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Africa and Climate Change in the Era of Complex Interdependent Globalised International System

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Abstract

As long as there are two parallel opposing views on the causes of global warming and its attendant effects on human and eco-system security, no concrete solution is in sight to curb this menace. This is more evident when the main culprits in the causes of the climate change pretend as if the reasons for the increase in temperature of the world were not solely the activities of human being. The negative impacts of global warming are not restricted to the Northwestern world; they also reverberate in the Third World States (TWS). Globalisation and its effects on international borders' degree of porosity and the way at which the activities of one state affect the climate of others make it a worrisome issue for Africa in tackling this peril. As long as the issue of globalisation in every ramification is half-heartedly addressed, the entire negative attributes of the global village syndrome will mostly hard-hit Africa. The twin concepts of externality and the *tragedy of the commons*[1] that are in favour of the developed world continue to be a vampire that impacts on climate change with no concise solution in sight. Unless the Multinational Corporations (MNCs) do away with the current technology and invent in those that are inherently clean, renewable and non-toxic, the global system cannot move towards a sustainable world. Imposition of embargo on goods and services produced through questionable technology is a way of forcing the North to address ecological problems through holistic approach. Also of note is the need to have knowledgeable consumer associations in Africa that can challenge the MNCs overarching power on what type of technology is acceptable for consumable goods and services.

> Unless we find a way to change our civilisation and way of thinking drastically about the relationship between humankind and the earth, our children will inherit a wasteland (Al Gore, 1992).
>
> If we fail to address the challenge of climate, we cannot achieve sustainable development (Kofi Annan, 2005).
>
> While we lack all the tools we need to address it (climate change), we are not applying the tools we do have available. Despite the magnitude of the task ahead, global action has been slow (Kimble, 2005).
>
> Rising temperatures may also foster the spread of diseases by enabling mosquitoes, ticks, and other disease-carrying organisms, including fungi, to spread farther afield. The dangers posed by climate change are nearly as dire as those posed by nuclear weapons (Awake!, 2008: 3).
>
> Management of environmental issues is complicated by the epistemic communities, which make collective goods problems hard to resolve (Goldstein andPevehouse, 2009: 385).

Introduction

The issue of global warming, environmental degradation, the 'greenhouse effect'[2] and accelerated extinction of flora and fauna species, threats to the ozone layer and other resource have become academic household from the 1970s. Each year, the "effects of climate change are coming into sharper focus. Barely a month goes by without some fresh bad news: ice sheets and glaciers are melting faster than expected, sea levels are rising more rapidly than ever in recorded history, plants are blooming earlier in the spring, water supplies and habitats are in danger, birds are being forced to find new migratory" (Victor et al, 2009: 64).Holistic approach to the study of these problems is needed because of the complex interdependence of environment, political, social and economic issues and the way in which they interact with one another (Carter, 2001: 3). The United Nations Conference on the Human Environment (UNCHE) held in Stockholm in 1972 was the first global attempt at addressing international environmental issues. It was the offshoot of environmental diplomacy, identified *Common Heritage of Mankind* and sovereignty of states in exploiting their natural resources, but mindful of its

effects on others[3]. In 1988, the United Nations (UN) established Intergovernmental Panel on Climate Change (IPCC) to look into changes in climate impacts on human activities. At the 1992 Earth Summit in Rio de Janeiro, 153 countries, the United States of America (US) inclusive, signed a treaty on the "stabilisation of greenhouse gases concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system…within a time-frame sufficient to allow ecosystems to adapt naturally." The follow-up Tokyo conference of 1995 brought about the convergence of anti-American environmental development strategists who posed to re-orientate the US and international assistance programs on the practical ways of solving global warming issues and its effects on general development (Adas, 2006: 376; Stiglitz, 2006: 169).

Politicians, Non-Governmental Organisations (NGOs), mass-media, civil servants and scientists could not have a common position on the issue of global warming. The press gave a picture of imminent self-annihilation if states' and Multinational Corporations' (MNCs) trend of minerals and natural resources exploitation continues. It has been recorded that in 2005 "atmospheric levels of carbon dioxide (CO_2) were 379 parts per million (ppm), which is higher than what obtained at any time in the past 650,000 years. Out of the 12 warmest years on record, 11 occurred between 1995 and 2006. Global CO_2 output in 2006 approached about 32 billion tons of which 25% of it came from the US (Kluger, 2007: 40). NGOs, dominated by the Western world, continue to vacillate on the causes of, and solutions to, the climate change. This is an attempt not to offend their sponsors in having access to unending researchgrants from the most pollutant states in the world[4]. The politicians, probably because of the bureaucratic bottleneck, could not come up with a concrete, well-articulated panacea to the problem. Therefore, for government security or because of the cost that would involve in reversing the trends to the *status quo ante*,America in particular, under the Republican Party, played down the effects of global warming.

The Rio Summit failed to agree on the practicality of some policy options agreed to. The US$600 billion yearly agreed to by the participants for Earth sustenance without any *modus operandi* on how to source for the fund relegated the institution to a lame dog. Principle 2 of the Rio Declaration continues to attract various nuances. States have the "sovereign right to exploit their own resources pursuant to their own environmental and

developmental policies. This is in accordance with the Charter of the UN and the principles of international law. The Declaration also stated that 'the activities within member states' jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction'. There are two major contradictory statements here. One, the non-interference in the internal affairs of other states, and two, the need for states to come together in addressing the issue of sustainable development, which hinges on climate change is problematic. These contradictory statements coupled with doctored research findings in the US could have inspired the industrialised states to have little input on the agenda. This is more evident in the Kyoto Protocol on climate change when the George W. Bush administration took uncompromising position in March 2001, based on "unsettled scientific work of global warming" (Hertz, 2002: 185).

Main causes of the global warming influenced America's opposing position despite the contrary position of the European Union (EU) on climate change. The superficial view by some scholars and media houses that the main cause of climate change is carbon dioxide (CO_2), which they believe is usually caused by industrial activities could have led to the US position on the need for China, India and the Asian Tigers to lead in curbing environmental degradation. With global economic meltdown, the US and China met in late July 2009 before the December 2009 Copenhagen, Denmark, Summit on Climate Change to find a joint solution to trade, investment and climate change. The US realised the need for both to cooperate on these because of the economic advantage China has over the Washington government. The US is the most uncontested industrialised state in the world either at home or through foreign direct investment of her MNCs at the global level (Catley, 1999: 4). America's support for climate change would have put the state on the need to innovate its technologies to an environmentally friendly one. No doubt, the same would have had implications on the economic growth and development. Also worth noting is the lack of a unified position by the students of climatology and meteorology on the causes of climate change. The US exploited this gap on the pretext that not until full-proof scientific findings on the causes of the ozone depletion and its subsequent climate change, Washington government would not join other states in finding a practicable solution to the problem.

Blurred delineation between MNCs and the parent states continues to be a source of tension rather than unity in solving free ride problem. The claim by the MNCs of paying series of taxes to their host states' environmentally friendly society is worth passed for heresy. Their constant emphasis on their philanthropic activities in their areas of activities is not more than propaganda. The impact of climate change is not confined to the area of the MNCs' activities. The usual supports of the parent states on this position continue to affect the plight of the African states. The oil and other minerals MNCs' contributions to environmental hazard without an appreciable compensation to the affected people and biodiversity causes series of political instability in the oil and other mineral resources areas. The disputed Koko Waste dumped in Nigeria on 24 September 1987 is an example; this was when a private construction company (Iruekpen), an Italian (GlanfrancoRaffaach) and some Nigerian government officials were rumoured to have negotiated on behalf of the Nigerian government to receive the toxic wastes at a cost (financial) from the Italian government. Following from the foregoing analysis, this paper interrogates the influence of climate change on the development of Africa. More emphasis would be placed on the activities of the MNCs at the domestic level. In addition, the impacts of environmental hazards on Africa because of the inappropriate technology declared environmentally risky in the North but imported to Africa to produce goods and services that are meant for global consumption without adequate compensation to lower the level of CO_2 will be dealt with. This paper suggests that embargo should be placed on goods produced out of environmentally incompatible technology to Africa.

The Complex Interdependence Theory postulated by Robert Keohane and Joseph Nye (1987) will be a useful theoretical tool. However, students of international relations believe that single theory hardly proffers solution to a problem. This could be because of the parasitic nature of the discipline or the complex nature of human relations of which it has direct relations to the environment at which they operate. This paper shall refer to David Lake's (1993) hegemonic theory position. This will, undoubtedly, enable this paper to have a balanced position to the academic knowledge on the climate change and its effects on the TWS, with more reference to Africa.

