

Environmental Deterioration and Environmental Education: The Challenge of Climate Change

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ABSTRACT

The challenge of anthropogenic climate change has attracted considerable attention, particularly from the United Nations. The United Nations has through the United Nations Framework Convention on Climate Change, the Kyoto Protocol, the Paris Agreement, the work of the Intergovernmental Panel on Climate Change and the Conference of the Parties devised several strategies to address Climate Change. Environmental Education and the associated Education for Sustainable Development and Climate Change Education, have been promoted as strategies. The conceptualisation and employment of these ideals, whose emergence and significance are closely related to the concern for environmental deterioration, have been of considerable interest. Be that as it may, there are several obstacles in the effective employment of Environmental Education/Climate Change Education in addressing the climate crisis. These include the perspectives promoted by climate change sceptics and deniers, the reluctance/refusal of the Global North to accept responsibility for climate action based on a reparation principle, the insistence of the Global South on climate justice, and unorganised climate action laggards or inactive individuals and groups. Aggressive and effective Climate Change Education is necessary in order to achieve the UN's objectives of 1.5 degrees centigrade and the Net-Zero objectives.

Keywords: Environmental Education, Climate Change Sceptics, Climate Change Deniers, Global North Climate Action Reluctance, Global South Climate Action Reluctance, Aggressive Climate Change Education.

INTRODUCTION

Environmental education (EE) and its expected subsequence of environmental literacy (EL), are fundamental in effective environmental management. The basic tenets of EE, environmental awareness, environmental knowledge, attitudinal change, skills acquisition and participation (UNESCO & UNEP 1975; Thomson et al. 2010; Karama 2016; Fang et al. 2023) are so significant that no effective positive environmental action is possible where they are non-existent. Environmental awareness and environmental knowledge typically result in changed attitude towards the environment that encourages the acquisition of skills and subsequent participation in the process of environmental management. The significance of EE is clearly put by UNICEF (2019: 7) in the case of climate change (CC), thus: education is ... an important part of the answer to tackle the climate crisis we are facing now. Increasing environmental awareness and education on climate change can contribute to effective adaptation and mitigation.

Indeed, since the emergence of the theory and practice of Education for Sustainable Development - ESD (Gadotti 2009; Wals & Kieft 2010; Leicht et al. 2018), EE has increased in significance.

The setting has been such that as the global environmental challenge increased, so has the significance of EE. The CC challenge is a typical example that has catalysed the attention to EE, particularly ESD. CC is not only one of the greatest global environmental crises (Kunelius & Roosvall, 2021; IPCC, 2023) but also one of the greatest challenges facing humanity (World Economic Forum, 2023). There is considerable concern globally that the impacts of CC, such as extreme weather events and rise in sea level, are increasingly threatening the welfare and, indeed, the very existence of humanity. The CC-related disasters of 2022, such as Hurricane Ian which affected Cuba and USA, Super Typhoon Noru in the Philippines, floods in Pakistan, Nigeria and several other parts of the world, heatwaves in Europe, and wildfires in Australia, Europe and North Africa, were indications of the challenge.

“Concerned that human activities have been substantially increasing the atmospheric concentration of greenhouse gases resulting in global warming”, which “... adversely affects natural ecosystems and humankind”, countries of the world signed the United Nations Framework Convention on Climate Change (UNFCCC) on 12 June 1992 to address the menace (UN 1992). The Convention, which came into force on 21 March 1994, has guided the United Nations (UN) in its policies and actions meant to address CC. The UN, through the Conference of the Parties to the UNFCCC (COP), has through several decisions, resolutions, protocols, and agreements made efforts to address the challenge (Kuyper et al. 2018; Zangerolame & Sabba 2019; Ikporukpo, 2022). In spite of this, the challenge remains. Given the relevance of EE, its effective application provides prospects for addressing the challenge.

This article analyses the challenges in an effective application of EE, and the associated ESD and Climate Change Education (CCE) in addressing the Climate Crisis. In order to provide a context for the analysis, the environmental base in the evolution of EE is also examined.

