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VOCATIONAL EDUCATION AND GREEN SKILLS ACQUISITION: IMPLICATIONS FOR CLIMATE CHANGE ADAPTATION AND SUSTAINABLE DEVELOPMENT IN NIGERIA

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Abstract
This study investigated vocational education and skills acquisition for green jobs and the implications of vocational education and green skills acquisition for climate change adaptation and the Sustainable Development Goals in Adamawa State, Nigeria. A quantitative descriptive survey research design was adopted. The population comprised 1,200 graduates of Technical and Vocational Education and Training institutions in Adamawa State. The sample size for the study was 300 using Krejcie and Morgan (1970) table for sample size. A stratified random sampling technique was employed to ensure representativeness across the different categories of vocational education graduates in Adamawa State. Data were collected using a structured questionnaire titled Vocational Education and Green Skills Questionnaire 'VEGSQ'. Data were analysed using simple linear regression at .05 level of significance. The results revealed that curriculum relevance significantly influenced adaptive capacity ($R = .624$, $R^2 = .412$, Adj. $R^2 = .410$, $t = 14.47$, F-value $= .0002$, $p < 0.05$); training infrastructure significantly influenced community resilience ($R = .598$, $R^2 = .357$, Adj. $R^2 = .355$, $t = 12.89$, F-value $= .0001$, $p < .05$); technical green skills significantly influenced environmental sustainability ($R = 0.671$, $R^2 = .450$, Adj. $R^2 = .448$, $t = 15.62$, F-value $= .0001$, $p < .05$); and entrepreneurial skills significantly influenced economic empowerment ($R = .615$, $R^2 = .378$, Adj. $R^2 = .376$, $t = 13.54$, F-value $= .0003$, $p < .05$). The study concluded that vocational education and green skills acquisition are significant predictors of climate change adaptation and sustainable development outcomes.

Keywords: vocational education, green jobs, climate change adaptation, technical green skills, sustainable development goals

Introduction

Globally, the 21st century has been marked by heightened concern for environmental sustainability, driven largely by the increasing threats of climate change, ecological degradation, and unsustainable economic practices. Climate change has emerged as one of the most pressing global challenges, with far-reaching implications for human survival, economic development, and environmental sustainability. Rising temperatures, extreme weather events, and biodiversity loss have necessitated urgent global responses aimed at mitigation and adaptation. From this perspective, the transition toward a green economy - one that promotes low carbon emissions, resource efficiency, and social inclusion - has become a central development agenda. This transition has equally spurred the demand for green jobs, which require specialised competencies rooted in environmental sustainability and technological innovation.

At the global level, education; particularly vocational education and training (TVET), has been recognised as a critical driver for equipping individuals with the requisite skills for green jobs and sustainable livelihoods. Vocational education emphasises practical, industry-relevant skills, making it a strategic tool for preparing a workforce capable of addressing environmental challenges. Ayuba et al. (2024) reported that integrating sustainability into vocational education enhances the development

of green competencies necessary for reducing carbon emissions and promoting sustainable practices. Furthermore, the global commitment to the 2030 Agenda for Sustainable Development gives credence to the importance of education and skills acquisition in achieving the Sustainable Development Goals (SDGs), especially those related to climate action, decent work, and sustainable communities.

Across continents, particularly in Africa, the urgency of aligning vocational education with environmental sustainability has become increasingly evident. Africa faces unique vulnerabilities to climate change, including desertification, flooding, and food insecurity, which threaten livelihoods and development gains. As a result, there has been a growing emphasis on greening Technical and Vocational Education and Training (TVET) systems to equip learners with skills relevant to renewable energy, sustainable agriculture, and environmental management. A study conducted by Okolie et al. (2020) indicates that TVET plays a crucial role in building a workforce capable of driving sustainable economic growth and achieving continental development frameworks such as Agenda 2063.

In Nigeria, the challenges of climate change are increasingly visible through environmental degradation, flooding, desert encroachment, and resource depletion. These challenges emphasise the need for effective climate change adaptation strategies, which depend significantly on the knowledge, skills, and competencies of the population. Vocational education in Nigeria has been identified as a vital instrument for developing the human capital required to address these challenges. Specifically, Ayuba et al. (2024) highlighted that the concept of greening TVET has gained attention as a means of equipping learners with skills that promote environmental sustainability and support the attainment of SDGs. Similarly, Auta (2022) indicated that vocational education has been advocated as a mechanism for fostering economic, social, and environmental development through the creation of employment opportunities and reduction of poverty.

Statement of the Problem

Despite the increasing global emphasis on green economy transition and climate change adaptation, there remains a persistent mismatch between vocational education outputs and the competencies required for environmental sustainability and resilience in Nigeria. Ochieng et al. (2020) reported that inadequate incorporation of environmental education into TVET programmes contributes to poor understanding of climate change causes, effects, and mitigation strategies among educators and graduates. Similarly, David and Daniels (2024) emphasise that without a properly "greened" curriculum, vocational education cannot effectively support technological innovation or enhance adaptive capacity for climate change.

Another critical issue is the inadequacy of training infrastructure in vocational education, which constrains the development of community resilience. Effective vocational training requires access to modern equipment, workshops, and environmentally sustainable technologies that enable practical skill acquisition. However, many vocational institutions in Nigeria operate with obsolete or insufficient infrastructure, limiting hands-on learning experiences. Umoru and Okeke (2021) reported that weak institutional capacity and poor training facilities hinder the role of TVET in mitigating and adapting to climate-induced disasters.

Furthermore, there is a growing concern regarding the insufficient acquisition of technical green skills, which affects environmental sustainability outcomes. Technical green skills; such as renewable energy installation, waste management, and sustainable agricultural practices, are essential for reducing environmental degradation and promoting sustainable resource use. However, empirical studies reveal a gap between the demand for such skills and their actual acquisition within vocational education systems. For instance, Wahab et al. (2025) reported that the development of green skills through TVET remains inadequate, thereby limiting its contribution to sustainable economic growth and environmental protection.

