

An Analysis of Renewable Energy Policy and Law Promoting Socio-economic and Sustainable Development in Rural South Africa

Kola O. Odeku

School of Law, Faculty of Management and Law, University of Limpopo, South Africa

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ABSTRACT Energy is essential to the existence of human beings because it plays a fundamental role in their economic and social activities. In South Africa, majority of the people in the rural remote areas have no access to energy. Against this backdrop, the government has put in place various policies and laws aimed at making available modern energy to rural dwellers. However, implementation is the major challenge because of the cost of energy and connection of the rural households to the grids. This article highlights the importance of other energy sources in order to meet energy needs of the rural dwellers. The article advocates for renewable energy sourced through natural means as an alternative to conventional fossil fuel energy. The overarching importance of renewable energy is that it is sustainable, accessible, affordable, clean, environmental friendly and does not necessarily need to be connected to the grid. The article examines and analyses various interventions by the government, stakeholders and role players that are now having positive impacts on the promotion and use of renewable energy.

INTRODUCTION

In South Africa, the majority of the poor people live in the rural areas and they do not have access to modern energy (Ndingaye 2009). This is attributable mainly to the then ousted apartheid regime which pursued policies that had negative impact on the well-being of the previously disadvantaged South Africans who lived predominantly in the rural areas. They were isolated and deprived from virtually all modern social amenities including electricity. However, the 1994 election in South Africa led to a change from apartheid to a more democratic form of government, resulting in new initiatives and directions in virtually all sectors including the energy sector.

The new democratic government in South Africa embarked on various initiatives through policy formulations, laws, interventions and implementations in order to correct the anomalies and hardships of the past. One of the areas that was quickly identified for immediate attention

and consideration was the provision and access to modern energy by the people living in the rural areas in South Africa. This drastic turn of event paved the way for the democratically elected government to focus on the implementation of policy on modern energy services sourced mainly from conventional energy in order to make electricity available to rural communities. However, in the process of implementation, this approach led to another problem whereby majority of the rural areas were not connected. Where some communities were connected, distribution of electricity became problematic because the transmitters were not upgraded in order to increase the number of the users (Sebitosi 2008). The consequence of this was that most of the rural communities were regularly cut off during load shedding periods.

It is against the above setbacks and challenges that the government considered the option of other sources of energy for the use of the rural dwellers. Consequent upon this, the government promulgated and put in place policies, laws and initiatives that were expected to promote the use of renewable energy as an alternative energy sourced from the sun, hydro and wind. These sources are regularly replenished (Sherman 2001), easily accessible and do not emit carbon dioxide associated with climate change and environmental degradation (Xiaodong 2007). To a greater extent, supply is as-

Address for correspondence:

Professor Kola Odeku,
School of Law,
Faculty of Management and Law,
University of Limpopo,
South Africa,
Telephone: +27152682718.
Fax: +27152672904.
E-mail: kolawole.odeku@ul.ac.za

sured and secured. These initiatives and legal frameworks and policies being in place, they have, since, been having positive impact on the people because the rural dwellers are now able to access and use electricity for their various domestic and economic activities. In terms of production of goods and services, availability of electricity has encouraged and promoted remarkable outputs. As such, the rural dwellers have continuously been prospering by using energy for various economic activities culminating into financial prosperity and economic growth.

It is pertinent to mention that in many sparsely populated and remote areas of South Africa, off-grid renewable energies have provided least-cost solutions to rural electrification compared to grid extension or fossil fuel based options, such as diesel and kerosene (Wasielke 2007). These renewable energy resources are fuelled by indigenous resources and are environmentally benign (Ardayfio-Schandorf 1996). In addition, off-grid, particularly mini-grids have also contributed to productive uses and social services, as well as generating heat, motive power, and other non-electric energy. Compared to fossil fuel based options, however, off-grid has unique characteristics with high upfront investment requirements but low energy costs (Karekezi and Kithyoma 2002). Renewable energy is an effective approach to mitigate climate change. These initiatives and strategies are now promoting and impacting on the government policies that seek to alleviate poverty and improve the standard of living of the rural people in South Africa (Mehlum 2012).

