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TOWARDS THE DEVELOPMENT OF CLEAN GREEN ENERGY RESOURCES IN SUB SAHARAN AFRICA (SSA)

[1]SMART BELLO, [2]ANAKHU A. ESTHER AND [3]SULEIMAN A. IBRAHIM

[1]Department of Mechanical Engineering Technology, School of Engineering Technology. Auchi Polytechnic Auchi, Edo State [2]Department of Chemical Engineering Technology, School of Engineering Technology. Auchi Polytechnic Auchi, Edo State [3]Department of Agricultural and Bio-Environmental Engineering Technology, School of Engineering Technology. Auchi Polytechnic Auchi, Edo State

Abstract

Renewable energy resources exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation, and

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INTRODUCTION

Countries present in sub-Saharan Africa are rich in renewable energy with sources that have been exploited and some unexploited. The abundance of renewable energy in Sub-Saharan Africa is exceptional as they can be harnessed for thermal applications, electricity and even industrial applications (Mukasa et al., 2015). The attainment of sustainable production of energy and efficiency in its utilization for the creation of wealth, economic goods and targeted change in climate are the major issues facing human mortality in the Sub-Saharan region (Management & Information, 2016). The International Agency states that power generated in this region would come through efficient space utilization, partnership and resources in the

economic benefits. The objective of this paper is to find means of making Renewable Energy More Accessible in Sub-Saharan Africa to outline the implementation techniques. Energy poverty creates class distinctions and prevents ownership of luxury goods. Energy poverty poses a substantial challenge for development. If people lack the ability to light their homes after sunset, activities such as studying, domestic chores, and even small business endeavors must end when the sun goes down. The use of clean green energy will reduce burning of biomass, increased household income, improved quality of life, etc.

Regions with green and clean sustainable resources of energy. Problems arise due to the glitch in poor frameworks on the region with problems existing in the social-economic, environmental and political factors that when combined with overdependence on non-renewable energy sources (Evald, 2009).

Renewable energy resources exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation, and economic benefits. The objective of this paper is to find means of making *Renewable Energy* More Accessible in *Sub-Saharan Africa to outline the implementation techniques* (Mukasa et al., 2015, Meagher and Mohammed, 1996).

From the end of 2004, worldwide renewable energy capacity grew at rates of 10–60% annually for many technologies (Colenbrander et al., 2015). In 2015 global investment in renewables rose 5% to $285.9 billion, breaking the previous record of $278.5 billion in 2011. 2015 was also the first year that saw renewables, excluding large hydro, account for the majority of all new power capacity (134 GW, making up 53.6% of the total). Of the renewables total, wind accounted for 72 GW and solar photovoltaics 56 GW; both record-breaking numbers and sharply up from 2014 figures (49 GW and 45 GW respectively). In financial terms, solar made up 56% of total new investment and wind accounted for 38% (Evald, 2009).

It's widely accepted that we need to make a change to cleaner and renewable energy sources if we want our planet to survive. For example, the UK government plans to phase out oil fired heating boilers by 2025 with natural gas boilers heading for the same fate by 2050. Instead they want us to adopt renewable energy sources (Colenbrander et al., 2015). Renewable energy is energy that can be reproduced in a short period of time. The 6 most prevalent forms of renewable energy are solar, air/wind, biomass, hydro power, geothermal and biofuels. Each of these renewable energy sources provides an alternative to traditional energy generation (Meagher and Mohammed, 1996).

