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Integrating Green Curriculum into Nigeria's Polytechnics and Similar Technical and Vocational Education and Training (TVET) Institutions for Sustainable Development

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Abstract- ***Technical and Vocational Education & Training (TVET) is widely acknowledged to provide the technical knowledge and vocational skills to the manpower required to exploit the environment for industrial, commercial and economic development. However, continuous and largely unregulated exploitation of natural resources has contributed significantly to climate change, environmental degradation, and associated socio-economic and health challenges globally. Technological advances should consider the safety measures for compensating the environmental uncertainties accompanying them. This paper adopts an expository research approach to argue that integrating green curricula into TVET institutions, particularly polytechnics in Nigeria, can foster a workforce imbued with environmental consciousness, green skills, and sustainability-oriented values. The current study observes that existing TVET curricula in Nigeria insufficiently emphasize environmental preservation and sustainability concepts, resulting in limited climate literacy among graduates. The paper concludes that embedding environmental and sustainability principles across all TVET programmes will produce graduates with sustainability literacy capable of supporting national and global sustainable development goals.***

Keywords: Technical And Vocational Education & Training (TVE), Climate Change, Green Curriculum, Sustainable Development.

I. INTRODUCTION

Climate change and extreme weather conditions pose significant threats to ecosystems, food security, livelihoods, public health, and global socio-economic stability [1]. The Intergovernmental Panel on Climate Change (IPCC) [2], reports that human activities have already caused approximately 1.0 OC of global warming above pre-industrial levels, with projections indicating a rise to 1.5 OC between 2030 and 2052 if current trends persist. Such warming is associated with irreversible impacts, including biodiversity loss and ecosystem collapse. In his address to the UN General Assembly in 2018, Secretary-General António Guterres quoted World Meteorological Organization (WMO) data showing that the past two decades have included eighteen of the twenty warmest years since record-keeping began in 1850. "Climate change is moving faster than we are," said Secretary-General Guterres. "We must listen to the Earth's best scientists," he added [2].

According to [3], the former United States president, Barack Obama, said at the United Nations summit that "it is imperative that we act now to create a sustainable future: our generation's response to the challenge of climate change will be judged by history, for if we fail to meet it – boldly, swiftly, and together – we risk consigning future generations to an irreversible catastrophe."

As an intergovernmental body jointly established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the Intergovernmental Panel on Climate Change (IPCC) has provided policy makers with the most authoritative and objective scientific and technical assessments. Since 1990, series of IPCC Assessment Reports, Special Reports, Technical Papers, and Methodology Reports have always carried a bleak picture of the threat of climate change to human well-being and planetary health. Particularly, the IPCC's Fifth Assessment Report called for concerted global response to the threat of

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climate change and recommended that the global average temperature should be held to well below 2OC above pre-industrial levels, while pursuing efforts to limit the temperature increase to 1.5OC above pre-industrial levels.

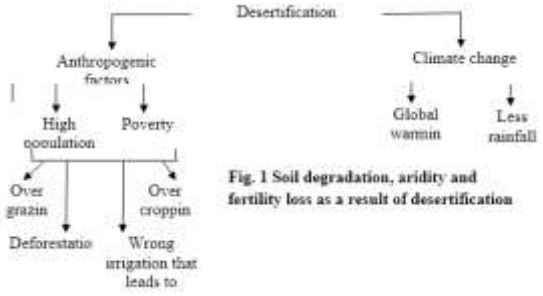

Fig. 1 Soil degradation, aridity and fertility loss as a result of desertification

Nationally, Nigeria has had its own fair share of devastating effects of extreme weather conditions in form of desertification induced by climate change and anthropogenic factors, Fig. 1. The factors promoting climate change in Nigeria include bush burning, indiscriminate timber logging and deforestation, oil spillage and gas flaring in the Delta region, over grazing in the Northern region, etc., while the impacts of climate change manifest through desertification, flooding, deforestation, declining agricultural productivity, pollution and coastal erosion. According to [4], desertification effects are trending down towards the southern parts of Nigeria at a rate of 0.6 km per annum, engulfing about 351,000 ha of cropland and rangeland annually. Desert features now account for approximately 580,841 km2 of Nigeria's landmass and accounting for up to 63.8% of the country's landmass. About 30 million people (17% of the national population and 15 out of 36 States of the Nigerian Federation) are affected by desertification in Nigeria. Refs. [5, 38] identified characteristics of weather pattern to include high temperature, inconsistent rainfall, falling water levels in rivers and lakes and drought in the north, flooding and rise in sea level in its southern region; and that phenomenon of climate change has created many problems in agriculture, health, economy and security among many other social problems.

