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ROLE OF TECHNOLOGY ON CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

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Abstract
The global ecosystem which includes the earth's atmosphere is daily impacted upon by humans deliberately or inadvertently, as a result of agricultural activities, industrialization and in the daily pursuit of other economic gains. On the one hand, climate change impacts could erase the progress made in achieving the goals of sustainable development. On the other, controlling greenhouse gas emissions will depend ultimately on underlying economic and technological development pathways. In the course of these processes, the earth's atmosphere and the environment are impacted upon thus, leading to climate change, global warming and loss of biodiversity. This paper promotes sustainable environment and development through the concept of technology. The paper reasoned that third-world countries may lack the mainstream technology for combating environmental pollution; as such alternative technology that suits the culture and value system should be adopted as preventive and control measures. The paper concludes that Technology provides a pathway to industrial and economic development, while taking environmental health into consideration. In light of this, the paper finally relates the concept of appropriate technology to soil fertility.

Key words: Technology, Biodiversity, Climate Change, Environmental Health, Sustainable Development .

Introduction

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather around longer term average conditions (i.e., more or fewer extreme weather events). Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Certain human activities have also been identified as significant causes of recent climate change, often referred to as "global warming".

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions or the distribution of events around the average (example more of fewer extreme weather events). Climate change may be limited to a specific region or may occur across the globe.

Climate change is a sustainable development issue, impacting on and impacted by a wide range of economic, social and environmental factors and policies. Linking quantitative information on climate change mitigation and adaptation to sustainable development information systems is a means to make the fact "climate change is a sustainable development issue" relevant in practice.

Sustainability is an important concept in this age and time, more importantly in the awakening era of globalization and sustainable development. The Brundtland Commission considers sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In this context, sustainability is defined as a holistic development that meets the needs of present generations without jeopardizing the ability of future generations to meet their own needs. This is achievable through the use of eco-efficient solutions, by developing new technologies, employing life cycle perspectives in resource and product stewardship, and of course positively addressing biological diversity and ecosystem dynamics.

Appropriate Technology and Sustainable Development

Appropriate technology is technology that is sustainable-biased, designed with special consideration to the natural environment, and the socio-cultural, political and economic environment of the Society. Appropriate technology is always easy to maintain and most importantly environment friendly; its low cost, low usage of fossil fuels and use of locally available resources endear it as a veritable tool for sustainable development. The term Appropriate Technology, has been erroneously stereotyped as a cheap and elementary type of technology befitting of developing countries only. In reality Appropriate Technology is a global brand. This type of technology results in less negative impact on the environment; it is cost effective, durable and functional. In perspective, sustainable development in its true sense is achievable, most especially in developing countries if the concept of Appropriate Technology is wholly practiced. Though, sustainable development is a global issue, however, it is of note that developing countries lack the mainstream technology in combating environmental

problems and their attendant consequences. As such, Appropriate Technology may be the keystone to minimizing pollution and at the same time aids the economy. In Nigeria, for example Appropriate Technology can be utilized in all sectors of the economy from agriculture to industrial production. The generation and emissions of greenhouse gases can be minimally reduced through the application of Appropriate Technology which promotes energy and materials efficiency. In addition, Appropriate Technology to a large extent also provides a pathway to technology independence to third-world countries, as it gives rooms for innovation and invention using readily available resources in meeting their needs.

Appropriate Technology does not only affect materials or substances but of course ideologies, values and economic systems of a society for about-face development. The incorporation of plant species in fallow management technique is an appropriate technology that will replenish soil nutrients or can restore the soil status to its natural composition before tillage. Chromolaena (Siam weed) is a natural resource and invasive weed that is abundant in sub-Saharan Africa; it does not require high technology to increase soil fertility. Unlike other soil fertility practices such as fertilizer application and bush burning for potash generation which poses great threat to human, biodiversity and environment; Chromolaena is environment friendly and provides an environment that is conducive for soil microbes and faunas that can facilitate organic matter decomposition, nitrogen fixation and their consequent release to the soil pool. It also helps in the purification of the atmosphere through the absorption of carbon and the release of oxygen into the atmosphere thus reducing global warming throughout the period of fallow.

The paradigm of Appropriate Technology has been successfully used in Brazil, Malaysia, Singapore, and India in providing a viable economy as leading producers of essential and luxury goods to other third-world countries.

