Working Paper

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Renewable Energy Development in Africa

Perspectives on Challenges and Achievements

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Key message

- Africa remains a relatively minor player on the global clean energy landscape, while Asia and Europe dominate.
- Africa is faced by many technical and fiscal challenges as it endeavors to achieve the UN strategy towards Sustainable Energy for All (SE4ALL)
- Reliance on inefficient household cook-stoves and solid fuels leads to enormous burdens on families' livelihoods, especially women and girls in Africa.
- The role of regional corporations and development agencies in enhancing access to renewable technologies in Africa.

Introduction

While access to energy in Africa is essential for the reduction of poverty as well as promotion of social and economic growth, Africa continues to face critical challenges related to its energy sector. Provision of health services, education, communication technologies, industrialization, agricultural production, and expansion of municipal water systems all require abundant, reliable, and cost-effective energy access. Although in many ways fossil fuels provide a simple, easy to use energy source that powered the industrialization of modern nations, the negative consequences of the widespread use of fossil fuels are well known.

It has been argued that the application of renewable energy technologies has the potential to alleviate many of the energy problems Africa faces, especially if done in a sustainable manner that prioritizes human and environmental rights. While a great number of projects are currently underway aimed at electrifying rural areas either through grid or off-grid, there are many challenges hindering this goal. However, decentralized generation using renewable energy systems is a strategic policy option.

Biomass will remain one of the primary sources for meeting energy needs in most African households. Efficient use of biomass could reduce the resource pressure on fuel wood supply, reduce health impacts resulting from lower levels of indoor air pollution, decrease cooking time, and lessen the time spent gathering fuel and further reducing emissions. However, electricity use is gaining momentum especially in rural towns, powered by introduction of rural electrification programs in most countries. Due to this increasing demand for electricity across the continent, there is urgent need to adopt low carbon generation technologies, by using renewable sources rather than fossil fuel ones.

The main objective of this paper is to outline some of the benefits that African nations can enjoy if they shift from conventional energy sources to renewable ones. Key challenges incurred in the process of this shift have also highlighted. The other issue is the global concern that African nations will continue to be victims of resource exploitation from the North. Some policy options that could be implemented to avoid such scenarios have been discussed. Compelling case studies have been cited throughout, together with reference to some of the energy strategies proposed by African Regional Economic Communities (RECs).

i. What does the "Energetic Turn" mean for African countries?

The term "Energetic Turn" has been used variously. It has been used by civil society, researchers, and development agencies to refer to turning away from conventional fossil and nuclear energy to wind energy. In other debates, it has been used to refer to a shift from fossil and nuclear energy to wind, solar, biofuel and other renewable energies. There have also been debates as to whether this turn is a European project aimed at obtaining raw material from Africa for the generation of green energy to develop their economies.

As we are all aware, Africa is endowed with huge renewable energy resources but only a fraction is currently being exploited. Consider that only 5% hydropower has been exploited, and less than 1% of geothermal potential has been harnessed. Furthermore, Africa receives abundant solar radiation throughout the year, and recent studies have confirmed the availability of abundant wind energy resources along coastlines, and specific inland areas of the Continent.

Due to vast land mass and low population density in many African countries, centralized electricity generation faces many challenges due to high transmission costs. A variety of decentralized power generation technologies have therefore been proposed as providing a solution. Wind and solar energy have many inherent benefits to Africa due to their scalability, which means playing a key role in both decentralized and centralized systems.

Africa still lags behind other regions in development of wind energy. For example, in 2008, the Continent only had about 476MW of installed wind energy generation capacity compared to a global estimate of 93,900MW(GWEC,2012). While Africa is endowed with wind energy resources, it is only in Mediterranean North Africa that wind power has been developed at scale. According to Global wind energy council (2012) by the end of 2011, over 98% of the continent's total wind installations of just over 993 MW were to be found across four countries - Egypt (550 MW), Morocco (291 MW), Tunisia (114 MW) and Cape Verde (24 MW). Although North Africa remains the leading region in wind energy markets in Africa, southern and eastern African countries are expected to reduce the gap, contributing 36% and 8% respectively of combined ongoing and planned projects (Mukasa et al,2013). The Lake Turkana wind farm in Kenya is one of the largest wind energy projects planned in Sub-Sahara Africa. Egypt has a target of producing 20% of its electric power from renewable sources by 2020, while the Moroccan government has set a target of raising the contribution of renewable energy to 20% of national electricity use (up from 7.9%) by 2020.

