Climate Change Education for Sustainable Development in the 21st Century

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ABSTRACT

Education for Sustainable Development (SD) has a fundamental role in aiding the 21st century individuals to recognize the global issues of Climate Change. Education is also regarded as an antidote for combating and ensuring adequate adaptive measures to Climate Change. The purpose of this research article underscores the critical role education has in addressing and responding to Climate Change in all of its complexity to achieve Sustainable Development. A comprehensive overview of the study entails education as a factor for achieving Sustainable Development bearing in mind the related pillars of SD "Environment, Social and Economic," Climate Change, Impact of Climate Change, Climate Change Education, Characteristics and program objectives for Climate Change Education and Sustainable Development, the role of Education in combating Climate Change for Sustainable Development and the way forward. In so doing, it presents Education as a panacea for achieving Climate Change thereby enhancing Sustainable Development.

Keywords: Climate Change; Education; Sustainable Development. 21st Century, Characteristics, Economy, Social, Environment, Global, Factors

1. INTRODUCTION

The issue of Sustainable development (SD) has gained providence in the United Nations since it nurtured the Millennium Development Goals (MDGs) in the year 2000. This is because of the role played by the International Organizations in ensuring a friendly ecosystem for all individuals. The 2030 Agenda for sustainable development is aimed at addressing the key challenges of individuals, planet and the prosperity of individuals in the 21st century (United Nations, 2015). Oriflame (2017) define sustainable development as a process that meets the present needs of individuals without compromising the ability of future generations to meet their own needs. Howarth (2012) suggests that a sustainable future will come into being if the biophysical and social conditions needed to support the socio-economic activities are maintained from each generation. Nevertheless, sustainable development pursues to satisfy the quest of the 21st century generation without undermining the ability of the next generation to accomplish its own necessities. Mckeown (2002) identified three related pillars of Sustainable development; namely environment, society and economy. Mckeown (2002) further maintained that, in other to achieve sustainable development, it is required to balance environmental, societal, and economic considerations in the pursuit of development and an improved quality of life.

In balancing sustainable development with environment, society and economy, it is imperative to consider education as a parameter to check-mate climate change as an undermining factor by most individuals to sustainable development. UNESCO (2014) has it that education is an essential element of the global response to climate change. It helps people understand and address the impact of global warming, increases climate literacy among young people, encourages attitudinal and behavioural changes among individuals, and help individuals adapt to climate change related trends. The United States Climate Change Science Programme (2009) defined climate literacy as "someone who understands the essential principals of earth's climate and climate change in a meaningful way and makes informed and responsible decision with regard to actions that may affect climate". Climate change as a contemporary issue has attracted major concern internationally and locally. The United Nations Sustainable Development Goal (SDG 13) highlighted the need to take urgent action to combat climate change and its impacts. The researchers therefore employ education as a panacea to combat climate change issues in order to achieve sustainable development in the 21st century.

