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The Role of TVET in Mitigating Climate Change among SMEs

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Abstract

Business enterprises, particularly small and medium scale enterprises (SMEs) are the mainstay of many economies, but are faced with a lot of challenges, including climate change impacts. This work investigated the role of TVET in mitigating climate change among SMEs. Questionnaire survey was conducted on 210 SMEs randomly selected in the three economic hubs: Awka, Onitsha and Nnewi in southeast Nigeria. Results showed that the level of awareness on climate change was low and that even though businesses contribute to it, they were mostly not aware of that. Much of the SMEs use sources of power that is less climate friendly (generators) than other more environmentally friendly options (mainly solar energy). The SMEs have requisite knowledge about their businesses but their level of awareness on TVET and adaptive capacity to climate change are low. Their levels of education did not determine or influence their knowledge on TVET; hence the need to expose firms and the society to its rudiments. Formal education was perceived as a better method of teaching TVET, but needs to be combined with informal education so that much of the staff of SMEs could be reached more effectively. Transfer of information on green industrialization was deemed necessary and methods such as: using experienced entrepreneurs, seminars/workshops, annual training, government enforced training and short courses/internships (in decreasing order of effectiveness) were identified as veritable pathways to achieving that. There is need to sensitize the SMEs to have plans for managing climate risks and promote the use of technologies that are not only recent, but are climate friendly and green. TVET has the capacity to actualize the desired green industrialization and climate change adaptations among SMEs, but will require proactive measures such as promoting new forms of education for employees, ongoing training within companies, establishing vocational centres and exposing the younger generation to such initiatives all through their formal education process.

Keywords: climate change, economy, environment, greening, TVET

Introduction

Climate change and its attendant consequences are growing in magnitude over the years and are expected to have global impacts on ecosystems, livelihoods and economy (Sintayehu, 2018; Weiskopf et al. 2020; Ngoma et al. 2021). Resulting from natural climate variability or from human activities, this phenomenal occurrence alters the composition of the global atmosphere (IPCC, 2001) and has huge consequences especially in the developing regions of the world due to their low adaptive capacity (Collier et al. 2008). Efforts to tackle climate change concerns have involved adaptation and mitigation options; with the former focused on handling the impacts through a set of actions and attitudes (which moderates harm), and the later showing direct and strategic actions that need to be taken to reduce the sources of the (causes of climate change) greenhouse gases or creating sinks for the greenhouse gases (IPCC, 2007). Mitigating climate change is an onerous task that requires collective efforts from government, stakeholders and individuals to ensure its efficiency. How this is handled seems quite varied across the developed and developing regions of the world, with the later receiving less perceived commitment and attention. Such loopholes in framework and requisite guidelines are however embodied in technical and vocational education (TVE).

Technical and vocational education training (TVET) provides the required framework and makes technical and vocational education more practical and result oriented, and hence, will make role of TVE in addressing climate change more viable. TVET is an all encompassing term that embraces all forms and levels of educational process. It indeed "comprises of education, training and skills development relating to a wide range of occupational fields, production, services and livelihood" (UNESCO, 2016). Such wide application of TVET and relevance for everyday processes affords it the privilege to be equally relevant in addressing anthropogenic induced climate concerns arising from technological interventions and economic activities. TVET achieves such aim through the promotion of green economy. This form of economy (green economy) is not only focused on efficiency, but also fairness and ensures a just transition to an economy that is low-carbon, resource efficient and socially inclusive (UNEP, 2011). Such initiatives promote sustainable development as it is not biased towards an egocentric profit economic venture that is oblivious of the attendant environmental consequences and climate change impacts arising from such activities. Imbibing such practice among entrepreneurs and promoting same among the wider public domain and society is the focus of TVET.

Economic activities are increasing in scale and no doubt, improves the lives of people, reduce poverty and facilitates development; but equally contributes to environmental degradation and climate change (Twerefou et al. 2017). Promoting the greening of entrepreneurial activities is hence of key importance to addressing climate change concerns associated with such activities. Such concerted efforts are much needed across developing countries and emerging economies characterized by high urbanization and industrial growth (Henderson, 2002; Chen et al. 2014) and yet a lower resilience for climate changes impact. Policies that will promote green growth and environmental technologies are much needed in order to cope with the trend and need for economic growth and promotion of environmental sustainability. Since education is tasked with the responsibility of fostering 'the right type of skills, attitudes, and behaviour that will lead to sustainable and inclusive growth'. (Bokova, 2016; Pavlova, 2019), it will help to achieve such goals. With the position of TVET as a transition between formal basic education and work or further studies, acquiring a range of transferable generic skills, including in green

jobs (Pavlova, 2019), achieving green economy are seen as feasible initiatives. Such innovation is 'key to decoupling growth from pollution' (Capozza and Samson, 2019) and needs to be applied in developing areas like Nigeria, particularly in south east region where economic activities are thriving with weak environmental regulations. The role of TVET in mitigating climate change will be explored in south east region using small and medium scale industries (SMEs) as they play vital role in the economy, are generally more in number than large firms and pivotal in shaping innovation.