In Kenya, the construction of the €582m Lake Turkana Wind Power project (LTWP) is due to start with support from World Bank and African Development Bank. LTWP will provide 300MW of low-cost power to the national grid, equivalent to about 20% of the current installed electricity-generating capacity. The major outstanding condition precedent is the issuance by KETRACO of the delayed Notice to Proceed (NTP) to Isolux, for construction to start on the transmission line (Tarnoy H, 2014). Although South Africa's electricity system is primarily based on coal, the country is ideally suited for wind power development, given its abundant wind resources. The South African

Wind Energy Association (SAWEA) estimates that with the right policy framework, wind turbines could provide as much as 20% of the country's energy demand by 2025, translating into 30,000 MW of installed wind farm capacity.

Africa has great potential for the exploitation of solar power especially in desert areas such as the Sahara, Namib, and Kalahari etc. Solar home systems are the most common application. For example, it is estimated that South Africa and Kenya have over 11,000 and 3,600 KWp installed, respectively. However, wider use of this energy option has been deterred by high upfront costs. Looking at COMESA region in particular with regard to total installed capacity, around 52,000 megawatts have been installed. Approximately 69 % of these is thermal and 30 % hydro (COMESA,2012).

Case Study 1: Geothermal Power Generation in Kenya

The instability of tectonic rocks in Kenya's rift valley has made the region major reservoir for geothermal resource. Kenya has a large potential of geothermal energy estimated to be more than 15000 MWe. Currently, only 160 MW are being exploited primarily for electricity generation. The formation of Geothermal Development Company (GDC) was designed to fast track the development of geothermal resources in the country. The creation of GDC was based on the government's policy on energy - Sessional paper No. 4 of 2004, and the energy Act No.12 of 2006 - which un-bundled the key players in the electricity sector to ensure efficiency.

To date, 33 wells have been drilled. Thirty-one of these are currently connected to the power station while two are retired. The main problem hindering Geothermal Power development is one of high tariffs. Besides primary generation of electricity, geothermal is also being used indirectly supply heat for greenhouse farming, swimming pool and pyrethrum drying. The Government needs to raise funds both internally and through donor support in order to undertake a comprehensive geothermal resource assessment. The project has received enormous support from the World Bank, the European Investment Bank, KfW of Germany, and Kenya's KenGen.

Case Study 2: Concentrated Solar Power (CSP)

Concentrating Solar Power (CSP) is a power generation technology that uses mirrors or lenses to concentrate the sun's rays and, in most of today's CSP systems, to heat a fluid and produce steam. The steam drives a turbine and generates power in the same way as conventional power plants. The innovative aspect of CSP is that it captures and concentrates the sun's energy to provide the heat required to generate electricity, rather than using fossil fuels, biomass fuel or nuclear reactions. Another attribute of CSP

plants is that they can be equipped with a heat storage system in order to generate electricity even on cloudy days or after sunset. This significantly increases the CSP capacity factor compared with solar photovoltaic systems.

CSP projects are currently running in Egypt, Morocco, Tunisia, and Algeria with support from the World Bank, working with the African Development Bank, Islamic Development Bank as well as Japanese, European, Arab, and other donors. Morocco announced a plan targeting 2,000 MW of solar electricity production by 2020, and in 2010 launched preparation of a 500 MW plant in Ouarzazate. Egypt plans to build a 100 MW solar plant in Kom Ombo.

Case Study 3: Biomass and Household energy

Traditional biomass, despite the environmental, social and health problems associated with it, remains the main source of energy for the majority of the disenfranchised. It accounts for 70-90% of primary energy supply in some countries, and as much as 86% of energy consumption. In some countries biomass energy contributes as much as 97% of total energy supply. It is important to note that variations exist within Africa regarding consumption of biomass fuel with, biomass accounting for only 5% of energy consumption in Northern Africa and 15% in South Africa.

Biogas, like solar energy technology, requires high installation cost, an amount that cannot be raised easily by many households. Countries like Ghana, Kenya, Niger, Burkina Faso, Mali, Ethiopia, Senegal and Rwanda have implemented pilot projects aimed at establishing the technical and socio-economic viability of biogas technology as an alternative source of energy for cooking and decentralized rural electrification.

