

# Energy Sector Development in Sub Saharan Africa: Case Study of Rwanda

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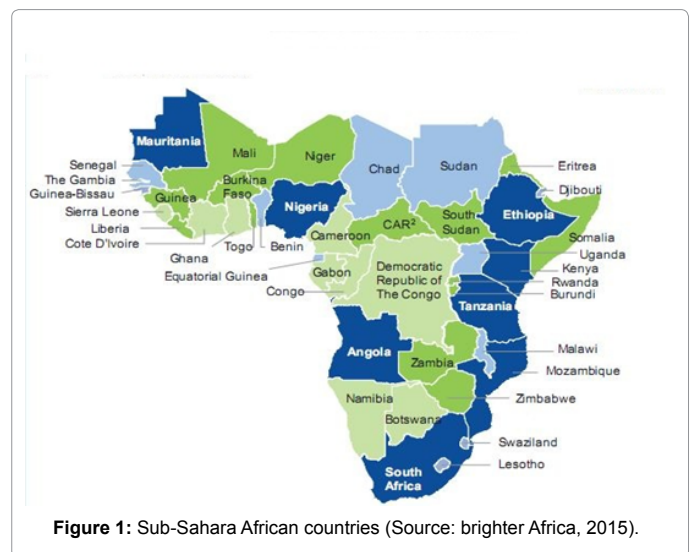
## Abstract

For more than a decade, African countries have been struggling to raise their economic level from developing countries to developed countries. Energy is the 7<sup>th</sup> goal in World's sustainable development goals. As a driving factor, electricity is a major factor to run economic development through manufacturing, construction, storing equipment, lighting infrastructures and fulfilling households' daily needs. Limited number of Sub-Saharan African has access to the electricity. Population continues to grow at 1.18% to reach 685 million in 2050. It is important to prioritize energy development which will have to meet today and future demand of the population and economic development. Electricity accessibility raise at 45% from 2000 to 2015 on continent scale through countries cooperation and international funds. Rwanda is striving to connect 70% of its population to the electricity. Across the country; Renewable energy such as hydropower plants, solar power plants, Wind, methane gas power plant, peat power plants and Non Renewable such as electricity generators, and coal are being exploited to meet Rwandan Energy target in one year to come. Currently 190 MW over 563 MW is already reached through 25 hydropower plants in South and North-WEST, 2 solar power plants in the center and East, 2 Electricity Generator power plants in Kigali City and 1 methane gas power plant in Karongi District. Two (2) peat energy power plants constructed in Gishoma and Gisagara are expected to boost the energy sector in years to come with 10.85 MW and 80 MW respectively.

**Keywords:** Sub Sahara Africa; Rwanda; Megawatts; Energy; Electricity; Sustainable development

## Introduction

Developing countries continue to surge their primary, secondary and tertiary sectors of development. Energy demand continues to grow rapidly and effort is being made to efficiently extract and discover new energy sources. These processes consist of extraction, processing and conversion into useful energy such as heat, gas and electricity [1]. The strong need of electricity is observed in every development sector which shows total dependency on electricity particularly in hospitals, industries, factories, commercial areas, public institutions and households. Developing countries' energy sector is characterized by two main factors; the use of traditional and cheap energy source such as fuel wood-biomass and charcoal which lead people to stick to it. The second is the high demand and undistributed use of modern energy sources like electricity, gas and petroleum which prevent its widespread in rural areas [2] (Figure 1). According to the United Nation projection; population (7.3 billion-2015) will continue to grow with 1.18% per year which means almost addition of 83 million people annually who will need enough electricity in their everyday life [3]. Since the beginning of 21st century, Sub Saharan Africa is having a very significant economic growth reaching more than double \$ 2.7 trillion in year 2013. Energy demand within this region grew by 45% from 2000 to 2015 and account 4% on global demand. Limited number in sub Saharan Africans have access to modern energy services and more than 620 million people (two-thirds of world population) are without access to electricity [4]. Nowadays, sub Saharan Africa has about 800 million people distributed in 38 countries. The projected population in 2050 will count 685 million (age 0-14), 1.25 billion (age 15-64) and 100 million (older than 65). The economic growth is driven by investment in mining, oil and infrastructure. The slowdown may be caused by lower global oil adjustment, insecurity and political instability. Sub-Saharan African countries have been linked to be low income countries with a huge number of population living in poverty. The region stays in average of 248 kg of oil equivalent to 238 kg which is almost half of world average. The electricity is unequally distributed with more connected households in urban areas than in rural areas [5]. As Sub-