Education plays a central role in addressing these challenges. TVET in particular, shapes the skills, competencies, and values of the workforce responsible for technological development and industrial production. However, conventional TVET programmes largely prioritize technical efficiency with limited attention to environmental sustainability. This paper argues that integrating a green curriculum into Nigeria's TVET system is critical for aligning skills development with sustainable development goals.

1.1 NECESSITY FOR GREENING TVET CURRICULA

International Labour Organization [6] defined Technical and vocational education and training (TVET) as "initial and continuing education and training provided by schools, training providers or enterprises that imparts the skills, knowledge and attitudes required for employment in a particular occupation, or group of related occupations, in any field of economic activity." TVET supports industrialization and economic growth in emerging economies like Nigeria's. The purpose of Technical Education as spelt out by the National Policy on Education is "to provide technical knowledge and vocational skills necessary for industrial, commercial and economic development." This implies that acquisition of knowledge, skills and abilities in an undergraduate level is aimed to develop individuals with the right attitude and competency to contribute to the common good of the society. Nevertheless, increasing technocratic control over natural systems without sustainability considerations has intensified environmental and social challenges [7], hence the current global discourse about sustainable development. In the report of the World Commission on Environment and Development (WCED), Sustainable development, as defined by Brundtland et al. [8] and subsequently cited by Okanovic et al. [31], emphasizes meeting present needs without compromising the ability of future generations to meet theirs. Achieving this balance requires reorienting educational objectives, particularly within TVET institutions whose graduates directly influence production processes, resource utilization, and technological deployment. Sustainability crisis is one of the greatest challenges of our times [9].

Xiong et al. [10] defined green curriculum as "the curriculum that is taking environmental protection, natural conservation, resources saving and rational utilization, and advocacy of environmental

friendliness as the principal content and teaching objectives." According to the Illinois Central College Curriculum Committee in the United States [11], "a green curriculum is related to sustainability and equips learners with the knowledge and skills to identify, analyze, and solve problems in various social, economic, and environmental domains." The green curriculum aims to mainstream or integrate sustainability into the teaching process so that learners can obtain sufficient knowledge and skills to become sustainability minded citizens. Previous studies [12] related to the green curriculum confirm that this type of curriculum focuses on environmental crises and often aims to empower people to solve these crises. A green curriculum is the type that integrates climate mitigation and adaptation in teaching and learning from pre-primary, primary, secondary and tertiary school levels as well as in teacher training [13]. According to [14], green curriculum aims to adopt and integrate a climate education framework into all schools including the approved curricula in the country. Greening the curriculum is considered a plan to ensure students' ability to face the challenges of the 21st century, such as global warming and climate change, social inequalities, unsustainable lifestyles, and the urgent need to move to an economy based on renewable energy [15].

Zakka, Ignatius and Ezekiel [5] described greening TVET as the strategies of sustainable practice in TVET that facilitates the transition to climate resistant societies, and greater resource efficiency and highlighted that TVET is expected to play a key role in preparing learners for emerging green jobs and providing them with green skills. [16, 31] identified curriculum change as the implications for green skills and suggested the need to integrate green skills into TVET curriculum as a way to add skills that are cross-occupational, at the same time add green skill requirements for specific occupations, and then develop training programs for new green occupations. With rapid industrialization and technological development, come the challenges and adverse affects of unsustainable pattern of production and consumption as man's exploitation of the biosphere is now threatening its very existence and delicate balance. Over the last few decades, the pressures on the global environment have become self-evident, leading to a common outcry for sustainable development [9]. Therefore, there is necessity for continuous actions that will guarantee intergenerational habitability of the earth by harnessing comprehensive strategies for building a sustainable future which is equitable for all human beings and biodiversity [17, 32]. With this comes the requirement for a new frame of mind and new sets of values to be inculcated in the drivers of policy, commerce and industry through a unique form of education that will promote and improve people's capacity to address environment and development issues, also known as sustainable thinking. Thus, sustainable thinking is aimed to empower individuals to comprehend the complex issues of sustainability and relate same to the challenges facing human society at local and global levels, and then leverage the resultant knowledge to seek logical solutions to these challenges.[17] recommended sustainable education at all levels as a vital tool in propagating environmental literacy among citizens that will be adopted in all fields of research, technology, pure and applied sciences, humanities and social sciences. In order to achieve this recommendation, a multidisciplinary and ethically-oriented set of instructional instrument (referred to as green curriculum) that contains solutions for the problems linked to sustainable development must be developed.