Despite its abundance of natural resources that could be used for energy – oil, natural gas, coal, sun, wind, waves, crops, and water – sub-Saharan Africa remains the world region with the lowest access to electricity, leaving 621 million Africans without electricity, 32% of the region's population (see Figure 1 for regional comparisons). The worst rates are in rural areas, where a large percentage of Africans live (Buzar, 2007, Cohen, 2006, Goldemberg, 1985). The literature is unclear on the precise relationship between energy and economic growth: some studies showing no relationship and others finding a causal relationship, with growth leading to more electricity, or the reverse causal relationship, with electricity leading to more growth. Even if there is no clear causal relationship with GDP growth, there is evidence that electricity can generate higher employment, bring light to the home comfort longer hours of studying, improve medical care through refrigeration, inter alia, not to mention liberate people, usually women, from the hard work of hand-washing clothes, provide improved health through refrigerated fruits, vegetables, and milk, and so on. In addition, bioenergy – mostly wood and charcoal – accounts for 60% of energy demand in Africa, with most rural Africans using traditional cook stoves for cooking and heating. The term "cook-stove" might conjure up something more than what it often is: a3-rock fire (Buzar, 2007, Cohen, 2006, Goldemberg, 1985). Globally, about 3% of diseases worldwide are caused by indoor air pollution from wood smoke, resulting in an estimated 1.6 million premature deaths each year; Africa accounts for about 600,000 of these deaths. Millions more have significant health problems from traditional cook stoves, such as asthma, respiratory disease, and low-birth-weight babies. In addition, collecting wood for burning is one of the major causes of deforestation in Africa (Buzar, 2007, Cohen, 2006, Goldemberg, 1985).

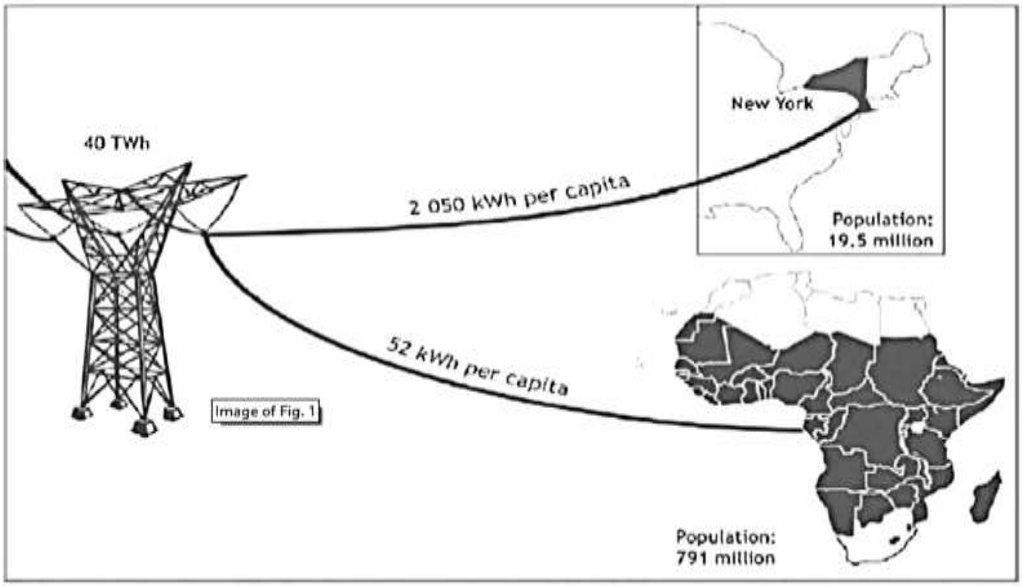

Fig. 1. Difference in electricity consumption in New York vs. Africa. Source: International Energy Agency, United Nations Development Program, and United Nations Industrial Development Organization (2010)