Sahara Africa continues to initiate and invest in energy development, this research paper is expected to assess today's African energy infrastructure development and its installed capacity and later focus on Rwanda's energy sector development.

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## Materials and Methods

This research is based on both qualitative and quantitative methods to analyze the status of energy sector in sub Saharan Africa and assess the interrelation of Energy sources, Energy policy and energy infrastructures development in countries. The quantitative methods statically analyses electricity accessibility, use of energy by sector, production and distribution of electricity from various sources. Qualitative method clearly identify sub-Saharan electricity challenges and explore ways energy infrastructures development in order to achieve Sustainable development goal seven (7) which is to ensure affordable, Reliable, sustainable and modern energy all. Energy especially electricity is needed by almost in all areas of life. Energy services contribute in Transport, processing, Cooking, heating, lighting and are the main basic needs to the development of economic sector of a region. Different research papers have been focusing on energy policy, energy sustainability, energy accessibility, energy and poverty and status of Energy in Africa. However this research only focuses on status of electricity accessibility, interrelation between energy policy and energy infrastructure development in Sub-Sahara Africa. Later it focuses on energy investment and electricity accessibility in Rwanda. Data collection on countries' energy sector is done through literature review; research papers, countries' energy reports, Global Environmental Outlook (GEO). In Rwanda, previous literatures and documentation were consulted and onsite data collection was done to assess the current energy sector level. Energy sources with respective installation capacity were investigated in their 2010 to 2016 period.

## Results and Discussion

### Over view of energy sector in Sub Saharan Africa

Sub-Sahara African countries have been raising their installed capacity generating electricity for households, factories, commercial building, agriculture and other areas of economic development. Countries like South Africa Nigeria, Ghana and Cote d'Ivoire are high suppliers where half of these energies are from natural gas, hydropower and oil. Others are still relying on electricity importation to meet their demand. Electricity is unequally distributed within these countries. Electricity accessibility percentage goes with countries' economic levels and population served (Figure 2). This is caused by the significant of financial resources required for electricity supply which limit rural households and business center to have access to electricity. To overcome this, the main drivers are cooperation between countries, attraction of private investors who built new power plants and rehabilitate existing damaged installations. It also requires finding new energy sources of generation to extend production capacity (Figure 3). Strong transmission and distribution systems plus skillful African technicians and policy makes shall be able to do proper management and take strong policies regarding energy (IRENA, 2015) (Figure 4).

### Energy sector in West Africa

West Africa has a considerable percentage in energy production, distribution and production of energy. Energy is a focal sector in these countries. The 11<sup>th</sup> EDF regional indicative programme with 200 million Euros for energy development. The initiative aims to promote and develop infrastructure for power generation and transmission. So far projects done are West African power pool developed in 2006 at Cotonou, Benin, construction of 1357 km transmission line from cote d'Ivoire to sierra Leone, guinea and other incentives for hydro-power and renewable energy. There are expectations on rising electricity accessibility by 60,000 households, create 200 full time job, 1000

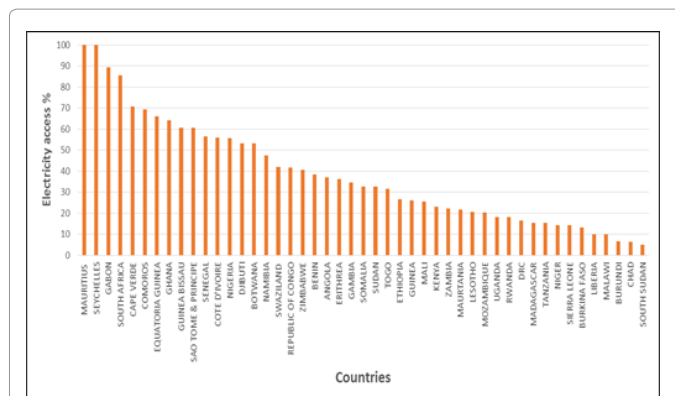


Figure 2: Sub Saharan Africa countries access to electricity in 2012.

