



Climate change mitigation and renewable energy for sustainable development in Nigeria: A discourse approach



Z.A. Elum^{a,*}, A.S. Momodu^{b,2}

^a Department of Agriculture and Animal Health, College of Agriculture and Environmental Sciences, University of South Africa, South Africa

^b Energy Center, College of Engineering, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

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ABSTRACT

Global anthropogenic activities resulting in the emission of harmful greenhouse gases (GHGs) to the atmosphere have increased the challenges faced from climate change. The greater awareness of the need to mitigate climate variability has brought about intense focus on the adverse impacts of fossil-fuel based energy on the environment. Being the single largest source of carbon emissions, energy supply has attracted much attention and more so that, climate change impacts extend beyond national boundaries. Since energy use is sine qua non to economic development, scientists have reiterated the necessity of developing and utilising renewable energy. Although, past and present CO₂ emissions have and are majorly caused by industrialized countries, it is envisaged that future GHGs emissions would be mostly from developing countries as they industrialize. Renewable energy sources that include biomass, hydroelectric, wind, solar and hydrothermal systems, are carbon-neutral, releasing relatively no emissions. This paper discusses the initiatives associated with the provision of renewable energy to the energy mix in Nigeria as an indication of the country's commitment to adopt a sustainable development strategy in shaping the economy. It reviews the literature and employs a discourse analysis to examine the limited use of renewable energy sources in Nigeria and the factors prevailing against their development. The paper concludes by identifying social and political obstacles as most significant roadblocks towards rapid implementation of a green economy through the deployment of renewable energy for sustainable development.

1. Introduction

Renewable energy is derived from natural processes that can be replenished within a short time scale and can be derived directly or indirectly from the sun and from other natural mechanisms [1]. Renewable energy sources include hydropower, bioenergy, thermal, geothermal, wind, photochemical, photoelectric, tidal, wave, and solar energy. It excludes energy from fossil fuel sources (oil, coal and natural gas) [1]. Agreed, emissions from fossil fuels are harmful to the environment and are responsible for the enhanced global warming that has led to climate change. Hence, the world's attention has been drawn to the need for a sustainable development agenda that demands the use of cleaner forms energy such as renewables that can promote human wellbeing, economic development and environmental protection. Renewable energy can be used for the production of heat, electricity, and vehicles fuels.

It is established that developed countries have greatly contributed

to current climate as a result of the development path taken in the past and present times. For example, the twenty-one Asia-Pacific Economic Cooperation (APEC) which include such economies as Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Chinese Taipei, Thailand, the United States, and Vietnam collectively consume about 60% of world energy [2]. In addition, the United States, Australia and Canada have been identified as being among the world's highest per capita carbon emitters as a result of high energy consumption made possible by government supports [2]. For instance, energy consumption in the United States is subsidized, thereby distorting global energy prices [3]. These statistics throw up the question of equity when it is considered that poor developing countries have been asked to disinvest from cheaper energy sources, mostly fossil, and invest in costly renewable energy projects that would also be costly to the citizens that do not enjoy subsidies from their governments due to constraints placed by

* Corresponding author.

E-mail addresses: zelda.elum@uniport.edu.ng, zeldaforreal@yahoo.com (Z.A. Elum), asmomodu@knust.edu.gh (A.S. Momodu).

¹ Permanent address: Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Port Harcourt, P.M.B. 5323, Rivers State, Nigeria.

² Permanent address: Division of Energy Management and Technology, Centre for Energy Research and Development, Obafemi Awolowo University, Ile-Ife, Nigeria.

international funding organisations. However, developed countries have greater financial and institutional capacity to tackle climate change issues and largely for this reason, they have been in the forefront championing the cause for reduction of greenhouse gas (GHGs) emissions and requesting respective countries to return their emissions to 1990 levels [4]. Therefore, based on equity consideration, it becomes appropriate that the richer developed countries should partly fund the cost of implementing mitigation and adaptation strategies of developing countries to climate change. Such a measure would in part help developing economies to improve on their infrastructural needs at low carbon emissions.

The energy sector is about the largest source of GHGs emissions and it has been estimated that globally, energy-related emissions would increase by about 16% by 2040 [5]. Considering the environmental degradation and release of harmful gases to the atmosphere emanating from the exploitation and use of fossil energy sources, there is a need for Nigeria to diversify its energy mix in meeting energy needs. The country currently has a strong dependence on fossil fuel. There is the need to increase renewable energy uptake such as hydro, solar, biogas and wind resources into rural and urban energy planning. Thus, the objective of this study is to explore the apparent concerns over Nigeria's perceived inability to meet its energy demand and to contribute to the discourse on the ways to achieve sustainable development in Nigeria through low carbon emission pathway. The paper also aims to address a major research question which is: why has Nigeria been unable to achieve a transformation agenda in the energy sector despite having laudable sustainable development policies? To put the study in perspective, a simple concept based on system dynamic principles was developed. The concept is a system mapping that shows the stock and flow of the interlinking of energy resources, the environment and economy as presented in Fig. 1.