CHANGES IN ENERGY REQUIREMENT

High levels of energy poverty in Africa are the driving force for African governments, donors and NGOs to increase electricity access in Africa, whether by fossil fuels or renewable energy, the subject of this Special Issue. Energy poverty creates class distinctions and prevents ownership of luxury goods. This definition is often subjective and can vary widely within a small geographic area. Developing-Rural is specific to rural areas in developing states. This definition of energy poverty is computed based on estimated energy required to provide electricity for lighting and energy-dense fuels for cooking in a rural locale. Almost by definition, world regions that are predominantly classified as energy poor are comprised mostly of developing states: this includes the 2.5 billion people who rely on biomass as cooking fuel, and the 1.6 billion people without access to electrification. The population density of the energy poor is higher in urban than in rural areas, with the rural-to-urban migration trend expected to increase over the next 30 years. The energy poverty problem cannot be solved with-out first determining what per capita energy consumption is for urban areas in developing states (Buzar, 2007, Cohen, 2006, Goldemberg, 1985). There is a fast growth in the economy of the Sub-Saharan countries with investors coming in in the energy sector such the Chinese Companies. The reduction of traditional non-renewable sources of energy for environmental and sustainable friendly transportation methods, home heating, housing and industrial usage is urgent in this region. The countries that produce oil in this African region need to show compliance with adopting green and clean technologies in the energy sector. The United Kingdom has enhanced achievement in the deployment of grids and storage access to its citizens, making it a leading investor in the storage of energy and production of technologies with low carbon. This makes the Sub-Saharan countries have unique chances that facilitate the change to sustainable energy for the long term (Anoop, Deepak, & Stig, 2013).

GREEN CLEAN ENERGY FACILITATION BY THE UNITED KINGDOM

The United Kingdom has developed its complex industrial energy. It's strengths coming from hydropower, solar, wind and geothermal exercise. The Institutions and Stakeholders of the UK are experts in research and development in the latest technologies in the energy sector with experience in supporting and designing environmental policies that strengthen its institutional capacity (Colenbrander et al., 2015).

The UK has the potential of producing hydropower turbines, silica dust recycling, ICT metering and producing efficient solar cells. Hence, it is liable to believe without a

doubt that the UK can partner and help the sub-Saharan nations in developing, storing and transmitting green and clean energy (Anoop, Deepak, & Stig, 2013).

THE SUB-SAHARAN RENEWABLE ENERGY SOURCES

Access to energy is fundamental to human welfare. We need energy to cook our food and heat our homes. We use illumination after the sun goes down to extend our productive hours and provide us with huge improvements in quality of life. Beyond these basic functions, we rely on energy to provide services such as telecommunications, health care, and education as well as many of the conveniences available to people in modern economies. Without access to modern and efficient fuels, households are forced to rely on polluting and dangerous sources of energy such as the burning of dung, charcoal, and kerosene (Pachauri and Spreng, 2004).

Solar Energy

Abundant renewable energy sources from solar energy are present in Sub-Saharan nations all year round. This energy can be tapped to generate electricity or to power thermal use. Various scales can be enabled in the use of solar energy thus it features suitable community and household levels to national and industrial level operations. Generally, the generation of solar power in the Sub-Saharan nations has a great magnitude (Anton, Katharine, Elvira, & Pedro, 2016).

Wind energy

Energy from wind can be converted into other energy forms by utilizing turbines that drive generators or can directly drive pumps or other electrical machinery. Theoretically, wind in the Sub-Saharan nations has a high magnitude with an approximate 5% high-quality resource potential (Anton, Katharine, Elvira, & Pedro, 2016).

Geothermal

This is the natural heat that comes from the earth's ground that can be tapped for the generation of electricity or other uses such as heating purposes. The African continent has the ability to generate 15GW most of it found within the Rift Valley region. In the past year, 2014, about a geothermal capacity amounting to 606MW was installed in Africa. This was done in the Sub-Saharan region (Anton, Katharine, Elvira, & Pedro, 2016).

Biomass

The potential for processing agro residue in Africa can be estimated at around 4.2 EJ to reach 2030. The western region of Africa takes up a total of 40% of this portion to

provide an energy resource with the sub-Saharan region taking up most of the 40% (Pachauri and Spreng, 2004).

THE IMPACTS OF ENERGY POVERTY

Energy poverty poses a substantial challenge for development. If people lack the ability to light their homes after sunset, activities such as studying, domestic chores, and even small business endeavors must end when the sun goes down. Likewise, if people are unable to warm or cool their houses, they can be left very uncomfortable at certain times of the year, with particular risks to the very young and very old. Further, when populations living in energy poverty do gain access to fuels, they often risk significant harm. For example, the burning of traditional biomass in people's homes is estimated to cause 600,000 deaths annually in sub-Saharan Africa alone (Africa Progress Panel, 2015). Unless current trends change, deaths from indoor air pollution are forecast to exceed deaths from tuberculosis and AIDS by 2030 (see Figure 2 and 3) (Africa Progress Panel, 2015). Kerosene, which is used for cooking and lighting, is associated with respiratory infection (though less so than cooking with solid fuels), and it also poses risks of poisoning and fires (Buzar, 2007, Cohen, 2006, Goldemberg, 1985).

