978-989-8770-15-8

ISSN 2311-634X

West Africa Institute (WAI) - Institut de l'Afrique de l'Ouest (IAO) - Instituto de África Ocidental (IAO)

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www.westafricainstitute.org

West Africa Institute

Critical Analysis and Action Strategies

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Obstacles to the use of renewable energies and energy efficiency in the framework of a regional climate change policy in West Africa

No. 9 - 2014

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Abstract

Accelerating development in the ECOWAS region will require massive expansion of access to secured and affordable energy services especially electricity—currently reaching only about one-third of households. This paper explores how essential legal, policy and economic development might be reconciled with the need to keep carbon emissions in check through renewable energy deployment. The author adopted desk research and organised a workshop for experts in renewable energy (RE), energy efficiency (EE) and climate change to collect information. The paper argues that, scientific research into innovative financing mechanisms, capacity building for policy makers and financiers of Renewable Energy Technologies (RETs) and rational use of energy is needed to overcome legal, policy and economic obstacles to the development of RE and EE. The results suggest that though decentralized renewable energy will likely play an important role in expanding rural energy access, the specific energy needs of the people have to be considered. The issue of gender and energy access is very important and cannot be overlooked where sustainable energy development is under consideration. These findings underscore the need to de-carbonize energy mix for expanded power generation in West Africa.

Key words:

Renewable Energy, Renewable Energy Technology, Levelise Costs of Electricity

I. Introduction

The West Africa sub-region has abundant renewable energy resources which could be harnessed to provide sustainable domestic and industrial energy while at the same time, helping in the mitigation of climate change externalities. Nonetheless, the ECOWAS region is saddled with the challenges of energy access, energy security and climate change mitigation and adaptation, which are intertwined with the region's economic challenges.[1] The hugely identified potentials, geographically, are spread over the whole region; however, they are neither connected to each other physically nor having suitable policies to unlock them. The develop-

1 ECREEE, Baseline Report for the ECOWAS Renewable Energy Policy (EREP) (Praia, Cabo Verde: August 2012).

ment and use of these identified RE and EE potentials are hindered by legal and economic obstacles, leading to persistent challenges of energy access, energy security and climate change mitigation in the region.[2]

The result is that, the ECOWAS region continues to face significant challenges in energy delivery: with more than half of its 344.7 million citizens living in the rural areas and where access to electricity or the services it provides ranges between 6% and 8%.[3] That is more than 175 million people with no access to improved nor reliable and affordable electricity services.[4] To address these challenges simultaneously in order to shape the regional energy situation, urgent investments in sustainable energy infrastructure and services as well as policy frameworks in the ECOWAS member countries must be taken into account.[5]

2 ECREEE, Baseline Report for the ECOWAS Renewable Energy Policy (EREP) (Praia, Cabo Verde: August 2012). REN21. 2014. Renewables 2014 Global Status Report (Paris: REN 21 Secretariat) pp 92-97.

3 ECREEE, Baseline Report for the ECOWAS Renewable Energy Policy (EREP) (Praia, Cabo Verde: August 2012). REN21. 2014. Renewables 2014 Global Status Report (Paris: REN 21 Secretariat) pp 92-97.

4 SE4ALL. 2013. Global Tracking Framework (Washington, DC

5 Brown, M. A., Sovacool, B. K., 2011. Climate Change and Global Energy Security: Technology and Policy Options. MIT, London, England

There are certain schools of thought that describe renewable energy as ‘‘a doomed revolution’’ which has little future in tackling the perennial energy crises in mainly developing countries.[6] Going further, it’s noted, renewable energy is unsustainable in the longer term because, while it does have a minor, supportive role to play in the overall energy scheme of things, its negligible, considering the global percentage of renewable energy in the overall energy mix [7] However, others see renewable energy systems as offering unprecedented opportunity to accelerate the transition to modern energy services in the regions where affordability and accessibility of modern energy services are far behind expectations.[8]

To these schools of thought, not only will the deployment of RE and EE services increase access to sustainable cooking and heating devices, affordable lighting, communications and refrigeration; improve public health and energy for processing and productive activities, they are also important contribution to

6 Glover, P.C., Economides, M. J., 2010. Energy and Climate Wars. Continuum International Publishing Group

7 Glover, P.C., Economides, M. J., 2010. Energy and Climate Wars. Continuum International Publishing Group

8 Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP

the fight against climate change.[9] In a recent work, Ndzibah argues that improved access to clean modern energy in developing countries is a necessary requirement for the reduction of poverty, unemployment and the achievement of other economic goals.[10] Going forward, decentralized renewable energy solutions have been found to play a crucial role in the provision of access to modern, reliable and affordable energy services in rural and remote areas in Sub Sahara Africa. However, the investments in renewable energy mini-grids or stand-alone systems have not reached economies of scale.[11] Many of these solutions face challenges to attract financing due to the absence of tailored financing instruments and high overhead costs for the financiers or due to the absence of formalized policies besides legal and regulatory frameworks.[12]

9 United Nations. 2014. ‘‘Sustainable Development Challenges’’ available at www.sustainabledevelopment.un-.org

10 Ndzibah, E., 2013. Marketing Mechanisms for Photovoltaic Technologies in Developing Countries. Doctorate thesis. University of Vaasa, Finland.

11 ECREEE, Baseline Report for the ECOWAS Renewable Energy Policy (EREP) (Praia, Cabo Verde: August 2012).

12 Papermans, G., Driesen, J., Haeseldonckx, D., Belmans, R., D’haeseleer, W., 2006. Distributed generation: definition, benefits and issues. Energy Policy 33 (6), 787-798.

This paper can be described as ‘‘thinking out of the box’’ approach on the analysis of the legal, policy and economic barriers to the use of renewable energy and energy efficiency in the West Africa sub-region. It incorporates cross-sectoral and inter-disciplinary approach to the analysis and linkages of climate change policies, renewable energy deployment and identified barriers. It seeks to diagnose structural mechanisms that need to be ‘‘broken’’ to be able to implement renewable energy services to ensure sustainable regional energy sufficiency. At the end of it all, the paper will recommend a direction of long term renewable energy and energy efficiency research topics by which the West Africa Institute (WAI) in collaboration with its research partners will undertake. The idea is for WAI to use the proposals to source for funding and undertake the field research afterwards. The collaboration between WAI and ECREEE is still being developed. Further discussions on formulation of Terms of Reference (ToR) for the collaboration which would spell out the respective benefits for each organization is on-going. However, it could be pointed here that, WAI, with its reputable research skills and expertise and

ECREEE with its broad-based expertise in Capacity building, policy and RE & EE projects formulation will have mutual benefits from this collaboration.

