sustainable qualities structurally in terms of the messages they give to the environment and the individuals receiving education in them. Sustainability criteria in educational buildings are examined under different headings in many sources. Some of the sustainability criteria that should be applied in green schools are explained below.

Energy Efficiency

School buildings rank among the top public buildings in terms of energy consumption, and energy costs typically represent the largest expenditure in most school budgets. Therefore, reducing energy consumption in schools is of significant economic importance (Ezema et al., 2022). Green schools feature design elements that minimize energy consumption. For example, the use of solar panels and energy-efficient heating and cooling systems, the installation of sensor-based smart lighting, and the use of smart thermostats reduce the environmental footprint of school buildings. Additionally, utilizing natural light and proper building orientation can also reduce the need for heating. Energy-efficient buildings have lower operational costs and contribute to more efficient learning processes for students. There are various examples of green schools around the world that focus on energy efficiency. One of the best examples of sustainable living is the Green School project in Bali, brought to life by the environmentally-conscious and design-focused couple, John and Cynthia Hardy (**Figure 5 a, 5b**). The school, built on profound wisdom, places equal importance on all areas of life. The primary material used in the school is bamboo, a traditional material of Bali, and it serves as an educational facility for local children as well as those from different parts of the world. The school, constructed with bamboo—an easily renewable, durable, lightweight, and flexible material—derives its energy from renewable sources. Located by the Ayung River and near forested areas, the Green School generates its energy through solar panels and generators powered by water.

Figure 5a. The moment of studying in open-air bamboo classrooms overlooking the gardens

Figure 5b. Student school buses, BioBuses

Water Efficiency

The continuity of clean water that we can leave as a legacy to future generations is of great importance, requiring the conscious use of resources, water conservation, prevention of water pollution, and raising awareness about the importance of water. Sustainable water management

can be considered as reducing water consumption through the application of water efficiency technologies alongside changes in user behavior. Schools use a significant amount of water daily for heating and cooling systems, restrooms, faucets, cafeterias, laboratories, outdoor play areas, and landscaping. Implementing sustainable water systems in green schools provides an important opportunity to educate students about the significance of conserving our natural resources (Rabab et al., 2019). In green schools, the implementation of rainwater harvesting systems, the use of water-saving fixtures, reducing water consumption in landscaping, reusing gray water from sinks and showers for irrigation or cleaning, and installing systems that prevent rainwater from directly reaching the building's foundation while allowing water to accumulate, contribute to significant water conservation. Green schools raise awareness among students through practices that promote water efficiency, helping them develop water-saving habits (Okasha et al., 2016; Demir, 2012). Uaso Nyiro Primary School, located in the arid Central Highlands of Kenya, has been named one of "the two greenest schools in the world" by the U.S. Green Building Council. The school has not only made a significant impact on its educational environment but has also undertaken a vital project addressing a critical issue in its arid region. The school has not only served as a sustainable educational space but has also provided a solution to the region's most pressing issue—water scarcity—by harvesting rainwater. The school collects 350,000 liters of rainwater annually, and the water, filtered through a clay-based system, is even used for agricultural activities like irrigation in the school garden. The rainwater collected from the roof is provided to the school within its own habitat, ensuring that it reaches many people (**Figure 6.)** (https://www.yesilist.com/dunyadan-3-yesil-okul/.).

Figure 6. The Uaso Nyiro primary school's water collection system

Indoor Air Quality

Indoor environments, where individuals spend approximately 90% of their time, contain gases, particles, air pollutants, and volatile organic compounds such as formaldehyde, which the WHO has highlighted as harmful to human health. Outside of the home, schools are indoor environments where children spend a significant portion of their time and are often their first social spaces in life (Sa´ et al., 2024). Therefore, it is crucial to prevent the negative health effects of poor air quality in schoolchildren. There is strong evidence that exposure to indoor air pollutants in educational buildings affects children's health, academic performance, and engagement. Improving indoor air quality has been shown to make students' time spent at school more productive and reduce health-related issues (Branco et al., 2024, Sadrizadeh et al., 2022). In green schools, the use of non-toxic indoor coatings, cleaning products, and school materials is crucial to improve air quality. Additionally, when constructing a green school building, it is important to avoid sources of pollution such as wet areas, nearby hazards, or fumes from highways, and to keep the school building away from parked vehicles. Natural ventilation systems improve indoor air quality, allowing students to focus better and learn in a healthier environment. For this reason, a green school building should be designed and constructed with a large number of openable windows (Ramli et al., 2018).

