West Africa Institute

Avenida da Liberdade e Democracia,
Nº 9 – 5º andar
Praia
Achada Santo António

BP 396- A
Cape Verde

Phone: +238-(0)262-40-59
www.westafricainstitute.org

Rheinische
Friedrich-Wilhelms-
Universität Bonn

Center for European
Integration Studies

Walter Flex-Straße 3
53113 Bonn
Germany

Phone: +49-(0)228-73-1810
www.zei.uni-bonn.de

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Center for European
Integration Studies

Felix Fofana N'Zué

Formulating a Regional Policy for Energy and Technology/Innovation: What Role for Taxation?

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Introduction

Energy and technology are at the heart of any serious development strategy. Indeed, energy goes hand in hand with technology and innovation. Energy and technology are at the beginning of mankind and continue to dictate the way mankind live and better its life. Developed countries are those countries that put their available energy to good use through permanent improvement in technology and innovation. From Europe to Asia via Northern America, energy and technology innovation were the instruments used for growth and development. The industrial revolution was made possible because of energy and technology. The world is seeking more and more energy to sustain its livelihood, leading to a race for energy sources which includes fossil fuel sources and non-fossil fuel sources.

Fossil fuel sources include among others, coal, oil, natural gas and petroleum. Most developed countries have made extensive use of these fossil fuels. Emerging economies like China and India are extensively using fossil fuels to produce the energy needed to boost their development. Although an increased awareness of the consequences of the continuous use of fossil fuels energy resources is pushing some countries (mainly developed countries) to look for alternative (renewable) sources of energy, however fossil fuels will continue to supply around 80% of world energy use by 2040 (International Energy Outlook, 2013).

Felix Fofana N'Zué is Manager of the Economic Policy Analysis Unit in the ECOWAS Commission in Abuja, Nigeria. He holds a Master in Applied Economics from the National University of Cote d'Ivoire and a Master of Science in Agricultural Economics from Oklahoma State University as well as a PhD in Agricultural Economics from Oklahoma State University. He has held several positions as a Senior Researcher and Research Manager all over Africa and teaches as a Professor at the University of Cocody in Cote d'Ivoire.

By IEO 2013 estimates, the world industrial sector consumes over half of total delivered energy. Indicating the essential role of energy in development and or industrialization (industrialization cannot be thought of without energy consumption and technological innovation). West Africa cannot develop and be industrialized unless it meets the growing needs for energy. Despite the region's rich endowment in natural resources which could be transformed into energy (see below, the list of natural resource endowment in West Africa) and make it a hub of prosperity in sub-Saharan Africa, countries in this region are among the poorest in the world.

Table 1: List of West African Countries and their respective Natural Resource endowments[1].

Country	Renewable Natural resources	Non-Renewable Natural Resource
Benin	Water1 (25 cu Km), Arable land2 (23.53%), Timber	Small offshore oil deposits, limestone, marble.
Burkina Faso	Water (17.5 Cu Km), Arable land (17.66%)	Manganese, limestone, marble; small deposits of gold, antimony, copper, nickel, bauxite, lead, phosphates, zinc, silver, Salt.
Cape Verde	Water (0.3 Cu Km), Arable land (11.41%), fish	Salt, basalt rock, limestone, kaolin, Clay, gypsum.
Cote d'Ivoire	Water (81 Cu Km), Arable land (10.23%), Timber, hydro-power	Petroleum, natural gas, diamonds, manganese, iron ore, cobalt, bauxite, copper, gold, nickel, tantalum, silica and sand, clay.
The Gambia	Arable land (27.88%), fish	Clay, silica and sand, titanium, tin and zircon.
Ghana	Arable land (17.54%), timber, fish, rubber, hydro-power	Industrial diamonds, bauxite, gold manganese, Zinc, Nickel, Petroleum, Silver, Salt, limestone.
Guinea	Arable land (4.47%),Water (226 Cu Km), hydropower, fish	Bauxite, iron ore, diamonds, gold, uranium, Salt.
Guinea-Bissau	Arable land (8.31%), Water (31 Cu Km), fish, timber,	Phosphates, bauxite, unexploited deposits of petroleum, clay, bauxite and Limestone.
Liberia	Arable land (3.43%), Water (232 Cu Km), timber,	Iron ore, diamonds, gold, hydropower.
Mali	Arable land (3.76%), Water (100 Cu Km), Hydropower.	Gold, phosphates, kaolin, salt, limestone, uranium, mineral deposits unexploited: bauxite, iron ore, manganese, tin, and copper.
Niger	Arable land (11.43%), Water (33.8 Cu Km)	Uranium, coal, iron ore, tin, phosphates, gold, petroleum.
Nigeria	Water (286 Cu Km), Arable land (33.02%)	Natural gas, petroleum, tin, columbite, iron ore, coal, limestone, lead, zinc,
Senegal	Arable land (12.51%), Water (39.4 Cu Km), fish,	Phosphates, iron ore.
Sierra Leone	Arable land (7.95%), Water (160 Cu Km)	Diamonds, titanium ore, bauxite, iron ore, gold, chromite.
Togo	Arable land (44.2%)	Phosphates, limestone, marble.