Materials and methods

Study area

Anambra state is one of the states in south eastern Nigeria. It has a total land area of 4,416 sq. km and is situated on a generally low elevation on the eastern side of the River Niger. Truly representative of south eastern Nigeria, Anambra is known for business and commerce in different sectors. Anambra state has two well known big Markets at Onitsha and Nnewi, and then another market in Awka, its state capital. Much of the populace are involved in buying and selling enterprise and a large category that are artisans, and involved in crafts like blacksmithing, auto-mechanic, and fabrication of wares and household goods. Its influence spreads through the whole south east and beyond, and is indeed the hub of economic activities and development across the region. It is the second most densely populated state in Nigeria after Lagos State, with an estimated 1,500 to 2,000 persons living within every square kilometre (National Bureau of Statistics, 2012).

This zone's climate is humid tropical, tropical wet and dry, and marked with rainy and dry seasons.

Conceptual framework

Concept of Green Economy and TVET

The famous economist, Pearce, was the first person to put together the word, green economy. He was with the view that there exists a relationship between the environment and the economy (Pearce, 1989). According to UNEP (2011), a green economy is one that concentrates on human and natural factors, and can also create high-salary jobs. Such greening strategy is expected to be adapted by a firm in order to achieve the environmental management goals of protecting the environment. Following UNIDO (2011), the green economy approach consists of two pronged endeavour:

1) Greening of industries- this entails that all industries, regardless of sectors, size or location, continuously improves their environmental performance by using resources more efficiently, phasing out toxic substances, substituting fossil fuels with renewable energy sources, improving occupational health and safety, taking on increased producer responsibility and reducing the overall risks.
2) Creating green industries- this entails stimulating the development and creation of industries that provide environmental goods and services. This aspect covers all types of services and technologies aimed at contributing to reducing negative environmental impacts or addressing the consequences of various form of pollution.

Greening involves the process of transforming economic sectors to become more environmentally friendly. It normally involves the improvement of environmental performance, energy and resource efficiency and reduction of emissions (Mertineit and Huyen, 2016). Hence, the transformation to a green economy will require changes in patterns of doing things- including industrial operations and social transformation of lifestyle. Green economy can be enhanced across the industries of different sectors and viable for mitigating climate change. Though challenges such as finance, poor technological knowledge base and awareness on what is required to actualize environmental friendliness seems to hamper such strides, technical and vocational education training offers viable strategies to realizing the target. TVET will achieve that by engaging in a paradigm shift that will inadvertently bring about a social transformation of lifestyle, habits and practices.

Data Collection and Analysis

Three locations that represented the bulk of economic activities in Anambra state was selected for the study, namely: Awka, Onitsha and Nnewi. Random sampling was adopted for the study as it enabled much coverage of SMEs in the location. Across each of the three locations, seventy questionnaires were distributed to business outlets and so a total of two hundred and ten questionnaires were gathered for analysis. The questionnaire focused on assessing the level of awareness on climate change as well as the contribution of business operations to it, the varied sources of power used in the SMEs, awareness on TVET and the role education might play in its knowledge. It equally assessed if the different business operators got any training for the line of business they were doing and at what point they got the training, which form of education was best to teach TVET and the effective methods of information transfer on green industrialization.

Descriptive statistics: frequency, mean, standard deviation and percentages were used to analyze and summarize the responses bordering on the overview, awareness on climate change, TVET, requisite training needs and operations of the firms, and methods for information transfer. Chi square test of independence was equally used to show if there is any relationship between the awareness on TVET and the levels of education of the entrepreneurs. A benchmark of 1.5 was set for the mean scores to be used for decision making, while standard deviation (set at 0.5) was used to check for the variability in responses.

Results

Overview

The SMEs captured for the survey were varied (table 1) and included: crafts, services, production, and distribution/logistics. The respondents' ages ranged from 30 and below to 60 and above, and their highest level of education ranged from primary school to postgraduate degrees (table 1). They comprised of 46% male and 54% female.