Natural Lighting

In the design of school buildings, balancing daylight and energy performance is crucial. It is well-established that the quality of learning, which is a fundamental activity for children spending about 30% of their day at school, is directly linked to natural daylight. Daylight plays a significant role for students in terms of memory retention, mental activity, and psychological well-being (Erlalelitepe et al., 2011; Alkhatatbeh et al., 2023). It is well-known that natural daylight has positive effects on students' health, mood, and performance. By effectively utilizing daylight, the need for artificial lighting can be minimized, contributing to the country's economy. To make the most efficient use of daylight, it is important to consider the proper orientation of school buildings, the selection of large windows, the use of skylights, and the preference for light-colored materials that increase the interior light levels. At the same time, to reduce and control the negative effects of daylight such as glare and reflection, sun shading panels can be used on the exterior facade, light shelves and shading panels can be used indoors. According to Barker (1982), in schools and classrooms, the lighting level must be at its optimum level to ensure that all tasks are completed effectively and to protect the eye health of both staff and students. Furthermore, he argues that proper lighting significantly contributes to students receiving education under the most suitable conditions and helps individuals become healthier and more productive (Tavşan&Yanılmaz, 2019). Nortside Elementary School in North Carolina, which has been awarded LEED Platinum certification, is a good example of a classroom environment created with natural lighting (**Figure 7**).

Figure 7. The use of natural lighting at Northside Elementary School in North Carolina (https://www.usgbc.org/projects/northside-elementary-school?view=overview)

Acoustics

Sound is one of the factors that affect both the physical and psychological health of individuals. Noisy educational environments cause mental stress and psychological issues for both students and teachers. Therefore, ensuring good acoustics in school environments plays a crucial role in creating the most conducive learning environment for students. The negative effects of noise pollution on human health are well-documented and widely recognized. Especially in educational buildings, noise, which reduces the perception and learning skills of students and causes distraction, is an issue that should be carefully examined at the design stage. School climate is the most important factor determining the quality of education in schools. Noise disrupts the school climate and reduces the efficiency of education and training activities. (Bulunuz et al., 2018). Noise pollution can come from a wide variety of sources, particularly in school environments. External sources include aircraft, traffic, rain, noise from playgrounds and outdoor sports, and noise from nearby school buildings. Inside the school, sounds from pupils and teaching activities can be transmitted between floors and through the walls. When designing green school buildings, controlling sound

in instructional areas should also be carefully considered (Liu et al., 2023). Arcadia Primary School, located in Scotland, is a great example of creating acoustically comfortable environments through the use of high-quality materials (**Figure 8**).

Figure 8. Arcadia primary school in Scotland is an educational environment that regulates acoustics through the use of high-quality materials

Green School Practices

In learning, when individuals engage in hands-on experiences, apply their acquired skills in real-life situations, and observe the impact of their actions, it enhances the durability of their behaviors. This experiential learning process increases retention and helps individuals internalize what they've learned, making it more likely that they will continue applying these behaviors over time (Dewey, 1952; Perkins, 1991; Piaget, 1969; Vygotsky, 1978; Bruner, 1990). Therefore, having schools with sustainable structures and curricula aligned with green education will positively support students' learning and implementation processes. Green schools play a key role in developing environmental awareness and sustainability skills in students, contributing to building a healthy future. For children, it is thought that having sustainable, environmentally friendly systems around them at all times, especially in the school environment, and getting used to them will cause them to look favorably on these systems in the future (Özburak, 2019).

Ensuring the quality of the education process is a necessary foundation for achieving sustainable development goals. Education, aligned with these principles, not only involves the transfer of knowledge but also helps individuals develop awareness and responsibility regarding environmental and social issues. Today, education is seen as a crucial tool for addressing challenges like pollution, biodiversity loss, and climate change. It shapes the values, perceptions, and awareness necessary to tackle these current environmental problems (Hnatyuk er al., 2024).

School programs should be designed to raise awareness in individuals about respecting nature, protecting the environment, and preserving it for future generations. This is essential for fostering environmental awareness, ethical values, attitudes, skills, and behaviors that support sustainable development, as well as encouraging meaningful public participation in decision-making. For environmental and development education to be effective, it must engage with the dynamics of both the physical/biological and socio-economic environments, as well as human development, which may include spiritual aspects. Such education should be integrated across all disciplines, utilizing both formal (in-school) and informal (out-of-school) methods, and employ effective communication tools. (Gough, 2020).