Source: https://www.cia.gov/library/publications/the-world-factbook/fields/2201.html#213.

1 This list is not exhaustive. Regarding Benin: Long-term average water availability for a country in cubic kilometers of precipitation, recharged ground water, and surface inflows from surrounding countries. Values have been adjusted to account for overlap resulting from surface flow recharge of groundwater sources. Total renewable water resources provides the water total available to a country but does not include water resource totals that have been reserved for upstream or downstream countries through international agreements. Note that these values are averages and do not accurately reflect the total available in any given year. This measures the percentage share of total land area, that is cultivated for crops like wheat, maize, and rice that are replanted after each harvest; it excludes land cultivated for crops like citrus, coffee, and rubber that are not replanted after each harvest, land under flowering shrubs, fruit trees, nut trees, and vines (permanent crops) also excludes any land not arable permanent meadows and pastures, forests and woodlands, barren land, etc.

Poverty is rampant in the region and access to electricity is around 30%. West Africa is seriously challenged with accessibility to energy and energy security when it is available. Having recognized the essential role of energy in the development process and being aware of the region's rich endowment in natural resources that could be used for energy production, the Economic Community of West African States (ECOWAS) has identified energy production as a priority area for intervention. To materialize this political declaration several actions were taken[2] with the view to resolving the energy deficit.

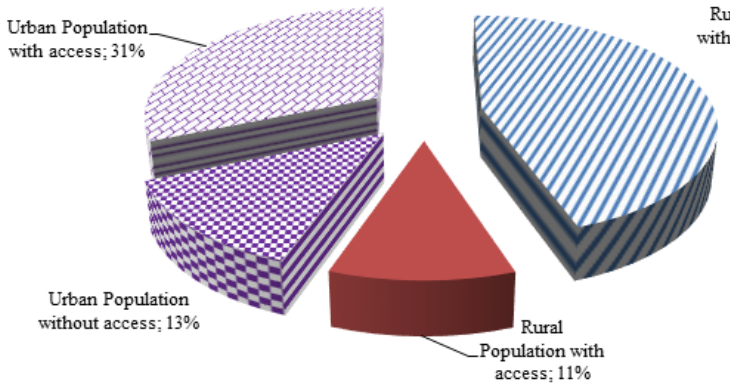
Despite these actions, the region remains challenged in energy production and utilization. There is therefore a need to better understand the political economy of regional energy as well as technology policy formulation and explore ways to improvement, including as well as the possible roles that taxation could play, if any, at national and regional levels. The rest of the paper is organized as follows: the next section presents Energy Access in ECOWAS member States. Section 3 sheds light on existing institutional frameworks (at national and regional levels) for energy production and utilization in West Africa. Section 4 presents the region's efforts in regional policy formulation for both energy and technology/innovation. Section 5 looks at taxation provisions in the regional energy policy. Section 6 concludes the paper.