Thus, this paper is divided into six major parts. Part one is the general introduction to the problem. Part two concentrates on the theoretical explanation of the

climate change. However, there is a need to amalgamate two identical, but different theories in analysing climatic change as it affects Africa, more emphasis will be placed on the complex interdependence theory rather than belabouring on the hegemonic theory, which is more economically fitted. Part three explores some of the existing literatures on climate change. Part four investigates the myth or otherwise of climate change. This is necessary because of the conflicting positions of some scholars and politicians about the issue of global warming and its effects on climate change. Part five interrogates the African position in the era of environmental globalisation where state-centric paradigm as the only credible approach of analysis has undergone radical changes. Part six concludes the paper and it proffers some policy recommendations.

Theoretical Framework of Analysis

Because international politics is a parasitic discipline that hinges on so many other subjects, one theory, in most cases, is not adequate in analysing relations between states (Garnett, 1984:27-50). Consequently, our intention is to employ complex interdependence theory.

The main features of complex interdependence:

- There is multiple channel of interaction such as inter-states of realist school; transgovernmental relations where the inputs of different government departments and various parastatals play a vital role in communalising states' relations; and transnational non-state actors such as environmental organisations like Greenpeace, Friend of the Earth, Liberation Movements, religious movements, trade unions, MNCs and the like.
- There is absence of hierarchical system where issues of high and low politics are less relevant. This thesis is of the belief that military/security, politics, economical-social, environment and culture play prominent roles at different times, depending on issues at hand.
- There is what one could term as jointness and nonexclusiness. That is, all the member states in a system are sensitive to actions and inactions of any member states either on domestic or on foreign policy issue.

- The degree of vulnerability to member policies depends on the import of goods contributed by one or more state to the system. It has little to do with the level of political, economic and social developments of other members in question.
- It erodes the notion of total autonomy and sovereignty of different units to the whole system. More emphasis is on sharing of sovereignty on three levels: international legal, Westphalian/Vatellian and domestic (Krasner, 1999: 9-25; 2004: 88).
- Like in integration theory, absence of the use of force and coercion, and the use of collective action to promote mutual interests are equally prominent with complex interdependence theory (Evans andNewnham, 1998: 254).

Interdependence (means) changes or events in any single part of a system will (sensitive effect) produce some reaction from or have some significant consequence to other actors of the system *whether they like it or not* (Russet and Starr, 1992: 439). Keohane and Nye (1987: 364) are of the view that the need for interdependence is from the need to achieve all unattainable in isolation. It emphasizes the links or interconnectedness among the units of a system. Such links may affect both the opportunities of states and the willingness of decision makers to act. These linkages can be likened to economic, political, social or environmental incremental integration. As much as this can generate stability, predictability, regularity, unity, growth and development, it can as well breed frustration, anger, instability, competition and conflict. It may be asymmetrical where one of the units (usually the centre) in a system tends to benefit more, but when it is symmetric (an ideal type that hardly meets), it connotes that members enjoy mutual benefits and experience little or no conflict among themselves (Keohane and Nye, 1987: 365).

The contemporary cobweb international system has radicalised communication, transportation, environmental issues and economic interdependence. This is one reason why the concept of domestic sovereignty/Westphalian sovereignty has resulted to what Rosenau terms microelectronic revolution (c.f. Russett and Starr, 1992: 441). Issues such as capital movement, (atmospheric pollution), and the drug trade, terrorism, AIDS/HIV and currency/economic crisis are more of transnational concern than national problem (Krasner, 1999:12). The same pose common problems and solutions to the whole gamut of international politics. Owing to high degree of interdependence in all facets of international relations, there are some elements of sensitivity among states in the whole

system where action or inaction of a member state affects others, at least in the short term. Therefore, all states in a designated system are sensitive to changes in the rules of policy, social or economic transaction. On the other hand, and in the long term, vulnerability type of relationship may exist; this brings about a scenario of unequal exchange (asymmetrical relationship) in the system under consideration. In some cases when a state is vulnerable to the other's policy, i.e. inability of state A to absolve the cost B imposed on it due to its internal or foreign policy, it could lead to conflict and the use of military power. The most vulnerable state/s may not necessarily be the most sensitive one (Keohane and Nye, 1987: 368).

Increase in the interconnectedness of states brings the concept of sovereignty into question. It also questions the existence of international relations and (mis)subject the same to transnational relations. Relations among states have gone beyond state-centric decision-making. Movement of goods, ideas and information across borders "without significant, direct participation or control by high-level governmental actors" of which states have no control signifies the need to question the absolute relevance of international relations (Russett and Starr, 1992: 443). The permeability of states brings into prominence the import of NGOs. Even at governmental level, sub-national actors (part of bureaucracy) do relate with their counterparts from other state without the knowledge of national government (usually highly sensitive security matters), mostly in federal or confederal system of government. In addition, what makes states more vulnerable to transnational relations is the improvement in the level of technology where private individual can source for information from any part of the system within a twinkling of an eye through the internet and telephone call. One of the implications of this on political, social and economic demands in a state is that it can lead to changes in government policy or a total change in government due to popular demand.

Unlike the realists position, military security and the use of force are less important; *autonomy dilemma* scenario makes states to consider the input of non-state actors in policymaking. The same made them to be vulnerable to one another. Worthy of note is that the issues that are central to interdependence thesis are not static. Strict hierarchical system of high and low politics as believed by the realist school is not attainable in the complex interdependence school. Military capability of a state is not

fungible in achieving socio-cultural, political and psychological interdependence (Russett and Starr, 1992: 445). Domestic politics or economics can influence international economics and politics and vice versa, the degree of sensitivity and vulnerability only differ.

Externality in the complex interdependence theory, unlike the private goods where the law of supply and demand determines its availability, it addresses people's choices, costs and benefits as it affects others (Russett and Starr, 1992: 451-452). The 1986 Chernobyl nuclear accident not only affected Russia, but also brought cost to its neighbours in term of exposition to radiation and cost of its clearing. This brings this study into what is termed as collective goods where member states equally benefit either positively or negatively on supplied goods, that is, *jointness* and *nonexclusiveness* (Russett and Starr, 1992: 453).

Vulnerability or *forced–rider* is another type of interdependence. This is when the cost of collective goods supplied by a member state is forced on all members in a system. The cost of climate change and nuclear accident knows no boundary. This, in most cases, generates conflict of who should pick the bill of clearing the pollution and accidental nuclear discharge (Ecological Economics, 1992: 22). Despite some pockets of conflicts among states, there is still a need for coming together for collective goods properties. Another problem associated with interdependence is *the tragedy of the commons that brings ruin to all*. Anthropocentrically, states tend to ignore their responsibilities as the member states will always like to maximize their share of the common goods, their limited supply notwithstanding. On the other hand, ecocentric view debunks the Judeo-Christian world-view and the enlightenment perspectives of instrumental value thesis of non-sentient living things. Human resources, as viewed by the capitalists, is to satisfy the use of human beings irrespective of its ecological implication (Carter, 2001: 16). With the theoretical analysis of complex interdependence theory, we need to apply this through published works on the problem. Therefore, we turn to review of the existing literature on climate change.

Literature Review

There are various theories employed by the students of environment, mostly those with international relations background on the study of global warming. These theories range from Liberal, Neo-liberal, Idealist, Marxist to Structural schools in proffering explanation to the environmental issues at the international level. The most common denominator among these schools is that they could not come up with a practically agreed solution to the problem of climate change. Greene (1997), in his contribution towards the problem in question, sees it from the use of trans-national approach where the roles of non-state actors prevail in solving the problem. He is of the view that the state is less concerned with environmental issue compared to the activities of environmental NGOs such as the Greenpeace, Friends of the Earth and World Wildlife Fund for instances. His point of departure is that transnational/multinational institutions, supranational organisations, intergovernmental organisations and private individuals (like environmental scientists) do influence states to address environmental problems (Greene, 1997: 319-321). His main argument centres on the issue of knowledge, power and interest as he is of the opinion that "knowledge helps to set agenda, affects patterns of influence and power, and shapes assessments by key actors of their priorities and interests" (Greene, 1997: 321). He opined that only the above named institutions have the three criteria of pushing the environmental issues further compared to the limited interest of state and government that have less concern if not *forced* in addressing the *global commons*.