The paper is organized as follows: It begins with a literature review on the status of energy access, and climate change and energy development in the ECOWAS region. The subsequent sections present the research method, results, and suggestions.

2. Background Literature

Analysis of the legal and economic obstacles to the use of renewable energy and energy efficiency in the framework of regional climate change policy will seek to assess and unveil the hidden constraints that are policy and economic related, described in the UN "Sustainable Development Challenges"[13] as primary obstacles to energy transformation in many developing countries. It will also seek to assess the inter-connections among renewable energy, climate change and legal framework development. An in-depth analysis of the inter-linkages among these subjects will contribute important knowledge in determining the pathway for planning and implementation of RE&EE programmes by policy makers and promoters.

A recent study, noted that, Green House Gas (GHG) emissions affect climate variability by generating, for example, a deficit in rainfall.[14] The climate pattern of the West African region is increasingly showing the effects of climate change due to the observed variations in the ecosystems and the economy.[15] The immediate effect of climate variability is food insecurity: for example, groundnut production has virtually disappeared in Niger and a similar trend is evident in Senegal. The Sahel region – including Senegal, Mali, Burkina Faso, Niger and Nigeria has experienced three decades of drought and patchy rain.[16] The quality of rain is as important as the amount of rain, with heavy downpours and wind causing flooding, erosion and deterioration of the soil.[17]

13 United Nations. 2014. "Sustainable Development Challenges" available at www.sustainabledevelopment.un-.org

14 Brown, M. A., Sovacool, B. K., 2011. Climate Change and Global Energy Security: Technology and Policy Options. MIT, London, England.

15 Alanne, K., Saari, A., 2006. Distributed energy generation and sustainable development. Renew Sustain Energy Review 10, 539-558; Akakpo, J., 2008. Rural Access: options and challenges for connectivity and energy in Ghana. Energy Policy 32 (5).

16 Gnansunou, E., 2008. Boosting the electricity sector in West Africa. IAEE Energy Forum 17 (3) 22-29.

17 Mallet, V., 2013. The African Energy Crisis. African Energy Journal 14 (3).

In addition to food insecurity, there is deterioration in air quality, especially in urban areas. The resulting pollution affects the quality of life of people in these areas. It also generates environmental costs and impacts on public health. Drought has resulted in increased dust generation in Western Africa and this affects not only the countries of the region but is believed to impact on climatic systems in the Caribbean and may affect coral reef health.[18]

To a significant extent, the goal of reducing greenhouse gas emissions may be aligned with the pursuit of other energy-related objectives, such as developing indigenous renewable resources and reducing local forms of pollution.[19] Implicitly, any resource investment in renewable energy development potentially is an investment in reduction of GHG emissions and for that matter, climate change mitigation.

Many studies have been undertaken at the regional and national levels to analyse the current energy problems in the ECOWAS region.[20] However, many of these studies have concentrated on conventional energy resources or specific renewable energy technology solutions, without concentrating on in-depth analysis of legal and economic obstacles to the use of renewable energy and energy efficiency in the framework of climate change policies.[21] The ECOWAS Centre for Renewable Energy and Energy efficiency (ECREEE) has succeeded in formulating Renewable Energy and Energy Efficiency Policies (REEEP) for the region. These policies were adopted by the heads of governments of the region in July 2013. Currently, 15 consultants have been hired by ECREEE (One for each country) to help in the development of various national RE&EE Action Plans (NREAPs and NEEAPs). The ECOWAS region however does not have regional Climate Change Policy and there are no specific analyses of the main legal and economic barriers to the use of RE&EE that link the climate change adaptation strategies.

18 Gnansunou, E., 2008. Boosting the electricity sector in West Africa. IAEE Energy Forum 17 (3) 22-29.

19 Alanne, K., Saari, A., 2006. Distributed energy generation and sustainable development. Renew Sustain Energy Review 10, 539-558..

20 Akakpo, J., 2008. Rural Access: options and challenges for connectivity and energy in Ghana. Energy Policy 32 (5); Gnansunou, E., 2008. Boosting the electricity sector in West Africa. IAEE Energy Forum 17 (3) 22-29.

21 Gnansunou, E., 2008. Boosting the electricity sector in West Africa. IAEE Energy Forum 17 (3) 22-29.

2.1. Status of Energy Access in the West African Region

The ECOWAS region is saddled with the challenges of energy access, energy security and climate change mitigation and adaptation, which are intertwined with the region's economic challenges. Citing from ECREEE statistical presentation on "The ECOWAS Region" where it was noted that, 60% of the region's population lives in rural areas. 58% of the over 344.7 million of the region's inhabitants have no access to electricity. The ECOWAS region has one of the lowest energy consumption rates in the world, where the poor spends more of their income on low quality energy services and the rural areas rely mainly on traditional biomass to meet their energy requirements. Household access to electricity services is only around 20% (40% in urban and 6-8% in rural areas).

Whereas the world electrical capacity averages 300W per capita, that of the West Africa sub-region averages 50W per capita, confirming the description that, each of the countries in the region is bitterly power-deficient.[22] In fact, the total electrical installed capacity of the 11 coastal west African countries, including populous Nigeria is just under 15,000 MW (megawatts) or 15 GW (gigawatts), roughly the installed capacity of one small United States' state such as Oregon.[23] The ECOWAS region however, covers a population far more than that of the entire United Sates of America.

Within ECOWAS, national electricity access rates vary widely, from Liberia with an electrification rate of 15% in 2011, to Cape Verde, which has achieved nearly universal access („7.1. Figure 1"). However, national rates mask wide disparities between access in rural versus urban areas. In many ECOWAS Member States, national power grids provide service only to major cities, leaving rural and peri-urban areas un-electrified.[24] Projecting the energy scenarios to 2030, ECREEE indicates that without significant investment in expansion of access, energy poverty will continue to have considerable negative consequences on regional economies and societies in West Africa.[25] Not only is access to electricity for domestic, industrial and productive uses limited in

22 Mallet, V., 2013. The African Energy Crisis. African Energy Journal 14 (3); Gianfranco, C., Pierluigi, M., 2009. Distributed multi-generation: A comprehensive view. Renewable and Sustainable Energy Reviews 13.