Renewable energy technologies are growing rapidly and are precipitously becoming a mainstream industry (Garthwaite 2009). Towards this end, the government is promoting capacity in research and development culminating into development and production of renewable energy technologies and equipments. Against this background, the government has set up Renewable Innovation Fund (REIN) which was established with a view to support emerging technologies and innovative projects with the aim of using REIN's fund to stimulate the development of projects where sustainable development of technologies is promoted (Eskom 2009). It is in this regard that some research institutions in South Africa have taken advantage of this initiative by applying for and accessing funds from REIN and

used the funds for research, development and demonstration of technologies that are promoting the production and the use of renewable energy systems (Karekezi and Kithyoma 2002).

The key to success for renewable energy development and deployment is the implementation of a sound legal, policy, and regulatory framework which makes it possible for a large-scale investment in renewable energy (Kennett 2011). The government has identified that successful renewable energy policies must be long-term and consistent and have a secure and predictable payment mechanism. They must provide fair and open grid access and possess strong governance conditions with clear administration procedures and low transaction costs and have strong public acceptance. This has paved the way for the promulgation of the Renewable Energy Feed in Tariffs guidelines of 2009 and 2010 respectively. These guidelines are being implemented and are having various major positive impacts on the increase of energy produced from renewable energy. This is now enhancing electricity service deliveries in the rural areas and impacting on the improvement of social economics, goods and services.

METHODOLOGY

The traditional methods of citation, analysis of cases and other sources are the main scientific methods in legal scholarship. The methodology for this article involved the application of qualitative but not necessarily quantitative data that are illustrative of the concerns that form the crux of this study. Therefore, analysis of and engagement with contemporary literature in the field of policy and law on alternative energy were used. The South African Constitution and the Government White papers on renewable energy formed the basis and the crux upon which the argument for socio economics benefits and sustainable developments is advanced. Other relevant statutory, legislative and policy frameworks were also thoroughly examined and applied.

LACK OF ACCESS TO MODERN ENERGY MOTIVATED GOVERNMENT TO INTERVENE

It should be re-emphasised that in South Africa, it is no more 'news' that the previously disadvantaged rural dwellers were denied vari-

ous basic amenities, including, but not limited to, modern energy during the apartheid regime. It is important to point out that even presently, some communities still largely source and depend upon traditional energy, which comes mainly from biomass fuels, in spite of the policies and laws in place for accelerated electrification process (Karekezi and Kithyoma 2002). Women and children usually engage in domestic activities in the rural areas. The persistent use of fuel wood for cooking, amongst all income groups of poor rural households, has remained a matter of concern, particularly as the burning of fuel wood leads to indoor air pollution and affects the health of both adults and children and in some cases has led to death (Prasad 2009). With the massive introduction and diffusion of renewable energy, to some extent, the provision of modern energy services from renewable energy has lessened women's burdens and enables them to pursue both economic and social activities that afford them more qualitative and productive lifestyles. A typical example of this is the provision of hot water, using solar water heaters in the rural areas. This has the benefit of saving households money over the long term and reducing carbon dioxide emissions associated with fossil fuel usage (GNESD 2007).

In terms of the social and economic aspects of the electricity sector, energy policy, law and regulatory frameworks have been transformed from a defensive apartheid-era obsession with security to a new focus on promoting social equity and improving economic competitiveness as South Africa re-integrated with the global economy. Consequently, the normalization and democratization of the country now require enormous efforts from all and sundry to provide electricity, running water and education through renewable energy for the majority of South Africans in rural communities. South Africa has taken remarkable steps towards complying with the global demand for sustainable development by implementing renewable energy sources, improving efficiency in utilisation of electricity in homes and changing the way of life particularly of people living in remote and rural communities.

THE WHITE PAPER ON ENERGY POLICY OF 1998

The government's White Paper on Energy Policy (1998) sets as one of its targets, the im-

plementation of renewable energy for rural communities that are not connected to the electricity grid which is now providing modern energy to remote schools, clinics, energy for rural water supply and desalination, the use of passive solar and solar water heating for households. On a daily basis, jobs are being created, a significant number of unskilled labourers are being employed, mostly Black farm workers, on the farms (Prasad 2009). It is worth mentioning that government programmes aimed at promoting integrated sustainable rural development, through renewable energy are in the forefront and playing a significant role in supporting economic development (Prasad 2009).