2. EDUCATION AS A FACTOR FOR ACHIEVING SUSTAINABLE DEVELOPMENT

A concern for sustainability arose as response of environmental degradation (Richard, Clugston and Calder, 1990). The 1992 Earth Summit marked the beginning of an unprecedented effort to understand and work toward achieving sustainable development, addressing human needs holistically by integrating environmental, social and economic goals (Cheriyan, 2005). Dale, (2001) highlighted that environmental imperative is to live within global biophysical carrying capacity and to maintain biodiversity, the social imperative is to ensure the development of democratic systems of governance that can effectively propagate and sustain the values that people wish to live by while the economic imperative is to ensure that basic needs are met worldwide (Dale, 2001).
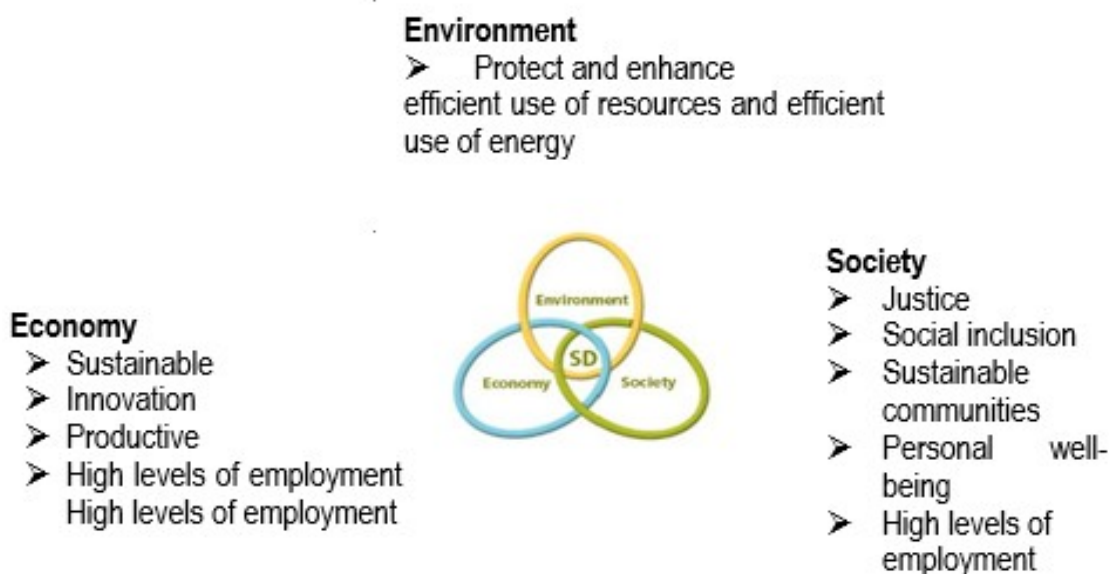
Environment
➢   Protect and enhance
efficient use of resources and efficient use of energy

Economy
➢ Sustainable
➢ Innovation
➢ Productive
➢ High levels of employment
High levels of employment

Society
➢ Justice
➢ Social inclusion
➢ Sustainable communities
➢ Personal   well-being
➢ High levels of employment

Fig. 1: Components of Sustainable Development
Adopted from Website accessed at http://www.dfes.gov.uk/

The role of education in promoting sustainable development was made explicit by Agenda 21, the global action plan for the 21st century, where it was noted that education should be recognized as a process by which human beings and the society can reach their fullest potentials (UNESCO, 2012). Education is critical for promoting sustainable development and improving the capacity of the people to address the environment and developmental issues (UNESCO, 2012). This made the Agenda 21 to be adopted and signed by 178 countries including Nigeria in Rio. Ten years after Rio, at the 2002 World summit on sustainable development (WSSD) in Johannesburg, the world community came together to review progress and accomplishments of the Earth summit, and to adopt concrete measures and targets for better implementation of Agenda 21, and the sustainable development goals (SDGs) (UNESCO. 2012)

Sustainable development is premised on seventeen (17) goals, with 304 indicators. the seventeenth goals include no poverty, zero hunger, good health and wellbeing, quality education, gender equity, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate change action, life below water, life on land, peace, justice and strong institutions, and partnership for the goals (Gupta and Geeta, 2015; Batty, 2015). However, despite the listed SDGs, quality education stands most appropriate in achieving the purpose of this study.

Quality education drives development of any kind be it in health, sanitation, poverty, inequality, production, climate change among others (Orji, 2013). Education is seen as a weapon to liberate ignorance, poverty among others and achieve sustainable development. Onyeka (2017) define education as the process or art of imparting knowledge, skills and development or facts, skills and ideas that have been learnt formally or informally. Education plays a key role in the ability of a developing country to absorb modern technology and develop the capacity for self-sustaining growth and development (Todaro and Smith, 2009). In order words, education holds the master key that unlocks a country's' potentials towards sustainable national development.

Sustainability means capacity to continue while development means path of human progress, Department for Education and Skills (DFES, 2003). Afunugo (2017) maintained that development is an eclectic paradigm for social change aimed at improving the condition and quality of life of the people, especially that of the majority of the poor and vulnerable people in the society. Sustainable development therefore means path for human progress that has the capacity to continue into the long term (DFES, 2003). Oriflame (2017) supported that sustainable development means the needs of the present generation without compromising the ability of future generations to meet their own needs. For development to be meaningful it has to be sustainable, that is to continue for a very long time, without causing damage to the environment, and to be of benefit to the present and future generations. Jhingan (2007) posited that sustainable development should keep going by emphasizing the creation of sustainable improvements in the quality of life of all people through education which is the hall mark of sustainable development in any nations.