In December 2002, United Nations (UN) at its 57th session proclaimed the time period between 2005 and 2014 as Decade of Education for Sustainable Development (DESD). The objective behind DESD was to integrate the principles, values and practices of sustainable development into all aspects of education and learning [18]. This means reviews of existing curricula in terms of their objectives and contents so as to develop transdiciplinary understandings of social, economic and environmental sustainability and recommended approaches to teaching, learning and assessment [7, 31]. Education for sustainable development has been portrayed as an agent that enables people to develop knowledge, values, and skills in order to engage in activities that will improve the quality of life now and without damaging the planet for the future [19]. This conceptualization of education for sustainable development encourages researchers and educators to

act upon the values, attitudes and behaviors of individuals towards sustainable life styles.

Furthermore, [20] suggested that achieving the great transition which will ensure reducing hunger and poverty as well as meeting basic human needs while maintaining the life support systems of the planet would, critically need changing human values, attitudes, and behaviors. Environmental sustainability is considered as the ability to maintain the qualities that are valued in the physical environment for the sake of the future wellbeing of humanity and the planet [21]. Achieving environmental sustainability is possible by developing a positive mindset in people towards environmental conservation as everyday decisions play important roles in shaping the future of the planet [22]. Local actions and personal decisions can and often do have vital ramifications on the quality of the environment. Developing a world view based on this fact stimulates individuals to establish their own futures and help them to bring about solutions to current and potential problems threatening the quality of life [22, 34].

The result of thesis research [17] indicated that there existed some knowledge gaps in university students' perceptions toward different aspects of sustainable development. Students might have favorable attitudes toward the environment; however, looking at the personal behavioural changes, their preferred individual ways of living were not necessarily coherent with sustainability. The above conclusion can still be applicable to students of tertiary TVET institutions in Nigeria.

Environmental issues are part of the 17 Sustainable Development Goals (SDGs) developed by the United Nations. Goals that directly affect environmental issues are: SDG 6 (clean water); SDG 7 (clean energy); SDG 12 (responsible consumption); SDG 13 (Climate Action); SDG 14 (life underwater); and SDG 15 (life on land). UN targets the realization of these goals by 2030 [24, 35, 36]. Goal 13 of SDGs emphasized the need for urgent action to combat climate change and its impacts. In order to achieve this, it recommended among other things to: (i) integrate climate change measures into national policies, strategies and planning; and (ii) improve education, awareness-raising and human institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. The Ubuntu Declaration, an initiative from education and scientific organisations all over the world, suggested that one of the roles of Universities is to review programmes and curricula in order to address the challenges of sustainable development [25]. Polytechnics, although TVET institutions, are tertiary like the Universities mentioned in the Ubuntu Declaration, and TVET products are equally directly involved in driving national policies and development projects, therefore, it is only imperative to embed challenges of climate change in all the TVET curricula.

The world's targets to reduce carbon footprint cannot be reached without the new technologies and fuels that will power this transformation. Decidedly, the personnel that will drive the new technologies will have to be trained and equipped accordingly. Therefore, standards will need to be set and curricula developed that will provide them with the requisite knowledge and skills they need to operate. According to [26], they must understand the challenges of climate change, biodiversity, unsustainable production and environmental degradation. So, teachers must integrate elements of climate change into their instructional plans to enable students, who are equally the future drivers of technology and economy, imbibe the knowledge of how they can participate in addressing climate change problems to their capacity level. As suggested by [35], integration of environmental education in educational curricula will potentially lead to the youths' acquisition of knowledge, skills and attitude that will make them vital agents of environmental protection. Students must understand that climate change has consequences for the earth and human lives, and they have vital role to play to address the negative effects.
The notion of sustainable development was popularized in the Rio de Janeiro Earth Summit of 1992. The Summit outlined a worldwide action plan which highlighted education as a critical tool for promoting sustainable development and improving the capacity of the people to address sustainable development issues. These declarations highlighting the crucial role of education as a key element for sustainable development also recommended reorientation of education towards the requirements

of sustainable development [27, 37]. Education for Sustainable Development (ESD) has been seen as a major contributor towards the achievement of sustainable future through promoting awareness, developing values and influencing behavior. According to [26], the Honourable Supreme Court of India in its landmark decision, mandated environmental education in all undergraduate programs to develop more environmentally sensitive and responsible citizens of the country; noting that higher education has a critical role to play in producing sustainable students by helping them to understand the complex connections and interdependencies between the environment, energy sources, economy and social well-being often referred to as sustainability. The Polytechnic as a popular higher education institution in Nigeria is well positioned to achieve that by greening its curricula, as it can encourage a new way of thinking which can use the green economy as the focal point for understanding sustainability. Given Nigeria's vulnerability to climate change, greening TVET curricula is therefore imperative.