23 Mallet, V., 2013. The African Energy Crisis. African Energy Journal 14 (3).

24 ECOWAS. 2014. Renewables Status Report. ECREEE-REN 21 Joint project. 25-30..

25 ECREEE, Baseline Report for the ECOWAS Renewable Energy Policy (EREP) (Praia, Cabo Verde: August 2012).

West Africa, access to modern cooking fuels is severely limited as well.[26] In sub-Saharan Africa as a whole, the average share of national populations relying on solid fuels for cooking is just over 79%; within ECOWAS, this figure rises to 85.7%. Cooking with traditional biomass and solid fuels has significant negative impacts, particularly on women and children, who tend to spend more time near open fires and traditional cook stoves.[27]

Another important characteristic of the energy situation in the West Africa that cannot be overlooked is the problems with maintenance and upkeep which reduce functional capacity and creating further challenges. In Guinea Bissau for example, it has been estimated that as a result of obsolete equipment and limited maintenance, available capacity in the public network fell from 12.7 megawatts (MW) in 2003 to 2 MW in 2013. An estimated 400 MW of generation capacity is currently unavailable due to expansion and maintenance issues in Ghana. Dependence on either fossil fuels or hydropower can pose additional challenges. For example in Ghana, rising fuel prices and uncertain inflows to hydropower plants, particularly during the dry season, have resulted in a failure to achieve full generation capacity.[28] These scenarios may not be overcome until energy security: provision of sufficient and reliable energy supplies to satisfy demand at all times and at affordable prices, while also avoiding environmental impacts is addressed.[29]

With the adoption of the ECOWAS RE and EE policy by the energy Ministers of the region in October 2012, ECREEE and its partners initiated the regional cooking energy initiative called West Africa Clean Cooking Alliance (WACCA). The objective of WACCA is to bring clean, safe, affordable cooking energy solution to the entire ECOWAS population by 2030. It is worth noting that, despite this effort, none of the ECOWAS member countries has set specific targets for access to modern cooking fuels, improved cooking stoves and mechanical power. In addition, no country has set a specific target for

26 SE4ALL. 2013. Global Tracking Framework (Washington, DC).

27 SE4ALL. 2013. Global Tracking Framework (Washington, DC); Karekezi, S., Kithyoma, W., 2002. Renewable Energy Strategies for Rural Africa: is a PV-led renewable energy strategy the right approach for providing modern energy to the rural poor of sub-Saharan Africa? Renewable Energy 22 (1) 12-15.

28 Gnansunou, E., 2008. Boosting the electricity sector in West Africa. IAEE Energy Forum 17 (3) 22-29; ECOWAS. 2014. Renewables Status Report. ECREEE-REN 21 Joint project. 25-30.

29 Muller, S., Brown, A., Olz, S., 2011. Renewable Energy: Policy Considerations for deploying Renewables. (EMS), OECD-IEA, Vienna, Austria.

reducing the share of the population relying on traditional biomass.[30]

2.1.1. Renewable Energy Ressource Potentials

A recent work, noted that, the main energy resources in the region are natural gas (held in majority by Nigeria and lesser extent by Ivory Coast).[31] The region also produces hydropower, the majority of which is located in Nigeria, Ghana and Guinea Conakry and to a small degree, Sierra Leone, Liberia and Mali. About 23,000 MW of feasible medium to small hydropower potential have been identified out of which 18% or less (4,140MW) have been exploited.

In his technical discussion paper on general energy access in the ECOWAS region, N'Guessan indicated a huge potential for all forms of bioenergy (modern biomass, biogas and biofuel); average solar radiation of 5-6 kWh/m2 per day throughout the year for solar photovoltaic and solar thermal development and considerable wind power potential with an average of 6-7 m/s, going up to 12m/s in some countries.[32]

With respect to energy efficiency opportunities, there is significant potential to improve the demand side and supply side energy efficiency in buildings, appliances, power generation and transmission. It is estimated that in West Africa, 25% to 30% of the total electricity supply is consumed in the building sector, namely cooling and hot water heating. The technical and commercial energy losses due to theft and or illegal operators lie in the range of 25% to 30% (some sources quote 40%). This is quite high in comparison to the 7% to 10% range of energy theft in Northern America and Western Europe.[33]

All these potentials notwithstanding, the region continues to suffer the consequences of low access to modern, efficient and affordable energy services. The subject that needs to be addressed is whether nothing could be done to improve this situation.

30 N'Guessan, M., 2012. Towards Universal Energy Access Particularly in Rural and Peri-urban Areas of The ECOWAS Region: UNDP workshop, Quebec, Canada.

31 Kabele-Camara, A.K. 2012. Achieving Energy Security in ECOWAS through the West Africa Gas Pipeline and Power Pool Projects: Illusion or Reality? Masters Dissertation Published in CEPMLP Annual Review - CAR Vol. 16.

32 N'Guessan, M., 2012. Towards Universal Energy Access Particularly in Rural and Peri-urban Areas of The ECOWAS Region: UNDP workshop, Quebec, Canada.

33 ECREEE, Baseline Report for the ECOWAS Renewable Energy Policy (EREP) (Praia, Cabo Verde: August 2012).

2.1.2. Energy Access and Women

In the ECOWAS region, as it is in many developing regions of the world, a woman has the domestic responsibility to provide household energy for heating and cooking purposes. This responsibility socially assigned to women, places on them the unenviable roles as fuelwood collectors, charcoal producers and general domestic fuel suppliers. In the West Africa sub-region, women play key roles in energy use and supply, so energy projects will not be as effective without targeting both women and men.[34] Energy projects can contribute to gender equality and women's empowerment by involving women throughout the value chain and in decision-making roles from which they have traditionally been excluded. Incorporating gender concerns into energy projects can maximise the benefits of energy projects for both women and men, and increase the sustainability of energy initiatives. More than 80% of the inhabitants of the sub-region rely on solid biomass to meet their domestic energy needs and in this; it is women who are most involved. The time and physical effort expended by women and girls in gathering fuel and carrying water seriously limits their ability to engage in educational and income-generating activities. Literacy rates and school enrolment levels in many of the ECOWAS member countries are dramatically different for men and women. Much of women's time is taken up with difficult and time-consuming chores related to producing and processing food without mechanical or electrical equipment and with cooking without clean-burning fuels and energy efficient appliances.

Renewable energy systems have been found to offer unprecedented opportunity to accelerate the transition to modern energy services in the remote and rural areas in the region where affordability and accessibility of modern energy services are far behind expectations.[35] The deployment of RE and EE services will increase access to sustainable cooking and heating devices, affordable lighting, communications and refrigeration; improve public health and energy for processing and productive activities.[36]

34 Ahuja, D., Tatsutani, M., 2009. Sustainable Energy for Developing countries. SAPIENS Vol.2 (1) 9-16

35 Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP.

36 SE4ALL. 2013. Global Tracking Framework (Washington, DC); United Nations. 2014. "Sustainable Development Challenges" available at www.sustainabledevelopment.un.org

The need for research into mainstreaming gender in energy services in the region cannot be overemphasized.