The role of Communication technologies and Mass Media

Climate Change debates are no longer privilege of a few today these issues make headlines in print and electronic media. Global warming and climate change are the hot and prioritized topics in the global mass media. Both the Governments and the people depend on Communication and Mass Media not only for disseminating information, but also in setting agenda for the development and other allied activities. Hence, communication media become powerful tool for disseminating information and diffusion of innovations. Due to depletion of natural resources and burning of fossil fuels there is a great threat to environment. It is high time to save the depleting natural resources and discourage the irrational usage of natural resources by focusing on Sustainable Development.

Media can focus on factors that cause environmental problems as well as adverse impact on people. The environmental problems, which threaten the present day existence as well as the future of humanity, are brought to peoples notice by the media. Some of these issues are really quiet alarming and need to be focused upon, so that people can be made aware of their intensity. Straight reports, discussions, photo features and articles by experts help in informing the people about different aspects of climate change issue. The layman may not be able to assess the impact of many of the environmental problems persisting around them. The effect of the depletion of ozone layer and its long term effect on global warming, poses threat of melting ice caps in the polar region. The inducing rise in sea level and extinction of all species of living beings on earth cannot be comprehended in full measure by everybody. If media attempts to educate the masses on such vital issues, at least, the intelligent and right-thinking people will become aware about the need to take the precautionary measures and they get sensitized towards the natural resource conservation and protection.

Communication is the only relief at times of disaster and hence the need for an efficient disaster management system becomes imperative in public places and even in business establishments and important commercial joints, where people move around in large numbers. Scientific and disaster mitigation organizations should seek to develop working relationships with media based on mutual trust and recognition of differing characteristics, goals, and needs. Regular, effective communication among these disparate groups, before, during, and after disaster "events" can greatly enhance those relationships. Identifying and communicating specific themes and messages, both through the mass media and in the other alternative forms of communication are necessary.

Carbon Capture and Storage (CCS) Technology

A rising carbon fee is the sine qua non for fossil fuel phase out, but not enough by itself. Investment is needed in RD&D (research, development and demonstration) to help renewable energies and nuclear power overcome obstacles limiting their contributions. Intermittency of solar and wind power can be alleviated with advances in energy storage, low-loss smart electric grids, and electrical vehicles interacting with the grid. Most of today's nuclear power plants have half-century-old technology with light-water reactors utilizing less than 1% of the energy in the nuclear fuel and leaving unused fuel as long-lived nuclear ''waste'' requiring sequestration for millennia. Modern light-water reactors can employ convective cooling to

eliminate the need for external cooling in the event of an anomaly such as an earthquake. However, the long-term future of nuclear power will employ ‘‘fast’’ reactors, which utilize ,99% of the nuclear fuel and can ‘‘burn’’, nuclear waste and excess weapons material . It should be possible to reduce the cost of nuclear power via modular standard reactor design, but governments need to provide a regulatory environment that supports timely construction of approved designs. RD&D on carbon capture and storage (CCS) technology is needed, especially given our conclusion that the current atmospheric CO2 level is already in the dangerous zone, but continuing issues with CCS technology make it inappropriate to construct fossil fuel power plants with a promise of future retrofit for carbon capture. Governments should support energy planning for housing and transportation, energy and carbon efficiency requirements for buildings, vehicles and other manufactured products, and climate mitigation and adaptation in undeveloped countries.

Economic efficiency would be improved by a rising carbon fee. Energy efficiency and alternative low-carbon and no-carbon energies should be allowed to compete on an equal footing, without subsidies, and the public and business community should be made aware that the fee will continually rise. The fee for unconventional fossil fuels, such as oil from tar sands and gas from hydro racking, should include carbon released in mining and refining processes, e.g., methane leakage in hydrofracking. If the carbon fee rises continually and predictably, the resulting energy transformations should generate many jobs a welcome benefit for nations still suffering from long-standing economic recession. Economic modeling shows that about 60% of the public, especially low-income people would receive more money via a per capita 100% dispersal of the collected fee than they would pay because of increased prices.

