Chapter 2.3
Energy, Environment and Socio-Economic Development:
Africa's Triple Challenge and Options

Divine Odame Appiah
Kwame Nkrumah University of Science and Technology, Ghana

Francis Kemausuor
Kwame Nkrumah University of Science and Technology, Ghana

ABSTRACT

This chapter espouses the spatial relationships between energy, environment and socio-economic development, as some of the main challenges African countries are grappling with. Energy is the main driver of all forms of socio-economic activities occurring within the human space over time. In Africa, however, low access to energy has, to a greater extent, hampered the socio-economic development of the continent. Although the Millennium Development Goals (MDGs) do not specifically stipulate on any energy target, the realization of all the goals stands threatened if households, commercial and industrial activities do not get the rightful access in terms of availability and affordability to energy systems, including their appropriate conversion technologies. The authors explore the dynamics of energy, socio-economic development and environmental sustainability in a nexus of the triple challenges facing Africa, from different African scenarios. In Africa, the obstacles opposing the continent's bid to expand the energy frontiers from the traditional sources of wood and fossil fuels into other second and third generation energy forms have been constructed in the areas of intense competition for arable lands for food crops and feed stocks cultivation. Suffice to say that increasing population densities, food shortages and insecurity and malnutrition with associated diseases have culminated into acute forms of poverty in recent years in Africa; the problems have been aggravated by the wanton degradation of the environmental resource base and the over-dependence of particular energy mix at both the rural and the urban settings. The above disposition therefore, militates greatly against the socio-economic efforts of most countries in sub-Saharan Africa. From a systemic perspective, the energy sector which drives almost every sub-sector of the broader socio-economic activity needs to factor the environmental consequences of extraction and use, with the attending impacts of climate variability and change in a vicious cycle of sustainability.

DOI: 10.4018/978-1-4666-0882-5.ch2.3

INTRODUCTION AND BACKGROUND

Africa is richly endowed with fossil and renewable energy resources, which if fully exploited would provide a good quality of life for all Africans. According to British Petroleum [BP], (2010), as at the end of 2009, Africa's gas and oil reserves, respectively, stood at 9.6 percent and 7.9 percent of the world's total while production was at 12 percent and 6.8 percent of the world's production. Over 83 percent of Africa's oil reserves are in just four countries, Libya, Nigeria, Angola and Algeria. Sixty-six percent of the gas reserves are in two countries, Algeria and Nigeria. South Africa accounted for 3.7 percent of proven world coal resources as of the end of 2009. Africa's share of the world's oil and gas resources translates to 127.7 billion barrels of oil and 14.76 trillion cubic metres of natural gas of proven reserves and over 32 billion tonnes of coal. Konde (2007) assessed that the African continent has technically exploitable hydro-energy capacity of about 1,888 TWh/y and abundant biomass. Up to year 2050, the biomass energy potential based on dedicated woody bioenergy crops on surplus agricultural lands (i.e., land not needed for the production of food and feed) is estimated at 41 – 410 EJ/year depending on the level of advancement of agricultural technology (Smeets, Faaij, Lewandowski & Turkenburg, 2007).

Geothermal power potential is also estimated at about 14,000 MW and mainly concentrated in Eastern Africa (United Nations Industrial Development Organisation [UNIDO], 2009). It is a fact that the continent receives abundant solar radiation almost all year round (Kassenga, 2008; Munzhedi & Sebitosi, 2009) and recent studies have confirmed the availability of abundant wind energy resources along some of the coastal and specific inland areas of Africa (Bekele & Palm, 2009). Conclusions could be drawn from these assertions that, Africa has abundant energy potential and reserves. In spite of the abundant energy resources available in the continent, per capita energy consumption in sub-Saharan Africa (SSA) continues to be very low. Per capita consumption of electricity in sub-Saharan Africa averages just 457 KWh annually, with the average falling to 124 KWh if South Africa is excluded (World Bank, 2008). By contrast, the annual average per capita consumption in the developing world is 1,155 KWh and 10,198 kWh in high-income countries.

The paradox is that SSA countries have not been able to translate their collective strength in global energy resources into processed forms that could be used for household and industrial activities. Several factors have contributed to these poor performance including low capacity levels, political instability, weak institutional frameworks, inadequate capital, low technological development and poor investment incentives for the private sector.

Energy is central to achieving socio-economic development on a sustainable level (Johansson * Goldemberg, 2002; Davidson * Sokona, 2002). The International Atomic Energy Agency [IAEA] (2005) has stipulated that the availability of energy has a direct impact on poverty, employment opportunities, education, demographic transition, indoor pollution and health, and has gender- and age-related implications. Sufficient and affordable energy supplies have been keystones to economic development and the transition from subsistence agricultural economies to modern industrial and service-oriented societies. Furthermore, energy is essential to improving social and economic well-being of people living in SSA, and also indispensable to most industrial and commercial wealth generation. In rich countries, energy for lighting, heating and cooking is available at the flip of a switch. In poor countries, up to six hours a day is required to collect wood and dung for cooking and heating, and this task is usually done by women, who could be otherwise engaged in more productive activities. In areas where coal, charcoal and paraffin are commercially available, these fuels take up a large portion of the monthly household income.