2.1.3. Vulnerability of the ECOWAS region to Climate changes effects

The impact of climate change is becoming a major contention to the sustainable development of the ECOWAS region. According to the ECOWAS annual report, West Africa will pay a heavy price as a result of the negative effects of climate change.[37] The region already suffers from changing and extreme weather conditions and according to the 5th assessment report of IPCC, the overall Impacts of climate change in the ECOWAS region and the climatic change effects currently being experienced are likely to intensify.[38] Droughts, floods, storms and temperature changes will increase both in frequency and intensity. Precipitation levels and rainfall patterns are also likely to change thus impacting negatively on agricultural productivity and energy security of ECOWAS countries.[39] Sharp differences in climate change effects would be seen across different regions and those in the weakest economic position are likely to be the most vulnerable to the effects climate change.[40]

The ECOWAS region in this case is particularly vulnerable because, as indicated, 11 out of the 15 countries in the ECOWAS region are considered least developing countries (LDCs) with little adaptive mechanisms to the climate change effects.[41] Impact of Climate change in these countries will limit any attempt to progress towards the goal of sustainable economic development.[42] Addressing the effects of climate change through technologies that minimize the emission of greenhouse gases is therefore highly relevant for the

37 ECOWAS. 2013. Annual Report: ECOWAS Adaptation to Climate Security and Development Changes. Abuja, Nigeria. 124-135.

38 IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, P. Gian-Kasper, M.M.B. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, P.M. Midgley (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

39 IPCC (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

40 ECOWAS. 2013. Annual Report: ECOWAS Adaptation to Climate Security and Development Changes. Abuja, Nigeria. 124-135.

41 ECREEE. 2012. In Vilar D., (ed.) ''Renewable Energy in Western Africa: Status, Experiences and Trends''. A joint project work; ECREEE, ITC and CASA Africa. Madrid, Spain.

42 United Nations. 2014. ''Sustainable Development Challenges'' available at www.sustainabledevelopment.un-.org

ECOWAS region.[43] In previous works, a wide array of viable and cost-competitive options can be explored to provide sustainable energy services to displace the current overreliance on fossil fuels and its consequent GHGs emissions.[44]

Discussing climate change effects in the ECOWAS region without mentioning its peculiar impact on women and children is like taking the cake half-baked. In the West Africa sub-region, women are already facing many challenges, especially those who are living in poverty and/or dependent on small-scale agriculture and collection of water and fuel from their local environment to meet their daily needs (mainly in the rural communities). In many cases they lack even basic technologies and modern energy services like lights, stoves, grinders and pumps that could ease their daily household burdens, or any modern equipment that could provide opportunities for sustainable livelihoods.[45] Climate change is likely to make the lives of such women even more difficult as indicated.[46]

Another gloomy analysis suggests that if we act now, we have 10 to 15 years' "breathing space" during which action is possible at a relatively modest cost.[47] But every year of delay reduces this breathing space, while requiring ever more stringent measures to make a difference.[48] All these are clear indication of what the future holds for the people and environment of regions like that of the ECOWAS.

2.1.4. The political approach to the regional energy access challenges

The Energy sector in West Africa is considered today as one of the most prominent integration factor for the region. Some political responses and strategies have been put in place with the aim of tackling energy access problems in the region. Both the ECREEE

43 Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP

44 Brown, M. A., Sovacool, B. K., 2011. Climate Change and Global Energy Security: Technology and Policy Options. MIT, London, England; Martinot, E., McDoom, O., 2000. Promoting Energy Efficiency and renewable energy. Global Environment Facility Climate Change Project. GEF, Washington, DC.

45 N'Guessan, M., 2012. Towards Universal Energy Access Particularly in Rural and Peri-urban Areas of The ECOWAS Region: UNDP workshop, Quebec, Canada.

46 IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, P. Gian-Kasper, M.M.B. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, P.M. Midgley (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

47 Organisation for Economic Co-operation and Development. 2008. Climate Change Mitigation: what do we do? Available at www.oecd.org/env/cc/41751042.pdf

48 Organisation for Economic Co-operation and Development. 2008. Climate Change Mitigation: what do we do? Available at www.oecd.org/env/cc/41751042.pdf

Baseline report on the renewable energy policy and the policy document itself[49] talk about the ECOWAS Energy Protocol adopted in 2003, which provides a legal framework for energy sector investments and trade guarantee on key principles as “open access” and “free trade” of electricity within West Africa. Since that date, efforts have been continuous and uninterrupted in order to establish the regional electricity market. The creation and operationalization of the three specialized institutions of ECOWAS namely: the West African Power Pool (WAPP) Secretariat in Cotonou (2006), the ECOWAS Regional Electricity Regulatory Authority (ERERA) in Accra (2008) and the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) in Praia (2010) have materialized the political commitment of the 15 ECOWAS Member States.

49 ECREEE. 2012. In Vilar D., (ed.) “Renewable Energy in Western Africa: Status, Experiences and Trends”. A joint project work; ECREEE, ITC and CASA Africa. Madrid, Spain; ECOWAS. 2012. Renewable Energy Policy. Available at www.ecreee.org

2.2. Climate change and renewable energy development in West Africa

Many studies have identified inherent linkages between climate change and renewable energy development and use, and have linked the barriers to the use of renewable energy and energy efficiency to those of climate friendly technologies.[50] A recent work, described the barriers facing climate-friendly technologies as tenacious and interconnected.[51] They further assert these barriers are deeply embedded in social fabrics, in institutional norms, in regulations and tax codes and in models of productions. With this description, it is apparent that one cannot undertake analysis of the legal and economic obstacles without looking into its interconnectivities. The paper will therefore attempt to touch on

50 Glover, P.C., Economides, M. J., 2010. Energy and Climate Wars. Continuum International Publishing Group; IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, P. Gian-Kasper, M.M.B. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, P.M. Midgley (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA; IPCC (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

51 Brown, M. A., Sovacool, B. K., 2011. Climate Change and Global Energy Security: Technology and Policy Options. MIT, London, England.

all the prominent inter-linkages in the energy access challenges in the region.