Education as a factor in achieving sustainable development is aimed at leaving individuals with the ability to apply knowledge in a variety of unpredictable situations, practical problem solving among others (Jucker, 2001). It is imperative to note that, individuals especially those in low belt regions or underdeveloped country's lack the opportunity to put SD into practice and this will hamper on achieving SDGs projected for 2030 (Steinemann, 2003). Wals and Jickling (2002) has it that if individuals are able to jointly create solutions through the introduction of education at all sphere, this will be of value to the environment and enhance sustainable development. Furthermore, hands-on experience can be incorporated into the educational course design itself.

Jucker (2001) opined that individuals ought to; "practice what they preach", and redesigning the educational process towards achieving sustainable development. Steinemann (2003) added that hands-on experience with sustainable development education at work can be incorporated into the course design itself. Nevertheless, Education for Sustainable Development (ESD) empowers individuals to change the way they think and work towards a sustainable future. One way to promote ESD at the local level is through lifelong learning programmes that impart new knowledge, skills and attitudes to learners of all ages and from all backgrounds.

3. CLIMATE CHANGE

The world entirely is currently witnessing climatic change. Climate change affects all facets of human endeavor, (International Panel on Climate Change "IPCC 2007"; Bates, Kundzewicz and Palutik, 2008; Lesnoff, Corniaux and Hiernaux, 2012). IPCC (2013) define climate change as a change in the state of the climate that can be identified by changes in the mean or the variability of its properties. Climate change is a long term alteration in global weather patterns especially due to increase in temperature and storm activity. IPCC (2013) consider climate change as the alternations in one or more climate variables including temperature, precipitation, wind and sunshine. Therefore, the increase in temperature as response to "climate change" of the Earth's atmosphere is known as global warming.

Global warming is a measurable increase in the average of temperature of Earth's atmospheric, oceans, and landmass (Mastrandrea & Schneider, 2009). It is believed that the earth currently is facing a period of rapid warming brought on it by rising levels of heat trapping gases known as greenhouse gases in the atmosphere. The gases prevent the escaping heat (terrestrial radiation) from the surface of the earth like a blanket thereby increasing the atmospheric temperature. The greenhouse gases are water vapour, carbon-dioxide (CO_2) Methane, Nitrous Oxide (NO_3), Ozone (O), Synthetic chemicals and Aerosols. Some of these gases occur naturally in the environment while others are as a result of human activities such as, burning fossil fuels, cutting down rainforests and farming livestock, industries and farming activities. It is important to consider the impact of climate change.

3.1 Impact of Climate Change
The impacts of climate change are noticeable in several aspects of our natural resources. Climate change impacts negatively impair on the well-being of livelihoods especially those in developing countries (IPCC, 2007). The impact of climate change on the natural environment is summarized in a concept map as follows:

The health impact of individuals as responds to the impact of climate change has rising from a more intense heat wave which result to more heat related deaths or illness to a decline in air quality and respiratory tract infections (UNESCO, 2014a). Climate change has drastically affected the health of the young, elderly and those with respiratory problems. UNESCO, (2014a) has it that, the cost of medication for climate change related illnesses reduces available funds for feeding the families and increase hunger. Climate change however reduces the period of winter cold, which is a welcome development for countries in the high latitudes or temperate regions and affect the agricultural activities of individual especially those in developing countries.