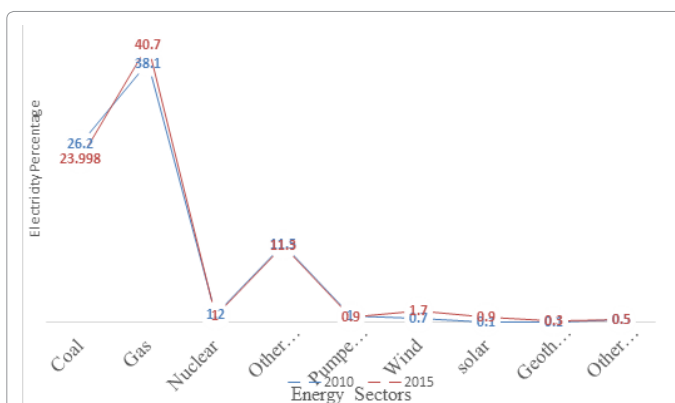


Figure 3: Electricity production by sectors in Africa (International Monetary Fund 2015).

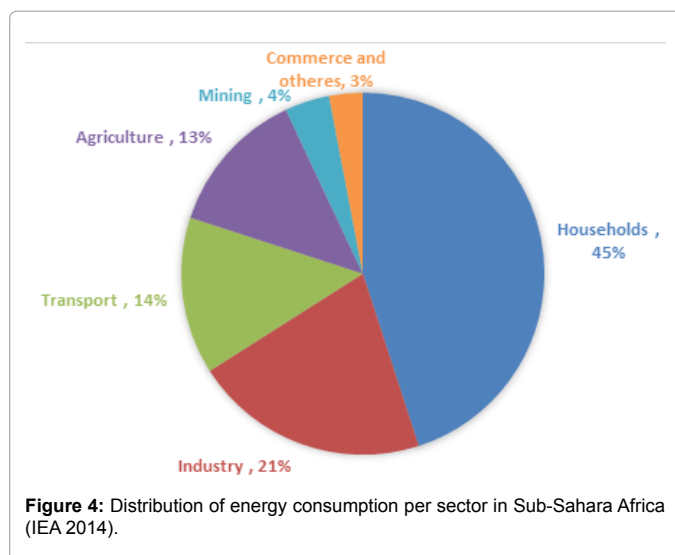


Figure 4: Distribution of energy consumption per sector in Sub-Saharan Africa (IEA 2014).

temporary jobs and general benefit to 25 million people from electricity transmitted [6,7]. From the creation of Economic community of West African states (ECOWAS) up to now, energy sector has continuously increased by different undertaken projects. The source of energy is primarily petroleum and natural gas but electricity is also generated through hydro-power and thermal resources. The improvement in power reliability is encouraged by ECOWAS with big countries having

big resources like Nigeria, Cote d'ivoire, Ghana and Senegal leading these projects to boost power supply in the region. According to the 2005 report of U.S.DOE, Energy; electricity generation is mainly coming from thermal power stations 59.5%, hydroelectric plants 40.5% of all installed capacity [8].

### Energy sector in Central Africa

Urbanization and business sector is relatively low in central Africa. The region has 115 million people and presents \$ 227 billion/year of GDP, 23% access to electricity with 91 KWh per capita. Central African countries have largest hydro-electric potential with about 60% of African hydropower potential but due to the bad management; electricity accessibility is still a problem to many people. The average solar radiation is relatively high but renewable energy technologies which can provide economical solution for off and on grid electrification in remote areas are still missing [9]. The economic development and population growth in central Africa oblige development of electricity network, expansion of power plants, and integration of regional electricity networks. Countries like Republic democratic of Congo (RDC), Cameroon, Equatorial Guinea and Gabon have strong potential to rise their electricity generation and lead the region to sustainable energy sector through regional and sub-regional electricity transmission infrastructures. The Sustainable energy for all (SE4all) initiative with \$ 1 billion is targeting 15 initiatives and programs to rise electricity accessibility to all but compared to other African regions, this initiatives are small numbers to make an impact [10].