Environmental issues have become a concern of everybody in international society. It is no more an academic issue that centres solely on natural scientists and geographers. Politicians, government officials, social scientists, consumer associations, NGOs and the military have started to concentrate on the study, recommendation and implementation of environmental panacea. Environmental regimes, mostly ozone regime, are of particular importance to the student of international relations (Greene, 1997: 313).

In his own contribution to the climate change, Patten (2006) was of the view, like a student of interdependence theory, that global cooperation of states could solve the problem. As a diplomat, he added colours to his state's inputs toward global stable environment. He described US policy as 'not only selfish but foolish and self-destructive; he therefore called for developing states persuasion to join the developed world in solving environmental problems (Patten, 2006: 302). He believed that trans-boundary

nature of the problems such as ozone depletion, climate change and the depletion of fish stocks have revealed the futility of national responses without international cooperation. He called for emergence of a new and complex body of international law to regulate environmental issues. To reduce global warming, Patten advocated for "letting the market do what it deems best can work for the environment, especially if externalities can be internalised to reflect the true environmental cost of a common good. He called for the removal of subsidies that contribute to over-exploitation of the 'global commons 'and the serious damage to the environment".

In his own contribution and in line with Patten point of argument, Hart is of the view that real capitalism, unlike the tailored free enterprise of the pre 21st century, is the only solution to the greenhouse gas emissions. His line of departure, which this paper is going to focus on, is the need for the free market economy in its perfect condition, change the definition of sustainable development[5] through creative destruction (Hart 2007: 87-109). This is when, according to Hertz (2001: 147-158), power belong to people through series of consumer association that will be able to force government through multinational companies to change from incremental continuous production as advocated by the Kyoto Protocol to Ecomagination. That is "aggressive commercialisation of new technologies such as wind power, solar energy, fuel cells, high-efficiency gas turbines, hybrid locomotives, lower-emission aircraft engines, lighter and stronger materials, energy-efficient lighting, and water purification technologies" (Stuart Hart and Clayton Christensen as c.f. Hart, 2007: 95). His anti-technophile position and rejection of trade embargo on states that refuse to comply with energy efficient technology is a major shortcoming in his position.

In their complex contribution to a sustainable environmental friendly system Victor et. al. (2009: 64-76) advocate for new strategies named geoenginering in form of launching reflective particles into the atmosphere or positioning sunshades to cool the earth.This system of controlling the climate is not a new step in finding a conducive planet to live. It could be traced to the 1940s former Soviet Unions and the US attempts to *seeding clouds* in order to facilitate more rain for the crops production. In 1965, President Lyndon Johnson called for a catholicon to the climate change in form of geoengeneering. Since then much ground was not covered on scientific means of

teleguiding climate change. Attempt by the US military experts to introduce nuclear explosions to create more friendly climate was banned by the UN in 1976. This led to the natural asphyxiation of environmental modification technique in the military and agricultural sectors. As much as this system could cool the planet, it could not stop the build-up of CO_2 or lessen all its harmful impacts(Victor et al, 2009: 66).It does not take the animator time to realise its lapses as its infancy help in not being taken serious by the politicians and policymakers in every state. It is the opinion of this school that if religiously adhered to by the international system by creating international norms governing its use, much headway would be covered in balancing ecosystem.As much as this option tends to solve the problem of climate change, it is not enough to fix all related problems of global warming, as it does not stop increase in the concentration of CO_2 in the atmosphere. The result of this phenomenon is the movement of the CO_2 concentration to the ocean where it will form carbonic acid. Carbonic acid will eventually upset the ecosystem in the continental shelves where fishing activities of millions of people being threatened; and the organisms that make shells will disappear.

The Myth or Demystified Climate Change

US Position: The Kyoto Protocol was signed in 1997 by almost hundred countries, but could not be easily ratified by the industrialised states, most especially the US and Australia until December 2007 during the Bali United Nations Conference on Climate Change (UNCCC). The Protocol committed the developed states, 38 countries, to cut their greenhouse gas emissions by 2012 from 5% to 7% below their 1990 levels[6]. The US that harbours 5% of the total world population produces 25% of the world's emissions. TWS viewed that it was morally bound that the US should take a lead in anti-greenhouse gas emissions (Halper and Clarke, 2002: 124). When President Bill Clinton left the White House in 2001, the conservative Republican government headed by George W. Bush (2001–2008) abandoned his predecessor's agenda to save the planet against self-annihilation and declared the treaty *dead* (Goldstein andPevehouse, 2009: 390). He refused to table the Kyoto Protocol before the US Senate for ratification. The Byrd-Hagel Resolution that called for equal involvement of both developing and developed states in financial commitment to the effects of greenhouse gas emissions encouraged Bush anti-

Kyoto stance.[7] America's position on this was that it would reduce the States' economic growth by 20% of which the same would be impacted on the global international economic relations (IER). It would also affect oil subsidization of America and therefore impact on transportation (Patten, 2006: 301). Bush administration also opined that should Washington ratify the Protocol, some emerging developed states like China, India, Mexico, South Korea, the Asian Tigers and Brazil, that are economically buoyant would enjoy a free ride at the disadvantage of the US (Economy, 2007: 45). This could have made the Bush government to engage China, India, Japan, Australia and South Korea through Asia-Pacific Economic Cooperation (APEC) on Clean Development and Climate to facilitate energy efficiency and environmentally sustainable growth. America believes that this would affect global warming more than the Kyoto Protocol (Drezner, 2007: 43). Washington's lack of interest to provide common goods at the global level has reduced her to a minimal hegemonic power status. Condoleezza Rice, then the Bush security adviser (later the US Secretary of States) was unequivocal about the need to reject Kyoto Protocol when she was of the view that it was not the US interest to abide by the Protocol (Halper and Clarke, 2002: 124). Economic development as a priority over clean environment by the US government frustrates the need to cut emissions by between 60-80 % in order to stabilize the current atmospheric concentration of CO_2. Despite several rhetoric calls by the European Union (EU) to cut gas emissions, its adoption of emissions-trading scheme is theoretically good for the global environmental question, in practice, the carbon prices too low to effects any significant impact on the use of fossil fuel as a means of industrial production. The Scandinavian states that called for stiffer action against the emissions of CO_2 experienced a net increase in its emissions.

In response to the challenges posed on clean environment, China, in her March 2006 declared a 5-year development plan energy efficient technology to reduce the cost and ensure environmentally friendly energy sources. The state also increased taxes on fuel and its related products. In an attempt to discourage deforestation, another source of climate change, and more taxes were imposed on wooden chopsticks (Stiglitz, 2006: 323). China is being considered as Africa's friend against Northwestern developed states because of its support for anti-colonialism in the 1960s and its readiness to transfer technological knowhow to the continent in exchange for fossil fuel, agricultural raw

materials and markets at the global ruling prices (Wilmot, 2007: 72-74). Despite this, as of 2009, China remains one of the major states that depend on the use of coal to power its industrial development. Also of note is the Japan's reduction of its greenhouse gas (GHG) emissions by 9%, exceeding 1990 levels, in 2006 (Luta, 2009: 2). As in the case of China, Japanese industrial development and the urge to maintain favourable balance of trade and payment makes the state to invest on industrial sector.

The oil majors' interests further strengthen US's anti-Kyoto Protocol. Bush-Cheney's personal interest in oil business is instructive. Contrary to the need to preserve the eco-system through sustainable exploitation of natural resources, Oil MNCs dominated by the US declared at the 2006 world economic summit in Davos that thawing of ice in the Arctic Ocean would give more access to the oil exploration in the polar region that were not accessible before. This school of thought forget to appreciate thawing permafrost effect releasable to the atmosphere in form of greenhouse gasses which eventually compound the global warming problem.For instance, the Hurricane Katrina in Florida and the September 1999 Hurricane Floyd caused by climate change and their attendant effects on the American economy were enormous and too destructive to ignore[8].

Despite the US hard-line position on the reduction of gas emissions, there were some forces that made the States to abide by gas emissions reduction. In the 1970's oil shock, the American government was forced to import fuel-efficient automobiles from Japan instead of the Detroit Ford and General Motors oil guzzlers. In 1979, the US and the European states set up the Long Range Trans-boundary Air Pollution (LRTAP) with the aim of limiting emissions of sulphur dioxide and other pollutants causing air pollution and acid rain (Greene, 1997: 316; Middleton, 2007: 40).