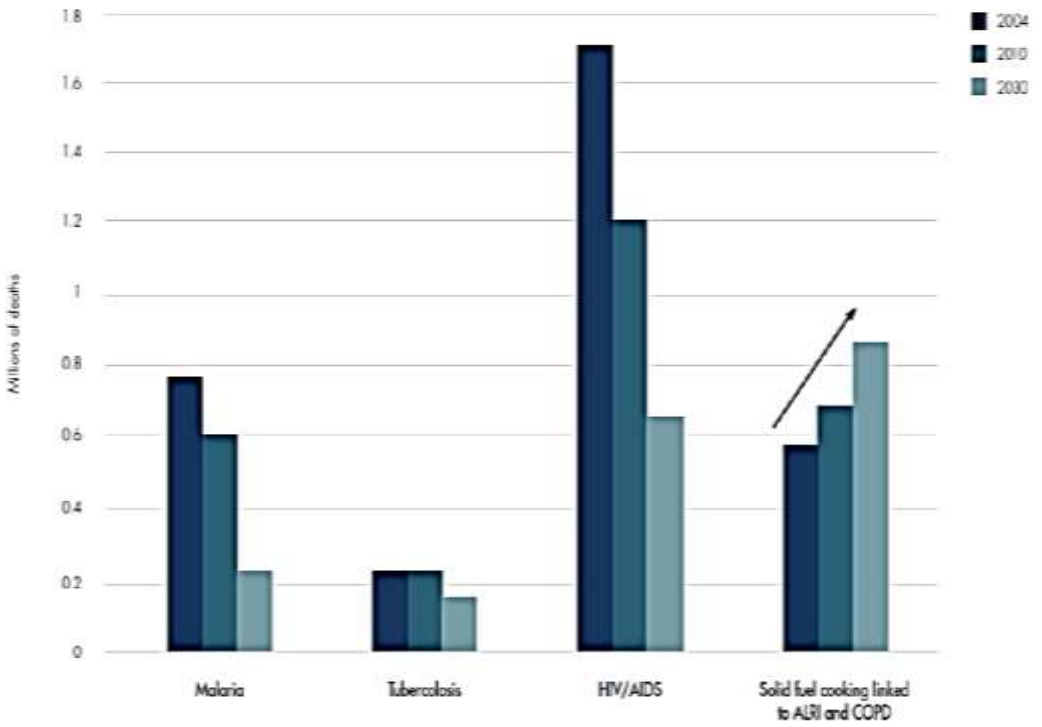

Figure 2: Deaths caused by major infectious diseases compared with acute lower respiratory infections, 2004, 2010, and 2030
Source: (Colenbrander et al., 2015)