Similarly, Surabi and Mamtha, (2013) opined that agriculture and forestry increase in temperature due to global warming with increase in carbon-dioxide (CO_2) may benefit certain crops, plants and forests depending on the availability of water resources. But much increase in temperature affects crops and vegetation adversely in the Sahel regions leading to desert encroachment and over grazing since the grasses become scarce (Surabi & Mamtha, 2013). Scarcity of grasses for forage leads to the frequent conflict between farmers and herds men. In this way many families suffer various degrees of loses especially in the North-East region of Nigeria and this has drastically affected wildlife conservation.
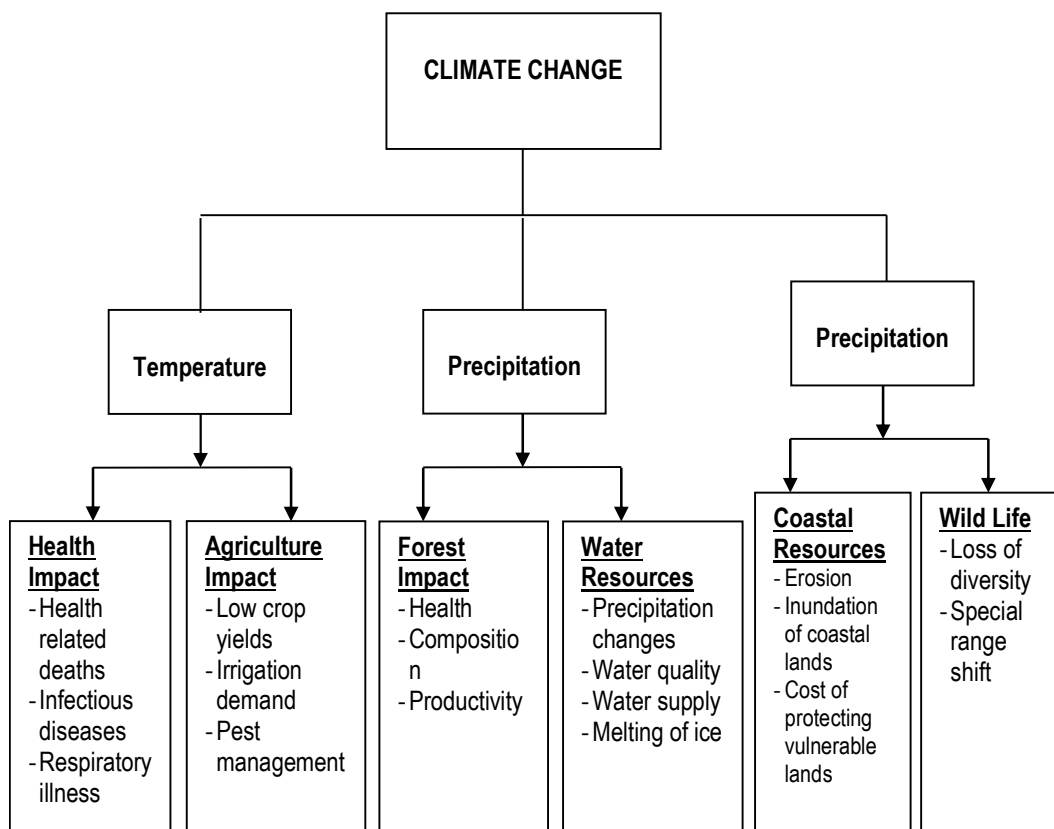
Fig 2: Impact of Climate Change
Source: Intergovernmental Panel on Climate Change (IPCC) (2007).

Wild life forests and grasslands constitute the primary habitats of animals in the wild. Howarth (2012) has it that, vegetation is also the primary producer of food energy in the ecosystem. Unfortunately changes in the climate elements such as temperature and rainfall have drastically affected vegetation most in developing countries. These two elements single handedly determine the time for leaves sledding, flowering and fruiting of trees in the forest where the animals live and feed on. Climate change has caused drought, desertification, flooding, lack of water resources which destroy the natural habitats among others. Many wild animals will have to either migrate or die, leading to extinction of both plants and animals (Howarth, 2012).

Water Resources increase in earth's temperature could lead to dryness and prolonged drought in some places such as the desert fringes while some parts of the earth experience exceptionally heavy rainfall and floods (Stillman, 2015). The two events affect water shortages in the sub-Saharan regions leading to higher demand of water for irrigation purposes. Increase in water availability in some places could lead to flooding which damages farmlands, residential homes and pollute available water for drinking. These cause outbreak of diseases in families and communities especially in the river rind areas. Climate change has affected coastal area such as the rise in sea level due to increased precipitation and melting of ice/glacier. There is also an increase in storm intensity such as hurricane activities. Other impacts on coastal areas include; coastal erosion, coastal flooding (Tsunami), loss of coastal wetlands and increased risk of property loss along beaches from storm and wave surges. Understanding the impacts of climate change and its risks has been the principal focus of research at both global and local scales.