Table 1 Description of SMEs and respondents' overview

Variable	Mean	Standard Deviation
Classification of SME	2.70	1.14
Age range	1.98	1.03
Highest level of education	2.75	0.70

Source: Field survey 2022. * Shows accepted scores

Awareness and contribution of business operations to climate change

There is a low/ average awareness on climate change among the SMEs (Yes = 49%, No = 51%). Equally, the contribution of business operations (mainly through emissions) to climate change has a poor acknowledgement (Yes = 48.6%, No = 51.4%). With the small margin between the responses, it meant that there is a faint knowledge on the subject among the SMEs.

Source of power

The SMEs use different sources of power for their business operations: EEDC – 16.2%, Solar – 3.3%, Generator – 7.2% and a combination of EEDC and Generator – 73.3%. (EEDC is the electricity distribution company in the region). Much of the firms use EEDC, but since it is not reliable, they combine it with generator.

Awareness on TVET and educational influences

Level of awareness and knowledge of TVET are low among the business operators (Yes = 48.1%, No = 51.9%). Chi square test to verify if there is any association between awareness by business operators and their levels of education is given thus: $X^2 = 7.04$, $p = .071$. This showed that there is no statistically significant association between awareness (on TVET) and their levels of education. Being more educated did not facilitate better awareness on TVET; neither did being less educated ensure that.

Training on vocation or business endeavour practiced

Much of the operators got requisite training relevant to their businesses (Yes = 83.8%, No = 16.2%). These trainings were not taught formally in school and so were acquired at different time/ levels: Primary school level (6.7%), Secondary school level (27.6%), Post (after) secondary level (21%), Tertiary level (25.2%) and after tertiary education (19.5%).

Teaching on greening TVET and methods of information transfer

Formal education (55.7%) was identified as the better method (than informal education (44.3%)) for teaching greening TVET by most of the operators.

All the methods of information transfer (on green industrialization) for businesses reviewed, showed above average indices for effectiveness (table 2). Using experienced entrepreneurs was the most welcomed option (91% effectiveness). Other options: seminars/workshops, annual training, government enforced training and short courses/internships (in decreasing order of effectiveness; table 2) could equally be used in the SMEs.

Table 2 Methods of information transfer and training for green industrialization and required skills

S/NO	Information/training method	Very effective	Effective	Not effective	Not effective at all	Mean	Std. Dev
1	Using experienced entrepreneurs	73.8%	18.1%	6.2%	1.9%	1.36*	0.69
		91.9%		8.1%			
2	Seminars/workshops	55.2%	33.8%	9%	2%	1.58*	0.74
		89%		11%			
3	Short courses/internships	36.2%	42.9%	19%	2%	1.87*	0.78
		79%		21%			

4	Employee/Employers annual training	60%	25.2%	10%	4.8%	1.60*	0.85
		85.2%		14.8%			
5	Government enforced mandatory training for entrepreneurs	50%	30%	12.4%	7.6%	1.78*	0.94
		80%		20%			

Source: Field survey 2022. * Shows accepted scores Std. Dev = standard deviation

Discussion

Small and medium scale enterprises are highly vulnerable to climate change-seen through extreme weather events and slow onset of changes to the climate (Angelika et al. 2018; Crick et al. 2018); hence it was expected that much will be known on the subject across SMEs. This was however not the case across the study region as awareness about it was seen to be poor for the SMEs surveyed. Since such enterprises (with people of poor knowledge on climate change) dominate the area, the environment and livelihoods of the populace is then at risk and indeed requires attention. As a vast majority of people are in its employ in the area, as is similar with other parts of sub-Saharan Africa where the workforce of SMEs are up to 80% (Dougherty-Choux et al. 2015), knowledge of climate change and how to adapt is key to preserving the economy. Equally, how the businesses contribute to climate change was largely unknown to the people. This meant that the people were oblivious to the reality that business operations (mainly through the use of machines) and the resultant emissions (though negligible, but over time) promotes climate warming and change. With such dispositions, efforts targeted at reducing climate risks would not be much expected since the indices promoting such were never known. Adaptation decisions such as that, being the responsibility of the managerial cadre are not given much focus in most SMEs in developing countries due to lack of skilled labour and low managerial and technical capabilities (Hampel-Milagrosa et al. 2015).