1.2 STRATEGIES FOR IMPLEMENTING GREEN CURRICULUM AND SUSTAINABLE DEVELOPMENT IN TVET INSTITUTIONS

To mitigate the effect of climate change, the Nigerian government developed a comprehensive strategic policy called the Nigeria Climate Change Policy Response and Strategy (NCCPRS). Mwendwa [38] noted that the main objective of the policy is to promote low-carbon, high-growth economic development and build a climate-resilient society. The policy of the NCCPRS covers Agricultural, Forestry and other Land Use, Energy, Health, Industry, Oil and Gas, Transport, Waste, Water and Security. While the policy identified several strategies and priorities, the review of the policy in 2021 still did not emphasise education as one of them. Even the operationalisation and implementation of NCCPRS have not been very noticeable. In Nigeria as well as in other African countries there have been many poverty reduction strategies by governments at different times and at all levels, all aimed at economic growth, human development and environmental protection and conservation. In spite of these attempts by African governments, there is a growing perception that Africa could fail in achieving sustainable development. This perception is fueled by the evidence that while the world is undergoing rapid change, which is driven predominantly by technology, education, civilization and globalization, Africa remains backward, exploited and uneducated [29]. Countries abroad like India [30], Tanzania, [28] and Botswana [40] have integrated environmental education into various sectoral and educational curricula. Unfortunately two decades after the proclamation of DESD, Nigerian Schools at all levels have not formally integrated sustainable development issues in their curricula, implying that the country's educational system is yet to align with global requirements. This gap underscores the need for deliberate integration of sustainability education into TVET curricula. Education is important because in a knowledge-based society we now live, Nigeria must educate its young population on the importance of maintaining a balanced ecological environment [5]. A study on the contribution of education to pro-environmental behavior [41] confirmed that education significantly increases the probability of taking knowledge-based environmentally-friendly actions. Education is a powerful tool for instilling sustainable practices and mindsets in future generations. Without a strong educational component, green universities (and by extension tertiary TVET institutions) cannot fully achieve their potential in driving societal change towards sustainability [12].

Key strategies for implementing green curriculum/sustainable development include:

Prioritize sustainability objectives as the basis for establishment of new TVET institutions.

The Federal government should ensure that the establishment of Tertiary TVET institutions will be based on the principles of sustainable development by which such institutions are mandated from the outset to base their operations on what they can do to help society meet the challenges of sustainable development in response to United Nations Conference on Environment and Development (UNCED, 1992), otherwise known as the Rio de Janeiro Earth Summit. This will mark a breakthrough in raising consciousness within the institutions about the necessity to work innovatively to preserve the future and persuade such new institutions to give

sustainable development an important place in their activities. It will mark a break from the tradition of setting up new institutions to do just exactly what the older ones are doing. This implies that in curricula, institutional management and services to the local/regional society, a responsible balance between economical, ecological and social/cultural aspects has to be worked out [9] by the new institutions.

Implement the DESD protocol

The Federal Government of Nigeria should create policy framework to adopt the proposal of DESD and promote the integration of sustainable development in all educational institutions. In that way educational institutions will be made to understand and accept the concept of sustainable development as a non negotiable alternative.

Embedding sustainability objectives within existing and new curricula.

The National Board for Technical Education (NBTE) is an organ of the Federal Ministry of Education which is charged with the responsibility of regulating Technical and Vocational Education and Training (TVET) institutions in Nigeria. The Board was created by an Act of Parliament (Act No. 9 of 1977) and the amendments (Acts No. 16 of 1985, and No. 9 of 1993). The functions of the Board as contained in its enabling Acts includes among others: to lay down standards of skill to be attained and to continually review such standards as necessitated by technological and national needs. The above functions are achievable through continuous curriculum development of new programmes and review of the existing ones to meet national and international standards. Some of the curricula are already green, for example, ND Organic Farming and ND Renewable Energy, while a greater number is not. Further targeted effort should be taken to infuse sustainability objectives in all the existing TVET curricula.