A green school is defined as a learning institution that takes a holistic approach to education for sustainable development. These schools contribute to addressing environmental issues such as climate change through educational programs, school facilities, activities, management, and collaboration with the community. The aim of green schools is to provide students with knowledge and skills about the social, economic, cultural and environmental aspects of sustainable development (UNESCO, 2024). Focusing on developing green education in this field, FEE (Foundation for Environmental Education) launched Green-Schools and Eco-Schools (2014), the largest sustainable school programs in the world, providing students with fun and hands-on learning opportunities. These programs aim to teach students to take an active role and make contributions toward creating a sustainable world. FEE has created the following table to show how green schools can help achieve the sustainable development goals set by the United Nations, which are expected to be reached by 2030(**Table 1**).

Table 1. *Eco-schools reflect the following sustainable development goals (SDGs)*

	**HOW ECO-SCHOOLS ADRESSES THİS SDG**	**SUGGESTED TOPİC LİNK**
	**No Poverty** Eco-Schools is an inclusive programme which can be adapted to any social and cultural background	**Global Perspective**
	**Zero Hunger** Several eco-schools topics promote improved and sustainable food production. Many schools have gardens to teach sustainable growing techniques, local food products and the importance of biodiversity in agriculture.	**Global Perspective, Outdoor learning**
	**Good Health and Well-being** The Healty Living topic promotes the health and well-being of students and the wider community and makes environmental connections to health and safety.	**Healty Living**
	**Quality Education** The Eco-Schools methodology is a poerful tool for providing quality education for sustainable development at all school levels. Its whole instutional approach ensures an inclusive implementation throughout the whole kindergarten, school or campus and the involvement of all children and students.	**All Themes**
	**Gender Equality** The implementation of Eco-Schools programme also Works towards the achievement of gender equality by giving all students and teachers the equal right to participate in the Eco Committee and the activities which are realeted to the Eco-School programme.	**All Themes**
	**Clean Water and Sanitation** Within the Eco-Schools programme students are being sensitised to the sustainable use of water and sanitation. The water topic especially focuses on this issue providing an introduction to the importance of water both locally and globally and by raising awareness of how simple actions can substantially cut down water use.	**Water**
	**Affordable and Clean Energy** The Eco-Schools programme promotes energy saving initiatives and innovative solutions to reduce energy consumption within the schools within students' and teachers' homes as well as within the wider community. All members of the school work together to increase the awareness of energy issues and to improve the energy efficiency within the school. Furthermore, the students learn how to save energy at home.	**Energy**
	**Decent Work and Economic Growth** The Eco-Schools programme promotes and fosters a deep understanding for sustainability issues among students which are also of increasing importance in the working environment. Through the implementation of the programme students learn how to take leadership in sustainability development and to find sustainable solutions. Their knowledge and experiences gained through the Eco-Schools	**All Themes**

	**Industry, Innovation and Infrastructure** Through the implementation of the Eco-Schools programme innovation in sustainable develeopment is enchanced within the education sector. Especially EcoCampus provides a framework for scientific in sustainable innovaitons and practices.	**Waste, Energy, Transport**
	**Reduced Inequalities** Eco-Schools is a global programme, allowing the adoption to national and local cultures and contexts. To date, 64 countries on six continents have joined the programme, and the international coordination of Eco-Schools is continuously encouraging new countries to participate in the programme in order to widen the network and to give Access to education for sustainable development to all.	**Climate Change, Global Perspective**
	**Sustainable Cities and Communities** By integrating themes such as Sustainable Living. Waste Managemenet and Responsible Consumption into the curriculum, students learn how to reduce the environmental impact of their schools as well as of their personel lifestyles. Through the fostering of responsible behaviour within the school environment, students will also learn how to value and protect the cultural and natural heritage in their countries, as well as abroad.	**Litter, Waste, Transport**
	**Responsible Consumption and Production** The Eco-Schools programme supports responsible consumption and production th through many of its Themes. Students are encouraged to to reflect on their consumption habits and develop ideas and solutions for a more sustainable use of resources. Furthermore, education on resources. Fur recycling and the reduction of waste are integral parts of the Eco-Schools programme. Through the Litter Less Campaign, which is a joint initiative of the Wrigley Company Foundation and FEE, students are educated about litter, encouraging a long-term behavioural change.	**Waste**
	**Climate Action** Many of the countries running the Eco-Schools programme help schools and communities build Climate Change resilience. Examples of school activities include projects for rainwater harvesting, soil stabilisation, food production, sanitation, and waste management, amongst many others.	**Climate Change**
	**Life Below Water** Marine litter and the exploitation of the oceans are two of the most urgent matters of the twenty-first century, which is why one of Eco- Schools Themes is especially based on marine and coastal environments. Students learn about the sources of marine litter and its negative effects on the marine flora and fauna. Furthermore, the importance of using the oceans' resources responsibly is communicated to the students.	**Marine & Coast**
	**Life On Land** The Eco-Schools programme promotes the protection, restoration and the sustainable u use of terrestrial ecosystems through many different activities developed and implemented by the Eco Committee and the pupils. The Great Plant Hunt, a joint initiative of Toyota Motor Europe and FEE, is a special campaign which focuses on biodiversity with a particular emphasis on plants and their associated species. It aims to educate students about biodiversity, its importance, and encourage them to take positive action.	**Biodiversity & Nature**
	**Peace, Justice and Strong Institutions** Justice and democratic values are integral elements of the Eco-Schools programme. Through the Eco Committee the pupils learn how democratic decision-making works and how to respect the views and opinions of others.	**Global Citizenship**
	**Partnerships For The Goals** Through Education for Sustainable Development, the Sustainable Development Goals are implemented within the Eco-Schools network worldwide. Nationally and internationally, the programme cooperates with institutional and corporate partners to develop new projects and to support initiatives that also help towards sustainable development. Amongst others, a Memorandum of Understanding with The International Foundation for the Young Masters Programme (SYMP) for the promotion of overall sustainability awareness and the educational platform The Goals.org on sustainable development was signed.	**Eco Partner**