SOURCES OF DATA/INFORMATION

Two sets of data, namely, climate change-related and on EE, were collected. The Reports (Table 1) of the Intergovernmental Panel on Climate Change (IPCC), the UN body responsible for providing information on the State of CC, provide information on various aspects of CC. Data on the collective decisions on CC by the various countries, the views of countries and country blocs (such as G77 and Alliance of Small Island States), were obtained from various sources. Reports and Publications of the United Nations Environment Programme (UNEP), such as the Adaption Gap Reports, also provided data on various aspects of the climate crisis. Reports of the side-events during the COPs were also useful sources of information. Data were also sourced from Reports from the secretariat of the UNFCCC. Several publications by climate change scientists were also useful. Data/information on EE, ESD and CCE were sourced mainly from Reports/publications of UNESCO, UNEP and UNICEF. The relevant information included the evolution and the conceptualisation of EE and the associated principles. The relevant Reports were those that emerged from various conferences, workshops and seminars. Information was also obtained from publications/reports of UNFCCC, IPCC, and COPs. Various resolutions, protocols and agreements related to UNFCCC were also useful. Data were also obtained from several publications by researchers on EE, ESD and CCE.

Table 1: Major IPCC Reports from Inception to 2023

Assessment Reports	Special Reports
First Assessment, 1990	Aviation & the Global Atmosphere, 1999
Supplementary Report to the First Assessment, 1992	Emissions Scenarios, 2000
Second Assessment, 1995	Safeguarding the Ozone Layer and the Global Climate System, 2005
Third Assessment, 2001	Renewable Energy Sources, 2012
Fourth Assessment, 2007	Extreme Events & Disasters, 2012
Fifth Assessment, 2014	Global Warming of 1.5°C, 2018
Sixth Assessment, 2021 (Climate Change 2021: The Physical Science Basis)	Climate Change & Land, 2019
AR6: Climate Change 2022: Impacts, Adaptation and Vulnerability, 2022	Ocean & Cryosphere in a Changing Climate, 2019
AR6: Climate Change 2022: Mitigation of Climate Change, 2022	
AR6: Synthesis Report: Climate Change 2023 2023	

Source: Compiled by Author.

ENVIRONMENTAL CHALLENGE AND THE TRAJECTORY OF EE

Environmental Education as the name suggests pertains to educating people about the environment. As part of its evolution the related concepts of Education for Sustainable Development (ESD) and Climate Change Education (CCE) have emerged. The significance and the interest in EE are not only reflected by the volume of research but also by the numerous works conceptualising it. Table 2 is a sample of various conceptualisations. Awareness, knowledge and attitudinal change, generally speaking, have been the foci of the conceptualisations (Table 2).

Table 2: Sample of Conceptualisations of Environmental Education

Serial No.	Definition	Author/Source
1	A process of recognizing values and classifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulating of a code of behaviour about issues concerning environmental quality.	International Union for the Conservation of Nature and Natural Resources (OUEN), 1970
2	Environmental Education encompasses approaches tools, and programs that develop and support environmentally related attitudes, values, awareness, knowledge, and skills that prepare people to take informed action on behalf of the environment.	Ardoyn, Bowers & Gaillard, 2020
3	Education utilizing the findings of science and technology ... in creating an awareness and a better understanding of environmental problems.	UNESCO & UNEP, 1977, in Tbilisi Declaration
4	Education ... that will make it possible to develop new knowledge and skills, values and attitudes, in a drive toward a quality of environment and, indeed, toward a better quality of life for present and future generations living within that environment.	UNESCO & UNEP, 1975, The Belgrade Charter

5	A subject that aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems and motivated to work and participate in their solution actively.	Stapp, 1969
6	Environmental Education refers to organized efforts to teach about how natural environments function and, particularly, how human beings can manage their behaviour and ecosystems in order to live sustainably.	Kurama, 2016
7	(Education meant) to increase the public awareness of the problems which exist in the field, as well as possible solutions, and to lay the foundations for a fully informed and active participation of the individual in the protection of the environment and the prudent and rational use of natural resources.	EU, 1988
8	Environmental Education is a process that creates awareness and understanding of the relationship between humans and their many environments-natural, man-made, cultural, and technological.	Thomson, Hoffman & Staniforth, 2010
9	A process that enables people acquire knowledge, skills, and positive environmental experiences in order to analyze issues, assess benefits and risks, make informed decisions, and take responsible actions to achieve and sustain environmental quality.	North American Association for Environmental Education, 2004
10	Environmental Education is a process that allows individuals to explore environmental issues, engage in problem solving and take action to improve the environment.	US Environmental Protection Agency, 2022
11	A process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and to appreciate the inter-relatedness among man, his culture, and his biophysical surroundings.	Cerovsky, 1971
12	A discipline that enhances the environmental awareness, environmental ethics, and the responsibility of the nation taken as a whole, so as to safeguard the ecological balance of the environment, respect lives, promote social justice, and cultivate environmental citizens and environmental learning communities.	Environmental Education Act of Taiwan (Republic of China. Quoted in Fang, Hassan & LePage, 2023, p.8
13	Climate Change Education is education for preparing (individuals) for future climate change mitigation and adaptation measures.	Stevenson et al, 2017

Source: Compiled by Author.