### Energy sector in East Africa

East African countries consists of Kenya, Uganda and Tanzania which later were joined by Rwanda and Burundi to form East Africa Community. Energy supply and sources in this region are electricity, petroleum, hydropower, Solar and wind which are considered as commercial Energies because availability for these energies can make a great impact to the society. Biomass, wood, charcoal, plant and animal wastes are considered as non-commercial energies because they are still largely obtained for free or small charges [1]. In cities and countrysides, various factors such as availability, cost and source of energy influence energy consumption levels. The shift from non-commercial to commercial and probably clean energy tend to increase with the community's income increase. In addition, in this region, due to lack of electricity, women and children are much affected. They spend many hours fetching firewood and cooking using traditional cooking stoves which produce indoor pollution. Cooking stoves and kerosene lamps cause many respiration diseases and cancer that affects rural population's life. To meet the targeted economic growth, energy generation required capacity would have to increase by 115 percent in Rwanda, 96.4 per cent in Kenya, 75.3 percent in Tanzania and 37.7 percent in Uganda [11].

### Energy sector in Southern Africa

The southern part of Africa forms SADC which stands for Southern Africa Development Community. Energy like fuel and electricity are major catalyzers of infrastructure projects that drive the regional economic development. SADC has been elaborating several energy development strategic plans since 1996 such as; Energy cooperation Policy and strategy in 1996, SADC Energy Action Plan in 1997, SADC Energy Activity Plan in 2000 and SADC Master Plan and its Energy sector plan in 2012. All these actions, plans and co-operations were to offset the energy accessibility, enhancing states infrastructures in energy and subsectors of petroleum, natural gas, coal, and renewable

energy and their efficiency and conservation [12]. Particularly in South Africa, Eskom is a very big electricity producer which generates approximately 95 per cent of electricity used in South Africa and about 45 per cent of electricity used in Africa. To overcome energy crisis and inaccessibility in SADC; Eskom with other facilities shall look ways to enhance distribution on large scale, avoid interruption of power supply to certain areas which slow down people's activities, create backup plans for critical areas( industrial parks, hospitals) and ensure proper management of grid systems. SADC has potential of having abundance of renewable energy sources which can be a powerful tool to complement coal and petroleum as sources of energy. The fact that Southern Africa region is exposed to high speed wind and enough solar radiation, SADC shall encourage global energy investors in order to foster the integration of independent power producers that will feed clean energy into grid system or off grid to meet energy demand within the region [13].

### Energy sector in Rwanda

Rwanda has set priorities in various infrastructures to transform itself from low-income economy to medium income country. After 1994 Genocide, the country has made a significant economic and social progress. Rwanda consumes 42 kWh/year/capita which makes it to be in low energy consumers countries compared to other developed countries. For the country development; it is important to study more energy source alternatives to which the country can be based on in attraction of investors and development of all sectors in general. Based on the geographic situation of Rwanda (center of Africa), Renewable energy is a strong potential to generate sufficient energy for population, institutions, industries and commercial districts (Table 1).

The energy sector is growing rapidly, electricity access through off grid and on grid connections to the urban and rural areas become a major tasks as the country strive to reach middle income level by 2020. To promote this and reinforce energy sector's policy, the government of Rwanda has a 7 years electricity target to deliver to the public grid until 2017 to;

- Develop new hydropower plants to deliver about 232 MW.
- Develop geothermal power plants with capacity of 310 MW.
- Generate power from methane gas to deliver 300 MW.
- Generate power from peat to deliver 200 MW.
- Strengthen and expand the transmission lines by an additional 2100 km.
- Connect a total of 1,700,000 customers to the electricity grid (70% of access rate).