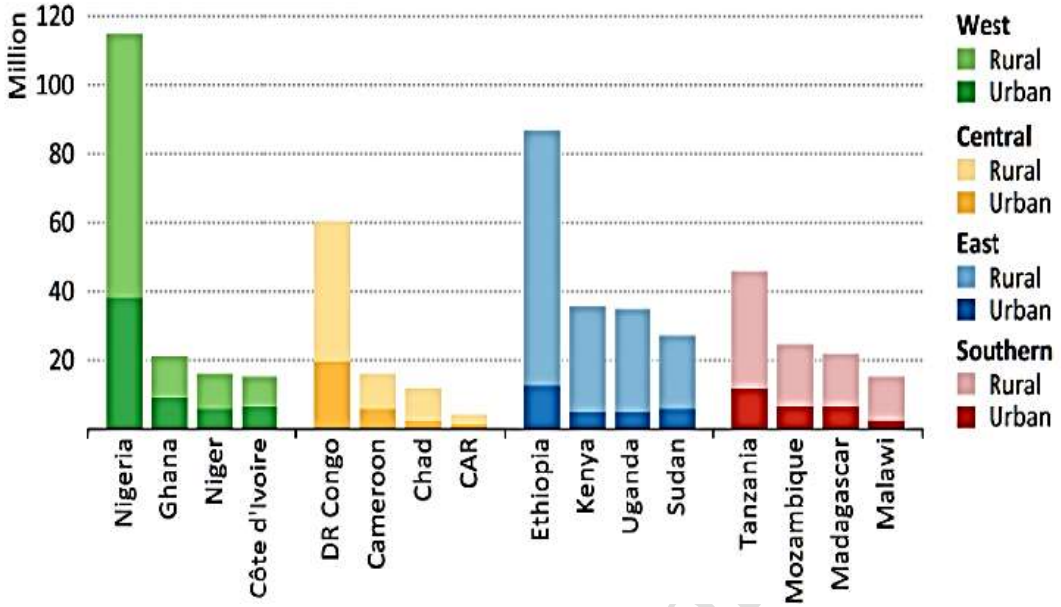

Figure 3: The largest populations cooking with traditional biomass in sub-Saharan Africa, 2012
Source: (Pachauri and Spreng, 2004)

Benefits of Green Energy

- **Improved health outcomes**: Reduced burning of biomass and kerosene in homes will reduce people's exposure to harmful pollutants. Access to modern fuels is expected to help prevent the cuts, falls, bites, and episodes of sexual harassment and assault that women and girls might otherwise sustain while collecting fuelwood. Finally, access to electricity allows for improvements to the cold chain, which are believed to be vital for vaccination, and access to electrified clinics is anticipated to improve health outcomes (Buzar, 2007, Cohen, 2006, Goldemberg, 1985).
- **Increased household income**: Households that purchase modern fuels are expected to reap savings from the use of more efficient fuels. Access to sufficient illumination will give households more productive hours, including increased study hours for students. Finally, access to modern fuels allows for pumped irrigation, potentially improving farm incomes, as well as for the diversification of income as households engage in agroprocessing and undertake light manufacturing.
- **Improved environmental outcomes**: Reduced demand for biofuels will lessen pressures on forests (Lewis & Pattanayak, 2012), with positive impacts for forest services including reducing runoff and climate change mitigation.

- **Improved quality of life**: Addressing households' reliance on fuelwood will reduce the drudgery experienced by women and girls whose job it is to collect those fuels. Greater access to entertainment services requiring electricity will improve people's well-being.
- **Access to ICTs and improved services**: Most ICTs require electricity to operate. The impact of television, radio, cell phones, and computers on people's lives will be significant. They can increase productivity, provide people with access to crucial information, and create new industries. In terms of services, schools, clinics, and government offices are all thought to be made more effective by access to electricity, with important impacts for the well-being of people who access them. Finally, improved quality of life in rural areas is expected to help retain qualified staff (such as teachers, nurses, bureaucrats), which will further improve access to services (Buzar, 2007, Cohen, 2006, Goldemberg, 1985).

CONCLUSION

If the opportunities existing for investment are scaled up by the use of a smart grid system in the Sub-Saharan nations, there would be a unique capability to escape the polluting age brought about by fossil fuels. These nations can take advantage of the sources of renewable energy that include wind, solar, geothermal and biomass (Pereira et al., 2011, Chaurey, 2004). Such a change would mean big investments and efforts by the partners involved. Exploiting the energy sources that are renewable in the Sub-Saharan region proves to be a good progress that is in the right direction by humankind. China has heavily invested in renewable energy technology production both in Africa and at home. This gives a leeway for the United Kingdom an ample reason and opportunity to also take part in such an investment. Also, other developing countries are taking chances with this investment in attaining their requirements in energy and financing and helping other countries too (Anton, Katharine, Elvira, & Pedro, 2016).

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