Reliance on inefficient household cook-stoves and solid fuels leads to enormous burdens on families' livelihoods, especially women and girls. This is because in many communities in African society, cooking and fuel wood collection is regarded a women's work. Women and girls can spend 20 or more hours per week on long, exhausting walks and in dangerous and isolated areas in order to collect fuel for their families' cooking needs. This task is not only laborious and time consuming but also exposes women to many dangers including attacks by wild animals while collecting firewood in the forest. Kenyan government through the Ministry of Energy has drafted a legislation that will make it compulsory for institutions that consume large amount of biomass to install efficient institutional stoves in their kitchens. These institutions will include schools, hospitals, prisons, and hotels.

Selected International Interventions in Africa

This section of this article is going to focus on selected international interventions in Africa, as there are a number of combined global efforts targeting this region, specifically, to promote the adoption of clean energy technologies in households. This has resulted in international clean energy projects designed to develop strategies and policies to fast track the adoption of these technologies.

a) ***The Global Alliance for Clean Cook-stoves*:** This Alliance for Clean Cook-stoves was founded by the UN Foundation and is mandated to speed up and mobilize high-level national and donor commitments towards the global adoption of clean cook-stoves and fuels. The Alliance has a ten-year strategy to ensure adoption of clean cook-stoves and fuels in 100 million households by 2020(GACC,2011). Because of its active clean cook-stove sector, a high percentage of people reliant on solid fuels for cooking and committed governments, East African nations are expected to account for approximately 15% of the 100 million cook-stoves by 2020. The Alliance is in the process of finalizing Country Action Plans (CAP) for west and eastern Africa countries. A CAP defines what the Alliance, both its Partners and its Secretariat, will do to catalyze a thriving market for clean cooking solutions.

b) ***Policy Innovation Systems for Clean Energy Security (PISCES)*:** This was a research consortium implemented in five countries- Kenya, UK, Tanzania, India and Sri-Lanka- with support from the United Kingdom's Department for International Development. The six year researech project was designed to inform clean energy policy formulation and implementation. Knowledge has been generated regarding production of biofuel feedstock, processing, appliance modification, business value chain, and policy implications. The consortium influenced bioenergy policy discussions in Kenya, Tanzania and, Sri-Lanka some of which traslated into legislations while some are bills as a result of consortiu's input.

   In Kenya and Tanzania, a biofuel policy spearheaded by PISCES in collaboration with the Ministry of Energy and many stakeholders has been finalized. In the Kenyan case, for example, with the promulgation of the new Constitution, all government policies are being amended to meet more decentralized service delivery expectations. Therefore, Energy Policy is undergoing ammendments to incoporate renewable energy strategies and policies that also consider climate change adaptation and mitigation. Knowledge generated by the PISCES project

regarding bioenergy, on the whole, has been instrumental during this process(PISCES,2011). PISCES also contributed to the development of regional Biofuel Standards formulated by the East Africa Community (EAC) and the International Organization for Standardization (ISO).

c) ***Project Gaia*:** This is a global initiative for the development of clean-cooking fuels from alcohol fuels. These include ethanol and methanol for cooking, lighting, heating and refrigeration. Since these are readily available material that can be localy manufactured and commercialized, Project Gaia argues that this is what could make the fuel sustainable within the local communities. While it aims to raise awareness of the safety, health, economic and environmental benefits of alcohol fuels, Projecct Gaia is concious of economic, social, environmental, health, and natural resource management issues associated with non-sustainable biomass use and reliance on petroleum fuels, including kerosene.

Although Project Gaia Inc. is based in United States, it has active presence in many african countries such as Ethiopia, Nigeria, Madagascar, Kenya, South Africa and Malawi. In Ethiopia, Gaia is working with UNHCR to distribute stoves among Somali refugees who previously used firewood stoves and face many challenges collecting the firewood. In Nigeria, Project Gaia installed microdistilleries that produce ethanol fuel for cooking and lighting from cassava and cashew apple waste. In Madagascar, Project Gaia is working with a consortium led by Practical Action Consulting to investigate the use of ethanol as a household fuel.