The roots and trajectory of EE are embedded in the evolution of the widespread concern for the environment, the Environmental Movement. It is from the Nature Study and the Conservation Movements that EE evolved. The Nature Study Movement, championed by such individuals as Jean-Jacques and Anna Botsford Comstock dominant in the late 19th and the early 20th centuries, emphasised education, both formal and informal, based on the practical outdoor study of the physical environment (Armitage 2009; Ralston 2011; Fang et al. 2023). The Conservation Education Movement, which followed, was catalysed by practical experiences of environmental deterioration, particularly the Dust Bowl land degradation of the 1930s in the heartland of the USA. The International Union for Conservation of Nature, established on 5 October 1948, was a major promoter (McCrea 2006; Fang et al. 2023).

The roots of the Environmental Movement encouraged its emergence, particularly as environmental deterioration and its associated challenges increased. Table 3 shows the immediate events in the emergence of EE and its trajectory. The increased environmental awareness, consequent on the publication of Rachel Carson's book, *Silent Spring*, in 1962, was a fundamental catalyst in the emergence of EE. The book drew attention to the rapid environmental decay in the USA as a result of widespread use of pesticides. Rachel Carson herself emphasised the need for environmental awareness/education in this widely publicised book. As she put it, there is still very limited awareness of the nature of the (environmental) threat ... When the public protests, confronted with some obvious evidence of damaging results of pesticide applications, it is fed little tranquilizing pills of half-truth ... The obligation to endure gives us the right to know (Carson 1962: 29 & 30).

Table 3: Major Events in the Development of Environmental Education

Serial No.	Event	Date/Year	Significance/Outcome
1	Publication of book, <i>Silent Spring</i> by Rachel Capson.	1962	Book became a major driver of the environmental movement and source of advocacy for environmental concern.
2	An International Conference on Global Biosphere Protection, sponsored by UNESCO in Paris, France.	1968	The Conference promoted the idea of Environmental Education.
3	Environmental Education Workshop in Carson Nevada, U.S.A.	1970	EE received its first formalisation and first official definition.
4	Passage of National Environmental Education Act of U.S.A.	1970	The Act established a National Advisory Council for EE and a domestic grants programme. Particularly significant because the first in the world.
5	Foundation in USA of National Association for Environmental Education (now North American Association for Environmental Education, NAAEE).	1971	This Professional Association is a major player in the promotion of EE.
6	United Nations Conference on the Human Environment in Stockholm, Sweden.	1972	Sensitised the world public on the need for environmental concern. Recommended (Recommendation 96 that the agencies of the U.N. such as UNESCO should establish International Environmental Education Programme (IEEP).
7	Establishment of the Alliance for Environmental Education.	1972 (Disbanded in mid-1990s)	This Alliance, made up of several national and international organisations promoted environmental education.
8	UNESCO & UNEP organised International Workshop on Environmental Education in Belgrade, Yugoslavia.	1975	The workshop urged nation and citizens to adopt environment ethics. It established education objectives and guiding principles.