The Green School Quality Standard aims to align accreditation criteria for schools that prioritize sustainability. This standard targets accreditation providers such as civil society networks, international associations, and governments, with a particular focus on recognizing and supporting schools' sustainability efforts in the field of climate change education. Additionally, it serves as a guide for educational institutions and policymakers. To achieve compliance with the standard, accreditation systems are required to include at least one-third of the recommended activities in the areas of governance, facilities, education, and community engagement. A climate-

ready green learning environment should be structured as outlined below (**Table 2**).

Table 2. *A climate-ready green learning environment (https://www.unesco.org/en/education-sustainable-development/greening-future/schools)*

SCHOOL GOVERNANCE	**TEACHING AND LEARNING**
…entrust the Green Committee to develop a Green School vision and policy and cover 1/3 of suggested activities on • Cultivating sustainable practices • Ensuring daily sustainable practices • Resilience and climate proof governance • Establishing a green community	…develop lesson plans on ESD and climate change education and cover 1/3 of suggested activities on • Integrating ESD with an emphasis on climate change in teaching and learning • Fostering meaningful connections beyond the school • Hands-on projects and initiatives • Leadership and capacity building
FACILITIES AND OPERATION	**COMMUNITY ENGAGEMENT**
…set up a monitoring team and cover 1/3 of suggested activities on • Climate education, awareness and training • Developing a climate-friendly infrastructure • Ensuring climate resilience and disaster preparedness • Promoting school safety and educational continuity management • Promoting green procurement and ethical purchasing	…organize awareness campaigns for the school and the surrounding community and cover 1/3 of suggested activities on • Building climate resilience in the community • School's contribution to community resilience to climate change • Local community support for education responses to climate change • General community-based climate awareness

Education on environmental and sustainability issues should be future-oriented, helping students develop a positive perspective as they face the current challenges of the planet. The importance of a positive attitude for students lies in the fact that they are the individuals who will shape the future of a nation. Their outlook on life should be grounded in a mindset that always carries hope for the best and avoids despair in the face of the worst. A positive attitude is crucial for laying the foundation for a successful and fulfilling life. One of the Sustainable Development Goals, *quality education*, emphasizes the ideal behaviors of students in schools and their contributions to building a sustainable learning community. The skills that a green school can foster in students—think, act, and reflect—are summarized under the main headings in the table below (**Table 3**).

Contributions of Green Schools to Education

Green schools make education more impactful and meaningful by incorporating eco-friendly practices and sustainability-focused approaches. These schools not only instill environmental awareness in students but also positively influence their academic achievements and overall development. The contributions of green schools to education can be outlined as follows:

1.Improving Student Achievement: Green schools enhance academic performance by providing healthy indoor environments and access to natural surroundings. Factors such as natural lighting, clean air, and low noise levels contribute to better focus and increased efficiency in learning processes (Higgins et al., 2005). Furthermore, sustainable building improvements positively impact students' physical and mental well-being, ultimately supporting their academic achievements (Chatzidiakou et al., 2017).