d) ***Lighting Africa*:** This is a programme implemented by the World Bank through the Energy Sector Management Assistance Program (ESMAP) and International Finance Corporation (IFC). It is another intervention that attempts to provide good quality off-grid lighting products accessible to energy-poor households. Lighting Africa is operational in Kenya, Ghana, Mali, Nigeria, Uganda, Democratic Republic of Congo, Burkina Faso,Liberia,Tanzania, Ethiopia, and Senegal. The program was launched in September 2007 with the goal of catalyzing markets for clean, modern off-grid lighting products to light up the homes and businesses of 250 million people by 2030.. This will be achieved by facilitating sales of 500,000 good quality off-grid lighting products through commercial sector players by 2012, while establishing a sustainable commercial platform to realize the vision of supplying 250 million people with off-grid lighting products by 2030.

ii. What are the challenges faced by African countries in the field of renewable energies?

a) ***Finance:*** Typical challenges faced by the renewable energy industry included the high duty and tariff costs, challenges with reaching the necessary economies of scale, limited access to business finance and start-up capital, and a lack of distribution and credit networks. Alternative funding mechanisms are needed to provide strong incentives for partnerships and dramatically reduce the risk involved during the initial stages of entering the market, as the funding is made available on a grant or subsidy basis.

   Globally energy related investments in billions of dollars show that in 2009, while Europe and Asia invested 43.7 and 40.8 billion dollars respectively, Africa combined with Middle East invested a mere 2.5 billion dollars. Low budgetary allocation in many African economies is clear evidence that African nations are reluctant to promote. Moreover, most RET projects are funded by foreign countries and development banks.

b) ***Infrastructure:*** A lack of distribution facilities in these isolated rural regions is also a significant issue affecting the emergence of the RET market in Africa, as establishing a full distribution chain requires significant capital and human resource development. Non-profit actors (e.g. government and development agencies) can substantially reduce the risk associated with entering these markets by providing alternative funding mechanisms and assisting in the development of necessary distribution networks.

c) ***Unsustainable business models:*** Most RET projects in Africa have been introduced by non-governmental organizations. These non-profit sector projects are not founded on solid business models and cannot function in a market system or more critically that they may actually hinder the future introduction of private sector initiatives by distorting prices and market conditions. They have also been linked to lack of personnel skilled in areas such as supply chain management and basic business entrepreneurship. Therefore, many such projects collapse once the donor withdraws support.

d) ***Technological barriers:*** Historically low quality products have deterred consumers. However, within the last few years high quality products, designed for African markets have begun to emerge. Initiatives such as the World Bank's

Lighting Africa project have supported these advances and provide significant product information to wholesalers and other organizations in the field.

e) ***Policy and institutional frame***: Coherent, consistent, and conducive policy and regulatory frameworks are central to the successful dissemination of renewable energy in Africa, yet such frameworks are generally absent. This situation makes it difficult for private sector and research partners to operate effectively in promoting RETs. Many countries have attempted to introduce favorable policies, but these policies are not widespread and many are inconsistent, or there is policy disaggregation in key line Ministries. Policy makers need to develop effective and evidence based policies that would create an environment conducive to scaling up renewable energy technologies and enforcing such policies.

iii. How could Africa benefit from the change towards green technologies instead of being trapped in another neo-colonial setting?

Africa remains a relatively minor player on the global clean energy landscape, while Asia and Europe dominate. As the rate of population growth in Africa outpaces the rate of connection, this trend is likely to worsen, with the population in rural areas suffering the most.

Switching to lower carbon pathways by using renewable energy technologies provides many benefits. These include carbon credits under existing and future mechanisms. According to Stockholm Environment Institute (2009), study on economics of climate change in Kenya indicates that renewable electricity generation makes economic sense for both centralized and off-grid application, particularly for rural areas where access is limited and alternative diesel generation is very expensive.

As average temperatures rise annually due to climate change, the number of hotter days increases as well. This will lead to increased demand for cooling, which subsequently means increased electricity demand. African countries would therefore need to diversify their sources of electricity and shift to renewable energy if these energy demands are to be met.

As African economies aspire to move from agriculture to industrialization, a critical challenge facing this sector is high-energy costs. Depending on one source of electricity, generation is not going to be a solution. Renewable energy technologies can provide African nations with an ideal energy mix that would also reduce energy imports and

divert the funds to other economic activities like food production, education, and health.