BENEFITS OF RENEWABLE ENERGY: AN OVERVIEW

Renewable energy offers significant economic and political advantages such as the replacement of fossil fuel with permanently available home-grown energy; thereby enhancing energy security leading to a growth in the domestic production of goods and services in rural areas. At the same time, it considerably reduces infrastructural requirements (Scheer 2006). Most renewable technologies are virtually free of air emissions. For instance, wind and solar power have zero emissions (Brebøl et al. 2003). Renewable energy is endowed with natural distribution close to the demand in contrast to the conventional energies. The monopolistic nature of the latter creates excesses in market prices and uncontrolled industrial development policies that place priority on financial profit that is enriching the emitters and negatively impacting the environment (Brebøl et al. 2003). Increasing the share of renewable energy sources in the energy balance enhances sustainability and helps to improve the security of energy supply by reducing dependence on imported energy sources. In addition, the development of energy efficiency is a central aim of the world energy policy in order to contribute to the reduction of greenhouse emissions (Patlitzianas et al. 2004). Renewable energy can be easily exploited with de-centralised facilities. The only direct costs of production are those needed for making available the necessary technology. Renewable energy has an edge over conventional solutions as it may take a whole decade to get a new conventional plant on stream, but only a few months

to build a solar plant (Patlitzianas et al. 2004). The greater the extent to which conventional energies are substituted, the greater the effects of renewables will be (Patlitzianas et al. 2004). Renewable energy offers environmental, social, and economic advantages because it is one of the major factors in the reduction of poverty in rural areas (Patlitzianas et al. 2004). With the need for energy for various uses and the government goal of universal access, renewable energy would continue to play a significant role in the provision of basic services especially in rural areas. Apart from the provision of basic services, renewables will serve as an important contributor to socio-economic development being used for productive income generating activities.

RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT

The concept of sustainable development was popularized by the International Union for the Conservation of Nature in its "World Conservation Strategy," and was refined in 1987 in the Brundtland Report of the World Commission on Environment and Development. Sustainable development is defined as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (Sherman 2001). The concept is generally interpreted and characterised by sustainable development which involves economic development, social development and equity (Cassim and Jackson 2003:2) as well as environmental development such as protection, conservation and preservation; which includes administrative sustainability by ensuring that there is capacity for programme development and implementation (Bugaje 2009).

In rural South Africa, most of the energy sources available are not sustainable because they are being sourced and used through primitive methods like using firewood for cooking and heating. Where government makes energy available, the rural poor are unable to afford it. The aim and objective of the government initiative is to ensure that rural poor households have access to sustainable modern energy that will improve their standard of living. It is against this backdrop that the government designed policy to widen access to renewable energy and this has led to economic and social development. Toward this end, the Department of Min-

erals and Energy developed an integrated energy plan codified in the White Paper (Lisa 2003). This Energy Policy informs government to pursue the security of energy supply through diversification of the sources of energy supply that would promote sustainable development. Central to the diversification process is the introduction of renewable energy sources and technologies into the energy mix (Lisa 2003). The strategic goals are meant to ensure that an equitable level of national resources is invested in renewable energy technologies. And through the White Paper, renewable energy has now been integrated into the energy economy and a lot of investment has been committed towards its implementation (Lisa 2003). This strategy is meant to make renewable energy sustainable leading to economic and social developments particularly in the rural areas.

It is pertinent to mention that energy becomes an instrument for the eradication of poverty only when it is directed deliberately and specifically towards the needs of the poor who were denied access to modern energy for several years (Goldenberg 1998). Perhaps the most critical challenge related to energy for sustainable development is how to increase access to affordable, modern energy services, whilst ensuring that the energy services provided do not cause further adverse environmental and socio-economic impacts. Consequently, as earlier mentioned, provision of sustainable energy will alleviate poverty and make the rural dwellers prosperous.

JUDICIAL ACTIVISMS ON THE CONSTITUTIONALITY OF THE LINKAGE BETWEEN RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT

The South African constitution provides for and embraces the notion of sustainable development regarding the issue of energy and natural resources in the South African Constitution (1996). In this regard, the government has established various institutions with responsibilities to ensure compliance and implementation of sustainable energy. It is pertinent to mention that the only reference to energy in the South African constitution is the item "electricity and reticulation" in Part B of schedule 4. This notwithstanding, by implication, energy matters generally and renewable energy in particular are

national matters administered by the Department of Energy (Glazewski 2009). Recognition is accorded the notion of sustainable development in the Minerals and Petroleum Resources Act 28 of 2002 which provides that:

“sustainable development” which is defined in section 1 of the Act as meaning: “...the integration of social, economic, and environmental factors into planning, implementation and decision making so as to ensure that minerals and petroleum resources development serves present and future generations” (Glazewski 2009).