Involving environmental agencies and sustainability experts in curriculum development and review processes.

In designing new curricula or reviewing existing ones, NBTE should ensure that apart from the usual stakeholders (representatives from the academia, employers and professional regulators), membership of each curriculum development/review team should include governmental and intergovernmental Environmental Agencies like Nigerian Meteorological Agency (NiMet), National Climate Council, National Agency for the Great Green Wall (NAGGW) and United Nations Environment Programme (UNEP). All courses (both professional and general) must emphasize on sustainability content to reduce the threat of environmental deterioration with increasing technological development [26].

Enrich national curricula with institution based local content without overloading the curricula.

Each TVET institution can embellish the NBTE national curricula with green courses/topics relevant to their locality, otherwise known as local content to address the sustainability challenges of host communities. In doing this, effort should be made to safeguard against overloading the national (NBTE minimum) curricula. The sustainability topics could be injected in the curriculum as separate general objectives at the end of each course or considered along with each specific learning objective that has environmental hazard contents.

Incorporate environmental impact assessment and sustainability analysis into students' final projects.

Final projects should incorporate aspects of environmental impacts and/or conservation as a way of raising the consciousness of students to sustainability [28]. Furthermore, tertiary TVET institutions should encourage interdisciplinary research projects related to sustainable development. This will foster healthy collaboration and knowledge sharing and also seek to overcome competitive instincts and rivalry between disciplines and departments. A researcher [42] highlighted the need for an interdisciplinary approach to address complex scientific problems, underscoring the importance of curriculum that incorporates sustainability across various academic departments.

Building staff capacity through continuous professional development in environmental education.

TVET institutions shall demonstrate real commitment to the principle and practice of environmental protection and sustainable development by fostering

programmes to develop the capacities of the academic staff that are teaching environmental literacy. They shall also set up periodical environmental education programmes/workshops involving academic and non-academic staff as well as students - all of whom should be exposed to the global challenges of environment and development. Public lectures on environmental education can also be devised for different target groups outside the academic milieu e.g. business, governmental agencies, non-governmental organizations, the media, etc.

Establish a service department to coordinate all aspects of environmental education.
It is germane to establish a department of environmental education which must be domiciled in each TVET institution to anchor all the training programmes on sustainability and environmental literacy and host environment advocacy lectures every world environment day.

Collaborative project supervision/funding with environmental agencies
TVET institutions and Environmental agencies could jointly engage in problem solving projects where TVET institutions provide expertise, and government agencies provide funding. This kind of partnership will avail both staff and students with green skills and opportunity to solve practical environmental challenges that could be used to enrich the green curricula.

1.3 PROPOSED TOPICS FOR GREEN CURRICULUM
TVET programmes in Nigerian polytechnics span faculties/schools including agricultural technology, engineering technology, environmental technology, science technology, management and social science, arts and communications, and general studies. Irrespective of specialization, the following thematic areas are proposed for curriculum greening:
Renewable Energy (Alternative Fuels), Non-renewable Energy, Cleaner Energy from Non-renewable Energy, Environmental Impact Assessment, Climate Change, Pollution, Global Warming, Ozone Depletion, Greenhouse Gases (GHGs), Kyoto Protocol, Ozone Depleting Substances (ODSs), Montreal Protocol, Desertification, Ecosystems and Biodiversity, Climate Resilient Development (CRD), Intergovernmental Panel on Climate Change, World Meteorological Organization (WMO), United Nations Environment Programme (UNEP), Sustainable Land Management, National Climate Council, National Agency for the Great Green Wall (NAGGW), Land Recovery, Land Restoration, Emissions Trading, Soil Degradation, Water Conservation, Waste/Water Recycling, Deforestation and Forestation, Refrigerant Retrofitting, Industrial Pollution Control Equipment, Waste Management, Climate-Related Health Challenges, Irrigation, Conventional and Organic Farming; Ecological Economics; Tourism and Sustainability, Zero Energy Building, Urban Physical Environments and Sustainability, Sustainable Energy Consumption, Energy Conservation and Management, etc.

1.4 IMPORTANCE OF GREEN CURRICULUM
Benefits of greening TVET curriculum/sustainable development include:
Greening TVET contributes to the transition towards a green economy by aligning skills development with environmental priorities

Traditional technological education often emphasizes specialization and reductionist thinking, which can neglect broader environmental and social implications [43]. In contrast, environmentally sustainable education requires the use of renewable resources to redesign production processes in a way that eliminates the production of toxic materials and guarantees the livability and beauty of nature while increasing the quality of life for all people and reducing excessive use of natural resources. It considers the significance of poverty eradication, principles of intergenerational equity and link between a healthy economy and healthy environment in comparison with limitations set by the carrying capacity of the environment [44].