It is important to fully appreciate the relevance of the system mapping concept as depicted in Fig. 1. The map consists of stock and flow diagram. The rectangles represent the stock (in this case, energy economy, development and sustainable development) while the valves represent the flow (inflows are indicated with an arrow pointing into or adding to the stock while outflows are represented by arrows pointing out of or subtracting from the stock). A combination of the rectangles and valves represent the structure of the system, with the pipes and valves showing flows between categories. Valves control the flows. Cloud (as seen in the energy flow rate pipe in the Fig. 1) represents the sources and sinks for the flows. A source represents the stock from which a flow originating outside the boundary of the model arises; sinks represent the stocks into which flows leaving the model boundary drain. Sources and sinks are assumed to have infinite capacity and can never constrain the flows they support. Suffice to note that system

dynamics diagrams are represented in two ways: causal loop (CLD) and stock and flow (SFD). As explained by Sterman [6], the CLD emphasize the feedback structure of a system, while SFD highlights their underlying physical structure. In addition, stocks and flows track accumulations of material, money, and information as they move through the system. The state of the system is characterised by the stock from which information is generated for decision making. The rates of flow and subsequently stocks can be altered by the decisions and possibly close the feedback loops in the system. Notably, the behaviour of a system arises from its structure. That structure consists of the feedback loops, stocks and flows, and nonlinearities created by the interaction of the physical and institutional structure of the system with the decision-making processes of the agents acting within it. Thus, Fig. 1 is a SFD to explain in simple terms the system structure and the interaction between renewable energy and sustainable development in a changing climate. The essence of this stock and flow map is to allow policy makers to be acquainted with what stocks and flows are in the system. Policy makers must be able to distinguish clearly between stocks and flows as failure to understand the difference between them often leads to underestimation of time delays, a short-term focus, and policy resistance [6].

To achieve the objectives of the study, the paper applied a discourse analysis of publicly available data from the World Bank, International Monetary Fund, the Energy Commission of Nigeria and other published research works. The structure of the paper is as follows. The next section in building up a case for renewable energy uptake focuses on the impacts of climate change and sustainable development paradigm. The third section highlights renewable energy in a global and national perspective as well as its potential for sustainable development in Nigeria. Section four presents the barriers to the development of renewable energy sources and discusses the way forward. The paper concludes in section five with recommendations towards the enhancement of the adoption of renewable and efficient energy systems for sustainable economic growth.

2. Evidence of climate change impacts

The impacts of climate change caused by enhanced global warming has been well established by the fifth assessment report of the Intergovernmental Panel on Climate Change [7] which indicated that regional changes in climate, especially increases in temperature, have already affected a diverse set of physical and biological systems across the world. Climate change poses a challenge to sustainability for its numerous potential effects. The identified evidences though not limited to include, thermal expansion of the earth's surface waters and melting of glaciers on land that has inturn caused sea level rise, flooding and

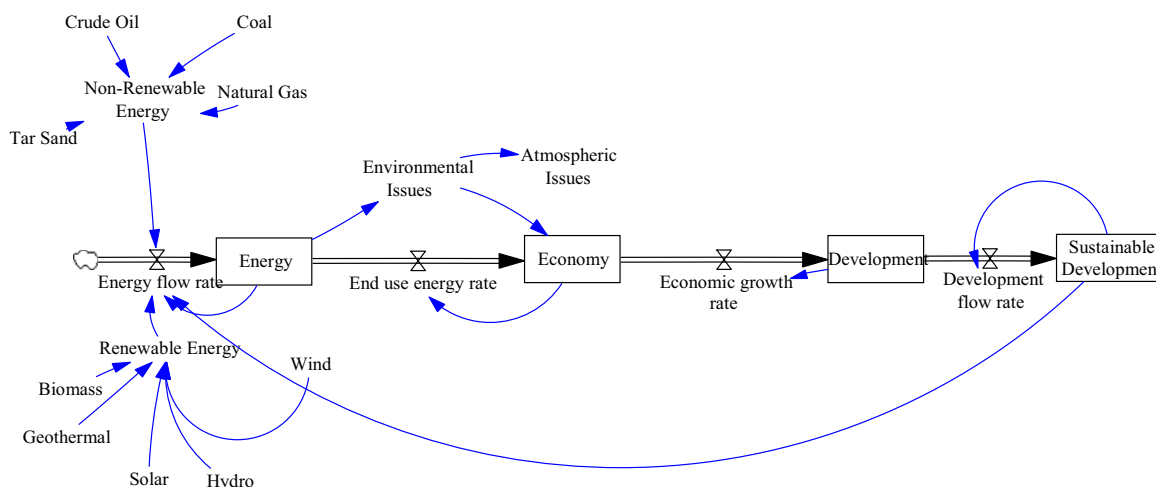


Fig. 1. System mapping of sustainable development and renewable energy (Source: Author).

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