9	Establishment of International Environmental Education Programme.	1975	Meant to promote EE through the activities of UNESCO and UNEP.
10	Intergovernmental Conference on Environmental Education, sponsored by UNESCO & UNEP in Tbilisi, Republic of Georgia.	1977	A framework for the development of EE was provided. The need for the development of EE was emphasised and urged all nations to be active.
11	The Brundtland Report, Our Common Future published.	1987	The Report formally introduced the concept of sustainable development which later became a major ideal in environmental education.
12	UNESCO & UNEP sponsored Environmental Education and Training Congress in Moscow, Russia.	1987	It provided international strategy for action on environmental education.
13	Birth of United Nations Framework Convention on Climate Change.	1992	It provides the basis for climate policies and action. Article 6 on education, training and public awareness pertains to climate change education.
14	United Nations Conference on Environment and Development in Rio de Janeiro, Brazil.	1992	The most significant aspect of the outcome of the Conference and its Rio Declaration as far as EE is concerned is Agenda 21. Chapter 36 of Agenda 21 pertains to reorienting education for sustainable development, increasing public awareness, and promoting training.
15	UNESCO sponsored Conference Environmental Education for a sustainable future held in Thessaloniki, Greece.	1997	It developed a vision for action.
16	A resolution declaring 2005-2014 as the Decade of Education for Sustainable Development by the Development by the United Nations General Assembly.	2002	The resolution whose implementation was driven by UNESCO promoted environmental education worldwide, particularly Education for Sustainable Development.
17	UNESCO International Environmental Education Conference in Ahmedabad, India.	2007	Reviewed the evolution of EE and urged a new thinking on the central importance of sustainable development.
18	UNESCO International Seminar on Climate Change Education in Paris, France.	2009	It provided opportunity for designing policies, programmes and curricula on climate change education; for identification of good practices; for mobilisation of networks and partnerships for supporting climate change education.
19	World Conference on Education for Sustainable Development, Bonn, Germany.	2009	It called for the need to promote Education for Sustainable Development in the Bonn Declaration. The Bonn Declaration emphasised the need to re-orient education to take care of environmental sustainability.

20	UNESCO World Conference on Education for Sustainable Development in Berlin, Germany.	2021	It emphasised the need for environmental education for all ages in the Berlin Declaration. It urged action for sustainable development through education and ESD becoming core aspect of curricula.
21	World Environmental Education Congress in Prague, Czech Republic.	2022	Several dimensions of EE were discussed meant to improve theory and practice.

Source: Compiled by Author.

The globalisation of the thrust on the need for EE came following the Conference on the "Rational Use and Conservation of the Resources of the Biosphere" in Paris, France, from September 4-13, 1968. Of the 20 Recommendations and their associated preambles, 4 were on the need for EE (UNESCO 1968). These were

1. Recommendation 9 on the need for EE training at the primary and secondary school levels;
2. Recommendation 10 on the need for the introduction or extension of an ecological perspective and EE in University courses;
3. Recommendation 11 on the need for out-of-school EE; and
4. Recommendation 12 on the need for inter-agency coordination on EE to be led by UNESCO.

The significance of, and need for EE, were particularly emphasised in Recommendation 9, thus: Recognizing the special importance and need for sound environmental education ..., being aware of the pressing need for appropriate educational materials and curricula ..., (the Conference) recommends ... the revision of curricula so that environmental education be introduced, improved or extended ... (UNESCO 1968: 15).

As significant as these roots and foundation were, it was the flurry of activities in the early-1970s and the mid-1970s that marked the formal beginning of EE. The significant events included the passage of the USA EE Act in 1970, EE Workshop in USA in 1970, foundation of USA Association for EE in 1971, Stockholm Conference on the Human Environment in 1972, Foundation of Alliance for EE, the International EE Programme and the International Workshop on EE in Belgrade in 1975 (see Table 3). The early conferences and workshops, including that of Tbilisi in 1977, provided the early definitions of EE and charted its future. For instance, the International Union for the Conservation of Nature's 1970 Workshop in Carson City, USA, provided the first official definition, with others emerging from the 1975 Belgrade Workshop and the Tbilisi Conference (IUCN 1970; UNESCO & UNEP 1975 & 1977; Hens 2004; Fang et al. 2023). Although all the early conferences and workshops provided frameworks for the development of EE, the 1972 Stockholm Conference on the Human Environment was particularly significant as its Recommendation 96 ultimately led to the emergence of the International Environmental Education Programme in 1975 (UN 1972; Sauve et al. 2007; Dorn 2020).

The Stockholm Conference Recommendation 96 urged the UN Secretary General and the associated bodies of the UN, especially UNESCO, to:... take the necessary steps to establish an international programme in environmental education, inter-disciplinary in approach, in school

and out of school ... and directed towards the general public, in particular the ordinary citizen ... with a view to educating him as to the simple steps he might take, within his means, to manage and control his environment (UN 1972).

The International Environmental Education Programme that subsequently emerged, ran from 1975 to 1995. Within the period, EE was promoted all over the world through awareness-creation, training and supporting programmes. As Sauve et al. (2007: 33) put it succinctly,

The UNESCO-UNEP International Environmental Education Program (1975-1995) provided impetus for developing, legitimizing, and institutionalizing environmental education.