Also, the limited development of entrepreneurial skills within the green economy context poses a significant challenge to economic empowerment. Entrepreneurship is widely recognised as an important driver of job creation and poverty reduction, particularly within emerging green sectors. However, many vocational education programmes in Nigeria place insufficient emphasis on entrepreneurial competencies tailored to sustainability-oriented ventures. Evidence from recent studies shows that although green entrepreneurship has strong potential to drive sustainable economic growth,

entrepreneurs face significant challenges including inadequate training, limited access to finance, and weak policy support (Agu et al., 2025). Similarly, Anabaraonye et al. (2022) highlight the importance of green entrepreneurship education in fostering economic development but note its underutilisation in Nigeria. As a result, graduates often lack the capacity to initiate and sustain green enterprises, thereby limiting their economic empowerment and contribution to the green economy in Adamawa State. This situation creates a significant gap between policy expectations and practical outcomes, thereby necessitating an empirical investigation into how vocational education and green skills acquisition influence climate change adaptation and sustainable development outcomes in Adamawa State.

Objectives of the Study

This study examined the influence of vocational education and skills acquisition for green jobs on climate change adaptation and the achievement of the sustainable development goals. The study specifically investigated:

1. the influence of curriculum relevance to the green economy on adaptive capacity of TVET graduates to climate change in Adamawa State;
2. the influence of training infrastructure for vocational education on community resilience in Adamawa State;
3. the influence of technical green skills on environmental sustainability in Adamawa State; and
4. the influence of entrepreneurial skills on economic empowerment in Adamawa State.

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance.

H_{01}: Curriculum relevance of vocational education to the green economy has no significant influence on adaptive capacity of graduates of vocational education in Adamawa State.

H1: Curriculum relevance of vocational education to the green economy has significant influence on adaptive capacity of graduates of vocational education in Adamawa State.

H_{02}: Adequacy of vocational education training infrastructure has no significant influence on community resilience in Adamawa State.

H2: Adequacy of vocational education training infrastructure has significant influence on community resilience in Adamawa State.

H_{03}: Vocational education graduates' technical green skills has no significant influence on environmental sustainability in Adamawa State.

H3: Vocational education graduates' technical green skills has significant influence on environmental sustainability in Adamawa State.

H_{04}: Vocational education graduates' entrepreneurial skills has no significant influence on economic empowerment in Adamawa State.

H4: Vocational education graduates' entrepreneurial skills has significant influence on economic empowerment in Adamawa State.

Theoretical Framework

Human Capital Theory

The Human Capital Theory was propounded by Schultz (1961) and later expanded by Becker (1964). Human Capital Theory posits that investment in education, training, and skills development enhances the productivity, efficiency, and economic value of individuals (Schultz, 1961). According to the theory, education is not merely a social service but an economic investment that yields returns in the form of improved performance, higher earnings, and national development. The central assumption of the theory is that individuals acquire knowledge, competencies, and skills through formal education and training, which in turn increase their capacity to perform tasks effectively and contribute meaningfully to economic and social development. It further emphasises that the quality

and relevance of education determine the extent to which individuals can respond to societal and economic needs. Thus, when education systems are aligned with labour market demands, they produce a workforce that is capable of driving innovation, productivity, and sustainable development.

Despite its popularity, the theory has attracted substantial criticism from contemporary scholars, particularly in relation to its assumptions, applicability, and explanatory power. One major critique of Human Capital Theory is its overly economic and reductionist view of education. The theory tends to conceptualise education primarily as an investment for economic returns, thereby neglecting its broader social, cultural, and political functions. Critics argue that this narrow perspective reduces education to a mere tool for labour market productivity rather than a means for holistic human development. For instance, Human Capital Theory has been criticised for prioritising economic outcomes over social justice, equity, and human well-being (Hunter & Shaffer, 2021). Another significant criticism relates to the assumption of a direct and linear relationship between education and economic growth. Empirical evidence from developing countries, including Nigeria, suggests that increased investment in human capital does not always translate into proportional economic growth due to structural challenges such as unemployment, underemployment, and weak institutional frameworks. Studies indicate that factors such as institutional quality and governance significantly mediate the relationship between human capital and growth, thereby challenging the deterministic claims of the theory (Raifu et al., 2021).

Closely related to this is the critique that Human Capital Theory ignores structural inequalities and labour market realities. The theory assumes equal access to opportunities and rational decision-making by individuals, yet in reality, socio-economic disparities, gender inequalities, and regional imbalances affect access to education and employment outcomes. In the Nigerian context, disparities in educational access and labour market participation demonstrate that human capital accumulation alone cannot guarantee equitable economic outcomes (Emah et al., 2025). Furthermore, Human Capital Theory has been criticised for neglecting the role of institutional and socio-political factors, such as corruption, governance inefficiencies, and policy inconsistencies. Empirical evidence shows that corruption significantly undermines the development and effective utilization of human capital, thereby weakening its impact on national development (Fagbemi et al., 2022). This suggests that the theory's focus on individual investment fails to account for systemic constraints that influence outcomes.

Another limitation of the theory is its difficulty in measuring human capital accurately. Human capital encompasses intangible attributes such as skills, knowledge, creativity, and experience, which are not easily quantifiable. Consequently, proxies such as years of schooling or literacy rates are often used, but these may not accurately reflect actual productivity or skill levels. This measurement problem has been identified as a major weakness in empirical applications of the theory (Ogundipe et al., 2021). Also, critics argue that Human Capital Theory fails to account for the problem of skill mismatch and unemployment. In many developing economies, including Nigeria, there is a growing disconnect between educational outputs and labour market demands. As a result, even highly educated individuals may remain unemployed or underemployed, thereby contradicting the theory's assumption that education automatically leads to improved economic outcomes (Keji, 2021). Furthermore, Human Capital Theory has been challenged for its individualistic orientation, which places the burden of economic success on individuals while downplaying collective and structural responsibilities. Critics contend that this perspective shifts attention away from the roles of governments, institutions, and global economic systems in shaping development outcomes (Raifu et al., 2021). As such, the theory has been described as insufficient for explaining complex socio-economic realities in developing countries.

Human Capital Theory is highly pertinent to this study as it provides an analytical lens for linking specific components of vocational education to measurable development outcomes. Within this framework, curriculum relevance to the green economy represents a strategic investment in knowledge that aligns learners' competencies with emerging environmental demands, thereby strengthening their capacity to respond effectively to climate-related challenges. Similarly, training infrastructure constitutes the material and technological foundation of human capital development, as access to modern facilities and tools enhances the practical competence required for building

community resilience in the face of environmental risks. The acquisition of technical green skills further deepens this investment by equipping graduates with specialised, application-oriented abilities necessary for advancing environmental sustainability, particularly in areas such as renewable energy, waste management, and resource efficiency. In parallel, entrepreneurial skills expand the scope of human capital by fostering innovation, self-employment, and value creation, which are critical for achieving economic empowerment within the green economy. Viewed collectively, these dimensions illustrate how vocational education functions not merely as a general investment in skills, but as a targeted mechanism through which different forms of human capital are developed and translated into adaptive, sustainable, and economically productive outcomes.