Although the US called for the need to energise her Directorate of the Environmental Protection Agency (DEPA), Bush anti-Kyoto Protocol made the Agency to function below its capacity. DEPA director, Todd Whitman, promised to reduce CO_2 and abide by any legislation to that effect, but the Bush administration anti-environmentalism appeared to have killed his initiatives. As if the issue of environmental crisis would have some solutions with the coming to power of a Democratic Government led by President Barrack Obama, as of 2009, the US government has yet to cap on its

emissions because of the economic consideration over a clean and green environment. As of July 2009, the Democratic Senate dominated members on Environment and Public Works Committee abandoned plans to draft and mark-up a comprehensive national energy tax model. With this move, the Trans-Atlantic relations were subjected to question as the EU parliament condemned American unilateralism because of her short-term objective of economic development that overshadowed the global long-term sustainable development. As discussed below, the effects of $CO_{2,}$ unlike other conventional air pollutants, once enter into the atmosphere will remain their for over a hundred years.

Some Causes of Greenhouse Gas Emissions: Causes of greenhouse is another area that is yet to receive both scientific and academic rigorous attention. There are divergent views on the agents of global warming and rising sea levels. The IPCC's undisputed finding confirms that anthropogenic activity has largely contributed to it. The line of departure is the degree at which this affects the future change and variations in impact (Kimble, 2005: 104). Stiglitz (2006: 166) and Gandar (1991: 95-109) are of the opinion that 80% and 20% of burning fossil fuels and deforestation respectively are of the prime causes. On the other hand, Thatcher (2002: 451. See also Campbell 2003: 642-645), a politician, held a different view which is not too far from the argument of the US that as much as CO_2 contributes to the global warming, other pollutants also abound on which less emphasis is laid. Methane (CH_4), Nitrous Oxide (N_2O), Chlorofluorocarbons (CFCs) and Tropospheric (O_3) are some of the contributing agents of greenhouse gasses. Thatcher's view is in line with Melinda Kimble position on the causes of gas emission who opined that emissions resulted from the 'burning of fossil fuels, harvesting forests, raising cattle and sheep, or growing rice and other crops' (Kimble, 2005: 103). Methane, for instance, is a product from livestock, which consists of enteric fermentation in cattle and insects, and it carries almost 30%, biomass burning and waste burial 15%, coalmines and gas leaks 10%, rice paddies 25% and swamps tundra 20% of greenhouse gas agents. Thatcher's point of view on the effects of CFCs on climate change is analysed as follows: aerosols 30%, refrigeration and air conditioning 20%, plastic foams 52% and solvents for the computer industries and sterilants for medical supplies 8%. Nitrous Oxide, on the other hand, composes of fertiliser use, fossil fuel combustion, biomass burning and

changing land use. Tropospheric are reactions involving pollutants such as methane, carbon monoxide, nitrogen oxides and sunshine.

Africa in the Context of Climate Change

The sub-Sahara African states that lie in the tropical rain forest have become the major target of environmental degradation. From 1950s, tens of thousands of African plant and animal species are extinct each year. In 2004, the increase in the Indian Ocean level devastated Somali coast, which left thousand of Somali dead resulting from water or vector borne diseases. This phenomenon continues to have implications on the ozone layer. Africa did not realise the importance of climate change on the general development of their environment and its effects on the living condition of their people. This affected Africa's position at different forums of the UN sustainable development. Africa considered the Brundtland Commission[9] (1987) set up by the United Nations General Assembly (UNGA) as a means to *kill* development and social justice, the main pillars of sustainability. The Commission's pro-North, specifically the US, made Africa to kick against the initiative as more emphasis placed on the NGOs environmentalists lacks holistic approach to the problem. The efforts of *multinational NGOs* towards environmentally friendly international system appear parallel to the intention of the African states as mentioned above. At the Rio (Earth) Summit in 1992, the Secretary General of the Summit, Maurice Strong, carefully addressed the conference so that the TWS with their majority in the UNGA would not vote against the Summit's Communiqué. Two treaties signed at the Rio Summit, the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention on Biological Diversity (UNCBD) reflected the aspirations of the developed states (Victor, 2006: 97; Goldstein andPevehouse, 2009: 389). Expectedly, probably, because of little knowledge on the issue of environment or for the need to develop their states through the exploitation of their non-renewable natural resources, Africa accorded less support to the Rio Communiqué

Because of Africa's backwardness, little attention is being focused on the impact of climate change. The continent is known as less industrialised, but of subsistence agricultural production. Despite this, the impacts of the global warming resulted from climate change are most felt in the sub-Saharan Africa. A 2004 Tsunami felt along the

Indian Ocean had impact on Somalia where thousands of people were declared dead. This occurrence has put the low-lying coastal states such as Madagascar, Sao Tome e Principle and Equatorial Guinea at the risk of submergence due to increase in the sea level from global warming. Recurrent drought in Africa caused by *La Nina* undermined the degree at which annual rainfall could be determined. *El Nino* on the other hand causes torrential rainfall eroding the topmost rich soil that brings about poor agricultural yield. Famine, food and water security problems and political conflicts are inseparable in states like the Sudan, Somalia, Ethiopia and Eritrea. The Darfur crisis could be linked to a resource-driven conflict when crop farmers attacked herdsmen for overgrazing. This type of clash is rampart almost in every state of Africa, except perhaps in South Africa because of its relatively modernised agricultural system. Series of clashes, though at a low level, were yearly recorded in Nigeria, Niger, Mali, Chad and Cameron common borders with other states because of grazing. Gas flaring in Nigeria's Niger Delta is affecting Lake Chad shrinking, fluctuation in the Niger, the Nile and the Benue rivers. Senegal's erratic climatic condition, Cameroon's agricultural poor yield recently and the extinction of floral and fauna in Africa's mangrove forest and encroachment of the Sahara desert southward continue to pose danger to the continent.

Also of note is the impact of economic globalisation where capital flight from the industrial north to Africa is on the increase. Relatively cheap labour, unregulated environmental laws and easy access to raw materials have increased the rate of deforestation, urbanisation, dredging and mining with their attendant environmental hazard. Kenya for instance suffered two years of extensive winter floods and two years of severe drought, which affect agricultural production, and destruction of infrastructural amenities that cost the state an estimate of US$4.8 million between 2000 and 2005 (Kimble, 2005: 106). Effects of climate change are also much felt by the five states that border Lake Chad, the lake continues to shrink, as the human population continues to go up and compete for the same limited resources of the lake. The Niger and the Nile rivers could not meet the needs of the states that are previously enjoying them for hydroelectric generation and sources of irrigation for food production. This could have caused Boutros Boutros-Ghali, when he was the Egyptian foreign minister, to have said that Cairo could go to war with any state/s that disallowed his country to have unobstructed supply of the

Nile. Part of the reason why South Africa went to Lesotho to enforce peace in the tiny landlocked state in 1998 was to have continuous access to the supply of Highland's water.

Some of the implications of this are:

- Higher average surface and ocean temperatures.
- More rapid evaporation and then more rainfall (a speeding up of the water cycle).
- More variability and severity in floods and droughts.
- Rising sea levels due to water expansion from warming temperatures, and the runoff from continental ice shelves.
- An increased frequency and intensity of extreme weather events (floods and droughts).
- An extended range for tropical diseases, particularly those with insect vectors Kimble, 2005: 104).

In reaction to the climate change lately, Africa is of the view that if they have to participate in this global threat, holistic solution that goes along with environmental development in the context of North-South relations is worth addressing. The need for Africa to contribute to the issue of climate change receives some justifications by Greene (1997: 315) when he contends that:

> Environmental issues have become international and global in several senses. Many environmental problems are intrinsically transnational or global, or relate to global commons. Other local or national problems are experienced widely across the Earth… the processes generating most environmental problems are closely related to broader political or socio-economic processes, which are themselves part of an increasingly global system.