The need for the sustainable use of natural resources, which was central in the 1968 Biosphere Conference in Paris, increasingly became urgent as the concept of sustainable development formally emerged with the Brundtland Report of 1987 (WCED 1987) and the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil, 3-14 June 1992. Accompanying these developments was the need to place more emphases on environmental sustainability in EE. Thus, emerged education for Sustainable Development (ESD). Subsequently, in 1992, the first post-Rio global conference on sustainable development in the context of education and communication was organised by UNESCO, UNEP and ICC in Toronto, Canada. A major boost to ESD came in 2002 when the United Nations General Assembly declared 2005-2014 as the Decade of Education for Sustainable Development, an idea thought of earlier in 2002 during the World Conference on Sustainable Development in Johannesburg, South Africa (UNEP 2005; Arjen et al. 2010; Michelsen & Wells 2017; Leicht 2018). Several conferences followed which strengthened and popularised the idea and ideals of ESD, a major initiative being the Berlin Declaration of 2021 (UNESCO 2021). A more recent orientation in the development of EE is Climate Change Education (CCE), whose foundation lies in the UNFCCC of 1992; particularly Article 6 on education, training and public awareness. For instance, Article 6a(i) urged countries to develop and implement educational and public awareness programmes on CC and its consequences (United Nations 1992).

In spite of the existence of skeptics and deniers (Berlic 2018; Porter et al. 2018), researches by climate scientists, US National Academy of Sciences (NAS), the Royal Society (RS), and particularly IPCC (Parry et al. 2007; NAS & RS 2020; IPCC 2021) have conclusively indicated the increasing challenge of anthropogenic CC and the need for action. As IPCC pointed out in its Fourth Assessment Report (Parry et al. 2007: 9): Much more evidence has accumulated over the past five years to indicate that changes in many physical and biological systems are linked to anthropogenic warming. There are four sets of evidence which taken together support this conclusion.

As the manifestations and consequences of anthropogenic CC, such as extreme weather events, became more and more evident, and as more and more action were being taken by the UN and the various countries, the significance and the need for CCE increased. For instance, a study in Australia (Stevenson et al. 2017) revealed that although in 2012, 64% of 2000 respondents indicated that there was CC, the percentage increased to 77 in 2016. Similarly, although only 52 of the sample in 2012 indicated that Australia should lead the world in finding solutions to the climate crisis, by 2016 the percentage increased to 65.

The increasing significance of CCE has been such that in 2009 UNESCO organised an International Seminar in Paris on Climate Change Education. It was meant mainly to promote an effective integration of CCE into the educational system, both formal and informal (UNESCO 2009). Furthermore, IPCC (IPCC 1991) also provided in 1991 a “Public Education and Information Mechanisms” for fostering awareness and knowledge of climate change issues and encourage widespread participation in addressing the challenge. As it (IPCC) declared in the introduction, an environmentally informed global population is essential to addressing and coping with climate change. Indeed, during COP 26 in Glasgow, Scotland in 2021, the ministers of education and of environment committed their countries to including CCE in all their educational institutions. This was necessary, they declared, because of ... the large remaining gaps in providing everyone with knowledge, skills, values and attitudes needed to effectively participate in the transition towards climate positive societies (quoted in Cho 2023).

Several countries have embraced and promoted the ideals of CCE. The countries of the Pacific Islands Community made up of all Pacific Ocean islands, some of the most climate change-impacted parts of the world, are good examples. The Community CCE initiative (Pacific Community 2014) started in 2011 has the following objectives:

1. to ensure that all relevant aspects of climate change are included in formal and non-formal education;
2. to enhance opportunities to increase understanding and knowledge of climate change through the non-formal sector; and
3. to build service providers to provide accurate information and promote critical thinking about climate change.

Singapore, which employs CCE as one of the strategies for addressing the Climate Change Challenge (Fang 2022) is also an example. It is remarkable that a bill for a U.S.A. *Climate Change Education Act* was presented to Senate on 25 March 2021 (congress.gov). The Act is meant to increase climate change literacy, provide opportunities and promote new technologies and incentives on climate change adaptation, mitigation and resilience. Non-governmental initiatives meant to develop and propagate CCE have also emerged. A good example is the Climate Change Education Network. This organisation, made up of individuals interested in climate change knowledge, was founded in 2020. The immediate catalyst for its emergence were the extreme weather events, particularly the hurricanes in Australia around that period. As the organisation put it, it was founded, ... with the wider intention of creating an action response to the climate crisis, and to address the lack of climate change pedagogy and curriculum in educational settings (climatechangeeducation.net.au).