Rwanda received \$ 95 million from the World Bank in 2015 in order to strengthen electricity network and connect more 74, 000 households by the year 2021.

**Geothermal energy:** Geothermal energy is clean and reliable source of energy which is known to be efficient and requires low maintenance cost once in place. It is not affected by short term fluctuation in the weather or oil prices in the World. The geothermal energy occurs in areas with young volcanism, seismic and magnetic activity known as the ring of fire. Rwanda, as part of the ring of fire zone hosts two potential zones for geothermal energy exploitation. In 1982, Gisenyi and Bugarama was identified by the French bureau of geological surveys (BRGM) as geothermal potential sites with temperature over 100°C. the potential power generation from geothermal is estimated to be 20 MW

Area	2010	2011	2012			2013			2014			2015			2016	
Households	112	112	134			134			134			135			126	182
			Off Peak	Mid-Peak	Peak	Off Peak	Mid-Peak	Peak	Off Peak	Mid-Peak	Peak	Off Peak	Mid-Peak	Peak	Connected on MV	Connected on LV
Industries	105	105	96	126	168	96	126	168	96	126	168	96	126	168	126	182

Table 1: Electricity price in Rwandan Francs per Kilowatt Hour (KWH).

in short term and 300 MW in long term once but the exact size of the source is not yet proven and can go up to 700 MW [14].

**Solar energy:** Solar energy is the production of electricity by means of light and heat from the sun that is controlled using power technologies. Solar energy provides power to buildings and homes by means of Photolytic systems, solar water heater, passive solar heating and daylighting, solar process space heating and cooling and solar electricity. Rwanda is located in the tropical region and has total sunshine hours ranging from 1800 up to 2200 hours per annum and the sunniest months are June and July. The solar radiation is substantial. The radiation intensity is approximately equal to 5 kWh/m<sup>2</sup>/day with about 5 hours sun shine per day [15]. Rwanda is keen to develop solar energy to contribute to its target of increasing access to electricity at 70% by 2017. Solar energy is clean and environmental friendly, people in rural and remote areas can generally benefit from off grid solar energy which gives them full availability of electricity from household level to commerce centers.

Solar photovoltaic systems can be developed on both small and large scale to generate electricity by means of semiconductor devices that convert sunlight into direct current (dc) electricity. In Rwanda most solar photovoltaic projects are on small scale so called home systems and play a big role in the electrification of individual homes, rural public facilities such as schools, hospitals, health centers and administrative bureau [16]. Solar plants makes over 4.5% of Rwanda's current total energy and is set to reach 563 MW by the year 2017/2018. Electricity to all is a priority for the government which is continuously looking ways to provide clean and reliable energy to satisfy the growing demand in cities and 100 percent access to the population. A target of 70% of Rwanda's households to electricity by 2018 was set by the government with 48% on-grid connected households, 22% off grid connected households. On the large scale; the country has already implemented 8.5 MGW PV project in Rwamagana District, 10MW PV project in Nyagatare district and 250 Kw PV project on top of Mount Jali in Kigali city. The ministry of Infrastructure, Rwanda Energy group and private companies like Ignite Ignite power Ltd, GigaWatt Global and Stadtwerke Mainz are playing big role in the development of solar energy and its infrastructures [17].

**Hydropower energy in Rwanda:** Hydropower potential in Rwanda is very high, hydropower consist of big hydropower plants, small and micro-hydropower plants. The country's major rivers count 333 potential sites for micro-hydropower. Government and Energy private sector work to install 563 megawatts distributed along the country by the year 2018. The geographic location and topography of Rwanda reflect to a high interest of installing many hydropower plants across rives but detailed feasibility studies should be done for the downstream impact as the country is one of river Nile sources. Rwanda is keen to develop hydropower resources as part of its strategy to mainly increase installed power capacity in the country [18].