Energy Access in ECOWAS Member States

Energy is known as a development trigger. Unfortunately, access to it in Africa in general and in ECOWAS member States in particular, has been very poor. Indeed, data from the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) show that in 2009 only 31% of populations living in urban areas in the ECOWAS member States have access to energy. This rate decreases to 11% in rural areas. Hence, 58% of the ECOWAS population does not have access to energy despite the rich endowment of the region in energy sources. This situation is well depicted in the figure below.

2 The establishment of the West African Power Pool System (WAPP) in December 1999. A meeting of the Regional Multi-sector Group (Bamako, May 2005) led to the adoption by ECOWAS-UEMOA Heads of State (Niamey, January 2006) of a strategy to improved access to energy services. An ECOWAS Energy protocol (ECOWAS 2003) was Drafted and adopted. An ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) was established in 2010.

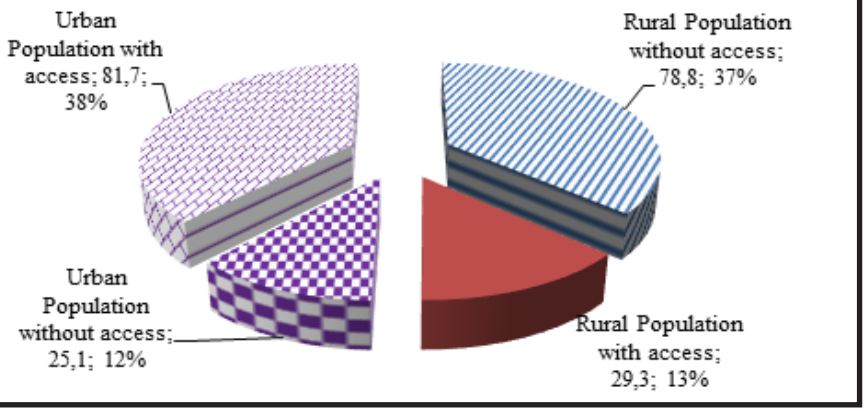
Figure 1. Access to Energy in ECOWAS Member States in 2009



Source: ECREEE, 2012.

The figure above gives a broad picture of the situation in ECOWAS Member States. However, there are country peculiarities. Indeed, not all countries are at the same level when it comes to energy access. Some countries could be considered as having high level access to energy. These are countries where access is above 30%. They include Cape Verde, Cote d'Ivoire, Ghana, Nigeria and Senegal. In these countries, around 38% of the urban population and about 13% of the rural population have access to energy leaving 49% of the population without access to energy (see figure below).

Figure 2. High level (>30%) Access countries in ECOWAS Member States in 2009

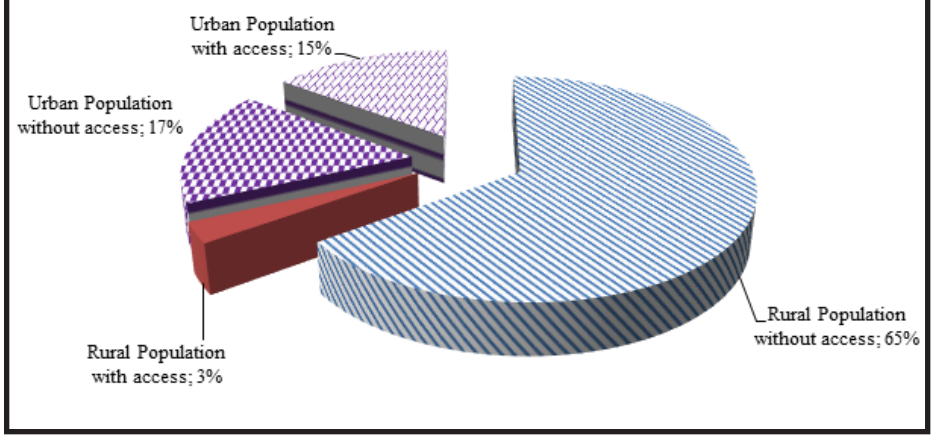


Source: ECREEE, 2012.

Apart from the above countries considered as high level access, the remaining countries have very low access level. Indeed, only 15% of the urban population and 3% of the rural population have access to energy leaving the great majority of the population, about 92%, without access to energy (see figure below). This is appalling if we consider the richness of the region in term of energy resources.