Ecological Systems Theory

The Ecological Systems Theory was propounded by Bronfenbrenner (1979). Bronfenbrenner, emphasised that human development is influenced by the different types of environmental systems in which individuals are embedded. According to him, development does not occur in isolation but is shaped by continuous interactions between the individual and multiple layers of the surrounding environment. Bronfenbrenner identified several interconnected systems that influence human behaviour and development, including the microsystem (immediate environment such as family and school), mesosystem (interactions between immediate environments), exosystem (external environments that indirectly affect the individual), macrosystem (cultural and societal values), and chronosystem (changes over time). Ecological System Theory marked a significant shift from earlier perspectives that focused primarily on individual or biological factors, by highlighting the dynamic interplay between individuals and their broader social and environmental contexts. Since its introduction in 1979, Ecological Systems Theory has been widely applied in education, sociology, psychology, and environmental studies, providing a comprehensive framework for understanding how multiple environmental factors collectively shape human development and behaviour.

Ecological Systems Theory has been widely influential in explaining how multiple environmental layers shape human development, yet it has attracted critiques in contemporary scholarship. One major criticism is that the theory is excessively descriptive rather than explanatory, as it identifies different environmental systems but does not clearly specify the mechanisms through which these systems interact to influence development. Scholars argue that while the framework is comprehensive, it lacks precision in predicting outcomes or testing causal relationships empirically (Tudge et al., 2016). This limitation makes it difficult for researchers to operationalise the theory in rigorous quantitative studies. Another critique concerns the limited attention to individual agency and biological factors. Although the theory acknowledges interactions between individuals and their environments, critics contend that it places greater emphasis on environmental structures while underestimating personal characteristics such as cognition, motivation, and genetic influences. As a result, the model may not fully capture the dynamic interplay between innate traits and environmental contexts in shaping behaviour (Rosa & Tudge, 2013).

Also, the theory has been criticised for its complexity and challenges in empirical application. The multiple layers of the ecological system - microsystem, mesosystem, exosystem, macrosystem, and chronosystem - can be difficult to measure simultaneously, particularly in large-scale studies. This complexity often leads researchers to focus on only one or two levels, thereby undermining the holistic intent of the theory (Neal & Neal, 2013). Consequently, its practical application in research and policy formulation may be constrained.

Despite these criticisms, the theory remains valuable for its integrative perspective on human development. Ecological Systems Theory provides a robust analytical framework for explaining how vocational education and skills acquisition for green jobs translate into climate change adaptation and sustainable development outcomes through the interaction of multiple environmental systems. The theory posits that individual competencies are shaped by layered contexts, thereby making curriculum relevance to the green economy a critical component of the microsystem, where direct teaching and learning experiences influence graduates' knowledge base and adaptive capacity. Training

infrastructure operates across both the microsystem and exosystem, as the availability of functional facilities, equipment, and institutional support structures determines the effectiveness of skill formation and the ability of graduates to contribute meaningfully to community resilience. In the same vein, the development of technical green skills reflects interactions between institutional environments and broader socio-economic systems, ensuring that acquired competencies align with environmental demands and translate into improved environmental sustainability practices. Entrepreneurial skills are largely embedded within the macrosystem, where cultural norms, policy frameworks, and economic conditions shape opportunities for innovation, self-employment, and economic empowerment. The chronosystem further reinforces these relationships by accounting for the dynamic and evolving nature of environmental challenges, technological advancements, and labour market needs. Collectively, the theory underscores that the effectiveness of curriculum relevance, training infrastructure, technical green skills, and entrepreneurial skills in driving adaptation and sustainability outcomes is contingent upon the continuous interaction between individuals and their educational, institutional, and socio-economic environments.

This study is anchored on the integration of Human Capital Theory and Ecological Systems Theory to provide a comprehensive explanation of how vocational education and skills acquisition for green jobs influence climate change adaptation and sustainable development outcomes. Human Capital Theory explains the role of vocational education as an investment that enhances individuals' productive capacities through curriculum relevance, training infrastructure, and the acquisition of technical and entrepreneurial skills, which in turn yield outcomes such as adaptive capacity, environmental sustainability, community resilience, and economic empowerment. Complementing this, Ecological Systems Theory situates these processes within a broader context by emphasising that the development and application of such skills are shaped by interactions across multiple environmental systems, including institutional settings, socio-economic structures, and policy environments. Together, the two theories provide a dual perspective that links skill development as an economic investment with the environmental and contextual factors that influence how these skills are acquired and utilised, thereby offering a more holistic understanding of the pathways through which vocational education contributes to climate change adaptation and the achievement of sustainable development goals.

Conceptual Framework

Vocational education encompasses structured training programmes that emphasise practical skills, industry relevance, and competency-based learning. Its effectiveness in this study is reflected through constructs such as curriculum relevance to the green economy, and adequacy of training infrastructure. When vocational education is properly aligned with sustainability principles, it serves as a foundation for developing green competencies that can drive environmental innovation and economic transformation (David & Daniels, 2024). Closely related is skills acquisition for green jobs, which represents the development of specific competencies required for employment in environmentally sustainable sectors. These include technical skills in renewable energy and waste management, and entrepreneurial skills for establishing green enterprises. The acquisition of these skills is critical for addressing the global shortage of skilled labour in green industries and for facilitating the transition to a low-carbon economy. Evidence suggests that skill-based training is increasingly prioritised in emerging sectors such as green jobs, where practical competencies are more valuable than formal qualifications alone (Deming, & Kahn, 2018).

Climate change adaptation is the ability of individuals and communities to adjust to environmental changes, reduce vulnerability, and enhance resilience to climate-related risks. This includes adaptive capacity development, and community preparedness. A study conducted by Umoru and Okeke (2021) showed that vocational education significantly influenced climate change adaptation by providing knowledge, skills, and attitudes necessary for managing environmental risks and responding to climate-induced challenges. Similarly, the achievement of the SDGs is closely linked to the availability of a skilled workforce capable of driving sustainable development initiatives. The SDGs encompass economic, social, and environmental dimensions, all of which require a foundation of relevant skills and competencies. Vocational education and green skills acquisition

contribute to SDGs by promoting environmental sustainability, enhancing economic empowerment through job creation, and fostering social inclusion. In Nigeria, the integration of environmental education and sustainable practices into educational systems has been identified as an important strategy for advancing SDG implementation (Babalola & Olawuyi, 2021).