**Medium and regional hydropower:** After 1994 genocide, some of hydropower projects were put in place and other are under construction; Rusizi III was constructed under European Union (EU), Africa Development Bank (AFDB) and the government of Rwanda

cooperation. Today it generates 145 MW shared by three countries; Rwanda, Burundi and Republic Democratic of Congo. Rusumo falls hydropower plant was constructed under cooperation of World Bank and Rwandan government, it is generating 81 MW and the power output will be shared by three countries which are Rwanda, Burundi and Tanzania. Nyabarongo hydropower plant installed on Nyabarongo River generates between 12-17 MW which are supplied to the national main grid. The total investment of these hydro powers sum up to 830 million USD (United states of America currency ) with \$ 450 million on Rusizi III, \$ 300 million on Rusumo falls and \$ 80 million on Nyabarongo II power plant [19].

**Small and micro-hydropower:** Small and micro hydro-power are usually define as hydropower generating 10 MW or there are various projects around the country and have significantly raised electricity in the national grid system. To develop water resource; the country plan to develop hydropower master plan in order to attract small and micro hydropower investors. These hydropower plants support rural energy development especially where the country national grid can hardly arrive, they may be connected on grid or be off grid system generating electricity in the surrounding areas. Recent micro hydropower has been successfully developed including Akanyaru generating 4 MW with investment of \$ 13 million, Ntaruka producing 2 MW with investment of \$ 10 million and other 20 projects totaling 9 MW with investment between of \$ 30 million finished in year 2015 [20].

A significant and continuous reduction of rivers' level due to climate change has affected the productivity of small and large hydropower plants by reducing power capacity. Hydropower is clean and renewable and if not protected and managed; these hydropower plants will not keep their power generation capacity.

**Methane gas:** The gas methane is found in the East African rift zone and the republic democratic of Congo. On the side of Rwanda, Lake Kivu with 2,400 sq. meters contains high concentration of gas methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>). The surface to 60 meters depth of the lake support the biology in it and the gas methane is locate underneath with maximum concentration locating between 270 meters to 500 meters from the surface.

Lake Kivu methane started to be extracted in 1963 by the Belgium company "Union chimique de Belge" with a gas pilot plant at cape Rubona and has supplied Bralirwa brewery to be used in its boilers requiring almost 5000 cubic meters per day of gas purified to 80%. This plant shout down after 40 years in operation. In 2016; KivuWatt phase I project become the World first methane gas water project to extract 26 MW to the national grid. It is located in Karongi District, Western province. this project has been implemented by an American firm named CountourGlobal and government of Rwanda which received funds from African Development Bank, World Bank, European union, Netherland, Belgium and United states of America. The phase II is under development and will be completed in 2020 with production capacity of 75 MW to the national grid. By the end of these two phases costing \$ 400 million of investment, Rwanda will have 100 MW to the national grid and will also benefit environmentally by the reduction of possible catastrophic outburst of the gas and aquatic animals preservation. Early

2017, the government of Rwanda signed an agreement with an American firm Symbion power LLC ltd to develop 50 MW taking \$ 106 million of investment and be completed within 36 month on the shores of Lake kivu in Rubavu district, Western province. The firm will be extracting, separating and processing gas methane dissolved in the deep water of lake kivu and deliver it to an on shore generating facility located at cape of Busororo in the same district (Nyamyumba).according to studies; lake kivu contains over 300 km<sup>3</sup> of dissolved carbon dioxide and 55 to 60 km<sup>3</sup> of methane gas accumulated and trapped in deep part of the lake. Lake Kivu has an estimated 700 MW of electricity from methane gas which can be extracted over 55 years and equally shared by Congo and Rwanda.

**Wind energy:** The rising of Energy demand in Rwandan cities and rural areas, the GoR is trying to explore all feasible ways to generate electricity. Wind is one of possible energy source development that can generate electricity to the National grid system or off grid by public or private places. Rwanda has an average wind speed which varies from 2 to 5.5 m/s and direction of wind which varies from 11° to 16°. The national meteorological agency has identified Kigali-Kanombe airport, Cyangugu-Kamember airport, Gisenyi, Gikongoro, Nyagatare and Butare as potential places to explore for wind power. So far; Wind energy has been used only in two sites: the first is in Gabiro district where a wind turbine is installed for the purpose of pumping water (3 m<sup>3</sup>/h), the second wind turbine was installed by a private person to supply 1 KW electricity to a cyber-network in Kigali city, Remera sector. There was a third which was at the National Radio and television headquarters but it was destroyed during the 1994 genocide [21].