The above picture of energy access in ECOWAS is a telling indication of the challenges that ECOWAS countries are confronted with. These challenges are multi-fold and include challenges of energy poverty, energy security and challenges associated with climate change.

Figure 3. Energy Access by other countries in the ECOWAS region in 2009



Source: ECREEE, 2012.

Institutional framework for Energy Production and Utilization in West Africa.

The energy challenge is well recognized in West African countries. Most of these countries strive to setup an institutional framework for energy production and utilization. This is illustrated by the existence of a dedicated ministry to energy affairs. In most cases, the Ministry in charge of energy is associated with other ministries including Mines, Economy and Finance, Trade etc. The table below provides a synthesis of the institutional framework for the production and utilization of energy in selected West African countries. The involvement of so many ministries could be detrimental to the development of the sector. Indeed, the diversity of actors/players in the energy sector at times renders the task of coordination and effective implementation of policies difficult. This is so because the concerns/interests of each actor or player within the group may differ. Actors are sometimes moved by political interests and not by the ´Common Good`. It is therefore of great importance that regulatory texts that take into account the peculiarities of the countries are drafted, adopted and enforced.

Table 2: List of key actors in the Energy sector in ECOWAS Member States

Country	Key Actors
Benin	Ministry of Mines, Energy and Hydraulics, Ministry of trade industry and employment and Ministry of Agriculture.
Burkina Faso	Ministry of energy; Ministry of Finance; Ministry of Trade.
Cote d'Ivoire	The Ministry of Mines and Energy for fossil energy, the Ministry of Environment for the wood-based energy and the Ministry of Economic Infrastructure.
Ghana	Ministry of Energy, Ministry of Finance and Ministry of Environment.
Liberia	Ministry of Lands, Mines and Energy.
Niger	Ministry of Mine and energy; Ministry of Environment and Ministry of Trade.
Nigeria	Energy Commission of Nigeria.
Senegal	Ministry of Energy, Ministry of Finance.
Sierra Leone	Ministry of Energy and Water Resources, Ministry of Agriculture Forestry and Food Security, Ministry of Lands and Environment and Ministry of Trade and Industry.
Togo	Ministry in charge of the economy and development. Ministry of Finance; Ministry in charge of energy; Ministry in charge of environment and forest resources.

It appears from the above table that most countries are interested first in providing access to energy for their population. In general, it is via traditional energy sources. Only in a few cases, renewable energy is mentioned. The table below gives a clear idea of the extent to which renewable energy is integrated into policy documents in ECOWAS member states as of 2011. From the table we observe that when it comes to renewable energy only five countries have a policy, out of which only two have a renewable energy law. Although, renewable energy is mentioned in the energy policies of seven countries, it does not imply that concrete actions are actually taken. It could just be a declaration of good will.

Table 3. Level of Renewable energy integration into policy documents in 2011.

	Benin	Burkina Faso	Cabo Verde	Cote d'Ivoire	Gambia	Ghana	Guinea	Guinea Bissau	Liberia	Mali	Niger	Nigeria	Senegal	Sierra Leone	Togo
RE in Energy Policy															
RE in Electricity Bill															
RE Policy															
RE Law															

Source: ECREEE, 2012.

Yes To some extent No

At the regional level, the institutional framework consists of 4 main institutions; the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), the West African Power Pool (WAPP), The ECOWAS Regional Electricity Regulatory Authority (ERERA) and the West African Gas Pipeline (WAPCo).

The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)

ECREEE is a specialized agency tasked with promoting the establishment of a regional market for renewable energy (RE) and energy efficiency (EE). It acts as an independent body but within the legal, administrative and financial framework of ECOWAS. The Centre was established in 2010[3] with the support of ECOWAS, the Governments of Austria and Spain and key technical assistance of the United Nations Industrial Development Organization (UNIDO). The setting up of ECREEE followed an increased awareness of the need for linking energy efficiency and renewable energy (Vilar, 2012). The ECREEE Secretariat is based in Praia; The objectives of the Center are:

- To promote sustainable development in West Africa by improving access to modern energy services, energy security and climate change mitigation through the use of RE&EE.
- To create an enabling environment for regional RE&EE markets by mitigating various barriers for the dissemination of green energy technologies and services.