Table 3. *Green School Skills (https://www.greenschool.org/wp-content/uploads/2018/11/Green-School-Skills.pdf, https://www.greenschool.org/wp-content/uploads/2016/03/Green-School-Skills-.pdf)*

THİNK	ACT	REFLECT
Think Creatively Be original. Be imaginative • *Find creative (outside the box) solutions to problems: find divergent thinking strategies* • *Work to your skills and strengths - thinking and Idea spaces, differenti ated assignments* • *Be curious and inquire - Ask great questions*	**Activate** Feel empowered and empowered others. Take action. Make a difference. • *Be a leader; put knowledge to action; experience fully* • *Build trust and empower others to meet goals* • *Model positive behaviour* • *Inspire others to action by taking a stand, taking initiative, taking risks and taking responsibility*	**Be Aware** Look within. Figure yourself out. • *Understand how one learns best and sustain a passion for lifelong learning* • *Be aware of oneself of one's emotional self, the impact of one's emotions on others and of one's personal responsibility for emotional regulation* • *Be aware of oneself and one's personal impact on the community, both locally and globally* • *Be mindful and practice mindfulness*
Think Critically Dig deeper. Ask why. Make connections. • *Exercise skepticism - Question and evaluate credibility and authority* • *Test assumptions* • *Analyze and evaluate evidence, data and arguments*	**Collaborate** Confident alone. Stronger together. Find your way. • *Collaborate and be part of a team (even if that means working alone) Find your role in the whole, and sharing responsibility for goals Consider multiple perspectives*	**Solve Problems** Figure it out. Go for it. • *Apply logic and innovation to investigations and scenarios* • *Set goals, keep focus, develop and implement process* • *Plan, prioritize and manage time and logistic*
Think in Systems Step back and see the whole picture • *See whole systems as more than a collection of parts* • *Identify how human and natural systems interact and impact one another* • *Employ compass tools and activities*	**Communicate** Process, organize, & coherently express ideas • *Listen actively* • *Consider purpose, audience and style* • *Interpret and express ideas graphically, verbally and numerically*	**Adapt** Bend like bamboo • *Change - being receptive and adaptive to change* • *Deal positively to unpredictable circumstances or setbacks* • *Accept and learn from failure. Adjust processes to meet goals*

2.Increased Environmental and Social Awareness: Green schools not only teach students to be environmentally conscious but also reinforce a sense of social responsibility. Integrating sustainability issues into the curriculum equips students with the knowledge and skills necessary to address environmental challenges. This, in turn, strengthens their sense of social responsibility and helps them make environmentally friendly decisions in the future (Lai et al., 2014). Furthermore, incorporating sustainability topics encourages students to think critically about the world around them, fostering a generation of individuals who are more likely to engage in environmentally conscious behaviors. The inclusion of real-world problem-solving, such as working on sustainability projects or addressing local environmental concerns, also helps cultivate

a deeper understanding of the importance of social responsibility and the role they play in it (Fisk, 2010; Cutter-MacKenzie & Smith, 2003).

3. Education on Climate Change and Sustainability: Green schools promote education on global issues such as climate change and sustainability. These schools encourage students to actively participate in environmentally conscious projects, which enhances their involvement in environmental activities and raises awareness on these critical topics (UNESCO, 2021). Through such initiatives, green schools aim to equip students with the skills and knowledge to contribute to solving pressing global challenges related to the environment.

4.Improvement of the Learning Environment: Green schools enhance learning environments by providing eco-friendly buildings and classrooms. Well-designed classrooms promote better learning and increase student interaction. These schools optimize learning processes by adopting a more responsive approach to students' needs, creating environments beneficial for student success (Earthman, 2004). By focusing on sustainable design and thoughtful classroom layouts, green schools ensure that the physical space supports both academic achievement and student well-being.

5. Long-Term Retention and Interest in Education: The environment-focused education provided in green schools fosters long-term interest in environmental issues among students. This helps students grow into individuals with sustainability and environmental awareness, not only during their school years but throughout their lives (Fisk, 2010).

Social and Economic Benefits of Green Schools

Green schools, by adopting eco-friendly practices and sustainability principles, not only provide ecological benefits but also offer significant social and economic advantages. Here are the social and economic benefits of green schools

Social Benefits

- Health and Well-being Improvement: Green schools enhance students' physical and mental health by providing clean air, natural light, and healthy living spaces. This environment helps students focus better and increases their overall well-being (Chatzidiakou et al., 2012).
- Development of Sustainability Awareness in the Community: Green schools raise environmental awareness among students and teachers, contributing to the spread of this consciousness. This, in turn, helps foster the adoption of eco-friendly habits at the community level. By promoting sustainable practices, green schools play a crucial role in encouraging broader societal shifts towards environmental responsibility.
- Strengthening Social Bonds: Green school projects enable collaboration between students, teachers, and families. This fosters the development of strong social bonds within the school community (Fisk, 2010).

