



# Green Content Analysis of Technical, Vocational Education and Training

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**ABSTRACT:** This study provides an overview of Green Economy and discusses whether the topic is extant or obsolete. Its relevance to technical, vocational education and training (TVET) was highlighted. Content analysis of a Nigerian TVET curriculum was performed against thirty-two (32) green economy keywords. Results indicate an urgent need for the greening of the curriculum; an urgent need for the development of appropriate human capital; and the need for definite implementation of education for sustainability beyond mere propaganda.

**KEYWORDS:** Green economy, Human capital development, TVET curriculum, electronic technology education, electrical technology education, Nigeria

Received 25 August, 2022; Revised 07 Sep., 2022; Accepted 09 Sep., 2022 © The author(s) 2022.

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## I. INTRODUCTION

Over the years, several classifications have emerged of the human society. One of such is: Developed and Developing nations. Remarkably, the distinction between the first and the latter is not in the possession of mineral resources otherwise, the list of countries within the classification would flip. Rather, the distinction can be traced to the quality of the human capital. In the educational sector this can be measured from the curriculum content and the quality of discuss within the academic environment. Hence, the need to evaluate Technical, Vocational Education and Training (TVET) curricula to stimulate appropriate qualitative and quantitative interventions.

“Green Economy” was coined at the Rio+20 conference and defined by [1] as an economy that fosters well-being, social inclusion, and significant reduction of environmental risks and ecological scarcities. Thus, green economy emerged as an economic term to describe an economy whose processes/activities and developments are sustainable.

Sustainable Development (SD) approaches were the major resolutions at the United Nations Conference on Environment and Development [UNCED] which held in Rio de Janeiro in 1992. That year, the United Nations of which Nigeria was and is still a member-State, adopted the recommendations of the Brundtland Report, and passed a resolution to the problems of that time and the foreseen challenges of this 21st century. These problems included “poverty, hunger, ill-health and illiteracy, and the continuing deterioration of ecosystems” on which human well-being depends [2]. Three decades after, those challenges are as real as predicted. More than 25 principles were proposed at that conference later referred to as Agenda 21. The role of Education in fostering those desired development was highlighted and explained.

Twenty years later, member-States converged again in the same city of Rio [Rio+20 conference]. At this time, an economic term had emerged and have become accepted even by policy makers. That term was “Green Economy” often referred to as green growth. Several countries and enterprises have since considered Green Economy [GE] as a tool for Sustainable Development [SD] [3].

With years of research, partnership among nations, policy development, and public enlightenment, such an economy had become characterized by certain concepts, and theories. The heuristic model of Green Economy developed by [4] can help to operationalize Green Economy [GE]. Such an operational knowledge is critical for effective implementation, and to promote the needed paradigm shift towards a genuine GE. This is because societal and company assumptions were amongst the identified barriers to attaining GE [3]. Other

challenges include funds, and adequacy of appropriate expertise [3], [5]. Such assumptions or paradigms could best be resolved through strategic enlightenment, education, training, and policy implementations.

Being an academic programme that imparts technological knowledge, skills, and experiences related to various economic occupations and social life – Technical, Vocational Education and Training [TVET] in Nigeria needs to start incorporating approaches to greening of its curriculum. This is because, curriculum can be conceived as a map with which implementers and students plot their bearing to arrive at a preconceived goal. A laudable preconceived goal notwithstanding, if the route dictated by the map does not provide the needed experiences needed to ensure achievement of the expertise, such laudable goals would amount to despair. TVET under the National Commission for Colleges of Education [NCCE] provides five (5) broad programmes: Agriculture, Business, Fine and Applied Arts, Home Economics, and Technical Education.

According to [4] Green Economy has become attractive to policy makers – governments, businesses, and institutions – hence, the need for TVET implementers to acquaint with its concepts and theories and educational implications. Similarly, TVET policy makers can consider it as a critical tool to achieve sustainable education and a prosperous future. Otherwise, the threats identified at the United Nations Conference on Environmental Development [UNCED] will continue unabated. Obviously, Green Economy is a contemporary international issue, and relevant to academia.