For instance, in 1991, various environmental NGOs from the North established a Global Environmental Facility (GEF) to fund the aspired sustainable development forum. About two-third of the fund realised was used to finance some issue areas of sustainable development such as climate change, biodiversity, pollution in international waters, land degradation, ozone depletion, and persistent organic pollutant (Victor, 2006: 98). Contamination of up to one million litres of water by a litre of used oil carelessly disposed off in the TWS is an issue worth looking into. Issue of human security and the need to finance research on alternatives to fossil fuel did not receive attention. This was probably to protect the business interest of the oil giants, mostly from America. The *war* between the environmentalists and African governments remains unresolved. The former

considered the impacts of climate change, ozone depletion, deforestation and the like as dangerous for the incoming generation. The latter on the other hand, considered environmentalists' position as antithetical to the continent's development. Africa wants an establishment of a system for norms, rules, regulations and taxes to curb and manage the damaged environment. That is, a holistic approach to sustainable development where development and social justice are addressed jointly. Major problem linked with this are how, who and when the presumed culprits are going to share the cost. Because of that Africa is of the view that the cost should be dropped on the doors of the developed states who have been exploiting the resources of the world unabated from the past hundred of years without compensation. Despite the adoption of the 1982 arrangement of the international law of the sea where 200 nautical miles from the coast (continental shelves) of each state is being transferred to the contiguous states; this fails to curb over exploitation of the natural resources on the high seas considered as global commons, mostly by the North's fishing activities (Dugard, 2000: 290).

Contrary to the intension of the environmentalists, primarily based in the North, Africa is less concerned with the issue of gas emissions reduction as the total number of population that has access to electricity and automobiles is less than 20% in the continent. More attention is being focused on Africa as the most reliable and credible source of fossil fuel. America and her trans-Atlantic neighbours appreciate the new roles of Africa in their industrial development as the Middle-East political turbulence makes oil drilling in the region more expensive and risky.

Also of a major concern is the exploitation of disparities among scientists on the causes of climate change and ozone depletion. The North's belief that the main source of stratosphere ozone depletion is the effect of CFCs (commonly used in refrigerator, air-conditioning coolants and the aerosol sprays) which reacts with the ozone layer and allowing cancer-inducing ultraviolet radiation to penetrate the atmosphere (Stiglitz, 2006: 168; Thatcher, 2002: 451). On the other hand, there is a need for aerosol sprays in tropical African region to eradicate mosquitoes, the primary agents of malaria, which is one of the deadliest diseases claiming several thousands of African lives each year despite governments' and several foreign donors' attempts to eradicate the cause. Air-conditioning is equally essential cooling system to avoid contacting diseases

accompanying hot climate. Food shortage in Africa inspired the use of chemically organic manures to produce more food for the teeming population. Agricultural subsidies imposed by the EU and the US despite their call for free trade entrenched global warming mostly from farmers in form of the employment of organic fertilisers and over exploitation of high seas for fishing.

Africa continues to be at the receiving end in the plight of climate change, it has not been benefiting from the economic development inherent in the use of fossil fuel for production of goods and services. Instead, tropical region is noted for deforestation. Cameroon, Equatorial Guinea, Gabon, Nigeria, the Democratic Republic of Congo (DRC), Ghana, Togo, Benin and part of Mozambique are daily losing their forests to the exportation of timbers to Europe, North America, Japan and China. Income from this resource timbers, rather than serves as a source of economic development in African states, it contributes to political instability. In Liberia and DRC, the resource war extended from mineral resources to the tropical hard wood. The Chad-Cameroon oil pipeline project aimed at transporting gas and fossil fuel from Chad not only contributed to carting away of the oil deposit of the area and its implications on environmental pollution, it also plays prominent roles in deforestation and instability of the people of the two states (Gunyer, 2002: 111).

As discussed above, the tragedy of the commons, which knows no boundary has become a nemesis of the African continent with more emphasis on littoral states. Global warming and its effects on the rising sea levels is becoming feasible in Port Elizabeth (South Africa), Beira (Mozambique), Zanzibar Island (Tanzania) and Mombassa (Kenya) where the governments of these states are struggling to claim the area from being submerged by the Indian Ocean. There is a possibility of more warming between 2.5 and 10.4 degrees Fahrenheit (1.4 and 5.8 degrees Celsius) by the end of this century, and a further rise in sea level of eight centimetres to one meter (Stiglitz, 2006: 166). It is also the view of climatologists that drought, floods, cyclones and hurricanes, the negative impacts of global warming are in the offing. The effects of these are very noticeable in the *downstream community* along the Indian Ocean in East and Southern Africa. Botswana, Namibia and South Africa experienced immense drought in 1996 that led to the death of wildlife animals in millions across their common borders. This not only

slowed down foreign exchange earning through tourism, but also upset the environment's ecosystem. Mozambique was hard-hit with hurricane which resulted from increase energy of the warming seas and air between 1996 and 1998; this changed the natural landscape and upset ecological stability of the state (Bright, 1997: 80). The drought that accompanied political instability in Zimbabwe between 2000 and 2007 and the Mozambique's civil war with crop failure attributed mostly to the climate change resulted from the economic practices of the developed states, though mostly blamed on the TWS.

In addition, the industrial sulphur emissions in the European states of Turkey, Italy, Spain, Greece and the rest of the Mediterranean Euro-states affected the buildings and agricultural production in form of acid rain in the Maghreb region of Africa. Unfortunately, the European states hardly budgeted for the environmental impacts of their activities to the immediate community, not to talk of the external environment. The externalisation of this cost is awaiting multilateral solution. Some international agreements on climate change are only applicable in Europe and America with less emphasis on Africa, Latin America and Asia. The signing of the 1987 Montréal Protocol that banned the use of CFCs is confined to the industrial states.

Options for Africa on Climate Change and Associated Problems

The industrialised states advocate for uniform solution for climate change at the global level. The argument of the developing states (India, China and Brazil inclusive) is that the present environmental hazard is not of their making, but resulted from the industrial activities of the Americans and Europeans from the era of industrial and scientific revolutions of the 16^{th} and 17^{th} centuries. African states believe that they should not be forcefully engaged in the economic burden of reduction of pollution, which is inflicted on the atmosphere by the North. The *caps and trades* on emissions theory open only broad options for the continent of Africa. This is an emissions-trading system (carbon trading) which allows states and companies to trade credits for their CO_2 emissions. If it is expensive for a state to reduce its CO_2, it could buy pollution reduction credits from low cost states. This approach met criticism from the environmentalists as the most inefficient means of carbon reduction. There is no major impact being felt from this approach. The less industrially developed states could sell their excesses to the developed states that in

turn may not come up with a national policy to reduce the use of fossil fuel and other agents of pollution.

The albedo method of challenging climate change option received academic interrogation above, but without the support of the developed states, this will remain a mirage in Africa. For the security of the North, it is necessary for the developed states to arrest the erratic atmospheric circulation, rainfall, and other aspects of the hydrologic cycle. Poor rainfall and drop in river flow increase drought and impact on agricultureand the supply of fresh water (Victor, et al, 2009: 70). Another shortcoming of geoengineering is that it is unilaterally adoptable by a state. The cost on other states in form of climates, ecosystems and economies elsewhere is devastating. Foreign policy implication of this is that it may serve as a source of tension among nations where the week ones may be forced to frustrate the big powers political and economic systems in forms of trade boycott, protectionism and other negative economic relations. Recently, there are some multinational companies engaging in experiments on ocean fertilization in the hope of sequestering CO_2. Another associated problem of albedomeans of checking global warming is the urge by private initiative is the profit motivation which would keep the technology away from other researchers and possibly from government.

Another option is closing down of manufacturing industries and relying on importation of goods and services from the North. This is what the theory of comparative advantage rest on so that import substitution, as called for by the developing states to save foreign exchange and to provide local employment, is unattainable. The impacts of this in the employment market and its spill over effects on the socio-political development of Africa receive little attention. Africa, on the other hand faces another challenge on this issue. The establishment of some industries in Africa by the North is not out of altruistic motive. The fact that some industries failed to meet the environmental standard and labour laws in their parent states coupled with wage differences between the North and South, as mentioned above, spurred some industrialists to move their capital to Asia, Latin America and Africa. As much as these industries upset unemployment problems, their inputs towards environmental degradation are enormous.

The call for alternative energy in Africa receives little attention. This could be because of the wherewithal to set up such programme rolling. The use of nuclear power

as one of the cleaner sources of energy would meet a brick-wall from the members of the International Atomic Energy Agency (IAEA) for various reasons. Most African states are considered politically unstable. To admit them to the nuclear club is a *sine qua non* to using the same for more than energy generation (but also for military purposes). Availability of nuclear power on the *wrong hands* such as the terrorists groups and *uncivilised states* is a worrisome issue for the developed states, mostly the US.