Recent climate change studies have shown that climate change has affected every part of the economic activities of humans, including the environment where humans live, agricultural activities and the natural resources. The introduction of climate change education in every facet of human activities will ensure a better understanding of dealing with the issue of climate change to ensure sustainable development

3.2 Climate Change Education

Climate change education (C.C.E) is part of UNESCO Education for Sustainable Development Program (ESDP) and the aim to make climate change education a more central and visible part of the international response to climate change (UNESCO, 2014). According to Yoko and Audrey (2015) C.C.E refers to processes aimed at improving the degree to which an educational system is prepared for, and is responsive to the challenges of Climate Change (C.C). Leiserowitz and Smith, (2012) maintained that C.C.E is the education geared towards acquiring knowledge, changing attitudes, decision-making processes, and behaviors about climate change and its effects

Similarly, Climate change education (C.C.E) is the education that equips the citizen with knowledge towards changing attitudes, decision making processes, and behaviors about climate change and its effects. To enhance climate responses through education, the realities of C.C are such that individuals need to learn new knowledge, skills and make significant behavioural changes in order to manage the risks associated with C.C and reduce individual's vulnerabilities to these risks by building adaptive capacity and resilient societies. Climate change adaptation according to UNESCO/UNEP, (2011) is defined as the process of building resilience and reducing the vulnerability of natural and human systems to the impacts of C.C. The 'adaptation' dimension involves developing the knowledge, skills and dispositions to better cope with already evident and looming climate impacts. It will usually have a strong local focus (UNESCO/UNEP, 2011). Adaptation is closely aligned with the concept of Disaster Risk Reduction, which comprises numerous efforts to minimize the vulnerabilities and disaster risks in society, in order to prevent, mitigate and prepare for the adverse impacts of natural hazards, and to facilitate sustainable development.

Similarly, IPCC (2013) defines adaptation as the adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Climate adaptation tackles the effects of climate change by minimizing its impacts. That is, it refers to all the actions taken by individuals to prevent damage to ecosystems, agriculture, coastal areas, urban infrastructure and human health.

3.3 Climate Change Adaptation Strategies

Some examples of Climate Change Adaptation Strategies include:
- ❖ **Water:** increased rainwater harvesting, water storage and conservation, water re-use, desalination, greater efficiency in water use and irrigation.
- ❖ **Agriculture:** altering planting dates and crop varieties, relocating crops, better land management (for example erosion control and soil protection by planting trees)
- ❖ **Infrastructure:** relocating people, building seawalls and storm surge barriers, reinforcing dunes, creating marshes and wetlands as buffers against sea level rise and floods
- ❖ **Human health:** action plans to cope with threats from extreme heat, emergency medical services, better climate sensitive disease surveillance and control, safe water and improved sanitation
- ❖ **Transport:** realigning and relocating routes, designing roads, railways and other transport equipment to cope with warming and drainage
- ❖ **Energy:** strengthening overhead transmission and distribution networks, putting some cabling underground, energy efficiency and renewable energy, reduced dependence on single energy sources. (IPCC 2013).

Similarly, Climate Change Education (C.C.E) for adaptation and mitigation should be approached as an integral process which seeks to empower people, communities and organizations to exercise significant positive influence on their livelihoods and well-being under conditions of environmental sustainability, social justice and economic equity and viability. One of the measures for strengthening adaptation to climate change is access to high quality information. This is possible only through the right type of education. Education and awareness raising enable decision making, play an essential role in increasing adaptation and mitigation of communities and empower them to adopt sustainable lifestyles (UNESCO,2014a).

Climate change education is not just about teaching the science of climate change. It is about giving learners the skills and attitudes to act upon its causes and effects (UNESCO, 2014). If we want to create action, we have to reach the heads, hands and hearts of the people through awareness creation; so that they can change their behaviour towards sustainable lifestyles and this can be possible through their attitude." Forrest and Feder (2011) opined that attitudinal change is the best option which comes through education and awareness. The goals of C.C.E according to Forrest and Feder (2011) include; an understanding of the process of science; empowering informed decision making and motivating changes in behavior.

3.4 Characteristics and Program Objectives for Climate Change Education and Sustainable Development
The scale and complexity of the climate crisis demands a robust educational response. This critically engages learners with the scientific, technical, behavioural, ethical, affective and practical dimensions of C.C. It also requires the promotion of key areas of knowledge and skills which will be needed at all levels of the system (primary, secondary, tertiary and adult education) and via diverse modes of delivery (formal, non-formal, informal) (Bangay & Blum, 2010).