Sustainable energy stimulates economic growth and development. The availability of modern energy in the rural settings has now created other economic opportunities whereby poverty levels have been drastically reduced and the standard of living of the rural dwellers improved. This achievement is as a result of institutions that were established purposely for the proper implementation of all the policies and laws pertaining to energy for sustainable development. It is in this regard that the concept of sustainable development is meaningful and well advanced because of its positive impact on the rural dwellers that were hitherto previously disadvantaged.

In South Africa, the judiciary, through their pronouncements, has been very pro-active in promoting and protecting the right to clean environment and sustainable development by ensuring that current development in the country meets the needs of the present without compromising or threatening the ability of the future generations to meet their own needs. In the case of BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation, Environment and Land Affairs (2004), the Court gave judicial interpretation to the notion of sustainable development by commenting that:

“The concept of ‘sustainable development’ is the fundamental building block around which environmental legal norms have been fashioned, both in South Africa, and is reflected in Section 24(b) (iii) of the Constitution. ...Pure economic principles will no longer determine, in an unbridled fashion, whether a development is acceptable. Development, which may be regarded as economically and financially sound, will, in future, be balanced by its environmental impact, taking coherent cognisance of the principle of intergenerational equity and sustainable use of

resources in order to arrive at an integrated management of the environment, sustainable development and socio-economic concerns. By elevating the environment to a fundamental justiciable human right, South Africa has irreversibly embarked on a road, which will lead to the goal of attaining a protected environment by an integrated approach, which takes into consideration, inter alia, socio-economic concerns and principles.”

The case of BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation, Environment and Land Affairs contributed tremendously to the jurisprudence on the notion of sustainable development. The court held the bull by the horns and emphatically asserted that any activity that would injuriously affect the environment will be retarded and disallowed to progress. In essence, the court has now realized that some aggressive commercial ventures, although legal, that are likely to impact the environment, will still be ruled against and stopped if such activity will be repugnant to the existence of human beings especially future generations and the environment.

In order not to be caught by the principle articulated in the case above, the most potent option is to use renewable energy because they do not emit carbon dioxide that would compromise or threaten the ability of future generations to meet their own needs.

POLICY AND LAW PROMOTING THE USE OF RENEWABLE ENERGY

From the outset, credit should be given to the government for initiating and embarking on proactive energy policies that have now paved the way for renewable energy. At present, renewable energy is being talked about in every nook and cranny of the world, because of its potent importance (Prasad 2009). At this juncture, it is pertinent to mention that the South African constitution is the supreme law of the land. Consequently, all other laws, policies, measures derive their validity from the constitution. With regard to the issue of energy, the constitution provides for and embraces the establishment of a national energy policy to ensure that national energy resources are adequately tapped and developed to cater for the needs of the nation (Prasad 2009). It is in this regard that the Department of Energy was assigned the sole responsi-

bility for renewable energy. In order to discharge this responsibility, the Department created an enabling environment to ensure that activities by various role players and stakeholders are properly coordinated in order to ensure uniformity, efficiency and sustainability.

In the same vein, the constitution also provides the legal basis for the production and utilisation of energy such that natural energy resources are tapped and made available, affordable and sustainable, thus leading to an improvement in the standard of living of citizens irrespective of geographical location (Prasad 2009). By virtue of Chapter 2 of the constitution, environmental and sustainable development issues are firmly entrenched and considered as rights that the state must respect, protect, promote and fulfil. These rights are well articulated in section 24(a) (b) (i) (ii) (iii) of the constitution which provides as follows:

“Everyone has the right—

- (a) to an environment that is not harmful to their health or well-being; and
- (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that—
 - (i) prevent pollution and ecological degradation;
 - (ii) promote conservation; and
 - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.