A large number of the African urban and rural population will remain unconnected to electricity because of the high costs of grid extension especially to remote areas. Decentralized off-grid electrification can provide an alternative solution for many low-demand users, at lower cost than grid extension. Off-grid rural electrification can provide power for domestic uses (lighting, cooling, TV, radio, communication), productive uses (e.g., water pumping, fencing, cooling, mills, sewing machines, etc) and public uses (e.g., schools, health facilities, municipalities, police stations)(World Power,2000).

iv. What kind of circumstances and conditions do we need on a national & international level to avoid exploitation of resources in Africa by the global North?

In his book *Biofuels and the Globalization of Risk*, James Smith argues that the nature of biofuels, so debated and contested, allows us to understand the relationships between and possible impacts of climate change, globalization, and development in entirely new ways. Most African countries still operate on colonial policies, rendering them vulnerable to invasion of their land and other resources (including renewable energy ones) by developed nations. African land policies need to be mainstreamed to enable African economies to benefit from renewable energies while protecting them against yet another scramble for Africa.

Land policies should also be developed that will protect small-scale biofuel feedstock producers, as well as large-scale producers. For instance, the land law regime in Tanzania is a product of colonial era, and allows biofuels investors to take advantage of policy loopholes at the expense of local communities (Lorenzo et al, 2008). At present, through Tanzania Investment Centre, the Government is encouraging foreign investors to produce bioenergy for export and domestic consumption in order to reduce fossil fuel imports and foreign exchange drain. This has resulted in displacement of local small-scale farmers. In addition, most African countries do not have renewable energy policies to guide them on sustainable use of renewable energy resources in a manner that would benefit and protect them against intrusion.

In Ethiopia, a number of large-scale private investments have been granted license in regions where land cover is mostly natural forest, woodland, and rangeland. Forest

clearance and establishment of Jatropha plantations by these companies have negatively affected local communities. A German private company purchased 200,000 hectares of land to plant castor seeds for biodiesel production. By 2008, the company had reportedly cleared 10,000 hectares of virgin forestland and bought up communal grazing land that adjoins an elephant sanctuary.

Power asymmetry among local stakeholders is another aspect that has encouraged unfair acquisition of land for development of renewable energy resources by large-scale foreign investors. RETs players possess different capacity to influence decision-making and to mobilize political support. They have varied technological capacities and varied degree of internal cohesion, for instance where local groups are divided on their position on proposed investment projects. These differences may be exacerbated by the higher stakes brought about by the biofuel project, when some community members may oppose the project while others may strike deals with government, and the private sector to the detriment of many communities members.

It should be noted that large-scale privately owned RET projects are not the only economically viable models for renewable energy production. Business models that will help promote inclusion of both small and large scale RET investors should be explored. Renewable energy technologies such as solar and wind, and other small-scale distributed energy sources are manufactured in industrialized countries. Africa is therefore a market for these technologies. African countries therefore need to explore options of manufacturing renewable energy technologies in order to benefit from this sector.

As earlier mentioned, most African nations have failed to set aside funding that will enable them to harness the full potential of their renewable energy resources. A number of corporations from industrialized countries have taken advantage of this situation and are exploiting these resources in exchange of minimal returns. There is therefore a need to develop regulatory reforms that will enable African countries to absorb increases in development financing and thus be able to use their resources themselves.

Clearly, off-grid rural electrification programs will only work if they maximize the local content. The more local communities are integrated into the decision- making process and the more ownership they develop, the more sustainable the project will be. Awareness and training for local retailers, operators and fee collectors are needed to keep rural lights shining for many years.

Activities undertaken by selected Regional Economic Communities (RECs) in Africa.

Recognizing limitations of national energy markets, Africa is experiencing a shift towards regionally integrated energy markets. Regional Economic Communities (RECs) like East Africa Community (EAC), African Union (AU) and Common Market for Eastern and Southern Africa (COMESA) are already working on regionally integrated power pooling, policy planning and development, and energy access programs.

a) ***East African Community (EAC):*** Article 101 of the EAC Treaty requires that Partner States adopt policies and mechanisms to promote the efficient exploitation, development, joint research and utilization of various energy resources available within the region. EAC is running a program called New and Renewable Energy Sources and Energy Conservation and Efficiency. The objectives of this program include the following:

1. To promote development of New and Renewable Energy Sources for which the region has vast potential but have so far not been adequately exploited
2. To initiate programs on energy efficiency and conservation
3. To prepare a comprehensive energy conservation and efficiency strategy and plan
4. To prepare a Renewable Energy Master Plan that will feed into the Regional Energy Master Plan

A Regional Strategy on Scaling-Up Access to Modern Energy Services has been prepared, whose aim is to enable achievement of the Millennium Development Goals as well as poverty reduction in the region. Specifically, the strategy aims to address the following energy concerns in East Africa region:

i. Access to modern cooking practices for 50% of traditional biomass users

ii. Access to reliable modern energy services for all urban and peri-urban poor

iii. Access to electricity for all schools, clinics, hospitals and community centres, and

iv. Access to mechanical power within the community for all productive services.

A Regional Power System Master Plan and Grid Code Study was conducted by EAC and report was submitted in May 2011. The objective of the study was to identify regional power generation and interconnection projects in the power systems of East Africa Power Pool and EAC member countries in the

short-to-long term. The study covered Burundi, Kenya, Rwanda, Tanzania and Uganda.

Another commendable strategy by the EAC towards promotion of renewable energy is the current development of EAC Bioenergy Standards, in line with the ISO/CD 13065. This is standardization in the field of sustainability criteria for production, supply chain and application of bioenergy. This includes terminology and aspects related to the sustainability (e.g. environmental, social, and economic) of bioenergy. EAC has constituted a Technical Sub-committee based at the Kenya Bureau of Standards and is composed of many bioenergy stakeholders across East Africa. Development of these standards has received support from the Swedish Standards Institute (SIS) together with Swedish International Development Agency (SIDA).

b) ***Common Market for East & Southern Africa (COMESA)***: COMESA members recognize the fact the development of appropriate physical infrastructure and facilitation in energy, transport and communications are key issues order to facilitate trade and investment across member countries. Moreover, as the region's economy and trade continue to grow, energy will be a critical element to support and sustain the achieved growth. COMESA has therefore recognized energy infrastructure development as a priority and strategic focus area that requires special attention.

The removal of supply-side constraints related to energy is an essential pillar/component necessary for improved market access and enhanced productive capacity. It is also critical factor in reducing the cost of doing business and in enhancing the competitiveness of COMESA in national, regional and international markets.

The "Model Energy Policy Framework" which was developed by the COMESA Secretariat was adopted by COMESA Council of Ministers in November, 2007. Its goal is to meet the energy needs, in an environmentally sustainable manner, through providing an adequate and reliable supply of energy at least cost; to support social and economic development and sustainable economic growth and also to improve the quality of life of the people.

Member states are expected to streamline their national policies with this new COMESA policy on energy. Specific objective of this Model Energy Policy Framework is to provide an outline of contents expected in National Energy

Policy, which countries can then adopt and/or customize, therefore, harmonizing policies in the spirit of regional integration.

c) ***African Union (AU):*** The first High-level Biofuels Seminar in Africa was held at the African Union (AU) headquarters in Addis Ababa, Ethiopia from 30 July - 1 August 2007. The Delegates deliberated on the following issues, among others, in order to promote biofuel use in Africa:

i. The need to closely assess Africa's biofuel feedstock production capacities and comply with emerging global sustainability guidelines
ii. The need to develop conducive policy instruments such as blending targets, tax benefits, smart subsidies and loan guarantees, considering the cross-sectoral nature of biofuels
iii. The importance of developing of mutually beneficial partnerships with technology leaders with a view to acquiring and mastering biofuel technologies, by enhancing existing South-South mechanisms
iv. That Africa should ensure that biofuel production will not cause unacceptable tradeoffs throughout its value chain.
v. And finally to ensure capacity building activities for stakeholders along the biofuels value chain

During a Conference of African Ministers in Charge of Energy on 1-5 November 2010 in Maputo, Mozambique, African ministers resolved to launch the "All Africa Energy Week" (AAEW) as a recurrent, high-level stakeholder forum for monitoring progress, taking stock, undertaking constructive dialogue and sharing knowledge, with the aim of optimizing the utilization of all available human and financial resources to enhance energy access. The Ministers reaffirmed the urgent need to develop and strengthen national, regional and continental strategies for the development of sustainable energy supply through the diversification of the various energy resources available in the continent. They also expressed their will to promote renewable energy in joint effort with others to reduce green house gas effects and address all issues relating to climate change with the technical and financial support from developed countries.