As a result of the need to promote the interest of the Israeli government or to check availability of foreign exchange for the *rogue states* in the Middle East, the US and Europe focus on the fossil fuel in Africa with more emphasis on the Gulf of Guinea. The oil producing states in Africa will like to promote the use of this commodity at the international level irrespective of it negative effects on the climate change; because it is the only credible source of their foreign exchange earning that could boast their industrial takeoff. It is also considered, so far, a only cheaper source of energy compared to others such as nuclear plants, bio-fuels, solar panels, windmills and hydropower.

Other alternatives to fossil fuel opened at the global level are natural gas, coal and tar sand, shale oils, ethanol, nuclear fission, solar, wind, water, tidal power and methane hydrate (Kunstler, 2006:100). Many of these are not available for Africa because they are of high innovative technologies that are not accessible because of the politics involved. The Lilliputian states in Africa cannot think of these strategies for power generation because of the economy of scale involved. If the continent wants to provide the same through sub-regional economic groupings such as the Economic Community of West African States (ECOWAS), Southern African Development Community (SADC), East African Community (EAC) and the Maghreb Union, the issue of corruption, politics of technology transfer and colonial factors appear daunting. South Africa, Nigeria, Egypt, and Zimbabwe are possible states that can adopt any of the above listed options due to their relatively developed industries and population that could support such projects. Some of these alternatives, mostly nuclear, methane (bio-fuel) and coal liquefication and gasification, have gained prominence in South Africa. This is attributable to the impact of economic sanctions and the support rendered by the Great Powers towards the apartheid minority government.

Africans' propensity to import goods and services is not in doubt; some of the produced goods from the North are strictly for the TWS. The implication of this is that Africa, if serious and more committed can adopt green consumerism, the use of environmental and ethical criteria in choosing whether or not to purchase a product or service, in their dealings with states that are not ready to cooperate in employing holistic approaches to the climate change (Carter, 2001: 8). This strength was severally put to test and came out to be a weapon against capitalist states in their rabid way of maximising profit. When the Muslim world asked the member states to stop importation from Spain because of newspaper story's blasphemous statement against Prophet Mohammed, the Madrid government felt the impact in term of foreign exchange received from exportation.

In addition, the Chinese chocolate that was tested not conducive for human consumption not only affected the company that produced it, it also had economic and diplomatic implication for Beijing government. If African states could come up, through the AU in considering environmental implication of manufactured goods before import the same to the continent, Europe, America and Asia would be forced to innovate their technology that is environmentally friendly.

Coal: South Africa, Zimbabwe and some other southern African states adopted the use of coal as an alternative energy, though with other sources such as nuclear and hydropower. In South Africa, 80% of its energy source is from coal. Of this amount almost half of it is used for electricity, a quarter of it burnt directly in the industrial or domestic sector while the remaining quarter goes to the production of liquid fuel by SASOL oil company (Gandar 1991: 97). The use of coal commenced industrial revolution in Europe despite its shortcomings on environmental hazard. It is dirty and highly polluting.

Health related problems are a major challenge in its use as a means of energy generation. Mercury pollution from coal is the cause of brain damage in newborn children and a source of asthma and acid rain. Coal, as an agent of human dislocation upsets ecosystem, as the inhabitants of coal producing areas would be forced to relocate to unwanted areas, despite their cultural attachment to the environment, through government eviction. Chemical changes in mine-related materials impair the water

quality of both ground and runoff. Mixing of air and water on the chemical compounds in the soil, such as iron pyrites produces sulphuric acid that is dangerous to floral and fauna (Gandar, 1991: 97).

Despite these shortcomings, South Africa still generates the high percentage of its electricity through coal. Pretoria is on equal footing with the developed states of Europe and North America industrial pollution through this source. Its effects extended to the coterminous states of Mozambique, Lesotho, Botswana and Swaziland where crops and soil fertility are yielding poorly recently. Respiratory ailment such as tuberculosis is another disease that is related with coal producing areas. This could have contributed to the rampant diseases in South Africa, mostly in East Rand of Gauteng, Northern Cape, Mpumalanga, North West and Limpopo provinces. Nigeria's proven of this commodity is about 3 billion tonnes in seventeen identified coalfields and over 600 million tonnes of proven reserves (Solid Minerals, 1996: 5).

With the impact of coal related hazardous chemicals emission, new technology makes gasification of coal before it burns to reduce it to a high-pressure synthetic gas. This is a way of stripping-off carbon from coal, leaving behind hydrogen, which does not endanger the planet. This would reduce sulphur dioxide emissions by 50% to 90%. Government legislation on the control of the activities of the mining industries is with little success and this is attributable to corruption among government officials. On the other hand are the MNCs whose activities are usually clouded with secrecy and complications beyond the comprehension of government officials.

Bio-fuel: Bio-fuels, ethanol, may be from corn or sugarcane. The cost of production in form of energy required to produce ethanol from corn is almost the same; except for sugarcane production that is eight times the energy it takes. This accounts for almost 40% of energy supply in Brazil. The only setback on sugarcane as source of energy is that it causes its own environmental hazards, as the forest cleared for the cultivation of sugarcane would have been used to produce the same product in form of wood chips or switch grass. Production of ethanol from coal is not only against the tenet of environmental issue but also leads to financial waste.

Hydrogen Economy: Hydrogen fuel cells have been around for 170 years. Discovered by a German scientist, Christian Schonbein in 1838 (Yee, 2008). The much publicised *hydrogen economy* (hydrogen-powered car) remains a mirage despite President Bush's pronouncement on its desirability at his 2003 State of the Union address. Bush declaration could be because of the General Motors' *creative destruction* in launching AUTOnomy hydrogen fuel cell technology in the automobile industry (Hart, 2007: 104). Unfortunately, gasoline as a major source of energy in the US makes this alternative to remain a mirage for now until the influence of the oil MNCs in government remain minimal. If this source of energy comes to reality in powering engines in Africa, it will be a breakthrough in the history of energy sources. Hydrogen production is for industrial and chemical uses. Its only by-product is drinkable water with no environmental hazard. Though hydrogen economy is attractive, yet it is not without some associated setbacks. It is not exactly a fuel, but a carrier of energy. It, like the production of tar sand and other alternatives to oil, takes more energy to manufacture than it produces. It relies on other sources of energy for it production. It is not a supplementary form of other sources such as nuclear and fossil fuel because its usefulness is limited in scope compared to its production procedure and the quantity that is produced within a very short period. Water in itself is not combustible; there is a need to free the combustible hydrogen atoms from the oxygen atoms in water. This requires much energy that may be economically unprofitable for producers and therefore more expensive for the end users. Another issue that is worth considering is the storage and transportation facilities. Low density of hydrogen gives it low atomic weight. In automobiles, it needs compression, which is additional cost, coupled with high pressure of the commodity that would escape rapidly; the product is extremely flammable (Kunstler, 2006: 113). Despite all the associated lapses of this source of energy, it could be economically viable with improve in technology and investment.

Natural Gas: Natural gas methane (CH_4) received some attention recently in Africa, most especially, by the oil producing states who receive foreign exchange through oil MNCs that extract it. Methane is the lightest natural gas made up of 75% of commercial product used in industry. It is invaluable for electrical power generation and home

heating. It comes out of the ground easily under its own pressure without energy input; and transported easily at air temperature through pipeline. Not only that it is indispensable as a source of energy, it is also useful as an input for the production of fertilizer, plastic, pharmaceutical products and other chemicals. Despite its cheapness and cleanness, gas remains *flared off* in many areas of its existence in Africa. Until recently, Nigeria, Cameroon, Gabon, Algeria and Angola lost it to flaring. Lack of interest by the oil companies dominated by the US is attributable to availability of the same commodity in Canada and Southern America with less cost of transportation and relatively less risky environment in doing business.

High demand for natural gas at the international level resulted from the unprecedented industrial development in Asia and *drying* off of Americas' gas. This made the oil MNCs commit their resources in Nigeria's Angola's, Chad's and Gabon's Liquefied Natural Gas (LNG). Ever increasing in demand for natural gas export affects the price at the local market, mostly in Nigeria where the product is not adequately available for household cooking, as a result of which consumers are forced to switch back to the use of wood, charcoal and paraffin stoves despite their shortcomings on environmental situation.

Propane and butane are other natural gases, but because they are denser and heavier, they are uneconomical. Like fossil fuel, natural gas is not renewable, and its extinction is without warning unlike oil (Kunstler, 2006:105).