According to UNESCO, (2014a) the core programme objectives for climate change education (C.C.E) for sustainable development include thus:
1.   To strengthen the capacity of member states to provide quality climate   change education for sustainable development at primary and secondary school level through:
- Improved education policy, analysis, research and planning
- Teacher education and training of education planners.
- Training on curriculum review/reform.

2.   To encourage and enhance innovative teaching approaches to integrate quality climate change education for sustainable development in school through:
- Interdisciplinary practices
- Science Education
- Whole school approaches
- Technical and Vocational Education and Training (TVET)
- Disaster Risk Education (DRE).

3.   To raise awareness about climate change and enhancement of Non-formal education programme, through media, networking and partnerships.

4. THE ROLE OF EDUCATION IN COMBATING CLIMATE CHANGE FOR SUSTAINABLE DEVELOPMENT

The role of education in combating climate change issues cannot be considered in isolation. This is because of the importance of education to the nation's economic activities. Bangay and Blum, (2010) opined that education is a pre-requisites for combating environmental challenges in a given environment. Education is critical to enabling learners to understand and respond to complex global concerns like climate change, global warming among others. UNESCO (2014) maintained that education and awareness creation has to prepare all learners and segments of societies for the challenges climate change poses and equip people and economies with the knowledge and competencies to engage and informed citizens in shaping green, low emission and climate resilient societies.

As part of UNESCO's work on Education for Sustainable Development, UNESCO supports countries to integrate climate change into their education systems, create awareness on the impact of climate change on the environment, facilitates dialogue and exchange of experiences on climate change education through organizing international expert meetings, access technical guidance material for teaching and learning of climate change issue, sustainability principles should be initiated in schools to combat climate change issues (UNESCO, 2014).

Though C.C, impacts have direct effects on educational access, enrolment and provision associated with increasing incidence of severe weather events (e.g., drought, flooding, cyclones, heat waves among others). Incremental environmental changes (e.g., sea level change, desertification, soil erosion, among others.) are likely to impact poor families' ability to make a living, thereby reducing household budgets. In addition, the significant financial burden associated with rebuilding schools and other learning environments in the wake of extreme weather events has the potential to undermine long term investment in the improvement of education provision (Bangay and Blum, 2010). Enhancing the education sector response to C.C is therefore one of the key mechanisms through which national governments can ensure and demonstrate their commitment and adherence to national and international frameworks pertaining to human rights, education, the environment and sustainable development. Grace, Solomon, Olugbenga, Vehcit and Mairo (2010) opined that, education is not only an objective in itself but also accelerates social and economic advancement. No sustainable development is possible without education.

5. CONCLUSION

Environmental degradation such as climate change impacts and vulnerability has already increased the interest among individuals; as such emphasis on the need for international countries of the world to promote and facilitate sustainable development through public awareness and education on the dangers of climate change should be on the increase Moreover, individuals motivation towards an environmental friendly lifestyle should be a wake-up call to improve sustainability.

5.1 Way forward
Climate change as responds to human and natural activities has gradually eating into the fabric of the nation's economy. Is it imperative that individuals (at all levels) should be given the opportunity to understand climate change as soon as possible either at the formal or informal level of education. This will help deal not only with the immediate challenges facing the environment, but the longer term challenges that assist with individuals making career choices; it will also assist individuals with consumer choices. As such, the level of individuals understanding of climate change grows, individuals will develop new attitudes about what is appropriate and moral. This may occur in part because the tropical rainforests offer a great way of drawing carbon pollution from the air, so the poorest farmers, fisherman through education can become crucial partners in sustainable development.

Below are other recommendations applied thus;

➢ Climate change education should be included in the school curriculum at all levels of our education. This will help tackle both man's anthropogenic activities which have resulted to global warming and other environmental problems that threaten the existence of man.

➢ Government should partner with industries and Non-governmental organizations to adopt clean energy production processes to reduce atmospheric temperatures and emissions in other to promote sustainable development.

➢ Climate change education should be incorporated into the curriculum thereby creating awareness among citizens on the dangers of man's negative actions on the environment.

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