Economic Benefits

- Energy and Resource Conservation: Green schools reduce costs through energy-efficient and water-saving practices. The use of renewable energy sources and sustainable building designs lowers operational costs, contributing to overall savings (U.S. Green Building Council, 2017). These measures not only promote environmental responsibility but also provide long-term financial benefits for schools.
- Long-Term Economic Savings: Energy-efficient building designs result in lower heating and cooling costs. Additionally, practices like water conservation and waste management offer long-term economic benefits (Earthman, 2004). These strategies not only reduce operational costs but also contribute to a more sustainable and cost-effective school environment over

time.

- Contribution to the Local Economy: Green school projects create job opportunities for local green technologies and the construction industry. Additionally, collaborating with companies that supply eco-friendly materials supports the local economy (McGinnis & McNally, 2018). This approach not only fosters environmental sustainability but also boosts the economic development of the surrounding community by generating employment and promoting sustainable business practices.
- Future Employment Opportunities for Students: Students raised with environmental awareness in green schools are better equipped for employment in sustainability and eco-friendly sectors, which in turn supports economic growth (UNESCO, 2021). By developing skills related to environmental responsibility, these students are prepared to contribute to and thrive in industries focused on sustainability and green technologies, enhancing both their personal career prospects and the broader economy.

Green schools not only fulfill environmental responsibilities but also make significant contributions to economic and social sustainability by enhancing the overall well-being of communities. By adopting sustainable practices, they support long-term ecological, economic, and social benefits, thus fostering a more resilient and prosperous future for both students and the broader society.

Green Education

The terms "Green School" and "Green Education" are frequently used as synonyms. Both in academic discourse and among the general public, expressions such as green education are commonly employed to refer to environmental education within both formal and informal contexts.

Even simple activities, such as introducing children to recycling, can be considered green education, as they raise awareness about the impact of human actions on the earth and other people (Pancheri-Ambrose & Tristchler-Scali, 2013). Green education is an educational approach aimed at increasing individuals' knowledge about environmental issues and raising awareness about sustainability.

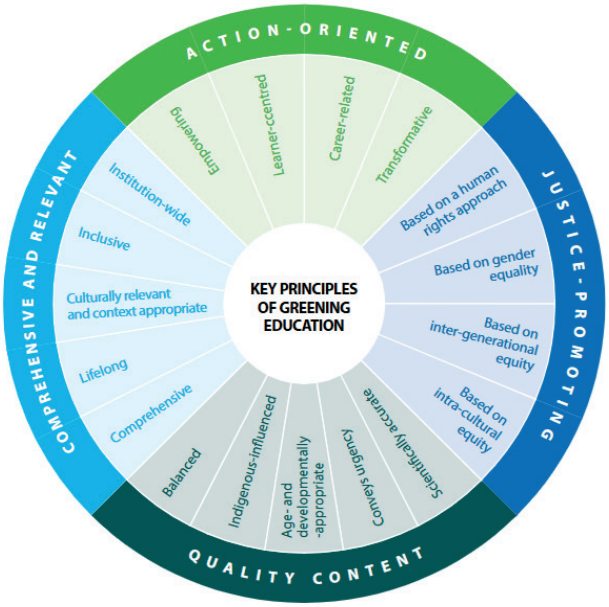

Figure 9. Key principles of greening education

This education seeks to teach students lifestyles that are in harmony with nature, encourage eco-friendly practices, and develop a sense of environmental responsibility. Green education is a teaching process that encompasses not only ecological sustainability but also social and economic sustainability (UNESCO, 2014). This approach sensitizes students to global environmental issues and encourages them to actively participate in solving these problems (Sterling, 2001). Additionally, green education aims to raise environmental sensitivity, fostering more conscious individuals who make environmentally respectful decisions and contribute to building sustainable communities.

FEE identifies the greatest threats facing the world as climate change, biodiversity loss, and environmental pollution. By promoting a better understanding of the causes and the environmental, social, and economic impacts of these issues, FEE aims to work with its members to educate and empower communities to take action and implement solutions to mitigate the effects of these issues at the local, national, and global levels. In line with these goals, the key principles of the climate change curriculum developed by UNESCO (2024) are outlined below (**Figure 9**).