d) ***New Partnership for Africa's Development (NEPAD):*** This is a program of the African Union (AU) adopted in Lusaka, Zambia in 2001. NEPAD is an intervention, spearheaded by African leaders to pursue new priorities and approaches to the political and socio-economic transformation of Africa. In a conference held in Nairobi between Sept 12th and 21st 2012 titled *Developing*

Africa's Response to Sustainable Energy for All, the technical team considered steps towards coordinated implementation of the energy priorities within the framework of the Program for Infrastructure Development in Africa (PIDA) as adopted by the January 2012, 18th African Union Summit. The meeting reviewed actions being taken on energy access, efficiency, and use of renewable energy. The workshop also discussed actions to be undertaken by African nations so as to achieve the three critical objectives of the initiative, namely-

i. Universal access to modern energy services;

ii. Doubling the share of renewable energy in the global energy mix; and

iii. Doubling the global rate of energy efficiency.

e) ***Comprehensive Africa Agriculture Development Program (CAADP):*** This is an Africa-owned and Africa-led framework through which the goal of transforming agriculture in Africa can be achieved. The CAADP position is that large-scale foreign land acquisitions constitute major and real concerns for Africans, and thus is of major concern to CAADP with regard to bioenergy feedstock. However, if land acquisition was carried out in a fair manner that will benefit African communities without undermining their rights, then bio-energy may provide new markets for farmers producing agro-fuels. While the pros and cons of bio-fuel production relative to environment and food security benefits are still strongly debated, the production of secondary sources could hold opportunities for African farmers. Greater benefits may be obtained if smallholders farmed bio-crops and biomass as a source of energy for themselves, contributed to commercial production for national or international markets (CAADP,2009). Additionally, some bio-crops can provide further benefits such as windbreaks, restoration of degraded areas, habitats for biodiversity and a range of ecosystem services.

Conclusion

Africa is endowed by huge renewable energy resources but this has not been fully exploited due to a number of reasons. These include lack of priority by many African governments during planning, un supportive policies that clearly consider promotion of renewable, low level of awareness among communities on the advantages of renewable energy technologies and inappropriate distribution models. However, countries mainly from the North are a breast in enhancing access to modern forms of energy. Selected countries from the south and east African regions are following soot and business as usual scenario is likely to change. Recent activities steered by civil societies, governments, and development partners are revealing joint efforts towards accelerating access to renewable energy products. It is through such collaborative endeavor that communities especially within Sub-Sahara Africa are going to realize the United Nations initiative of Sustainable Energy for All (SE4ALL) as evident by the case studies.

References

CAADP,.(2009). Sustainable Land and Water Management; CAADP Pillar I Framework. NEPAD. South Africa.

COMESA,.(2012). Energy Programme .Common Market for Eastern and Southern Africa. Lusaka.

GACC,.(2011). Igniting Change: A strategy for universal adoption of clean cookstoves and fuels. Global Alliance for Clean Cookstoves. Washington, DC.

Global Wind Energy Council,. (2012). Global wind energy outlook for 2012. Global Wind Energy Council. Brussels.

IRENA,. (2012). Renewable Energy Technologies: Cost analysis series; concentrating solar power, Volume 1: Power Sector, Issue 2/5 International Renewable Energy Agency.

James Smith,. (2010), Biofuels and the Globalization of Risk, Zed Books Ltd. London

Lorenzo, C., Nat D. and Sonja V,. (2008). Fuelling exclusion? The biofuels boom and poor people's access to land. IIED, London.

Mburu M,. (2009). Geothermal energy utilization. Geothermal Development Company. Kenya.

Mukasa, A., Mutambatsere, E., Arvanitis, Y., and Triki, T. (2013). Development of Wind Energy in Africa, Working Paper Series N° 170 African Development Bank, Tunis.

PISCES,. (2011). Bioenergy and Land; A review of linkages and impacts with a focus on Africa. ACTS Press. Nairobi.

SEI,.(2009). The Economics of climate change in Kenya. Stockholm Environment Institute. Sweden,

Tarnoy, H,.2014. Lake Turkana wind power project ,seminar on sustainable energy investments in Africa . Aldwych International, UK.

World Power,. (2000). Expanding electricity access to remote areas: Off-grid rural electrification in developing countries. World Bank. Washington DC.