2.2.1. Energy and Climate Change

It is difficult to make accurate assessment of the impacts of climate change and attempts in this area are limited, especially in African countries.[52] However, the 2013 IPCC report gives an analysis of overall impacts of climate change on the West Africa region. It is based on this report that I will argue on the need to have fully elaborated climate change policy and legal framework for the sub-region. In the same work elaborate on the likely negative climate change impacts on the region, citing high risks of flooding that could threaten people, flora and fauna; a decline in agricultural yields which could be a threat to food security, could result from prolonged drought and heavy floods.[53]

Effects of rising sea level, a phenomenon which could result in 5-10% loss of GDP, shortage of portable water supply in cities located along the coasts;

52 ECOWAS. 2013. Annual Report: ECOWAS Adaptation to Climate Security and Development Changes. Abuja, Nigeria. 124-135.

53 ECOWAS. 2013. Annual Report: ECOWAS Adaptation to Climate Security and Development Changes. Abuja, Nigeria. 124-135.

severe changes in rainfall patterns in the region which will adversely affect migration, agriculture, forestry, livestock, water resources and energy. All these adverse consequences of climate change stimuli can be felt in the region if efforts are not made today to safeguard the future. Sub-Saharan Africa stands to suffer immensely from climate change externalities by virtue of its low adaptive potentials in terms of economy and infrastructure. The answer to these problems lies in the use of renewable energy sources in place of conventional fossil fuels.[54] Though the region can boast of concrete policies on agriculture, environment, water resources and currently renewable energy and energy efficiency, there is no elaborated climate change policy. There are however, climate change adaptation and resilience strategies which aim to address or lessen the effects of climate change on the environment and the people.[55]

These adaptive strategies; described as robust decision making steps to be taken in the face of uncertainty do not put targets and requirements on member

54 Ahmada, S., Abidin, A., Kadirb, M. Z., Shafiea, S., 2011. Current perspective of the renewable energy development in Malaysia. Renewable and Sustainable Energy Reviews 15, 897-904.

55 ECOWAS. 2013. Annual Report: ECOWAS Adaptation to Climate Security and Development Changes. Abuja, Nigeria. 124-135.

countries to ensure compliance.[56] For instance, countries and communities in the ECOWAS region have been advised to set up adaptation and resilient strategies in order to address or lessen the effects of climate change in times of need. These advices are however not backed by legislations and for that matter not binding or mandatory.

Policies backed by legislations on the other hand, would demand action from member countries in the field of climate change effects. Sometimes policy imperatives clash, requiring policy modification or compromise. Strategies could also be modified to include specific quotas with better overall balance of focus.[57] It is in this light that, this paper is calling for modification and elaboration of the regional climate change adaptation and resilience strategies into concrete policies with mandates and quotas. This paper strongly advocates for scientific research into regional climate change policy and legal framework.

56 Lempert, R. J., Schlesinger, M. E., 2000. Adaptive strategies for abating climate change. Cambridge University Press. Climate Change 33, 2.

57 Muller, S., Brown, A., Olz, S., 2011. Renewable Energy: Policy Considerations for deploying Renewables. (EMS), OECD-IEA, Vienna, Austria.

2.2.2. Policy barriers

Though renewable energy motivations could lead to similar measures designed to encourage technology development and deployment, sometimes policy barriers become the obvious setback in their progress. It has been observed that, among the critical components in the strategies to promote the development and deployment of renewable energy and energy efficiency solutions are policies and legal frameworks backed by legislations.[58] In the West Africa sub-region, renewable energy is seen as a new technology, the development and deployment of which therefore need the support of policymakers.[59] Well-designed policies and programmes can address the majority of the region-wide barriers that militate against the smooth deployment of RE and EE. Challenges include policy, regulatory, financing, investment, technology, and capacity barriers; limited public awareness; a lack of standards and quality control;

58 Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP; ECOWAS. 2013. Renewables Status Report. ECREEE-REN 21 Joint project. 30-33

59 Muller, S., Brown, A., Olz, S., 2011. Renewable Energy: Policy Considerations for deploying Renewables. (EMS), OECD-IEA, Vienna, Austria; Martinot, E., McDoom, O., 2000. Promoting Energy Efficiency and renewable energy. Global Environment Facility Climate Change Project. GEF, Washington, DC

and inadequate resource assessments have been identified in the ECREEE Baseline report 2012.

Policy as a barrier to the use of renewable energy and energy efficiency can be exemplified in different fronts: complete lack of policy, the clash of policy imperatives requiring modifications or the formulated policies are simply not being implemented.[60] In the West Africa sub-region, there were no regional RE and EE policy to facilitate the deployment of the technologies. Though some of the member countries had energy policies, they were not backed by legislations.[61] Recent developments have seen some of the ECOWAS countries setting RE targets e.g. Cape Verde, Cote d'Ivoire and the Gambia; implementation has not been so much of a priority by the various governments.[62]

In general, development and use of RE and EE in the West Africa sub-region has not had the policy and legal support in many of the member countries. As noted several reasons in the front of

60 Muller, S., Brown, A., Olz, S., 2011. Renewable Energy: Policy Considerations for deploying Renewables. (EMS), OECD-IEA, Vienna, Austria.

61 N'Guessan, M., 2012. Towards Universal Energy Access Particularly in Rural and Peri-urban Areas of The ECOWAS Region: UNDP workshop, Quebec, Canada.

62 N'Guessan, M., 2012. Towards Universal Energy Access Particularly in Rural and Peri-urban Areas of The ECOWAS Region: UNDP workshop, Quebec, Canada.

policy and legal framework explain the weak contribution of renewable energy sources to modern energy access for populations in the region.[63] First, in situations where the policies exist, they are not backed by legislation. In many of the countries, standards and codes are absent or not adequately developed. Coherent, consistent and conducive policy and regulatory frameworks are central to the successful dissemination of renewable energy in the region, yet such frameworks are generally absent.

Though currently, RE and EE policies developed by ECREEE have been adopted by the heads of governments of the member states, they are neither operational nor are the bidding principles being enforced on any country. The ECOWAS RE Baseline report indicates that by 2030, 104 million inhabitants will be supplied with decentralized mini-grid systems, while 47 million inhabitants living in small settlements will be supplied by stand-alone systems.

The question is, how are these going to be made possible? Regional policies on agriculture, environment and water resources are not enforced in any way. In February 2000, the Governments of

63 ebd.

Nigeria, Benin, Togo and Ghana signed an Inter-Governmental Agreement (IGA) establishing the framework to realise the West Africa Gas Pipeline (WAGP) project and outlining each Government's commitment to the project participants.[64] Finally in February 2003, the four countries agreed on the enactment of a Treaty, valid for twenty years, to provide for an inclusive legal, fiscal and regulatory framework. Despite this legal and regulatory framework, the pipeline which is to provide uninterrupted gas supplies to Benin, Togo and Ghana sometimes can be described as ''dry holes'' because of frequent lack of supplies. The fact remains, policies and legal frameworks developed in the region are not always utilized.