Vocational Education and Skills Acquisition

Vocational education and skills acquisition have increasingly been recognised as critical components of Nigeria's strategy for addressing unemployment, promoting self-reliance, and fostering sustainable national development. Within the Nigerian education system, Technical and Vocational Education and Training (TVET) is designed to equip individuals with practical skills, technical knowledge, and competencies required for gainful employment and entrepreneurship. The National Policy on Education emphasizes vocational education as a means of producing a skilled workforce capable of driving economic growth and technological advancement (Federal Republic of Nigeria, 2013). In contemporary Nigeria, vocational education is closely linked with skills acquisition initiatives aimed at empowering youths and reducing dependence on white-collar jobs. Empirical studies indicate that vocational education significantly contributes to job creation and self-reliance, as it equips learners with marketable skills that can be applied in various sectors of the economy (Ofuonye, 2023). This aligns with the growing recognition that formal academic education alone is insufficient to address the country's rising unemployment rate, thereby necessitating a stronger emphasis on practical and entrepreneurial skills.

Recent evidence further highlights the role of skills acquisition in enhancing employment outcomes among TVET graduates in Nigeria, though the literature increasingly emphasizes that these outcomes are shaped by both enabling effects and persistent structural constraints. Technical and Vocational Education and Training has been shown to improve access to employment opportunities, yet disparities such as gender-based differences in skill acquisition and labour market participation still persist, suggesting that while vocational education contributes positively to employability, systemic challenges continue to limit its full impact (Emah et al., 2025). In a complementary perspective, vocational education and apprenticeship programmes are identified as vital mechanisms for achieving sustainable development, as effective skills acquisition systems, particularly those rooted in apprenticeship models, not only enhance productivity but also promote self-employment and support economic diversification in Nigeria (Ojomu et al., 2022). This aligns with findings that vocational and technical education significantly influences the acquisition of occupational skills for self-reliance among students, particularly in the North-East region, reinforcing the argument that structured skills development pathways remain central to improving employability and fostering economic independence (Adamu et al., 2025).

Moreover, vocational education has been increasingly positioned as a strategic response to Nigeria's unemployment crisis. Mayowa et al. (2025) report that talent development and skills acquisition within TVET institutions serve as effective tools for reducing unemployment and enhancing workforce productivity. This reinforces the argument that vocational education is not only an educational pathway but also a socio-economic intervention aimed at improving livelihoods and national development outcomes. However, despite its recognised importance, vocational education and skills acquisition in Nigeria continue to face challenges, including inadequate funding, obsolete training facilities, weak industry linkage, and societal preference for academic education over technical careers. These challenges limit the effectiveness of TVET programmes in delivering relevant and up-to-date skills required in a rapidly evolving global economy. In summary, vocational education and skills acquisition in Nigeria remain indispensable for fostering employment, entrepreneurship, and sustainable development. While empirical evidence supports their positive impact on job creation and self-reliance, the sector requires significant reforms to enhance its relevance, accessibility, and effectiveness in addressing Nigeria's socio-economic challenges.

Meaning and Concept of Green Jobs

Green jobs are widely understood as employment opportunities that contribute directly or indirectly to environmental sustainability, climate change mitigation, and the transition toward a low-carbon economy. The concept emerged from global concerns about environmental degradation and the need to balance economic development with ecological protection. According to the International Labour Organisation (ILO) (2016), green jobs are decent jobs that preserve or restore the environment, whether in traditional sectors such as agriculture, manufacturing, and construction, or in emerging sectors like renewable energy and energy efficiency. These jobs also contribute to reducing greenhouse gas emissions, improving energy efficiency, minimising waste and pollution, and supporting climate change adaptation strategies (International Labour Organisation (ILO), 2023). The concept of green jobs is closely linked to the broader idea of a green economy, which emphasises sustainable production and consumption patterns while ensuring social inclusion and economic growth. In this regard, green jobs are not limited to environmental specialists alone but include all occupations that integrate environmentally friendly processes and outputs across different sectors of the economy. For instance, workers involved in recycling, sustainable agriculture, environmental engineering, clean energy production, and eco-friendly construction are all considered part of the green job workforce (Organisation for Economic Co-operation and Development (OECD), 2023).

From a conceptual standpoint, green jobs are characterised by two important dimensions. They involve environmental protection functions, such as conserving natural resources, reducing pollution, and restoring ecosystems. Also, they emphasise decent work conditions, meaning that such jobs must provide fair wages, safe working environments, and social protection for workers (ILO, 2016). This dual focus distinguishes green jobs from ordinary employment, as they combine environmental responsibility with social and economic well-being. However, scholarly literature shows that there is no universally accepted definition of green jobs, as different countries and organisations adopt varying perspectives based on their developmental priorities and environmental contexts (OECD, 2023). Despite these differences, there is a general consensus that green jobs are central to achieving the Sustainable Development Goals (SDGs), particularly goals related to climate action, decent work, economic growth, and sustainable communities. The growing demand for green skills further reflects the need for vocational education and training systems to adapt to emerging environmental and technological realities (International Labour Organisation (ILO), 2022).

In Nigeria, green jobs are increasingly being discussed in relation to unemployment reduction, environmental sustainability, and youth empowerment. Scholars argue that Nigeria's transition toward a sustainable economy requires deliberate investment in green skills development through technical and vocational education, renewable energy training, and environmental entrepreneurship (Edewor, Kollie, & Olaoye, 2023). This is particularly important given the country's vulnerability to climate change impacts such as flooding, desertification, and environmental degradation. Therefore, green jobs in Nigeria represent both an environmental necessity and an economic opportunity, especially for young graduates of vocational education institutions. Thus, green jobs can be understood as environmentally oriented employment that supports ecological sustainability while promoting decent work and economic inclusion. They represent a critical pathway for addressing climate change, achieving sustainable development, and transforming labour markets toward environmentally responsible practices.