Similarly, the source of power supply used among the firms varied from clean and environmentally friendly ones to environmentally degrading ones. Solar energy which is a clean and climate friendly source of power was the least used across the firms (3.3%). Such low patronage could be attributed to the huge cost involved in acquiring it; which makes it less favourable than the sole use of generator (7.2%), which is less environmentally friendly. Though the use of EEDC is highly unreliable for business operations due to the unsteady power supply, it was seen to have the highest patronage (16.2%) than the other two. Being the cheapest source of energy supply, it had the highest patronage as sole energy source for the majority of the SMEs who ordinarily may not have much capital at the start of the business. Availability, cost of finance and insufficient access to finance is indeed a major constraint to businesses operations in Africa (Beck and Cull, 2014; Crick et al. 2018) and how this affects SMEs are quite varied. Coupled with poor infrastructure services, especially electricity supply (Page and Söderbom, 2015), businesses struggle to keep afloat and are mostly constrained to make choices that have environmental implications. The use of generator and EEDC; which meant, using generator when there is no power from EEDC (which is quite regular) was seen as the most realistic option for the SMEs, even though it has negative implications for the climate of the region. Dealing with climate change will require addressing factors that constrain the ability of the SMEs to invest in adaptation action namely: insufficient resources, inadequate expertise and lack of relevant knowledge (Agrawala et al., 2011).

Actualizing the desired transformation for a cleaner environment will require "integrative, innovative, and creative thinking, cultivated jointly by schools, governments, civil society organizations and companies" (Global Education Monitoring Team, 2016). Such knowledge is embedded in and advocated by TVET; hence the need for SMEs to be aware, understand and operate its tenets in their bid to actualize climate change mitigation. Awareness on TVET and knowledge of its framework was however seen to be low among the SMEs surveyed; their educational levels notwithstanding. This implies that the business operators do not know much and are not focused on the needed framework for proper industrial operations. As is common with many of SMEs in developing countries which struggle to survive (Berner et al. 2012), they are rather engrossed with achieving success and profit making. Hence, practices which will lead to the use of appropriate (clean, climate friendly) technology and industrial operations are largely unknown, and there seems to be no concrete plan of such in view. It is hence imperative that SMEs imbibe priorities posited by the United Nations Environment Programme, "such as new forms of education for employees, including sustainability-oriented TVET, and ongoing training within companies" (UNEP, 2015), so as to be abreast with the practices required in achieving sustainability.

Teaching SMEs the strategies for reducing green house gas emissions and climate change impacts are beneficial and could be done through formal and/or informal methods. Formal method of teaching was adjudged (though slightly) as a better strategy for teaching the needed strategies (55.7%) than informal method (44.3%). While this is mostly the norm for majority in the society, both methods should be adopted in the pursuit of teaching the requisite strategies. Adopting only formal education would mean that those already engaged in the SMEs will have slim chances of getting more informed and exposed to better strategies for industrial operations. TVET bridges such gap "given its position as a transition between formal basic education and work or further study and between old and new occupations; and actualizes it through its flexibility in modes of delivery and partnerships with industry through internships, apprenticeships, and on the job training" (Pavlova, 2019). Initiating and operating vocational centres will equally contribute to tackling the dearth in knowledge of proper industrial operations as is the case with the region. This will enable businesses to send their staff for training in areas of need and equally provide a basis for teaching them courses on pollution control and green technology.

Communicating the strategies for green industrialization could be done using different methods (table 2). Using experienced entrepreneurs, the use of seminars and employers/employee annual training were the most favoured (in decreasing proportion) among other options. Most often, employers normally provide training for the green transition especially because they are the ones that are directly exposed to changing skills needs, and partly due to the lack of formal TVET provision (Pavlova, 2019). Somehow, this may not always facilitate the desired aim across the SMEs since the employers and in other cases, some other persons at the (managerial cadre) top may not know much (green initiatives) to step down to others. Thoughtful considerations should be given to which method is most appropriate, depending on the environment, type of firm, characteristics of the people being trained, type (practical based or not) and purpose of training, cost involved and the availability of resource persons that will help achieve optimum results.

While there is no doubt that business operators have requisite training relevant to their businesses (up to 83.8%), much of these become obsolete over time and the need to be abreast

with recent innovative ways of operation becomes necessary. TVET no doubt is capable of exposing entrepreneurs and their employees to needed skills, including the path to climate friendly operations and green future. However, to more effectively actualize this, the society, particularly the younger generation needs to be exposed to such ideologies early. This will enable both those that eventually end with SMEs and other sectors to have the right perspective to greening and the requisite adaptive capacity to climate change risks. Since such initiative is a lifelong process, it will be ideal that such exposure starts in early childhood and that the right attitude, values and knowledge are acquired through basic education. These concerns need to be captured in the curriculum; hence the need for concerned authorities to initiate a curriculum reform accordingly.

Conclusion

Climate change impacts harm the environment and pose risks for businesses and the economy. SMEs are at great risk due to their poor knowledge on climate change and weak adaptive capacity. TVET has the potential to both promote such knowledge and expose the firms to climate friendly techniques of business operations. As technological advancements increases and skills for better business operations emerge, there is equally the need to update and carry SMEs along; especially as the need to use green technologies and innovations have become pertinent.

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