The bioenergy sector is one of the least attended to in the West Africa region. Governments still exhibit lack of political will to become involved in the wood energy sector. They often deliberately leave it in the hands of the informal sector and abstain from measures for fighting corruption and abuse of power by forest officials.[65] Sudden interventions such as putting blanket ban on exploitation of wood for charcoal and firewood have been seen to be counter-productive as has been experienced in Chad, Kenya and Tanzania.[66] Strengthening the institutional frameworks that oversee the household energy services and providing also adequate policy framework for the promotion of sustainable woodfuel production cannot be overemphasized.[67]

The work on the development of the various national RE and EE Action Plans (NREAPs and NEEAPs) is still at its infantile stage or on the drawing boards. Though formulating specific RE & EE policy targets that will promote private sector involvement, attract foreign and local investors, public-private partnerships that will promote innovative supply chain models in RE & EE dissemination is highly recommended; the implementation and enforcement of such policy is very important. In the

64 Kabele-Camara, A.K. 2012. Achieving Energy Security in ECOWAS through the West Africa Gas Pipeline and Power Pool Projects: Illusion or Reality? Masters Dissertation Published in CEPMLP Annual Review - CAR Vol. 16.

65 Sepp, S., 2014. Multiple household fuel use. In Volkmer, H., (ed.) A balanced choice betwenn firewood, charcoal and LPG. GIZ, Frankfurt, Germany. P7.

66 Sepp, S., 2014. Multiple household fuel use. In Volkmer, H., (ed.) A balanced choice betwenn firewood, charcoal and LPG. GIZ, Frankfurt, Germany. P7

67 N'Guessan, M., 2012. Towards Universal Energy Access Particularly in Rural and Peri-urban Areas of The ECOWAS Region: UNDP workshop, Quebec, Canada; Sepp, S., 2014. Multiple household fuel use. In Volkmer, H., (ed.) A balanced choice betwenn firewood, charcoal and LPG. GIZ, Frankfurt, Germany. P7.

ECOWAS, the RE and EE policies were modelled on the European Union structure, whereas the EU has powerful agency to champion the enforcement of the RE targets, the ECOWAS RE and EE policies did not include enforcement agencies.[68] The ECREEE National Focal Institutes (NFIs) who have been earmarked to monitor the implementation is already a spent force. Many activities left with the NFIs are not seen to in any way. To ensure implementation of the RE and EE policies, the ECOWAS Commission in collaboration with ECREEE will have to form an authorized implementation enforcement agency.

2.2.3. Economic Barriers

Sustainable energy, energy that is accessible, cleaner and more efficient, is a key to achieving economic development and poverty reduction targets.[69] This assertion is applicable mainly to the people of poorer regions and countries.[70] It must be realized that, people without access to modern forms of energy live in regions of the world where the population is growing most rapidly.[71] To make a difference in these people's lives, they need to be provided with connection to electricity grid or provide them with power sources suitable for off-grid applications.[72] The questions that come to mind are; does increase in access to electricity always reduce poverty or guarantee economic independence? How can we ensure that increase in access to electricity improves poverty reduction?

The characteristics of rural communities in the West African region which include settlement geographical density, population density and low income level and income cycles and its geo-demography determine the peculiar nature of their energy demand.[73] In these communities, electricity is needed for household basic non-productive needs (cooking, space heating and lighting); agriculture and fishing products conservation and

68 ECREEE. 2012. In Vilar D., (ed.) ''Renewable Energy in Western Africa: Status, Experiences and Trends''. A joint project work; ECREEE, ITC and CASA Africa. Madrid, Spain.

69 Energy Facility II contract, ACP/EU/2IE 2011. Sustainable production of decentralized electricity for rural and peri-urban population of sub-Saharan Africa: development of the 'Flexi Energy''

70 Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP

71 Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP

72 Gnansunou, E., 2008. Boosting the electricity sector in West Africa. IAEE Energy Forum 17 (3) 22-29

73 United Nations. 2014. ''Sustainable Development Challenges'' available at www.sustainabledevelopment.un-.org

transformation needs; manufacturing and services (tailor, carpenter, business centres, mechanical shops, etc.).[74] For these people, access to affordable and desired electricity is a major determinant for poverty alleviation.[75]

To overcome the economic obstacles to the use of RE is not only to surmount the upfront cost of renewable energy technologies deployment but also tackling the issues of productive use of the energy that is provided[76]. This means decision making on the type of energy technology to deploy has to take into consideration the locality and livelihoods of the people, their immediate needs and future aspirations.[77]

A previous research, noted that the New Partnership for Africa's Development (NEPAD) set the ball rolling in this direction way back in 2001.[78] Among the objectives set by NEPAD was "to increase from 10% to 35% or more, access to reliable and affordable commercial energy supply by Africa's population in 20 years". It is important to note that the NEPAD objectives already at this stage, pointed in the direction of productive activities for economic growth, reversing environmental degradation associated with traditional fuels and regional integration.

Research into how policy decisions are made in terms of energy demand and supply to communities will go a long way to fill this gap of misplaced priority allocations or top-down decision making and implementation of energy projects.

Research indicates that, both domestic and international funding have to be sourced as a key route to overcome the economic obstacles surrounding the energy access and challenges.[79] On the domestic funding front, it is important that countries mobilise all the financial resources to make a stronger case for external funding. Experience shows that addressing African energy problems cannot be done without significant doses of local financing.[80] The collaboration offered by the Africa

74 Shanker, A., 2011. Deploying PV services for regional development. IEA PVPS Workshop, Fukuaka, Japan

75 Shanker, A., 2011. Deploying PV services for regional development. IEA PVPS Workshop, Fukuaka, Japan

76 SE4ALL. 2013. Global Tracking Framework (Washington, DC)

77 United Nations. 2014. "Sustainable Development Challenges" available at www.sustainabledevelopment.un-.org

78 Brew-Hammond, A., 2009. Energy access Africa: challenges ahead. Available at www.elservier.com/locate/enpol Energy Policy 38, 2291-2301

79 Brew-Hammond, A., 2009. Energy access Africa: challenges ahead. Available at www.elservier.com/locate/enpol Energy Policy 38, 2291-2301

80 Brew-Hammond, A., 2009. Energy access Africa: challenges ahead. Available at www.elservier.com/locate/enpol Energy Policy 38, 2291-2301

EU Energy Partnership (AEEP) is an example of promoting dialogue and providing a framework in which policies and projects can be implemented with high levels of delivery and stakeholder buy-in, to significantly improve the lives of many millions of people.[81]

Fuel subsidies in favour of fossil fuels have been blamed for lack of development of renewable energy sources.[82] When talking about fuel subsidy, the question that comes to mind is; do the subsidies really benefit the target groups over the years? More often than not, the benefits end up going mostly to the richest individuals to the detriment of more productive ventures such as health, agriculture, education, infrastructure and more energy generation initiatives.[83] Subsidies create distortions among supply options encouraging investments in cheaper conventional technology and discouraging investments with high upfront capital cost (typically RETs), especially when planning never consider in real economic terms these least cost options.