It is worthy to reiterate that the 1998 White Paper on Energy which laid the foundation for energy policy was considered as a major departure from what it used to be before 1994. By virtue of the 1998 energy policy, the issue of supply of energy based on race was copiously disregarded and downsized. The aims and objectives of the policy lend credence to what the policy sets to achieve: participation by the previously disadvantaged, stimulation of economic development, managing energy-related environment and health effects, promotion of access to basic energy, services for poor households while reducing negative health impacts arising from energy activities and finally securing supply through diversity of supply sources. The 1998 policy is also considered as a policy that consolidated previous programmes on energy by improving energy services to the people, es-

pecially the previously disadvantaged (Stanford and Nwakasonda 2004). The white paper also pledges government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications (Prasad 2009). Currently, the key strategic goals and objectives of the White Paper are being translated into reality. Toward this end, various renewable systems have been produced and are now being utilized in different disadvantaged rural communities in South Africa.

Upon weighing various options related to the challenges posed by relying on fossil fuels and benefits to be derived from the implementation of renewable energy policy as an alternative energy, it is evident that government values and appreciates the potential and importance of renewable energy in South Africa and considers the need to increase the production and deployment of renewable energy. Government has since become proactive in the drive to ensure that renewable energy serves as an alternative (Prasad 2009).

POLICY IMPLEMENTATION

Although, the formulation of policies and measures are very important because they serve as a road map and guide, suffice it to say that the implementation of policies to the letter is equally important. Long term policies, including those defining a specific role for research and development in renewable energy technology have been identified as a major contributing factor towards implementation and these have been vigorously pursued and implemented by the government through various institutions that were established (Boehlert 2001). In addition to this, the institutions specifically designed and responsible for accomplishing the innovation and provision of renewable energy through implementation have been the major strength of all policies and measures. These institutions monitor compliance and achievements of the impact of the provision and utilisation of renewable energy. Furthermore, strategy on renewable energy monitoring and implementation has been developed to provide a practical plan for achieving the policies' goals and objectives. For example, the Energy Efficiency Strategy (EES) aims to assist in providing energy for all residents of South Africa, by reducing energy consumption

through efficient practices and sustainability. The provision of modern energy through renewable energy to the rural dwellers without connecting them to the national grid has avoided an additional load on the main grid. Since they are not connected to the grid, the energy meant to be used by the villagers is now being used for other productive purposes. This has contributed immensely to the efficient use of energy.

More importantly, implementation of a long-term policy framework has helped South Africa in developing and building a clean reliable energy supply because this has motivated developers and investors to invest in renewable energy. South Africa is now emulating countries like Brazil, China and India that have implemented a solid long term policy in the production of renewable energy leading to a huge success in terms of a larger share of renewable and energy sustainability (Karekezi and Kithyoma 2002).

Decentralized energy systems, particularly systems that use renewable natural resources, offer a solution (and in many cases, the only possible one) to supply electricity to isolated areas where the grid cannot reach, such as the remote rural areas. The Department of Energy has undertaken a few pilot projects with a view of assessing the use of renewable energy as a catalyst for economic development. These pilots have proven that renewable energy can contribute towards the improvement of the quality of life of the people. This involved assessing community needs and building capacity through educating the people about various forms of alternative energy. The capacity building has resulted in the development of entrepreneurial and business management skills in different rural communities (Alazraque-Cherni 2008).

Implementation of Renewable Energy Policy through Research, Development and Demonstration

In South Africa, the establishments of various technological support centres and institutes of technologies have led to the implementation of policy on renewable energy within existing research, development, demonstrations and capacity building. One such institution that is in the vanguard of promoting renewable energy through research activities is the Fort Hare Institute of Technology (FHIT-Centre of Excellence) at the University of Fort Hare, Alice, in the rural

Eastern Cape of South Africa. The Institute has developed various renewable technologies and they are currently being deployed and used by some of the communities in the rural Eastern Cape. These initiatives and efforts have assisted the rural dwellers tremendously by making modern energy available and affordable (Prasad 2009). For an example, in modern buildings, significant amounts of energy are consumed to keep the building environment comfortable. In South Africa, it is estimated that low-income families spend up to 17% of their monthly budgets on electrical energy for space, heating and cooking, and there are many negative health effects when these household services come from fuel combustion inside the home. On a global scale, the residential, commercial and institutional building sector consumed 31% of global energy and emitted 1900 mega tons of carbon in 1990. By 2050, these figures are expected to rise to 38% and 3800 mega tons respectively (Ellis 2009).