## **II. SIGNIFICANCE OF GREEN ECONOMY TO TVET**

To foster SD through Education for Sustainable Development [ESD], Agenda 21 in [2] proposed that member States should intensify the promotion of “environmental and development education” as an advance on Basic Education.

[3] informs that despite the decade history of sustainability, its concept is still evolving and being applied. Thus, this is a critical time for TVET curricula to be aligned towards sustainable development by engaging the dynamics of green economy.

The prompt adoption of “Green Economy” by the UN was to mitigate the empirically recorded threats to human life on planet earth [2], [3]. These threats were a product of the intense focus on profitability only (i.e., the economics of opportunities) neglecting the environment and social impacts. Despite the existence of Agenda 21 action-plan, there is an observed but undesirable delay in integrating green economy into Technical and Vocational Education [TVET]. This is not peculiar to Nigeria alone [6].

Most academic and organizational research are increasingly directed at greener products and processes. Sustainability has become a global discuss. Thus, potential graduates and teachers need to be aware of issues related to this topic. International partnerships and collaborations are increasingly dependent on knowledge of, and operation of these concepts and the related tools.

From the preference of solar photovoltaic panels over fossil fuels, to the innovation of electric vehicles to replace internal combustion engines, all such investments and innovations were driven by the decision to go green. Similarly, the creation of Nigeria’s Building Energy Efficiency Code [BEEC] and the rating of agricultural farm produce are all efforts to promote green economy. Graduates represent a critical part of a nation’s workforce and leadership. Therefore, it is inevitable to impart undergraduates with knowledge of the theories, concepts, and tools associated with green economy implementation.

## **III. FREQUENTLY ASKED QUESTIONS (FAQS)**

- 1) What is the environmental impact of the investment?
- 2) What is the social impact of the investment?
- 3) What is the economic impact of the investment?
- 4) What measures would be engaged to curtail the risks and ensure sustainable development?
- 5) What is the carbon footprint of the investment?
- 6) What is the Life Cycle Analysis of the of the investment?
- 7) How can the affected ecosystems be relocated, or protected?
- 8) How efficient is the energy utilization?
- 9) How inclusive is the greening of the economy? This question implies much more that, are all sectors of the system/economy green or is it only a few?

### **3.1 BENEFITS OF ALIGNING TVET CURRICULUM TO GREEN ECONOMY**

Despite the concept being globally adopted in 2012, a decade after, some nations including Nigeria are yet to achieve full-scale integration into her academic curriculum, at a national scale [6]. This tallies with [3] findings that there is usually a long and undesirable time between regulatory developments and its implementation. Nigeria like other UN member-states have taken steps toward going green since 2012. This can be seen in strategies as ‘Nigeria’s priority list at the Rio+20 conference’ (Daily Trust, 2012), the establishment of Nigeria Energy Support Programme [NESP], creation of Nigeria’s Building Energy Efficiency Code (BEEC),

and BEEC case study implementations in selected States of the federation: Lagos, Jos, and Edo State [7], [8]. These identified examples are policy/regulatory, and funding indices. Nigeria having addressed these two globally common barriers hence needs to step up and address the remaining two globally common barriers in the second phase. These barriers include availability of appropriate expertise, and societal and company assumptions. Barriers in this second phase can best be mitigated through education and training; in a more specific term, referred to as Human Capital Development [3], [9]

Drawing insights from the reviewed scholarly literatures, TVET and specifically Electrical and Electronic Technology would benefit immensely if aligned to green economy. Reasons include:

- 1) The environment and socio-economic threats identified and being addressed by the UN is common to all member-states, which Nigeria belongs to.
- 2) The resilient foundation which would be facilitated by such an education and training would stimulate positive change in societal and organisational paradigms towards a greener economy
- 3) Graduates' skill competencies and paradigm is a function of their academic experience and training environment [10], [11]
- 4) Green economy and sustainable development are critical and vital 21st Century issues that require urgent attention by relevant stakeholders. Moreover, Sustainable Development Goals [SDG] spans from 2015 to 2030.
- 5) Future energy, buildings, agriculture, and mobility are already tilted towards being 'green'. This requires an accelerated availability of appropriate professionals with corresponding change in societal and organisational paradigms.
- 6) The relevance of Higher Education Institutions (HEI) is a function of its usefulness to the needs of the local community and nation it serves. Decarbonization, resource efficiency, and circular economy are pivotal issues to Nigeria. TVET and EETE curricula that is green economy aligned would positively influence SDG#4, SDG#12, SDG#7, SDG#9, SDG#11, SDG#13, SDG#15, SDG#17.
- 7) Technologies become outdated every passing year. Yesterday's innovation could become obsolete today. This decade's innovative technologies and methods can become stale/obsolete in the following decades. Therefore, there is need to advance with the trends [12]
- 8) When TVET and specifically EETE values the urgent need for a green economy, HEI in this discipline would intensify their research in this sector, and proffer innovative and sustainable solutions.

Findings from [3] and [6] on the features of curricula needed to facilitate a green economy shows a striking difference from basic education. This validates United Nations Conference on Environmental Development (1993) call for a reorientation of education to achieve sustainable development. Table 4.1 shows the keywords used in this study to assess the NCE Minimum Standard TVET programmes.

**Table 4.1:** Green Economy keywords

Keywords	Code	Keywords [Cont.]	Code [Cont.]
Energy efficiency	1	Economic growth	17
Green technology	2	Economy (EY)	18
Innovations (INV)	3	Emissions	19
Energy Policy (EP)	4	Environmental Resource	20
Pollution control	5	Ecosystems	21
Bioenergy	6	Ethical standards (ES)	22
Recycling	7	Competitive advantage	23
Circular economy	8	Health and Safety (H&S)	24
Environmental policy	9	Cost efficiency	25
Climate change	10	Energy conservation (EC)	26
Life cycle analysis	11	Productivity	27
Carbon footprint	12	Ecological implications	28
Cost benefit analysis	13	Risk assessment (RA)	29
Employment (EMP)	14	Ecological economics	30

Sustainable development	15	Environmental economics	31
Sustainability	16	Intellectual property rights (IPR)	32

#### IV. METHOD

Content analysis was performed on 70 Technical Education modules. These entailed education, and general studies modules, and discipline specific modules. Frequency of the categorical data was recorded, and the average determined.

The sample consisted of all Modules offered in Technical Education. Technical Education entails five (5) programmes: Automobile Technology [TEA], Building Technology [TEB], Electrical and Electronic Technology [TEE], Metalwork Technology [TEM], and Woodwork technology [TEW]. According to the NCCE 2020 Minimum Standard, these five programmes, offer 34 Educational and General Studies Modules, and 36 specialized Technical Modules. A summary of total number of Modules offered in each programme is presented in Table 7.1. These five programmes are a three-year Certificate awarding programme. Thus, the content of 70 Modules were analysed cutting across the five programmes of Technical Education. Frequency of Modules containing Green Economy index (see Table 4.1) was recorded (see Table 7.1)

#### V. DATA PRESENTATION AND ANALYSIS

**Table V.1 Technical Education Programmes**

PROGRAMME	ABBREVIATION	NO. OF MODULES
Automobile Technology	TEA	69
Building Technology	TEB	69
Electrical and Electronics Technology	TEE	68
Metalwork Technology	TEM	68
Woodwork Technology	TEW	68

**Table V.2: Observed frequency**

*	Keywords								Total
	INV	EMP	EY	ES	H&S	EC	RA	IPR	
TEA	2	1	1	5	4	1	3	1	18
TEB	2	1	1	5	4	1	3	1	18
TEE	2	1	1	5	4	1	3	1	18
TEM	2	1	1	5	4	1	3	1	18
TEW	2	1	1	5	4	1	3	1	18
<b>Total</b>	<b>10</b>	<b>5</b>	<b>5</b>	<b>25</b>	<b>20</b>	<b>5</b>	<b>15</b>	<b>5</b>	<b>90</b>

\* Out of 32 researched Green Economy keywords, only 8 are out-rightly represented in Technical Education programmes.