The West African Power Pool (WAPP)

The WAPP is in charge of developing an integrated bulk power supply market for 14 ECOWAS countries (Cape Verde is not connected to the continent)[4]. Its headquarters in Benin, the WAPP[5] is tasked with the (i) monitoring of the development of the national electric power sector in ECOWAS member states with the view to alerting countries of the risks of performance deficiencies and to provide them with corrective measures; (ii) periodically analyzing the economic and technical viability of cross-border electricity trading arrangements among Transmission Using Members; (iii) facilitating the development of technical norms and standards for the collection and treatment of useful information for the efficient operation of the national and interconnected electric networks; and (iv) supporting and monitoring the technical performance of the electricity utilities.

3 *Regulation C/REG.23/11/08 establishing the ECREEE, the Regional Centre for Renewable Energy and Energy Efficiency based in Praia, Cape Verde.*

4 *West African Power Power Pool*. [Online] Available at: www.ecowapp.org.

5 Articles of Agreement of the West African Power Pool Organization and Functions (October 2005) defining the compulsory character of regional power projects. The WAPP has been created in 2006 and is based in Cotonou – Benin.

The ECOWAS Regional Electricity Regulatory Authority (ERERA)

ERERA is the regional regulatory authority for cross-border electricity interconnections in West Africa[6] .This came about as the manifestation of the desire of ECOWAS Member States for electricity interconnections through the joint implementation and sharing of energy resources of the region. This desire materialized through the adoption of an Energy Protocol, designed to put in place the appropriate legal and institutional environment for the development of the electricity sector of West Africa.

Within the framework of the Energy Protocol and the West African Power Pool Program (WAPP), the Member States of ECOWAS, in January 2008 established, the ECOWAS Regional Electricity Regulatory Authority (ERERA)[7] as a specialized institution of ECOWAS. ERERA's main objective is to ensure the regulation of interstate electricity exchanges and to give appropriate support to national regulatory bodies or entities of the Member States. ERERA's governance structure is provided by Council Regulation C/REG.27/12/07 of 15th December 2007 on the Composition, Organization, Functions and Operations of the Authority. Its headquarter is located in Accra, Ghana

The main missions and objectives of ERERA include the following:

- Regulation of cross-border electricity connections and trading among ECOWAS member states; Establishment of clear and transparent tariff setting methodology for regional power pooling.
- Facilitating the setting up of regulatory and economic environment for the development of the regional market.

6 *ECOWAS Regional Electricity Regulatory Authority*. [Online] Available at. http://www.erera.arrec.org/.

7 *Regulation C/REG.27/12/07 on the Composition, Organization, Functions and Operation of the ECOWAS Regional Electricity Regulatory Authority. Supplementary Act A/SA.2/1/08 establishing the ECOWAS Regional Electricity Regulatory Authority ERERA, which is constituted and based in Accra – Ghana since 2007.*

- Technical regulation of the regional power pooling and monitoring of regional market operations.
- Assisting the ECOWAS Commission in defining the strategy for the regional energy policy.
- Establishing effective dispute resolution methods among regional market participants.
- Assisting national regulatory bodies in ECOWAS with capacity building and technical issues upon request.

The West African Gas Pipeline Company limited (WAPCo)

The WAPCo is a limited liability company that owns and operates the West African Gas Pipeline (WAGP) under the auspices of ECOWAS. The company has its headquarters in Accra, Ghana, with an office in Badagry, Nigeria, and field offices in Cotonou (Benin), Lomé (Togo), Tema and Takoradi, both in Ghana. WAPCo is a joint venture between public and private sector companies from Nigeria, Benin, Togo and Ghana.

The company's main mandate is to transport natural gas from Nigeria to customers in Benin, Togo and Ghana in a safe, responsible and reliable manner, at prices competitive with other fuel alternatives. WAPCo is owned by Chevron West African Gas Pipeline Ltd (36.7%); Nigerian National Petroleum Corporation (25%); Shell Overseas Holdings Limited (18%); Takoradi Power Company Limited (16.3%), Société Togolaise de Gaz (2%) and Société BenGaz S.A. (2%). The West African Gas Pipeline Authority based in Abuja is the regulatory body for WAPCo.