Greening TVET curriculum enhances graduates' employability
The incorporation of green skills in all training courses, as well as the provision of green technology specializations in conventional training courses, enhances graduates' employability by equipping them with green skills relevant to a rapidly evolving

global economy [37]. The greening of the economy requires a parallel greening of jobs which, in turn, requires us to consider the skills needed and the TVET required in providing those skills. Greening TVET has a vital role to play in tackling the on-going challenges to our environment. It can not only support the green transformation of our societies and economies: it has the potential to lead the changes required by equipping our workforce with the skills and behaviours they require to transform their workplaces and communities [6].

Green curriculum enhances the public image and international acceptability of its concomitant educational system.

TVET institutions in Nigeria have been experiencing low uptake of their courses by the youth who consider them as secondary to university degrees. These institutions need to transform and revitalize themselves for acceptability by youths as a preferred form of post-secondary education by adopting sustainability concepts. Greening TVET can reposition polytechnics as attractive pathways for youths seeking practical, future-oriented skills aligned with global sustainability transitions [45].

Greening curriculum fosters environmental awareness

Greening curriculum encourages environmental awareness as well as empowers participation in minimizing adverse environmental impacts. It enables environment culture to be factored into all the decision making processes of institutions. According to UNESCO's Greening Curriculum Guidance [46], integrating climate mitigation and adaptation into teaching and learning is essential for fostering a holistic approach to climate change education.

Environmental management opens a vista of opportunities for lecturers and students to engage in researches on sustainability

A green curriculum is rapidly becoming a cornerstone of modern education worldwide. Integrating environmental and sustainability themes into TVET open numerous avenues for academic inquiry, enabling both students and educators to engage in applied research that addresses real-world problems. UNESCO [47] and other educational bodies emphasize that greening the curriculum involves embedding climate change and sustainability learning outcomes across disciplines, encouraging deeper investigation into topics such as renewable energy, ecological design, sustainable agriculture, and waste management. These topics are not only intellectually rich but also aligned with global sustainable development goals, offering TVET staff and students fertile ground for scholarly study, innovation, and curriculum enhancement.

It supports interdisciplinary research

Green curriculum research topics such as designing sustainable systems, modeling renewable energy processes, analyzing environmental impacts, or improving eco-efficient technologies often require scientific rigor and cross-disciplinary solutions. Unlike traditional siloed subjects, sustainability challenges are inherently interconnected, calling for expertise in physics, engineering, agriculture, business, social sciences, and ICT. For example, environmental projects may integrate scientific data collection (science), policy analysis (social studies), technological modeling (ICT), and communication strategies (language arts) to produce impactful outcomes [48]. This interdisciplinary approach encourages collaboration among departments that might otherwise operate independently. By working together on research that has ecological and societal relevance; academic units build common purpose and mutual respect, fostering collegial rather than competitive relationships. A collaborative research culture enhances innovation, promotes shared ownership of solutions, and strengthens institutional cohesion, as educators pool knowledge to solve complex sustainability problems that no single discipline can address alone.

It fosters community engagement in sustainability initiatives

Integrating community service with the green curriculum creates powerful place-based learning opportunities that extend academic inquiry beyond campus walls. Place-based or community-engaged education situates learning within the local context, transforming community challenges into authentic research and action projects. Students and staff can partner with community members, local industries, NGOs, and municipal agencies to address issues such

as water management, waste reduction, urban agriculture, or energy efficiency—bringing local expertise, cultural knowledge, and real needs into the classroom and research agenda [49]. Moreover, community service projects often result in mutually beneficial outcomes: communities receive research-informed solutions while academia gains practical insights that can inform curriculum development (enrichment) and enhance student learning experiences.

1.5 CONCLUSION

Climate change represents one of the most pressing challenges of the 21st century, threatening environmental integrity, economic stability, and human well-being. Addressing this challenge requires urgent and sustained action supported by education that promotes environmental literacy and sustainable behaviour. Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a livable and sustainable future for all [1]. Integrating a green curriculum into Nigeria's TVET institutions offers a strategic pathway for developing a workforce capable of driving sustainable development while mitigating environmental degradation. Clearly, the role of education is vital in raising the environmental awareness of students and in motivating them to take part in programs launched to mitigate environmental problems [35].

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