81 Africa European Union Energy Partnership, 2020 political targets: : Declaration of the First High Level Meeting of the Africa-EU Energy Partnership, Vienna, Austria, 14 September 2010

82 Mallet, V., 2013. The African Energy Crisis. African Energy Journal 14 (3)

83 Mallet, V., 2013. The African Energy Crisis. African Energy Journal 14 (3)

According to the World Bank's estimates, technically, sub-Saharan Africa could accommodate more than 3200 CDM projects, enabling an additional power generation of 170 GW. Although the ECOWAS's CDM project potential is huge, the region benefits less from the carbon market.[84]

Global petroleum prices are dictated by certain macro-factors for which various governments have no control over. The notable factors include growth of global oil demand, Increase in speculative transactions and the rise of risk premiums, decline in oil production capacities (peak oil), fears of supply disruptions and cost of oil production.[85] However, more specifically in West Africa, the greatest impediments to the stability of the petroleum prices are the depreciation of the currencies of most of the countries and high inflation rates. It is true that, fuel subsidization is a major policy in all the European Union member countries, but the economies of the West African countries do not have the financial bases to support such

84 The World Bank. 2011. Annual Report. Available at www.siteresources.worldbank.org Washington, DC.

85 Organisation of Petroleum Exporting Countries. Monthly Oil Market report. (June 2014), Vienna, Austria. Available at www.opec.org

policies.[86] Innovative legal framework and policies to mainstream RE and EE for economic support is very much recommended.

Moreover, institutional frameworks and incentives need to be developed to attract private investors especially if decentralised energy sector in the region will thrive as noted in Painuly's recent work and the SE4ALL global tracking framework. [87] The development of RE is part of a progressive approach based on sequenced series of setting financing systems. Before reaching a RE environment supported by the involvement of a strong private sector and banking system, it is necessary as part of an emerging market to support the development of RE by mixing subsidies, tax incentives and by the establishment of a favourable regulatory framework for RET IPP, and the feed in tariff approach.

86 Regarding fuel subsidization in the EU, see: Africa European Union Energy Partnership, 2020 political targets: : Declaration of the First High Level Meeting of the Africa-EU Energy Partnership, Vienna, Austria, 14 September 2010

87 Regarding the decentralisation of the energy sector in the region, see: Painuly, J.P., 2000. Barriers to Renewable Energy Penetration- a framework for analysis, UNEP.Regarding the SE4ALLglobal tracking framework, see: SE4ALL. 2013. Global Tracking Framework (Washington, DC)

3. Opportunities for the inclusion of participating actors

Global perception of renewable energy has changed considerably as a result of massive evidence of climate change, constantly increasing costs of fossil fuels and global discourse on energy access.[88] Today, renewables are seen not only as sources of energy, but also as tools to address many other pressing needs, including: improving energy security; reducing the health and environmental impacts associated with fossil and nuclear energy; mitigating greenhouse gas emissions; improving educational opportunities; creating jobs; reducing poverty; and increasing gender equality. It is in this light that, global network of key players has been working to advance renewable energy in both developed and developing countries over a period of a decade or two and has seen great success in its activities.[89]

It is therefore imperative to create a network of participating actors in the quest

88 United Nations. 2014. "Sustainable Development Challenges" available at www.sustainabledevelopment.un-.org

89 Department of Energy and Climate Change. 2014. Community Energy Strategies

for scientific and empirical solutions to the energy access problem in the ECOWAS region. Working together with public, private and third sector partners can be an effective way for communities to achieve their objectives.[90] It can bring together the right mix of skills, experience, assets, finance and investment with local interests and engaged communities. The inclusion of international collaborators (researchers, practitioners and policy makers) will allow experts and stakeholders to debate how to advance the regional energy transition with renewables, through networking and exchange experiences and debate how to overcome challenges in both informal and formal settings.

4. Research Methodology

The analysis of the set topic needed ample and detailed academic approach for information. To obtain such information, two methods were used; desk research into the works of academics and researchers in the West Africa, sub-Saharan Africa and global fronts was done. A literature search provides the opportunity for reviewing all readily available materials. These materials can include internal company information, relevant trade publications, newspapers, magazines, annual reports, company literature, on-line data bases, and any other published materials. It is a very inexpensive method of gathering information, although it often does not yield timely information.

90 Department of Energy and Climate Change. 2014. Community Energy Strategies

The second method involved organizing a workshop which gathered experts from the fields of climate change, renewable energy financing, renewable energy projects development, policy developers, energy researchers and practitioners from West Africa and Europe. Aside the presentations on planned topics, the workshop had quality time for deliberations on all the presentations delivered. The aim of this format was to create the opportunity for brainstorming by the experts to unearth research opportunities in the area of renewable energy and energy efficiency as the basis for a sustained, long-term cooperation between the West Africa Institute (WAI) and the ECOWAS Center for Renewable Energy and Energy Efficiency (ECREEE). The importance of this method is that, brainstorming sessions most often involve idea generation with the goal to identify as many

ideas as possible.[91] This type of method allows the opinions of the users to be collected without being interpreted by the researcher. It offers opportunity for semi-structured information gathering.[92]

5. Analysis and Results

The methodology employed in the research resulted with the following findings:

- The ECOWAS region has no climate change policy. There are climate adaptation strategies
- Promotion and provision of electricity itself is not enough guarantee to alleviate poverty. It has to be linked with productive uses by the people;
- Necessity for identifying the right forms of energy that are useful to the local people
- Gender needs are not properly addressed and factored-in when making decisions on energy services for any area or locality;
- Financiers of renewable energy technologies (RETs) do not have adequate knowledge of the technologies;
- Financial mechanisms and RE funding options that are applicable to other regions are not always ideal for West Africa;
- Policies and legal frameworks formulated in West Africa are hardly implemented or enforced if at all implemented;
- Operations and maintenance of energy generating infrastructure are poorly done in the sub-region. Thus the culture of maintenance is almost non-existent so operating efficiency keeps going down.
- RE and EE policies, though have been adopted by the heads of governments of the ECOWAS member states, are not being implemented

6. Discussions and Conclusions

Based on the deliberations and findings from the research, the following recommendations are made:

91 Laere, J. V., Nilsson, M., 2009. Evaluation of a workshop to capture knowledge from subject matter experts. Conference report. Seattle, WA, USA.

92 Guion, L. A., Diehl, D. C., McDonald, D., 2011. Conducting an in-depth interviews: Univ. of Florida, Florida, USA.

- Innovative climate change policy for the region needs to be formulated by the concerned bodies i.e. the Department of Environment of the ECOWAS Commission in collaboration with ECREEE, NGOs in the energy industry and all climate change advocates in the region;
- Innovative financing mechanisms that will bear specific characteristics to the West Africa sub-region need to be devised through scientific research;
- Capacity building on RETs for financiers, policy makers, practitioners, end-users should be used as a driving force for RE and EE dissemination;
- Scientific research on Innovative supply chain models in renewable energy and energy efficiency dissemination in the West Africa sub-region should be promoted.
- Powerful regional agency to ensure implementation of RE and EE policy targets needs to be formulated.
- Women groups and gender issues have to be factored in energy decision making.