Table 5.2 reveals that the frequency of the keywords in each programme is less than 5 except ethical standards. Critical indicators such as: climate change, energy efficiency, biodiversity, green technology, productivity, carbon footprint, and sustainability are absent in the current curricula. This calls for the urgent attention of NCCE, and VTE stakeholders. Since Education for Sustainability [ESD] is shaping educational curriculum reviews globally, there is an urgent need for VTE to be so realigned.

Percentage Green Economy content of each programmes' courses were evaluated using:

$$\frac{f_i}{\sum \text{Programme Courses}} \times 100$$

Average percentage green economy content was evaluated using:

$$\frac{\sum_{i=1}^n f_i}{\sum \text{Courses}} \times 100$$

Where:

$f_i$  = Frequency of identified Green Economy index

$n = 8$  (Since there were 8 identified indices)

*Courses* = Number of Courses offered in Technical Education programme

*Programme Courses* = Number of Courses offered in a specific programme

**Table V.3:** Green Economy percentage content of programmes in Technical Education

	INR (%)	EMP (%)	EY (%)	ES (%)	H&S (%)	EC (%)	RA (%)	IPR (%)
<b>TEA</b>	2.90	1.45	1.45	7.25	5.80	1.45	4.35	1.45
<b>TEB</b>	2.90	1.45	1.45	7.25	5.80	1.45	4.35	1.45
<b>TEE</b>	2.94	1.47	1.47	7.35	5.88	1.47	4.41	1.47
<b>TEM</b>	2.94	1.47	1.47	7.35	5.88	1.47	4.41	1.47
<b>TEW</b>	2.94	1.47	1.47	7.35	5.88	1.47	4.41	1.47

**Table V.4:** Average Green Economy content of Technical Education

INR (%)	EMP (%)	EY (%)	ES (%)	H&S (%)	EC (%)	RA (%)	IPR (%)
2.92	1.46	1.46	7.31	5.85	1.46	4.39	1.46

Thus, contributions toward Green Economy by Technical Education programme are less than ten percent each, having a cumulative average of 3.29%.

### 5.1 Health and Safety (H&S)

All five programmes had a course that presented issues about Health and Safety but ‘Safety’ specifically with respect to technical workshops. There were other courses which entailed topics about Health with respect to: counselling, contemporary health issues, and traditional science and technology.

### 5.2 Ethical Standards

Topics about ethics were presented by compulsory courses from other disciplines. These comprised the following aspects Examination, Counselling, Teaching Profession, Media and Information Literacy, and Citizenship Education.

### 5.3 Risk Assessment

Risks as presented in the curriculum is with respect to Technologies, and Business. There is an obvious silence on environmental and ecological risks associated with such developments.

### 5.4 Intellectual Property Rights

The concept of intellectual property rights was introduced by a course that is focussed on entrepreneurship and business. A productive knowledge and understanding of this are needed by students in this knowledge driven economy.

### 5.5 Energy Conservation

One course in the first year presented the ‘Law of Energy Conservation and Linear momentum.’ The global discuss has advanced from the basic education of energy conservation unto issues such as energy efficient buildings, and power system efficiency. There is need to integrate topics on energy efficient buildings, transmission, distribution, and generation.

### 5.6 Innovations

While the first course introduced innovations within the context of entrepreneurship, the second presented innovation with respect to ‘curriculum design’. If innovations targeted at sustaining the environment and ecosystem are not spelt out, curriculum implementers and learners alike would significantly remain ignorant of it. This defeats the goal of responsible consumption and production

## VI. CONCLUSION

Since Technical Education offers several courses across various disciplines in TVET, these findings can be considered a significant representation of TVET curricula however, other programmes in TVET should equally be analysed. This would provide definite data for interpretation, realignment, and appropriate review. Also, the results demonstrated an urgent need for the greening of the curriculum; an urgent need for investment in appropriate human capital; and the need for actual implementation of an education for sustainable development beyond mere propaganda.

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