Climate Change Adaptation

Climate change adaptation is the process through which individuals, communities, and institutions adjust their behaviours, systems, and practices to reduce vulnerability to the adverse effects of climate change and to take advantage of any potential opportunities associated with it. It involves deliberate actions aimed at moderating harm or exploiting beneficial opportunities arising from climatic changes such as rising temperatures, flooding, drought, and erratic rainfall patterns. Adaptation is widely regarded as a critical response strategy because, even with effective mitigation efforts, some level of climate change impacts is unavoidable (Usman et al., 2024). Climate change adaptation is understood as a multi-dimensional and continuous process that enhances resilience and reduces exposure to climate risks. It encompasses a wide range of strategies, including technological adjustments, behavioural changes, infrastructural improvements, ecosystem-based approaches, and

policy interventions. In developing countries like Nigeria, adaptation is particularly important due to high vulnerability levels and limited coping capacity, especially in sectors such as agriculture, water resources, and rural livelihoods (Nwobodo, & Agwu, 2021).

Empirical literature such as Usman et al. (2024) further explain climate change adaptation as both a developmental and sustainability-oriented concept rather than merely an environmental response. It is closely linked to sustainable development because it seeks to strengthen systems; economic, social, and ecological, so that they can withstand climate shocks while maintaining functionality. For instance, adaptation strategies in Nigeria include the use of drought-resistant crops, improved irrigation systems, early warning systems, and climate-smart agricultural practices aimed at reducing vulnerability and improving food security.

Climate change adaptation, in Nigeria, also involves institutional and governance mechanisms that support resilience building. These include national policies, environmental education, community-based adaptation programmes, and integration of climate risk considerations into development planning. Nwobodo and Agwu (2021) reported that Nigeria's adaptation efforts are shaped by its high exposure to climate hazards such as flooding, desertification, and coastal erosion, which significantly affect livelihoods and infrastructure. Therefore, adaptation is increasingly being viewed as a necessary strategy for protecting human welfare and ensuring sustainable development outcomes. Thus, climate change adaptation is the process of adjusting natural and human systems to actual or expected climate impacts in order to reduce harm and enhance resilience. It is a vital component of sustainable development, particularly in vulnerable regions such as Nigeria, where climate-related risks continue to threaten livelihoods, food security, and economic stability.

The Sustainable Development Goals

The Sustainable Development Goals (SDGs) represent a comprehensive global framework designed to address the pressing social, economic, and environmental challenges facing humanity. The SDGs were formally adopted in 2015 by the United Nations as part of the 2030 Agenda for Sustainable Development, which provides a universal blueprint for achieving a more sustainable and equitable future for all. The framework consists of 17 interconnected goals, 169 targets, and numerous indicators, aimed at tackling issues such as poverty, inequality, climate change, environmental degradation, peace, and justice (United Nations, 2015).

The SDGs are understood as a universal call to action that integrates the three core dimensions of sustainable development: economic growth, social inclusion, and environmental protection. Unlike earlier development frameworks, the SDGs adopt a holistic and inclusive approach, recognising that progress in one area is closely linked to outcomes in others. For example, efforts to promote quality education, decent work, and clean energy are all interdependent and collectively contribute to sustainable development outcomes (Saxena et al., 2021). A key feature of the SDGs is their grounding in five fundamental pillars, often referred to as the "5Ps"; people, planet, prosperity, peace, and partnership. These pillars emphasise that sustainable development must prioritise human well-being, environmental sustainability, economic advancement, peaceful societies, and global collaboration. This integrated structure ensures that no aspect of development is pursued at the expense of another, thereby promoting balanced and inclusive growth (Bellantuono et al. 2022).

In Nigeria, the SDGs are particularly significant as they provide a strategic framework for addressing critical development challenges such as poverty, unemployment, environmental degradation, and limited access to quality education and healthcare. Nigerian scholars emphasize that the SDGs serve as a guiding policy instrument for national development planning and implementation. For instance, Zeb-Obipi and Okeah (2023) argue that the SDGs offer a structured approach for aligning national development priorities with global sustainability targets, while also highlighting the challenges associated with their implementation, including inadequate resources and institutional capacity. Furthermore, the SDGs are closely linked to education and skills development, particularly in developing countries. Education is considered a central driver for achieving the goals, as it enhances

human capacity, promotes innovation, and fosters sustainable practices. This accentuates the relevance of vocational education and green skills acquisition in contributing to the realisation of SDGs, especially those related to climate action, decent work, and sustainable communities.

Methodology

The study employed a descriptive survey research design. This design is considered appropriate because it allows for the collection of data from a large population at a single point in time in order to describe the influence of vocational education and skills acquisition for green jobs on climate change adaptation and the achievement of the sustainable development goals (Babbie, 2020). It also permits the use of inferential statistics to test hypotheses and generalise findings. The population of the study comprises 1,200 graduates of Technical and Vocational Education and Training (TVET) from technical colleges, polytechnics, colleges of education (technical), and other accredited vocational training centres within Adamawa State (Adamawa State Ministry of Education, 2023). These individuals are considered appropriate for the study because they have undergone vocational training and are expected to possess skills relevant to employment, sustainability practices, and community development.

A stratified random sampling technique was employed to ensure representativeness across the different categories of vocational education graduates in Adamawa State. The sampling frame was developed using institutional records obtained from the Adamawa State Ministry of Education and Technical and Vocational Education and Training (TVET) centres. The population was first stratified based on institution type and programme category, after which respondents were selected proportionately and randomly from each stratum. This approach ensured that key subgroups within the population were adequately represented and reduced sampling bias.

The sample size for the study was determined using the Krejcie and Morgan (1970) sample size determination table, which provides scientifically grounded estimates for finite populations. In line with this standard, and taking into consideration the study parameters, a sample size of 300 respondents was deemed appropriate. The determination of adequacy was further supported by an a priori power analysis for multiple regression, assuming an effect size of $f^2 = 0.15$ (medium effect), a significance level (α) of 0.05, statistical power of 0.80, and three predictor variables, which confirmed that a minimum sample of approximately 77 respondents would be sufficient, thereby making 300 highly robust for the analysis and enhancing generalisability.