The preceding analysis has shown that the evolution of EE is fundamentally linked to environmental events and the development of concern for environmental challenges. It is also apparent that EE has a key role in addressing environmental challenges, such as the climate crisis. Given the fact that EE could be employed as a strategy for climate management, the next section examines the challenges in its effective employment.

EE AND THE CLIMATE CHANGE CRISIS

The climate change challenge has been characterised as a distortion of atmospheric processes by anthropogenic activities (IPCC 1991, 2021). It could be addressed through checking the increase in global temperature, and adaptation and mitigation measures. EE, and particularly

CCE, have been identified as one veritable strategy (UN 1972 & 1992; UNESCO 2009; UNICEF 2019; Feinstein & Mach 2019). Be that as it may, there are identifiable challenges in an effective employment of EE. These include the perspectives and action or inaction of the following:

1. Climate Change sceptics and deniers;
2. Climate Change literate but climate-action reluctant developed countries;
3. Climate Change literate but climate-action reluctant developing countries; and
4. Climate Change illiterate individuals and groups.

Climate Change scepticism (Carr et al. 2010; Grindal et al. 2017; Adam et al. 2020) and its more extreme form, denial (Petersen et al. 2019; Bjornberg et al. 2017; Hassan et al. 2022; Moreno et al. 2022) are the most challenging. The scepticism/denial school of thought, though not monolithic, generally speaking, doubts/denies the existence of climate change and its various dimensions. Whereas, the sceptics express doubt, the deniers outrightly reject the existence of climate change. It could be argued that the scepticism and denial spectrum is a continuum with different degrees of scepticism and of denial (Dunlap 2013).

Three main aspects of climate change are doubted by sceptics and rejected by deniers. These are the trend, the cause and the impact (Carr et al. 2010; Niederer 2013; Lewandowsky et al. 2015; Rensburg 2015; Adam et al. 2020). It is asserted that there has really been no anthropogenic climate change and that there have been periods of warming and others of lower temperatures over the decades and centuries. Thus, even if there were warmer periods now, that does not imply climate change. The “global warming hiatus” from 1998 to 2013, during which period the rate of global mean surface temperature-increase slowed, stabilised or even fell by the account of some climate scientists, though controversial and disputed by others (Rajaratnam 2015; Yan et al. 2016; Xie & Kosaka 2017), has been cited as evidence that there are cyclic periods of global warming and cooling. Indeed, it is asserted that there has been a cooling period since the beginning of the present century. It is also argued that a wrong impression of global warming has resulted from wrong models and inaccurate measurements and recording by some climate scientists. Pro-climate change scientists are also accused of being alarmists.

The central argument on the cause of climate change is that the global climate is overwhelmingly dependent on the sun and nothing else. It is the cyclical changes in the energy output of the sun that have determined the character of the earth’s climatic history over the centuries. In other words, where there are changes in global temperature, as does occur from time to time, the process is a natural one and not due to greenhouse gases, especially carbon dioxide (CO₂), emissions as posited by proponents of anthropogenic climate change. This position is in spite of the overwhelming evidence of the relationship between CO₂ and temperature and the consequent global warming (IPCC 2019 & 2021; Wolf et al. 2020). Furthermore, the skeptics assert that, based on ice-cores dating back to nearly one million years, a pattern of temperature and CO₂ increase occurs at approximately 100,000 years interval. A rise in CO₂ always follows a rise in temperature and not the other way round, they posit. In terms of the impacts, the sceptics assert that even if there were, these were so insignificant that do not require the attention given to them. It is argued that there were more pressing global challenges, such as those related to health and to poverty (Carr et al. 2010; Dunlap & McCright 2010; Niederer 2013; Adam et al. 2020). The sceptics believe that CO₂,

blamed for global warming, was beneficial rather than being harmful; for, it was necessary for the growth of plants and therefore increased agricultural production.

Several strategies and channels have been employed by sceptics and deniers to promote and disseminate their ideas (Dunlap 2013; Boussalis & Coan 2016; Adam et al. 2020; Hassan et al. 2022; Moreno et al. 2022). The commonly used strategies (Wardle & Derakhshan 2018; Hassan et al. 2022) include:

1. Presenting false evidence;
2. Presenting false context;
3. Distorting genuine evidence;
4. Presenting comment as fact;
5. Presenting conflicting evidence; and
6. Impersonating genuine sources.