**Peat to energy:** Peat is a source of energy which has been developed and used for at least 2000 years. It is an important alternative for firewood and charcoal for cooking and heating. Rwanda started plans to convert peat to energy since 1993 as the country indicates potential development of around 1,650 MW electricity from peat sources estimated at 155 million tones spread over 50,000 hectares in the country. Rwanda's peat potential places were identified in areas near Akanyaru River, Nyabarongo River, Rwabusoro plains and Bugarama sector. To date Rwanda is extracting 15 MW Gishoma peat to power located in Rusizi District, 80 MW in South Akanyaru in Gisagara District, 100 MW peat to power project located in Rwabusoro with PEC (Peat Energy Company), RAS (Rwanda Auto Service) and HAKAN Company respectively conducting mentioned projects. The peat mining opportunity is very high as Peat to power technology used is proven commercial and risks are very low in the environment. However, the government should undertake peat energy strategy, deep assessment of peat resources is supposed to be done for accurate and sustainably use because normally peat is not a renewable energy as it decrease with time and over exploration [17].

**Biomass energy:** Biomass energy is the longest energy in human kind history. It is obtained by burning combustible organic, non-organic matter which releases carbon dioxide in the atmosphere. In the energy demand, Biomass energy plays a big role to developing countries in meeting local energy demand to use in everyday life. It is the primary and substantial energy to use in absence of all other form of energy. Rwanda uses biomass energy in three ways namely; Traditional, improved and modern biomass. Traditional biomass energy is the generation of energy from biomass without any processing; it is the combustion of wood, grass, and other combustible matter at their original state. Improved biomass energy is a biomass energy technology used with designed cook stoves burning processed biomass such as charcoal and has for advantage to reduce heat loss, indoor

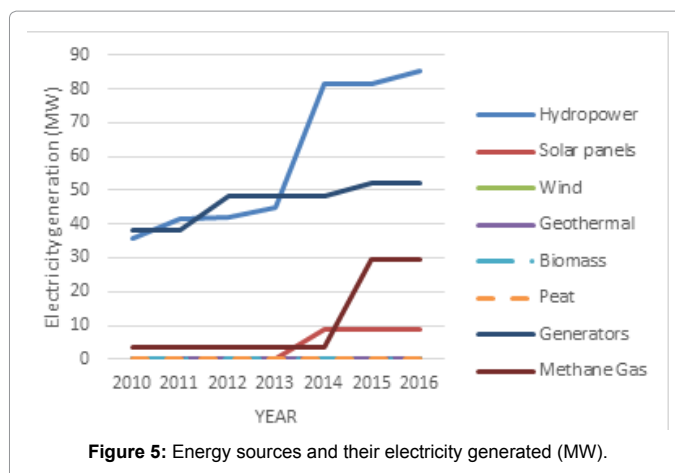


Figure 5: Energy sources and their electricity generated (MW).

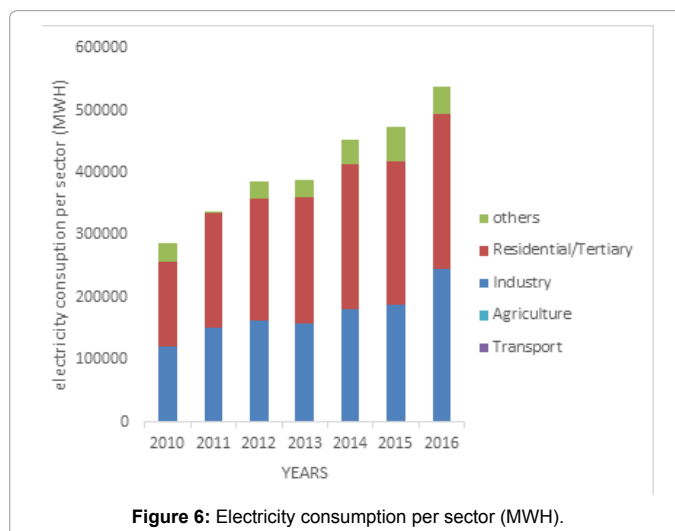


Figure 6: Electricity consumption per sector (MWH).