ECOWAS' Energy and Science, Technology/Innovation Policies

ECOWAS' Energy Policy

The ECOWAS energy policy was set to motion at the beginning of the 1980's when the ECOWAS Heads of States identified the need for a more pragmatic approach to the fight against energy poverty by taking major decisions on the regional energy program (ECREEE, 2012). Indeed, the ECOWAS Heads of States adopted the regional Energy Policy on May 29, 1982[8] (ECOWAS 1982). The Regional Policy had among others the following objectives:

- Establish by law in every member state a body within the machinery of government to be charged with the responsibility for coordinating and supervising all energy functions and activities within each state.
- Mount a concerted short, medium and long term program on energy by pooling together, through the avenue of viable institution and mechanism, the professional expertise already available within the Community with a view to tackling jointly all aspects of the Energy Equation which is prevalent throughout the ECOWAS Region.
- Forge closer and more regular interaction among energy professionals of all the Member States in order to enhance the sharing of experience in terms of actions already taken and to conduct more incisive prognosis in terms of actions contemplated.
- To harmonize the terms of trade and technical cooperation in the energy field between the member States of the community and the outside world and seek a remedy to the current energy crisis through a reordering of the political economies of Member States so as to serve essentially the interest of ECOWAS citizens.

Having set the tone for a regional energy policy, on December 1999, the Authority of Heads of States and Government, at their 22nd session, in recognition of the

8 *A/DEC/ 3/5/82 Decision of the Authority of Heads of States and Government of the Economic Community of West African States relating to the ECOWAS Energy Policy.*

growing energy deficit in the ECOWAS region, adopted a decision to establish the West African Power Pool (WAPP). This decision, together with the energy crisis that the region has been facing in recent years, added to the belated awareness of the critical role of energy in socioeconomic development and hence, triggered the design of a regional policy. This was followed in January 2003 by the adoption of the ECOWAS Energy Protocol and later on by the adoption of the ECOWAS Generation and Transmission Master Plan (January 2006); and that of a Supplementary Act establishing a regional regulator to ensure open and transparent energy trade in West Africa (January 2008).

This awareness afforded the drafting and adoption in 2006 (in Niamey) of a White Paper for a regional energy policy with three objectives: i) Reinforce regional integration by pooling good practices, exchanges of experience to strengthen capacity building; ii) Promote the harmonization of political and institutional frameworks so as to include energy access as a key national priority for ensuring human development and achieving the MDGs; iii) Develop, on the basis of national policy frameworks, coherent energy programs geared towards poverty reduction in rural and peri-urban areas and the achievements of the MDGs. These objectives are backed by a regional action plan with the following components: a) Capacity building of public and private sector actors; b) Supporting formulation and implementation of investment programs to expand energy access (soft loans, grants, private sector investment…); c) Exchanging, promoting and disseminating best practices (Knowledge Management); d) Promoting local production of energy goods and services;

Moreover, leaders of the Economic Community of West African States (ECOWAS) have now an increased consciousness of the need to augment the use of renewable energy resources if they are to achieve the goals for increased energy access and energy security. This consciousness led them to adopt in October 2012 two complementary regional policies on energy; the ECOWAS Energy Efficiency Policy (EEEP) and the ECOWAS renewable energy Policy (EREP). This was done keeping in mind not only the MDG but also the three targets of the Sustainable Energy for All Initiative (SEFA)[9]. Let's look at each of these policies.

9 Ensuring universal access to modern energy services; doubling the rate of improvement in energy efficiency; and doubling the share of renewable energy in the global energy mix.

The ECOWAS Energy Efficiency Policy (EEEP)

What are the main features of this policy? The following objectives are led out in the ECOWAS Energy Policy (ECREEE, 2012a):

- Phase out inefficient incandescent lamps by 2020.
- Reduce losses in electricity distribution, from the current range of 15% to 40%, to under 10% by 2020.
- Achieve universal access to safe, clean, affordable, efficient and sustainable cooking for the entire population of ECOWAS, by 2030.
- Establish an ECOWAS Technical Committee for Energy Efficiency Standards and Labeling, and adopt initial region-wide standards and labels for major energy equipment by end 2014.
- Create instruments for financing sustainable energy, including carbon finance, by the end of 2013.
- By 2015, begin implementation in each ECOWAS country of at least one of the priority initiatives.
- By 2016, implement measures that free 2 000 MW of power generation capacity.