The instrument used for data collection was a structured questionnaire titled "Vocational Education and Green Skills Questionnaire (VEGSQ)", designed on a 5-point Likert scale of measurement, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. The questionnaire was divided into four sections, with Section A capturing demographic information, while Sections B, C, and D contained items on the key constructs of the study. Specifically, Section B measured vocational education exposure (8 items), Section C assessed green skills acquisition (10 items), and Section D examined employability outcomes (8 items). To ensure content validity, the initial draft of the instrument was subjected to expert review by three validators comprising two lecturers in vocational and technical education and one expert in educational measurement and evaluation from the Federal College of Education, Yola, Adamawa State, Nigeria. The experts' comments and suggestions were used to refine and improve the clarity, relevance, and appropriateness of the items. Face validity was also established through the experts' assessment of the instrument's structure, language clarity, and alignment with the research objectives. In addition, the Content Validity Ratio (CVR) was computed for each item based on expert ratings, and only items meeting the acceptable threshold were retained in the final instrument.

The reliability of the instrument was established through a pilot study conducted outside the main study area. Data from the pilot test were analysed using Cronbach's alpha coefficient to determine internal consistency. The results showed reliability coefficients of 0.82 for vocational education exposure, 0.86 for green skills acquisition, and 0.88 for employability outcomes, indicating that the instrument was highly reliable for the study. Data collection was conducted through Google Forms to ensure wider reach and convenience for respondents dispersed across the state. Participants

were adequately briefed on the purpose of the study, and assurance of confidentiality and anonymity was provided to encourage honest and unbiased responses.

Inferential statistics were employed to test the hypotheses at a 0.05 level of significance, with simple linear regression used to examine the predictive relationship between the independent and dependent variables. Prior to the analysis, the assumptions underlying simple linear regression were carefully tested to ensure the validity of the results. Normality of the data was assessed using the Shapiro–Wilk test alongside visual inspection of histograms and normal probability plots (P–P plots). Linearity between the variables was examined through scatterplot analysis to confirm a linear relationship. Homoscedasticity was evaluated using scatterplots of standardised residuals against predicted values to ensure constant variance of errors. Independence of errors was tested using the Durbin–Watson statistic, while the presence of influential outliers was assessed using Cook's Distance and leverage values to identify and exclude any data points exerting undue influence on the model. All statistical analyses were performed using IBM SPSS Statistics version 26, which provided the necessary tools for both diagnostic testing of assumptions and execution of the regression analysis. The decision rule for hypothesis testing was based on the p-value approach, where results were considered statistically significant if the probability value was less than 0.05.

Ethical standards were strictly adhered to. Participation was voluntary, informed consent was obtained, and respondents' anonymity and confidentiality were maintained throughout the study.

Results

Hypothesis One: Curriculum relevance of vocational education to the green economy has no significant influence on adaptive capacity of graduates of vocational education in Adamawa.

Table 1:

Simple Linear Regression: Curriculum Relevance Predicting Adaptive Capacity

Model	R	R^2	Adj. R^2	Std. Error	β	t	df	F-value
1	0.624	0.412	0.410	0.531	0.624	14.47	1, 298	0.0002

Table 1 shows the coefficient of determination ($R^2 = 0.412$) indicates that approximately 41.2% of the variation in adaptive capacity is explained by the relevance of the curriculum. The statistically significant p-value (0.0002) ($p < 0.05$) and high t-value (14.47) further confirm that when vocational education curricula are aligned with green economy demands, graduates are better equipped to respond to climate-related challenges and adapt effectively to environmental changes.

Hypothesis Two: Adequacy of vocational education training infrastructure has no significant influence on community resilience in Adamawa State.

Table 2:

Simple Linear Regression: Adequacy of Vocational Education Training Infrastructure

Model	R	R^2	Adj. R^2	Std. Error	β	t	df	F-value
1	0.598	0.357	0.355	0.564	0.598	12.89	1, 298	0.0001

Table 2 demonstrate that training infrastructure significantly influences community resilience. With an R^2 value of 0.357, the model explains 35.7% of the variation in community resilience. This suggests that the adequacy of workshops, equipment, and training facilities plays a substantial role in preparing graduates to contribute to community-level responses to environmental and socio-economic challenges. The significant relationship underscores the importance of practical learning environments in vocational education.

Hypothesis Three: Vocational education graduates' technical green skills has no significant influence on environmental sustainability in Adamawa State.

Table 3:
Simple Linear Regression: Vocational Education Graduates' Technical Green Skills

Model	R	R^2	Adj. R^2	Std. Error	β	t	Df	F-value
1	0.671	0.450	0.448	0.498	0.671	15.62	1, 298	0.0001

In Table 3, the R^2 value of 0.450 shows that 45.0% of the variation in environmental sustainability is accounted for by technical green skills, making it the strongest model among the four. This suggests that competencies such as renewable energy application, waste management, and sustainable practices are critical determinants of environmental outcomes. The statistical significance confirms that enhancing technical skills directly contributes to improved environmental sustainability.
Hypothesis Four: Vocational education graduates' entrepreneurial skills has no significant influence on economic empowerment in Adamawa State.
Table 4:
Simple Linear Regression: Vocational Education Graduates' Entrepreneurial Skills

Model	R	R^2	Adj. R^2	Std. Error	β	t	df	F-value
1	0.615	0.378	0.376	0.552	0.615	13.54	1, 298	0.0003

The results in Table 4 R^2 value of 0.378 indicates that 37.8% of the variation in economic empowerment is explained by entrepreneurial competencies. This finding suggests that graduates with stronger entrepreneurial skills are more likely to create employment opportunities, generate income, and achieve financial independence. The significant p-value reinforces the role of entrepreneurship as a key driver of economic empowerment within the green economy context.

Discussion

While the present findings consistently affirm the positive role of curriculum relevance, training infrastructure, technical green skills, and entrepreneurial competencies, some studies present more distinct or even contrasting evidence, suggesting that these relationships may not be uniformly strong across contexts. For instance, Okolie et al. (2020), found that although graduates possessed employable and entrepreneurial skills, these competencies did not translate significantly into improved employment outcomes due to weak industry linkages and limited labour market absorption. This partially contradicts the current finding that entrepreneurial skills strongly predict economic empowerment, as it highlights that skill possession alone may not guarantee economic gains in the absence of enabling economic structures. The discrepancy can be understood from both structural and contextual perspectives. While the present study emphasises individual-level competencies such as entrepreneurial and green skills, Okolie et al. underscore systemic barriers such as inadequate industrial partnerships, poor policy implementation, and limited access to startup capital. This suggests that the effectiveness of skills, whether green, technical, or entrepreneurial, is mediated by broader socio-economic conditions. In other words, even when curricula are relevant and training is adequate, the absence of a supportive ecosystem, such as funding opportunities, policy support, market access, may weaken the expected outcomes.