Mitigation Technology and Mitigative Capacity

The Intergovernmental Panel on Climate Change (IPCC), Geneva, Switzerland recently elaborated six different reference scenarios that show a wide variety of alternative development pathways over the next century, each yielding a very different pattern of GHG emissions (IPCC 2000). Lower emission scenarios require less carbon intensive energy resource development than in the past. In the past decade, progress on GHG emission reduction technologies has been faster than anticipated. Improved methods of land use (especially forests) offer significant potential for carbon sequestration. Although not necessarily permanent, such methods might allow time for more effective mitigation techniques to be developed. Ultimately, mitigation options will be determined by differences in the distribution of natural, technological, and financial resources, as well as mitigation costs across nations and generations (IPCC 2001a). Although the path to a low emission future will vary by country, the IPCC results indicate that appropriate socio-economic changes combined with known mitigation technology and policy options could help to achieve a range of atmospheric CO2 stabilisation levels around 550 ppmv or less, in the next 100 years. Social learning and innovation, and changes in institutional structure could play an especially important role. Policy option that yie ld no-regrets outcomes will help to reduce GHG emissions at no or negative social cost. However, the incremental costs of stabilising atmospheric CO2 concentrations over the next century rise sharply as the target concentration level falls from 750 ppmv to 450 ppmv.

Integrating climate policies with non-climate national sustainable development strategy will increase the effectiveness of mitigation efforts. However, there are many technical, social, behavioural, cultural, political, economic, and institutional barriers to implementing mitigation options within countries. Coordinating actions across countries and sectors could reduce mitigations costs, and limit concerns about competitiveness, conflicts over international trade regulations, and carbon leakage. To summarize, early actions including mitigation measures, technology development, and better scientific knowledge about climate change, will increase the possibilities for stabilizing atmospheric GHG concentrations.

The effectiveness of future mitigation could be improved by strengthening ***mitigative capacity*** (i.e., the social, political and economic structures and conditions required for mitigation). The mitigative capacity among nations is inevitably varied and suggests tha more research and analytic capacity is needed in developing countries. Increases in mitigative capacity could allow climate change considerations to be more effectively integrated with action to address other (non-climate) sustainable development challenges in a manner that effectively limits GHG emissions over time, while maximising the developmental co-benefits of mitigative actions. Such a ‘win-win’ approach is examined below.

Mobile Technology

Mobile phones are the multimodal tool par excellence. In disaster management, SMS can be used to organize mass mobilizations, action alerts, precautionary and relief measures advocated by Government and Non-Governmental organizations. Current developments in the use of mobile phones include the enhanced ability of phones to create and transmit content other than SMS. High quality photo and video capability in the newest generation of mobile phones has led to several software tools that allow people to publish photos, audio, and videos from mobilizations directly to disaster related websites. Bulk SMS are also being sent through mobiles.

Web Based Technologies

Web Based Technologies emerged as a very important tool for effective planning, communication, and training in the various stages of the disaster management. It provides a platform for people across the world to exchange ideas, knowledge and technology. It brings people together with common interests irrespective of geographical location. Usage of web in disaster management increases as it reaches out to every nook and corner of the world and more and more people become online. All the countries recognized the importance of developing an information infrastructure capable of sustaining state of art technology for use at the time of disasters. Furthermore, there is a move towards globalization of disaster networks to provide speedy assistance to every disaster victim, irrespective of the national boundary and geographical location. With technology becoming more user-friendly, and cost-effective in India, Internet GIS is used for the management of disasters. It is used effectively in the event of any disaster for providing the first hand information about the extent of damage, the areas affected and to direct the rescue and relief operations. In India, the SWOT analysis (strengths, limitations, opportunities and the risks) is the Internet-based GIS for disaster management. Maps and spatial information are important components of the overall information in case of disaster event (flood, earthquake, cyclone, landslide, wildfire and famine). Hence mapping and spatial information acquisition becomes vital for disaster management effort. In general, GIS is used in any part of the disaster management cycle - disaster preparedness, response, recovery and mitigation.

Conclusion

Third-world countries need to adopt, appreciate and promote technology philosophies that are people oriented, cost effective and environment friendly. In Technology lies the answer to industrial development and economic growth in developing countries; it brings into focus the need to be self-dependent, innovative and inventive without being wasteful. Communication technology plays a vital role in educating and enlightening the people and the governments to protect and preserve natural resources in the interests of future generations and the climatic chaos. Sustainable Development is attained by protecting the environment in a judicious use of natural resources. Countries both the rich and the poor have an equal stake in this stewardship of the earth. The very survival of our planet depends upon it. In this regard media plays a pivotal role in creating awareness and bringing the positive behavioral change among people in mitigating the anthropogenic climate change.

Developing country needs to look inwards to adopt and develop appropriate technology required for self sufficiency and sustainable development. Indigenous and endogenous technology development should be encouraged at schools, from basic to tertiary level for sustainable economic growth and industrial development. Hence, the role and the responsibility of Technology are immense in Climate Change and Sustainable Development.

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