Hydroelectric Power: This is another means of generating energy. Jane Wholey (1980: 23) has this to say about it degree of reliability:

> …the real joy of waterpower…isn't that it cuts dependency on foreign fuel. It may be the safest, cleanest and most dependable of all alternative technologies (that is, not fossil-fuel or nuclear sources) available today. Unlike nuclear energy, it leaves no toxic waste; unlike coal, it does not sully the air. Furthermore, water is more dependable than the solar alternatives of sun and wind and is…energy made in heaven.

Despite the associated advantages inherent in this, it has limitation in scope in terms of availability for commerce and industry. There is a truism that with this means of power source, industries, home heating and cooking are possible without the need of fossil fuel, timber wood and coal if there is unperturbed supply of electricity through this medium. Erratic flow of African rivers, which is a function of alternate unstable dry and raining

seasons in the tropical region, makes this source of energy less appeal to some states. And worse still is the fact that there are other states whose geographical location has no river flow to construct dams for power generation. Another problem inherent in this is sedimentation, which is affecting Kanji Dam in Nigeria and the Akosombo Dam in Ghana (The World Bank Annual Report, 1999: 113). However, South Africa's intention is to tap the DRC's Congo River resources to supply the whole of Africa with uninterrupted electricity. Nevertheless, civil strive in the state is a cog in the wheel of the laudable idea. Crises that usually emanate from this type of project have their effects on other states that share the same river for other uses such as irrigation and transportation. This accounted for the need by some West African states that share the River Niger to form the Niger Basin Commission in 1964 for peaceful harnessing of the river resources. The same applies to the Nile River that is very important to ten Nile riparian states with Sudan and Egypt being mostly affected. Also worth noting is a question posed by Kunstler (2006: 120) where he opined, "can we even build the plants and equipment without an underlying base of cheap fossil fuel?" All the alternatives posed below and above need jumpstarting by the fossil fuel. Majority of African states can hardly embark on dam construction for electricity generation without resulting to borrow binge with imposed technical partnership with the MNCs. The implication of this is multifarious going by the politics involved in foreign aids, which is always at the disadvantage of the recipients (Hayterand Watson, 1985: 238-247). Another worrisome problem connected with the issue of water is its availability for domestic use. Egypt's readiness to go to war because of the Nile River is attributable to its vulnerability and sensitivity to the issue of water shortage from the Nile.

Fertile African coasts (continental shelves) are usually contaminated by human activities through agricultural use, industrial purposes and radioactive waste dump. Also, according to a study conducted by *Time* magazine on 5 November 1990 issue, the weekly magazine was of the view that by now (2009) the supply of water per person shall have fallen by 30 percent in Egypt, 40 percent in Nigeria and 50 percent in Kenya, with similar drops in the rest of Africa (McDonagh, 1996: 75). The Global International Waters Assessment (GIWA), an initiative of the UN Environmental Programme (UNEP), also maintains this position (Daler, Linden and Belusteguigoitia, 2002: 166).

Tar Sand: This is another source of energy for future use yet not without its shortcomings. Unlike natural gas and oil, it needs to be mined and *washed* with superheated water before being taken to the refining stage. Mining and washing require large amount of energy about three barrels of oil to produce two barrels of tar sand energy. In the end, this is not an alternative to fossil fuel. It is also environmentally unfriendly, as ground water will remain polluted. The case of oil shale/marlstone is the same as tar sand. It is a fine-grained rock that contains a rich hydrocarbon called *kerogen*. When heated to about 482 degree Celsius, the kerogen forms synthetic oil and gas. The c*ost* of disposing waste shale is problematic. For every 100,000 barrel of oil produced, one needs to dispose 150,000 tons of rock, which is environmental hazard to the groundwater or nearby streams. Production is economically unviable for Africa, even for the developed states (Vines, 1980: 32-33).

Geoengineering: The new technology, though, not all that new as mentioned above is the introduction of geoengineering where the control of climate through human efforts is developed by the developed states. Its efficacy in the TWS with more emphasis on Africa is not without its associated lapses. Africa is known for its backwardness in technology, only relies on the innovation from the West of which the same would be imported without its environmental implications for the continent. Ejected sulphate and other fine particles into the atmosphere during volcanic eruption enhance reflection of more sunlight and the same cooled the planet against warming by about 0.5 degree Celcious. Through proper management of the volcanic eruption and constant monitoring geoengineers could design a number of climate-cooling technologies with the aids of satellites and other scientific methods. Increasing the reflectivity of the planet called *albedo* offers the most promising method for cooling the planet. This is form of the above discussed sulphate ejection to the atmosphere; cloud seeding; well placed sulphur in the stratosphere; converting dark places that absorb lots of sunlight to lighter shades; launching a huge cloud of thin refracting discs into a special space orbit that parks the discs between the sun and the earth in order to bend just a bit of sunlight away before it hits the planet (Victor et al, 2009: 68-69). Attempt to embark on this scientific venture will not only reduce the cost of

reducing gas emissions, it is also cheaper and accurate compared to the capping method that is difficult to verify by other states.

Despite Africa's negative technological development, the continent can contribute to lower global warming, though with some shortcomings. Planting trees (re-aforestation) is one option since plants absorb CO_2 and emit Oxygen (a source of clean environment); the planet will remain safe for habitation. The only setback on this method of clean environment is that some light-absolving colour of their leaves causes them to retain heat and therefore increase warming (Kluger, 2007: 40). Imposition of more taxes on vehicles, encouragement of hybrid automobiles and government subsidies in the use of other alternative to energy generation are attractive to over-reliance on the use of fossil fuel. The need for the developed states to transfer appropriate technology to reduce the use of CFCs' induced chemicals is necessary. However, this appears simple at theoretical level, but the politics involved is very complex. On the need to use more of nuclear power, the renewable source of energy is not without its shortcomings. Not only that it is expensive to manage, the need for back up and expertise needed are beyond the reach of most of the African states. South Africa that had it during the apartheid era closed down some of the plants for economic and political reasons. This made the Pelindaba plant near Pretoria to remain a ghost. Another problem associated with it is the inherent environmental problems. The nuclear accident in the former Soviet Union in 1986 still remains a vampire that is haunting the human and eco-system of Chernobyl and its environ. As much as there is a need to develop alternatives to fossil fuel, the activities of the oil multinationals and parent states would not support any research towards this because it would take them away from business. Their tacit attempts to make it the most attractive source of energy are too costly to ignore. For instance, the activities of the US in the Gulf of Guinea and the creation of Africa Command (Africom) for the protection of oil deposit in the region implies that the developed states are not ready to switch to other sources of energy, at least in the next few years. The British Petroleum introduced *Beyond Petroleum* (BP) propaganda as an alternative means of energy source. This is a bogus initiative for various reasons. To avoid various Green movements' complaints on the oil companies activities in the host states on their environmental degradation, the company embarked on this campaign to serve as a deterrent to the oil producing areas that the

usefulness of their much cherished oil deposit would be soon replaced with other commodity as a means of energy source. Lastly, it was a strategy to change the public perception of the company from shameless polluter to more responsible actor (Hart, 2007: 91).

Fossil fuel is expected to remain an important source of energy for a long time, at least until when a radical technology innovative is in place to replace the pollution reduction machines. It is instructive to note that nearly all the above-discussed alternatives depend on an underlying fossil fuel economy. These alternatives to the use of fossil fuels have their own disadvantages ranging from the cost of their production, noise from windmills and radioactive waste from nukes.

Sequestration is another means of establishing a friendly environmental planet. This technology entails injecting deep underground large volumes of CO_2 that would otherwise go into the atmosphere. As much as this technology is laudable, the problem associated with it is that, even the developed states in Europe do not have access to it. The Lake Nyos (Cameroon) CO_2 accident in 1986 when about 1,700 asphyxiated while sleeping is not only enough to worry about the safety of the people, almost at the same time (1986), Chernobyl nuclear accident occurred in the former Soviet Union as mentioned above. Two years earlier, (1984), about 3,000 residents of Bhopa, India, died because of a toxic explosion at a Union Carbide plant. Externality devastating effects of nuclear radiation with its long-term health problem on the coterminous states in Eastern Europe limit environmental purity (Howlett, 1997: 340). As Victor (2006: 102) observed, there are risks of leaks, which are potentially catastrophic in an environment where there are no regulatory rules to control underground disposal. Another problem connected with CO_2 sequestration is the influence of public opinions, most especially the influence of the presumed knowledgeable environmentalists on the field. If the method is not to the interest of minority pressure groups, it tends to meet its untimely extinction.