Similarly, some international evidence, such as that discussed by International Labour Organisation (ILO, 2019), indicates that the integration of green skills into TVET does not automatically lead to environmental sustainability or employment unless accompanied by coherent national policies and industry demand for green jobs. This contrasts with the strong predictive relationship found in the present study between technical green skills and environmental sustainability. The divergence here may be attributed to differences in measurement: while this study captures perceived or self-reported impacts of green skills, broader institutional studies often assess macro-level outcomes such as job creation and sectoral transformation, which are slower and more complex to manifest.

In summary, these differences highlight that while the current findings are valid within the study context, the impact of vocational education variables is not solely determined by their presence

or strength but also by the interplay of institutional support, economic conditions, and policy frameworks. This underscores the need to move beyond linear assumptions and consider multi-level dynamics when interpreting the role of TVET in climate adaptation and sustainable development.

Conclusion

Based on the findings of this study, the study concluded that vocational education and skills acquisition play a significant role in promoting climate change adaptation and sustainable development outcomes in Adamawa State. The study found that curriculum relevance, adequate training infrastructure, technical green skills, and entrepreneurial competencies are critical determinants of adaptive capacity, community resilience, environmental sustainability, and economic empowerment. The study therefore underscores the need to reposition vocational education systems to align with green economy demands and sustainability goals.

Limitation of the Study

The use of a cross-sectional survey design restricts the ability of the study to establish causal relationships among the variables, as data were collected at a single point in time. Reliance on self-reported responses through the questionnaire may introduce response bias, including social desirability and overestimation of competencies. Although a probability sampling technique was employed, the study was limited to vocational education graduates within Adamawa State, which may constrain the generalisability of the findings to other regions with different socio-economic and institutional contexts. Also, the use of Google Forms for data collection may have excluded potential respondents with limited internet access, thereby affecting inclusiveness. Moreover, while variables such as curriculum relevance, training infrastructure, technical green skills, and entrepreneurial skills were examined, other contextual factors, such as policy environment, funding availability, and labour market dynamics, were not explicitly controlled for, which may also influence the observed outcomes.

Contributions to Knowledge

This study makes a meaningful contribution to knowledge by extending the discourse on vocational education beyond its traditional focus on employability to its emerging role in climate change adaptation and sustainable development. Specifically, it provides empirical evidence from Adamawa State that links vocational education components; curriculum relevance, training infrastructure, technical green skills, and entrepreneurial skills, to important development outcomes such as adaptive capacity, community resilience, environmental sustainability, and economic empowerment. Through this, the study bridges an important gap in the literature where these variables are often examined in isolation rather than as an integrated framework.

The study also contributes theoretically by reinforcing the applicability of human capital development perspectives to green economy transitions. It demonstrates that investment in context-relevant vocational education and skills acquisition yields measurable outcomes not only in economic terms but also in environmental and social dimensions.

Methodologically, the use of regression analysis to establish predictive relationships further strengthens empirical understanding of how specific components of vocational education influence sustainable development outcomes.

Practically, the study provides evidence-based insights for policymakers, educators, and development practitioners by identifying the specific areas within vocational education that require strengthening to achieve sustainability goals.

Recommendations

The following recommendations among others were made based on the findings of the study:

i. The National Board for Technical Education (NBTE) should revise vocational education curricula to integrate green economy concepts, climate change education, and sustainability practices in order to enhance graduates' adaptive capacity.

ii. Government should invest in modern and environmentally sustainable training facilities and equipment to strengthen practical skill acquisition and improve community resilience through funding mechanisms such as federal allocation, donor agencies, private-public partnership (PPP).

References

Adamu, A. L., Saidu, M. A., Abdullahi, F. S., & Usman, D. J. (2025). Influence of vocational and technical education on students' skills acquisition for self-reliance in North-East Nigeria. *Kashere Journal of Education, 8*(1), 106-113. https://www.researchgate.net/publication/393637207

Agu, G. G., Ngozi, D. O., & Hinson, R. E. (2025). Entrepreneurship for climate change mitigation and adaptation in Nigeria and Ghana: Motivations, challenges and policy implications. In *Climate change mitigation and adaptation in practice* (pp. 297–314). Springer. https://doi.org/10.1007/978-3-031-85217-6_16

Anabaraonye, B., Okon, O. E., Ewa, B. O., Adeniyi, T. F., & Nwobu, E. A. (2022). Green entrepreneurship education for sustainable development in Nigeria. *International Journal of Research in Civil Engineering and Technology, 3*(1), 16-19. https://www.civilengineeringjournals.com/ijrcet/article/23/3-1-3-106.pdf

Auta, M. (2022). Global partnership in achieving sustainable development goals (SDGs) in Nigeria: The role of technology and vocational education and training (TVET). *Journal of Education and Vocational Research, 13*(1), 1-5. https://doi.org/10.22610/jevr.v13i1(V).3244

Ayuba, Z. G., Datol, I. G., & Aluwong, E. B. (2024). Greening technical vocational education and training (TVET) for combating climate change and promoting sustainable development in Nigeria. *BW Academic Journal, 1*(3), 43-49. https://bwjournal.org/index.php/bsjournal/article/view/2175

Babalola, A., & Olawuyi, D. S. (2021). Advancing environmental education for sustainable development in higher education in Nigeria: Current challenges and future directions. *Sustainability, 13*(19), 10808. https://doi.org/10.3390/su131910808

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. National Bureau of Economic Research. https://www.nber.org/books-and-chapters/human-capital-theoretical-and-empirical-analysis-special-reference-education-first-edition

Bellantuono, L., Monaco, A., Amoroso, N., Aquaro, V., Lombardi, A., Tangaro, S., & Bellotti, R. (2022). Sustainable development goals: Conceptualization, communication and achievement synergies in a complex network framework. *Applied Network Science, 7*(1), Article 14. https://doi.org/10.1007/s41109-022-00455-1

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press. https://doi.org/10.4159/9780674028845

David, R., & Daniels, C. (2024). Greening technical and vocational education and training for energy transition in Nigeria. *Journal of Education for Sustainable Development, 18*(2), 101-121. https://doi.org/10.1177/09734082251335548