smoke and has increased combustion efficiency. A modern biomass energy was developed from the improved technology by looking available resources and minimizing risks and making this technology cleaner [22]. Biomass energy has been causing significant problems in population's life; the burning of combustible matter is associated to the release of carbon dioxide and other gases that cause air pollution, respiration problems, cancer, high mortality of children, . The increase in energy demand lead to the deforestation, loss of education time for kids fetching firewood for many hours daily and women sex violation in wood collection places. Rwanda is mainly using biogas energy with 84% of primary energy needs. Charcoal is the most used for cooking and heating resulting from tree harvesting across the country. Crop residue occupy a second source to families and facilities in cooking and heating. Energy strategy state that biomass consumption is expected to decline over time. The upgrade of cooking method from charcoal use to gas, solar, electricity and other form of energy will reduce the cutting of trees for charcoal making, air pollution from combustion and reduction of diseases and mortality from unclean energy (Figures 5 and 6).

## Conclusion

Electricity distribution in Africa is not uniformly distributed depending on countries economic levels. Countries having lot of energy generation potentials have not explored them to their best level. This explains the insufficiency of electricity in those countries and tendency

to import electricity from other countries. According to the non-energy sources distribution and electricity accessibility which is not reaching everyone; 800 million people living in sub-Sahara Africa will have to share sources between them in order to overcome lack of electricity challenges. At national and regional level, energy reform is to be done in order establish electricity trading between countries and to try to reap as much electricity as it can be allowed to take. Investment in energy sector has been successful in some places and failed in others. This may be caused by poor management and Energy policies. Due to the use of Alcaic energy technology, poverty persists in these regions because women don't find time improved themselves and kids don't have time to go to schools. They go fetch woods and charcoal instead. The lack of electricity is limiting Sub Sahara Africa's economic development as no industry or other facilities may come in such a region without electricity.

Rwanda, for the last 20 years, Electricity accessibility and installed capacity have been rising considerably. For only six years, it has raised from 77.76 Megawatts to 176.125 Megawatts without including under development Energy projects. Rwanda's rate of progress for expanding electricity is very good, the target of reaching 70% by the year 2018 is on way as many other energy infrastructures are being developed. Existing generation, transmission and distribution infrastructures have been reported to be properly managed and linked to meet Rwanda's target.

All hydropower plants are located in south and north-West of the country. This is because the steep topography which is advantageous due to alternatives of hills-valley and mountains. This region is known to have a favorable hydrology and dense rivers to generate electricity from small or medium hydropower plants. There are 25 hydropower plants in the country, some are still under construction and other are connected to the main grid with Ntaruka Hydropower plant in Burera District, generating the highest amount of electricity 11.25 MW. Solar radiation is high in the Center and flat areas of East of Rwanda and has made it possible to install solar power plants. To date; Jali and Gigawatts-Rwamagana solar power plants are the only solar power plants present and connected to the main grid. Gigawatts-Rwamagana solar power plant is the biggest, generating 8.75 MW on the national grid. To increase energy installed capacity and reduce possible power cut during business hours, Rwanda has installed to big electricity generators plants in Kigali city, Gasabo district, Jabana sector with 30 MW installed capacity. Biogas contained in Rwandan lakes is now extracted and Kivu-watt project has 26 MW as installed capacity supplied in national grid every day. The 3.6 MW project of KP-Rubavu is not operational due to its old and damaged operating system. Rwanda continues to boost its energy sector and follow its vision 2020 and Sustainable development goal to connect 70% country households. Currently two peat to power plants are being constructed; one in Rusizi District-Gishoma and another in Gisagara District-Rubona with installed capacity of 10.85

MW and 80 MW respectively.

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