Action-Oriented

Empowering: Green schools empower students by boosting their confidence, decision-making abilities, and important skills such as analysis and communication. This approach helps students gain the knowledge and values needed to deal with sustainable development challenges and effectively address climate change.

Learner-Centred: Pedagogical approaches, such as critical, participatory, problem-based, student-centered, and experiential learning, actively engage students in the learning process. These methods encourage learners to critically examine their personal experiences and natural environments while constructing their own understanding and knowledge.

Career-Related: It includes practices (problem-solving, collaboration, innovation etc) or ideas that can be applied to career choices and workplace practices.

Transformative: It supports local and global efforts to change human behaviors and systems, and to address the underlying causes of climate change.

Justice-Promoting

Based on a Human Rights Approach: This approach promotes and supports a universal understanding of human rights, especially the rights of children and young people, such as the rights to health, education, equal access to information, and freedom from discrimination. By focusing on human rights, climate change education aims to raise awareness that encourages young people to understand their own rights, respect the rights of others, and speak up for those whose rights are being violated.

Based on Gender Equality: This approach addresses how gender norms affect inequality and how these inequalities can increase vulnerability to climate change. It highlights that gender-based inequality, by examining the impacts of climate change on women, children, and other marginalized groups, shows that these groups are at greater risk.

***Based on Inter-Generational Equity*:** This approach aims to foster an understanding that not only protects the rights of the current generation but also considers the rights and responsibilities of future generations. It supports environmental sustainability and the equitable distribution of resources.

***Based on Intra-Cultural Equity*:** This approach aims to develop a vision of environmental, economic, and social justice and equality between societies and cultures. Achieving justice among communities of different cultures within the same generation requires the equitable distribution of resources and opportunities. This promotes equality between communities and fosters global solidarity.

These justice-promoting approaches teach students and the community not only environmental responsibility but also important values such as social and economic equality in the fight against climate change.

Quality Content

Scientifically Accurate: The content is based on evidence related to climate change and sustainable development. Scientific data and research ensure that the information used in education is reliable and valid.

Conveys Urgency: Green education emphasizes the urgency of adequately responding to the growing climate emergency. This raises students' awareness of global environmental crises, while recognizing the importance of swift and effective action to address these problems.

Age and Developmentally-appropriate: The content is designed according to the developmental levels and abilities of children and young people. Education is shaped in a way that is appropriate for the student's age, cognitive abilities, and socio-emotional development level.

Indigenous-İnfluenced: The education includes the knowledge and perspectives of local and, especially, indigenous peoples. This ensures the recognition of long-standing knowledge and traditional practices, particularly regarding environmental sustainability. The relationship of indigenous groups with the natural environment is a significant source of learning in the fight against climate change.

Balanced: The education addresses the cognitive, social, emotional, and behavioral dimensions of learning in a balanced way. This ensures that green education adopts a holistic approach, preparing students both mentally and emotionally for environmental issues. A balanced approach encourages students to think more deeply, develop empathy, and take effective action when faced with global challenges such as climate change.

Comprehensive and Relevant

Comprehensive: Green education provides comprehensive, accurate, evidence-based, and age-appropriate opportunities for learning about sustainable development and climate change. This education is continuously delivered throughout the student's formal, informal, and non-formal educational processes (e.g., through museums and libraries) and also includes areas such as TVET (Technical and Vocational Education and Training). This ensures that students consistently acquire deeper knowledge over time.

Lifelong: Green education refers to a continuous learning process that begins at an early age, where new knowledge is built upon previous learning. This process encourages students to acquire more comprehensive knowledge at each stage through a spiraled curriculum approach.

Culturally Relevant and Context Appropriate: Green education provides learning outcomes related to local climate change issues and solutions. It also focuses on the cultural structures and norms that influence people's choices regarding sustainable development and climate change. The education reflects the social context by taking into account cultural diversity and local realities.

Inclusive: Green education involves a range of actors both inside and outside of the educational system, including experts, parents, community members, and local leaders. These actors provide alternative perspectives, new skills, and intergenerational and indigenous knowledge on climate change issues and solutions. They work together to understand climate challenges and develop potential solutions.

Institution-Wide: The principles of green education are integrated into every aspect of the learning environment and influence institutional culture and practices. This ensures the adoption of sustainability principles throughout the organization in the overall strategy and implementation of educational institutions.