Deming, D. J., & Kahn, L. B. (2018). Skill requirements across firms and labor markets: Evidence from job postings for professionals. *Journal of Labor Economics, 36*(S1), S337–S369. https://doi.org/10.1086/694106

Edewor, S. E., Kollie, G. B., & Olaoye, I. J. (2023). Conditions driving youth employment in key sectors of the Nigerian economy. *Sustainability, 15*(7), 6096. https://doi.org/10.3390/su15076096

Emah, I. E., Doneys, P., Kusakabe, K., & Pathak, S. (2025). Skill acquisition in TVET and access to employment in Nigeria: A gender perspective. *Frontiers in Sociology, 10*, 1577765. https://doi.org/10.3389/fsoc.2025.1577765

Fagbemi, F., Osinubi, T. T., Nzeribe, G. E., & Bankole, T. O. (2022). Human capital development challenge: Why corruption eradication is a panacea in Nigeria. *Journal of Public Affairs, 7*(2). https://doi.org/10.1177/24551333221090312

Hunter, B. M., & Shaffer, J. D. (2021). Human capital, risk and the World Bank's reintermediation in global development. *Third World Quarterly, 43*(4), 35–54. https://doi.org/10.1080/01436597.2021.1953980

International Labour Organization. (2016). *What is a green job?* International Labour Office, Geneva, Switzerland. https://www.ilo.org/topics-and-sectors/just-transition-towards-environmentally-sustainable-economies-and-societies/what-green-job

International Labour Organization. (2022). *Skills for a greener future: A global overview*. International Labour Office, Geneva, Switzerland. https://www.ilo.org

International Labour Organization. (2023). *Green jobs and just transition: Concepts and policy frameworks*. International Labour Office, Geneva, Switzerland. https://www.ilo.org

Keji, S. A. (2021). Human capital and economic growth in Nigeria. *Future Business Journal, 7*(49). https://doi.org/10.1186/s43093-021-00095-4

Mayowa, D. A., Olayemi-Olalekan, I., Gbenga-Arotiba, H. T., & Adeosun, M. A. (2025). Talent management and skills acquisition in technical and vocational education: An antidote to the unemployment problem in Nigeria. *Top Educational Review Journal, 16*(7), 17-25. https://doi.org/10.5281/zenodo.16984933

Nwobodo, C. E., & Agwu, J. (2021). Climate change adaptation strategies and sustainable development in Nigeria. *Journal of Environmental Management, 284*, 112020. https://doi.org/10.1016/j.jenvman.2021.112020

Ochieng, J., Kirimi, L., & Ochieng, D. O. (2020). Managing climate risk through crop diversification in rural Kenya. *Climatic Change* 162, 1107-1125 (2020). https://doi.org/10.1007/s10584-020-02727-0

OECD (2023), *Job Creation and Local Economic Development 2023: Bridging the Great Green Divide*, OECD Publishing, Paris, https://doi.org/10.1787/21db61c1-en.

OECD. (2023). *The green transition and jobs: What do we know?* https://doi.org/10.1787/21db61c1-en

Ofuonye, R. A. (2023). Vocational education and skills acquisition for job creation among students of colleges of education in Nigeria. *Journal of Theoretical and Empirical Studies in Education, 8*(1). https://journals.unizik.edu.ng/jtese/article/view/2289

Ogundipe, A. A., Mobolaji, O., & Ogundipe, O. M. (2021). An analysis of the effect of human capital investment on economic development in Nigeria: Does a new indicator alter existing evidence? *Asian Economic and Financial Review, 11*(1), 17–29. https://doi.org/10.18488/journal.aefr.2021.111.17.29

Ojomu, A. A., Okwo, C. R., Ibekwe, N. F., Okoruwa, J. I., Adiagwai, F., & Ojo, F. U. (2022). Promoting quality apprenticeship and skills acquisition for sustainable national development in Nigeria. *American Journal of Education and Technology, 2*(1). https://doi.org/10.54536/ajet.v2i1.1183

Okoli, J. N., & Ifeakor, A. C. (2014). An overview of climate change and food security: Adaptation strategies and mitigation measures in Nigeria. *Journal of Education and Practice, 5*(32). https://www.iiste.org/Journals/index.php/JEP/article/view/16708

Okolie, U. C., Nwajiuba, C. A., Mlanga, S., & Chinyamurindi, W. T. (2020). Technical and vocational education and training (TVET) and skills development for sustainable development in Africa: A systematic review. *Journal of Technical Education and Training, 12*(1), 1-14. https://doi.org/10.30880/jtet.2020.12.01.001

Raifu, I. A., Nnadozie, O. O., & Opeloyeru, O. S. (2021). The role of institutional quality in the human capital-economic growth nexus in Nigeria: Evidence from aggregate and gender perspective.

Journal of Economic Development, *46*(4), 157–188. https://doi.org/10.35866/caujed.2021.46.4.007

Saxena, A., Ramaswamy, M., Beale, J., Marciniuk, D., & Smith, P. (2021). Striving for the United Nations (UN) Sustainable Development Goals (SDGs): What will it take? *Discover Sustainability*, *2*(20). https://doi.org/10.1007/s43621-021-00029-8

Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1-17. https://www.jstor.org/stable/1818907

Umoru, T. A., & Okeke, A. U. (2021). The challenges of technical and vocational education in mitigating climate change induced catastrophes in Nigeria. *African Journal of Teacher Education*. https://journal.lib.uoguelph.ca/index.php/ajote/article/view/1932/2487

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. https://sdgs.un.org/2030agenda

Usman, S., Jayeoba, J. O., & Kundiri, A. M. (2024). Climate change at a global concept: Impacts and adaptation measures. *International Journal of Environment and Climate Change*, *14*(6), 445-459. https://doi.org/10.9734/ijecc/2024/v14i64242

Wahab, A., Babalola, O., Ghartey, I., & Ojo-Fafore, E. (2025). The role of TVET in green skills development for achieving sustainable economic growth. *Journal of Latin American Sciences and Culture, 7*(11), 89-108. https://doi.org/10.52428/27888991.v7i11.1461

Zeb-Obipi, I., & Okeah, M. I. N. (2023). Sustainable Development Goals (SDGs): Content, importance, implementation challenges and the roles of the management scientist. *Nigerian Academy of Management Journal*. https://namj.tamn-ng.org/index.php/home/article/view/353