6.1. Discussions

- Innovative climate change policy for the region cannot be down played considering the current trends of events and the research predictions from the IPCC (both 2007 and 2013) and the World Bank 2011 reports. Considering the fact that, 11 out of the 15 ECOWAS countries are classified as least developed countries (LDCs), makes the region particularly vulnerable to climate change effects. This stems from the fact that, in times of extreme difficulties, many countries in the region will not have the economic strength and infrastructural capabilities to stand the test of the time. For example, during severe flooding or extreme drought, many of the countries in the region will fall short of their ability to withstand the effects. It is evident that, Niger and Senegal are facing severe reduction in groundnut production (food insecurity) as a result of the effects of climate change in the region. The time is long overdue for concrete policy and regulations that will facilitate actions on climate change in the region.
- As noted in the research of Brew-Hammond (2009), any financ-

ing mechanisms that will support the infrastructural and technological advancement of the energy situation in the region should have local support or financial input. In view of this, there is the need to research into innovative financing mechanisms that will have specific characteristics with the West African region and conditions for sustainability.

- Building the capacities of the local financiers in the knowledge of RETs and their usefulness will go a long way to enhance their understanding and ability to assess the financial benefits that could be obtained by their institutions and the consumer as well by promoting and financing RE and EE projects.

- Scientific research on Innovative supply chain models in renewable energy and energy efficiency dissemination in the West Africa sub-region should be promoted. This is because many of the rural areas have no access to the required energy (both grid-connected and off-grid connected). In places where electricity has been extended, the people have little or no economic use to it. Poverty alleviation through productive use of electricity is a sure way of breaking the poverty circle of the local people. A research into the policies that will involve the people in the decision making process of type of technology and energy the people desire is highly recommended. At this point, involvement of women groups in the decision making is also important.

- Finally, it is imperative to have well organized and powerful regional body that will ensure the implementation of the RE and EE policies as well as national institutions that will implement the various national renewable energy and energy efficiency action plans being currently formulated.

6.2. Proposed Areas for Scientific Research

The study presents below specific research proposals on innovative financing mechanisms for the ECOWAS region as a solution to going round the economic barriers to the use of renewable energy and energy efficiency. This study has proposed four key potential areas that can be developed into a four key research areas:

1. Concerning project profitability, to present an analysis of the levelised cost of electricity from renewable energy technologies compared to conventional options, in on-grid and off-grid scenarios across ECOWAS member states.

2. To examine how innovative policy mechanisms and tariff regimes can mitigate barriers concerning the profitability of renewable energy power projects in ECOWAS.

3. Concerning project financing, to present an analysis of the barriers facing renewable energy power producers' access to finance, focusing specifically on West African commercial financiers.

4. To examine policy directions on productive use of energy for poverty alleviation and climate change mitigation in the ECOWAS region

Scientific research supported by detailed empirical information in the areas suggested above may provide solutions to the economic obstacles militating the use of RE and EE in the research region, captioned as ‘‘innovative financing mechanism’’.

Another area for future studies can also include non-economic barriers and development and use of RE and EE in the ECOWAS region. The main areas identified in this study include:

1. Capacity building as a driving force for renewable energy and energy efficiency promotion in the West Africa region

Scientific research in the region should concentrate on the following activities:

Creating new research centres and strengthen the existing ones: development of applied research on RE and EE; design and development of innovative RE and EE systems that suit the local needs of West Africa; Promotion of long term data collection in the thematic area of renewable energy and energy efficiency; amending educational curriculum to incorporate RE in primary and middle level education; capacity building for students in the middle level education e.g. polytechnics

2. Mainstreaming gender into renewable energy and energy efficiency promotion and dissemination in the ECOWAS region

Scientific research into gender and energy focusing specifically in the ECOWAS region could have the following activities as a guide:

Promoting RETs awareness in gender; assessment of energy service requirements of women; capacity building for women in the productive use of energy and involving women groups in policy formulations for energy projects.

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7.1. Figure 1

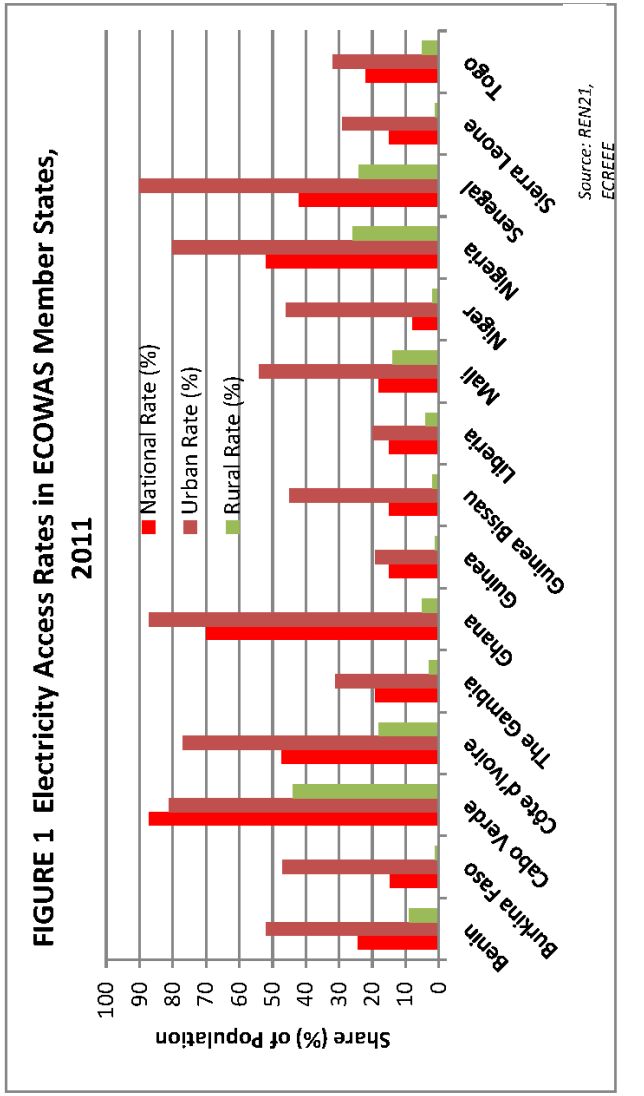

Figure 1

ISSN: 2311-634X
ISBN: 978-989-8770-15-8
WAI CAAS N° 9, 2014