Channels used include newspapers, blog posts newsletters, journals, reports, books and even workshops and conferences. The significance of the scepticism movements is reflected by the fact that the first international conference of sceptics, organised in March 2008 by a Chicago-based public policy think-tank, Heartland Institute, involved talks by more than 200 scientists and other experts from all over the world (Niederer 2013).

The characteristics of the sponsors and the participants also provide some indication of the significance of the movement. Conservatism is a typical characteristic of skepticism and denial. The group is made up of conservative politicians, conservative businessmen/women, conservative scientists, and conservative think-tanks (Dunlap 2013; Niederer 2013; Boulianne & Bellano 2022; Forehtner & Labard 2023). The support base of skepticism and denial is usually provided by corporate organisations concerned about the international and national efforts to check greenhouse gas emission. Understandably, the fossil fuel companies have been at the forefront; although since the end of the 20th century and the beginning of the 21st, several of these companies have started supporting climate action. It is the sponsored think-tanks and funded scientists that have been fundamental in the propagation of the scepticism and the denial positions (Dunlap & McCright 2010; Rensburg 2015; Boussalis & Coan 2016; Moreno et al. 2022; Forchtner & Labarda 2023).

Climate change sceptics and deniers pose varying degrees of challenge to effective climate policy and action. Not only do their perspectives hinder the emergence of effective climate policies but also effective programmes to address greenhouse gas emission. Adaptation and mitigation of the effects of climate change are also affected. The implication is that very aggressive environmental education, and specifically climate change education, is necessary. Although scepticism and denial pose the greatest bottleneck, climate change literate individuals and groups that are reluctant to take the necessary action are also a major challenge. The most significant group is made up of the climate action reluctant countries of the Global North. A clear indication of the reluctance to curb greenhouse gas emission is the ever-obvious difference between the intent of these countries to reduce emission and the actual reduction. In other words, the actual reduction in greenhouse gas emission, if any, has usually been far less than the promised or intended reduction.

By Article 4, paragraph 2 of the Paris Agreement of 2015, all parties/countries particularly developed ones, prepare, communicate and maintain successive five yearly Nationally Determined Contributions (NDCs) to reduce greenhouse gas emission by a given quantity, which as the name suggests, is determined by each party/country (United Nations 2015; UNDP et al. 2020; UNFCCC Secretariat 2022). The reality has been such that before and after the formalisation of the ideal through the Paris Agreement, the actual action has always fallen short of the promised action (UNFCCC Secretariat 2022; World Resources Institute 2022). The Executive Secretary of UN Climate Change lamented the failure to keep to targets, thus: ... the science (of climate change) is clear and so are our climate goals under the Paris Agreement. We are still nowhere near the scale and pace of emission reductions required to put us on track toward a 1.5 degrees Celsius world. To keep this goal alive, national governments need to strengthen their climate action plans now ... (UN Climate Change 2022).

Although the Executive Secretary's lamentation and urging applied to the whole world, there is no doubt that the focus was implicitly on the developed countries which are major emitters and by Article 4(4) of the Paris Agreement, "... should continue taking the lead by undertaking economy-wide absolute emission reduction targets".

The unwillingness to abandon fossil fuels has been key in the lack of rapid progress in climate action. Fossil fuels, coal, oil and gas, continue to be the dominant sources of energy in spite of the fact that they are the main contributors to anthropogenic climate change, accounting for more than 75% of the global greenhouse gas emissions and nearly 90% of the carbon dioxide emissions (UN Climate Action 2022; US Environmental Protection Agency 2023). Although the climate change impact of fossil fuels is widely accepted, the fossil fuel companies and the fossil fuel lobby argue that the abandonment of fossil fuels will result in grave economic and social consequences. The arguments centre around job loss, the diseconomies of stranded infrastructure and production centres becoming depressed (Baron & Fischer 2015; Ritchie & Dowlatabadi 2015; Covert et al. 2016; Jewell et al. 2022).

The basis of the reluctance by the Global South is different from that of the Global North. The arguments involve social justice, environmental justice and economic spheres. A general perspective in many of these countries is that climate change is as a result of the unsustainable development path of the developed countries over the centuries and therefore addressing it must be the responsibility of the Developed North. Perhaps, this perspective is given some credence by the principle of "differentiated responsibilities" which is enshrined in the Paris Agreement of 2015 and is referred to in the preamble and in Articles 2(2), 4(3) and 4(19). There is also Article 4, paragraph 4, assigning the Developed Country Parties the responsibility of emission reduction but providing that: Developing Country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the lights of different national circumstances.