The aim therefore is to design and construct new, affordable, passive solar houses to reduce the need for electrical heating and cooling. The concept of low cost, energy efficient, passive solar housing can be an immediate and long-term solution to the problem of housing and electrical energy in South Africa.

Against the above background, the Fort Hare Institute of Technology in partnership with Tuskegee University and the Blue Crane Route local municipality designed and constructed passive solar energy efficient housing structures in three towns in the rural Eastern Cape. A passive house is defined as a house which heats and cools itself in a purely passive way by utilizing the sun path in winter and summer respectively. These houses were constructed at the same cost of the former Reconstruction and Development Programme (RDP) of R 31,000-00 (South African Rand). The result is a house that is aesthetically pleasing and, more importantly, has a thermal efficiency of 78% as compared to the corresponding RDP houses which are only about 54% efficient. The clerestory windows use the lower winter sun to allow solar access to the rear of the house where heat is absorbed and slowly released during cold winter nights. The overhangs prevent solar access of the higher summer sun and by opening clerestory windows a natural ventilation current is created to expel warm air from inside.

Continuance of the project led to the construction of the first solar house in South Africa that is independent of the national grid. This solar house is fully self-sustaining and has the capacity to generate 8 000 kWh per year. In an equivalent house the energy requirement would be about 2 400 kWh per year at a cost of R1, 296.00, which may constitute up to 15% of the budget of a low-income family.

The last example of research conducted on the sustainable use of natural resources by the Fort Hare Institute of Technology is the implementation of the first commercial size biomass gasifier plant at a sawmill in Melani village close to the University of Fort Hare (Mamphweli and Meyer 2009). The local community has been plagued with air pollution caused by the burning of waste in a furnace for years. This project aimed at significantly reducing the pollution by using waste material as a fuel for biomass gasification to generate electricity. The waste from the commercial biomass gasifier from the sawmill is used as fuel to generate electricity. The gasifier has an electricity generation capacity of more than 1 million kWh per annum from a fuel which would have otherwise been a waste product (Mamphweli and Meyer 2009).

In addition, the exhaust gases of the biomass gasifier are much cleaner as the gas engine uses the energy content of the producer gases (CO , CO_2 , CH_4 , H_2 , etc.). The generated electricity is then used to power two community driven agri-businesses. Revenue generated through this can in turn be used by the community for the community's wellbeing. These examples illustrate the concerted effort by the Fort Hare Institute of Technology to make a significant contribution to wealth creation and the improvement of the quality of life of low-income people in general and people of the rural Eastern Cape in particular (Alazraque-Cherni 2008).

It is also pertinent to mention that government has initiated and implemented the Integrated Electrification Plan (IEP) through the development of a scheme that aims mainly at providing solar photovoltaic systems to households in remote, rural areas. This is to serve as an alternative to the use of candles, illuminating paraffin and diesel for lighting and battery charging. The DE has given tacit approval to the development and use of renewable energy in its IEP.

CONCLUSION

The reliance of rural dwellers on wood, coal and kerosene as energy sources contributes to high levels of indoor pollution. Renewable energy that is produced from sustainable natural sources has contributed immensely to sustainable development in rural South Africa. As most of the sources are indigenous and naturally available, energy supply is affordable, well secured and is not subject to disruption by international crises or limited supplies. Energy for households in the rural areas is of key importance for social sustainability. Various research institutes have heeded government's clarion call and embarked on research and development on renewable energy technologies and projects. These initiatives have produced various renewable energy innovations and technological breakthroughs. Similarly, they have also resulted in successful deliverables and diffusion into the energy mix. It is clear that these initiatives are now having positive impacts on modern energy provision and usage in the rural areas. To this end, it is worthy to mention that both domestic and economic activities of the people have been tremendously and positively enhanced. A lot of social and economic activities that seemed to be unaccomplished because of lack of energy are now becoming possible and realisable. Hospitals, schools and community projects are now functional because of the provision of modern energy generated from renewable.

RECOMMENDATIONS

While we applaud various government interventions that are promoting the use of renewable energy as an alternative energy, it is hereby recommended that the parliament should pass into law numerous pending bills on carbon dioxide emission reduction just like what was done in the United Kingdom which was considered to have passed into law Climate Change Act 2010. With this in place, implementation and enforcement will become easier for various institutions.

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