The lasting solution to this problem is no more than changes in the technology from responsible care to biotech revolution. This is in form of devising a new technology that will destroy existing hierarchies, which will bypass corrupt governments and regimes that would ensure widely distributed benefits, to the entire human community in Africa. Another system of capitalism, as against the Industrial revolution's that perpetrated the

state's wealth into the hand of a few, will unseat the established *status quo* by creating opportunity at the base of the economic pyramid on a previously unimagined scale, is discernible (Hart, 2007: 107). Already, the influence of the consumers with cooperation of different, though unwieldy associations, has been strong on the activities of the giant companies. This *silent takeover* could have called for a series of initiatives from American multinationals in abiding by the new tenet of *beyond greening* that eventually led to creative destruction (Hertz, 2001: 153-158). Hopefully, the initiatives of General Electric, General Motors, Du Pont, Monsato and Hoechst to change from chemical and fossil fuel businesses to *green chemistry* will make existing petro-chemically based products and application obsolete. Corporations' reliance on consumers is not negotiable. In an attempt to remain in business, consumers' demands have to be met, but ignored at the peril of such business. The consumers are taking the unprecedented awareness of buyers on the negative effects of the capital expansion without greenhouse gas emission consideration with seriousness. The need to react to this new demand has relegated incremental attitude of corporations to losing business to other firms that are conscious of the power of consumers. At least, eventually, this would have some positive effects in Africa considering the rate of information dissemination at the global level.

Conclusion

Africa is always at the receiving end of underdevelopment in general. The call for the participation of the developing states in the cost of environmentally friendly international system is problematic. The position held by China, India and some of the Asian Tigers on the issue of who pays for the ecological hazard caused by the industrial nations needs to receive more attention. The cause of disagreement is that the industrialised states are not ready to bear the cost of the global environmental damage without the support of the rest of the world. Though, America, according to the December 2007 Bali Conference on climate change, agreed in principle to partake in the Kyoto Protocol, the level of seriousness of America on this is questionable because of her recent positions on issues that directly affect Washington government. Her refusal to participate in the International court on war crimes and invasion of Afghanistan and Iraq despite United Nations Security Council's (UNSC) disapproval is worrisome.

The more the Asian states continue to produce goods and services without consideration of the environmental impacts at the global level, the less of overcoming environmental degradation. The question of who pays eco-taxes is still lingering. The MNCs that are the major cause of this usually claim to have paid to the host states through Environmental Protection Agencies. They support their arguments with the heavy taxes imposed on them by their host states which they should have used to clean the environment. The parameter to use in measuring the financial reward of polluting the environment is still an academic debate. Some African states, partly for the need to develop their industrial base, and in some cases to prosecute war, have little interest in the activities of these companies. Only what they need is the foreign exchange received from them and sometimes help either rebel or recognised government in power to procure munitions to prosecute war. In DRC, for instance, Laurent Kabila government gave unrestricted harnessing of the natural resources of his state to some mining companies from Angola, Namibia and Zimbabwe in exchange for military support between 1997 and 1999 (Amusan, 1999: 22-30). This arrangement is rampart in Chad, Gabon, Nigeria (Obasanjo government 1999 – 2007), Angola, and recently in Equatorial Guinea. As against the notion of the *The Group of Green Economists* (1992: 22-24), the developing states should also contribute to lowering pollution rate, the degree of participation could only be varied according to industrial development of each state.

The entire discussed alternative sources of energy, though laudable as they are, going by the technical inputs and the financial commitment, many African states cannot afford most of them. That South Africa could build its nuclear energy, for instance, was as a result of the apartheid system which received financial, technical and political supports from the industrialised states for the reason of mass migration of South African whites to Europe and to secure the strategic passage for oil shipment from the Middle-East to the West (Amusan, 2006: 187).

The only credible means of avoiding self-annihilation through gas emissions and other agents of pollution is a radical departure from the present technology. An attempt to hammer on the need to improve on the existed technology is not the solution. Hart (2007: 88-89) has this to say about that:

> It has become increasingly clear that many of the technologies developed during this period are unsustainable. Indeed, the spectres of toxic contamination, depleted forests and fisheries, eroded

> soils, loss of biodiversity, global climate change, burgeoning populations…and growing civil strive are explicit signals that companies must take more serious the social and environmental impacts of their technologies and businesses.

As long as the US, the only credible power in the international system is not ready to abide by and enforce the management of the commons according to Heibroner (1974) and Ophuls (1977), Africa could do this through raw materials control and refuse to import manufactured goods and services from the North, mostly those items produced under questionable clean technological compatibility. Though this survivalism (leviathan) approach to solve environmental problems receives criticism both from the socialist and capitalist states, it is only the main departure from self-annihilation practice of the developed world against Africa.

If the issue of *geoengineering option* is adopted and globalized by the North, the international system will experience some stable environment for sustainable development. For an environmentally friendly international system to unfold, scientists, diplomats, foreign policy experts and civil societies should come up with a new international regime to regulate the activities of the handful of scientists that are into geoengineering system. This is to give some credibility to the project. As mentioned above, going it alone by a developed state is a *sine qua non* to establishment of a rogue state among the comity of nations. Though sound and look esoteric among politicians, policy makers and social scientists, its impact, if followed to a logical conclusion would complement the activities of Intergovernmental Panel on Climate Change (IPCC). The fifth summit of the IPCC in Copenhagen should look into this method of arresting the effects of climate change on flora and fauna.

Notes

1. This is a term popularised by Garrett Hardin (1968: 1243-1248), its main argument is that any resources available to everybody without policy control tend to favour some and deny others. It is a zero-sum game where there is a need for either privatisation or social control as a regulatory system (Stiglitz, 2006: 162-164, 322; Greene, 1997: 321-323).
2. According to Boyle (1990: 19), Greenhouse effect is a very important process that makes our planet unique in the universe by allowing the human species and a whole range of eco-system to survive. The problems that we are facing now are the result of an intensification of the greenhouse effect, which we call global warming, due to the building up of greenhouse gases over and above previous levels.
3. The 1972 Stockholm's Conference serves as an eye opener for every state in establishing the Department of Environment, brought about the proliferation of Environmentalists NGOs to the developing states. The conference also creates the UN Environment Programme to co-ordinate environment-related activities of other UN agencies to integrate environmental issues to their various programmes (Greene, 1997: 317).
4. Exxon-Mobil provided funding for maverick scientists who claimed there is insufficient evidence of a human factor in climate change. The same oil MNC donated $10,000 to the science and environmental policy project run by Fred Singer, a highly vocal critic of the global warming (Hertz, 2002: 184-185; *New Africa* 2005. August/September: 20-21).
5. If the right definition of sustainable is the ability of the current generation to meet its needs without compromising the ability of future generations to meet theirs, it means that the much-publicised Kyoto Protocol is not the solution to the current greenhouse gas emissions.
6. The whole of Europe was asked to reduce its gas emissions by 8%, US 7% and Japan by 6% by 2012. On the other hand Russia and Australia were encouraged to increase their level of gas emissions or no reduction. The TWS were not asked to reduce their gas emissions forgetting that the impacts of these as more of the MNCs are moving to the third world states to avoid heavy taxes and access to cheap labour with machines with no quality control continue to contribute to environmental hazard.
7. The Bush government unilateralism did not start from the Kyoto Protocol, there are other international agreements US refused to sign, among these are agreements on chemicals, hazardous waste, coastal zone and ocean protection. Others are issue of International Criminal Court, withdrawal from the Anti-Ballistic Missiles Treaty (ABM) of 1972 agreement with the Russian government on the arms control its involvement in the Balkan crises and lately, the Iraqi and Afghanistan's political crisis are instructive (Drezner, 2007: 35-38; Kimble, 2005: 109).
8. The influx of warm current into the natural cold waters off the coast of Ecuador and Peru, called El Ninos (Spanish word for the little boy) invaded the Western Pacific. This brings about more rainfall that causes flooding. On the other hand is La Nina, that is cold current, less evaporation and less rainfall that brings about drought, famine and competition for grazing land (Bright 1997: 78-79).

9. Brundtland Commission was the World Commission on Environment and Development headed by then Norwegian Prime Minister, Gro Harlem Brundtland, under the UN Mandate. It task was to look into the issue of sustainable development in the era of industrial development and its impacts on natural resources (Victor, 2006: 92). The Commission's Report led to the 1992 UN Conference on Environment and Development,also known as the Rio Earth Summit.

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