Specifically, the reluctance of the Global South is based on the following premises (Earthlife 2009; Uddin 2017; Kumar et al. 2021; Massenberg 2021):

1. Based on principles of social and climate justice, the developed countries that created the climate change problem over the centuries should be responsible for addressing it;

2. The countries of the Global North, given their level of development, are capable of addressing the challenge while those of the Global South, because they are poor, are not capable;
3. Abandoning the use of fossil fuels, which are abundant, will exacerbate poverty in these countries;
4. Given the high level of energy poverty and the lack of access to energy, the countries of the Global South should be allowed to continue using conventional fuels such as coal, oil and gas; and
5. Since it is the fossil fuels that facilitated the rapid development of the Global North, it is fair that the Global South should use them for its own development.

The perspectives of the Global South are captured in the pronouncements of several groups and government officials from the developing countries. The Caribbean Community (CARICOM), a group of twenty countries, was particularly explicit in its *Declaration on Climate Change* that resulted from a meeting of ministers in charge of climate change just before COP 26 in Glasgow in 2021 (CARICOM 2021).

The Declaration asserted, thus: Noting that the developed countries have failed to deliver on the long-term climate finance goal of providing at least USD 100 billion per annum by 2020 ..., underscoring that member of the Group of 20, who account for 75 percent of global greenhouse gas emissions, have the greatest mitigation potential to curb emissions ..., we call on leaders of the Group of 20 to commit by ... urgently close the emission gap in order to maintain global warming to well below 1.5C.

Similarly, the Secretary General of the African Petroleum Producers Organisation declared at a conference of African Energy Ministers and stakeholders, thus: With 17% of the world's population, Africa's total contribution to greenhouse gasses, the main culprit for climate change, is just around 3% ... It is only fair that the world, especially the parts with the necessary technology works with the African continent to finance fossil fuels in the most sustainable manner, especially as it is a fact that technologies exist to make fossil fuel environmentally friendly ... The way forward for Africa in (energy) transition is to make the most of its existing energy resources. Abandoning fossil fuels at this time is tantamount to abandoning our guaranteed source of energy that is needed for the continent's development (Zali 2021). Nigeria's Deputy Minister (Minister of State) for Petroleum Resources put it bluntly at an energy conference in Houston, USA, in 2022 (Financial Post, 9 March 2022), thus: We are still in transition from firewood to gas ... Please allow us to continue with our own transition.

Even if the issues of climate change sceptism/denial and reluctance were effectively addressed, that of the innate character of human groups, where in any given group, there is likely to be a deviant, remains. Several studies in the developed world (Park et al. 2020; HM Government 2021; Hwang et al. 2021; Kolenaty et al. 2022; Venghaus et al. 2022) and in the developing countries (Oruonye 2011; Anderson 2012; Akpomi & Vipene 2016; Kabir et al. 2016; Njoku 2016; Sulistyawati et al. 2018; Gautam et al. 2021; Aziz et al. 2022) have shown that even with the increasing level of awareness, there is usually a knowledge gap and in some cases, resistance to change, particularly in the developing countries and among individuals of low socio-economic status.

CONCLUSION

Anthropogenic climate change has emerged as one of the greatest of humanity's challenges. There is no doubt that effort is being made, particularly at the level of the United Nations, to address this challenge. Several impediments hinder the various efforts to check climate change. Some of the hindrances are at the level of individuals and groups while others pertain to the behaviour of several nations. At the individual and group level, deniers and sceptics of the fact of climate change have posed grave challenges. At the level of nations, climate change has been so politicised that contending groups have emerged. There are contestations between the Global North and the Global South. Even within each of these two groups, there are subgroups with varying interests. Environmental Education and its associated Education for Sustainable Development and Climate Change Education, whose developmental trajectory has been closely associated with the challenge of environmental deterioration, could be effectively employed in addressing the climate crisis. UNESCO and UNEP have been particularly active in promoting EE, ESD and CCE in an attempt to address climate change and environmental challenges. Changing the perspectives and the behaviour of individuals and groups is important. However, an effective willpower on the part of the various nations of the world is even much more important; for, pro-climate change action by the various nations is needed for an effective mobilisation of the citizenry. There is no doubt that there is a gradual change evident from the progress made in the various COPs. However, faster changes and more determined action are needed to avoid a tipping-point in the climate change crisis.

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