When developing an educational curriculum, three fundamental questions must be addressed: what content will be taught, how the teaching will be conducted, and where the teaching environment will be provided (Tyler, 1949). A curriculum plan for climate change, one of the three major issues focused on by FEE, has been prepared by UNESCO (2024). In this curriculum, the answers to these fundamental questions are as follows:

WHAT TO LEARN	HOW TO LEARN	WHERE TO LEARN
• Address cognitive, socio-emotional learning and taking action • Contextualized emphasizing the relevance of local knowledge	• Learner-centred, experiential, and reflective • Integrated approach • Holistic assessment	• Schools through a whole institution approach • Communities through public awareness campaigns • Youth-created social movements • Nature-based museums and UNESCO-designated sites

In the process of curriculum development, there are specific learning outcomes that students are expected to achieve by the end of their education. Learning outcomes refer to explicit statements that define the knowledge, understanding, and/or competencies a learner is expected to acquire by the conclusion of a learning period. These outcomes represent the measurable results of the learning process, typically articulated in terms of a combination of knowledge, skills, abilities, attitudes, and understanding that an individual is anticipated to attain through successful engagement in a specific educational experience. (Adam, 2006). The learning outcomes expected from students aged 5-18 in the curriculum prepared by UNESCO for climate change are summarized in the following infographic:

In 2019 and 2020, the Foundation for Environmental Education (FEE) encouraged teachers to create and submit lesson plans that foster an action-oriented pedagogy focused on specific Sustainable development Goals (SDGs). The following lesson plan was selected:

There is still much to be done for schools around the world to become green and sustainable. Green schools, which adopt the concept of sustainability in their buildings and curricula, remain a minority compared to the total number of educational institutions. Many schools face financial and structural challenges that hinder the implementation of sustainable practices. The global spread of green schools is of great importance, as it enables more children and young people to receive an education that respects nature, culture, and society, while encouraging them to contribute to a more just, balanced, and sustainable world. Green schools are key to raising environmental awareness in future generations, teaching skills for living in harmony with nature, and fostering responsible individuals for the future.

With the development of new technologies and sustainable construction methods, more efficient and environmentally friendly school buildings are becoming more common, and these schools will serve as the educational institutions of the future by integrating renewable energy use, water conservation, the use of natural materials, and environmentally friendly transportation options.

Green schools are also learning environments that attach great importance to environmental education by offering a green curriculum in addition to the traditional courses in their curriculum and various activities aimed at raising awareness of these issues. Additionally, green schools are educational environments that emphasize environmental education by integrating a green curriculum alongside traditional subjects, as well as offering various activities designed to raise awareness of environmental issues. These activities aim to emphasize environmental education, making green schools learning environments that prioritize sustainability. In green schools, students have the opportunity to participate in projects and activities that promote sustainability, social equity, and community involvement, such as tree planting, establishing organic gardens, composting, waste collection, cleaning beaches and rivers, and recycling projects. In this way, they mature into mindful and responsible individuals.

Let's Save Water !

Introduction: This lesson plan aims to make students aware of the challenges of drinking water usage and wastage at a global and local level.

Objectives or Learning Outcomes Students will be able to:

• Understand the importance of saving drinking water.

• Develop their research, presentation and digital skills.

• Make conscious choices related to water.

• Promote active citizenship.

Time required: • Session 1 (150 min): Students conduct research in small groups about water scarcity in general and water usage at school. Then, students present their results as digital posters. Finally, students post their reserach on social media. • Water invoice, PPT presentation and Student's Book. • Videos: Aquametragem; Water, our future?

Resources required:

• Water invoice, PPT presentation and Student's Book.

• Videos: Aquametragem; Water, our future?

Activity

Classroom session 1

•The teacher projects an image related to the school's water bill and asks students about activities that use water at school.

•The teacher writes students' ideas about water consumption in a projected padlet.

•The teacher asks students to establish the relationship between the waste rate and the water consumption.

•Students form groups of 4. Students research about the availability of water on Earth, the water cycle, the water sources that reach the school area and the company responsible for waste treatment. The teacher must refer them to reliable sources for this research.

•Students are asked to suggest ways to reduce water consumption and water wasted.

•Students present the results of their work to the others in the form of digital posters.

*This lesson plan has been taken from the Eco-Schools website (https://www.ecoschools.global/lesson-plans-for-teachers).

Particularly in developing countries that are dependent on external energy resources, it is important to emphasize green schools that provide a healthy environment while fostering the necessary environmental awareness. In conclusion, green schools are educational institutions that invest not only in today's children, who are committed to sustainability and ready to deal with environmental challenges, but also in the future of the entire planet.

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