To achieve the above objectives, the policy seeks i) to harmonize the policy, legal and regulatory framework of energy efficiency for the ECOWAS region, including energy efficiency labels and standards. It is said that ECOWAS will support Member States in adopting national energy efficiency targets and action plans. Policies will be designed to be gender responsive, and will aim at encouraging private investment, so as to create a regional market and regional manufacturing capacity for energy efficient technologies. Energy efficiency policies will be linked to the ECOWAS Policy on Renewable Energy. ii) The coordination of capacity building at the regional level to create the necessary institutional and human skills to implement energy efficient technologies. Exchange of experience will facilitate the dissemination of lessons learned and best practices, for both public and private actors. iii) The policy will strive to raise awareness for energy users and the multiple decision makers in the design, purchase and maintenance of energy using equipment, from the simple cook stove to complex industrial systems. The ECREEE Observatory for

Renewable Energy and Energy Efficiency (EORE) will serve as a storehouse for information on energy efficiency technologies, potentials, investments and business contacts. iv) Finally, the policy will look for financial instruments to allow users to pay for energy efficient equipment through future energy savings.

This energy efficiency policy is also backed by an Action Plan based on five flagship energy initiatives, each including policy, capacity building, awareness raising and financing elements. The Action Plan can be summarized as follows:

a. An Initiative on Efficient Lighting to phase out inefficient incandescent lamps, and replace them with high efficiency lamps.

b. Achieving High Performance Distribution of Electricity, by reducing commercial and technical losses in electricity distribution systems.

c. Safe, Sustainable and Affordable Cooking to ensure that the entire ECOWAS population has access to clean and efficient stoves, with an assured supply of adequate fuels.

d. Standards and Labeling Initiative to create a regional harmonized system of energy standards and energy efficiency labels.

e. Finance for sustainable environmental finance instruments - for Green House Gases emissions reductions through Kyoto, NAMAs and voluntary markets, for ozone depleting substances through the Montreal Protocol, etc. - to support regional projects on energy efficiency and renewable energy.

The ECOWAS Renewable Energy Policy (EREP)

What are the main features of this policy? The policy sets up objectives for different targets (ECREEE 2012b) thus, at the regional level, it seeks to mobilize medium and large sized renewable energy (RE) options that could in the long term reduce the need for environmental adverse energy sources like coal and uranium.

At the national level, the policy seeks to assist and secure the mobilization of medium sized RE options which are cheaper and which help reducing durably the use of fossil fuel in power generation or/and enabling an increase of the overall power capacity alleviating the possible up-coming supply shortages due to the delays in the major regional strategies. It also seeks to promote a conducive regulatory and financial framework enabling the private sector to invest in the energy sector.

At off-grid level, the objective of the policy is to create the conditions for a real market for robust decentralized solutions that are affordable for the local rural population with a low purchase power.

At the household level, the policy intends to support national sustainable management of forests and savannah woodlands, promote an efficient use of domestic energy (fuel wood as well as gas and kerosene) through the regional policy for energy efficiency. It also seeks to promote productive or energy savings solar applications such as solar drier and solar water heater through information and sensitization activities. And finally, to promote the emergence of a market for solar lamps, to create opportunities for regional mass production.

ECOWAS' Technology/Innovation Policy

Unlike the regional energy policy, it was rather the various symposia and international conferences organized by the UNESCO in the early 1960's that triggered the national consciousness on policy in science, technology and innovation. These include but are not limited to the International Conference on the Organization of Research and Training in Africa in 1964 in Lagos, Nigeria ; The symposium on science and research management policy in 1967 in Yaounde, Cameroon and the regional symposium on the use of science and technology for development in Africa in 1970 in Ethiopia etc.

Following the recommendations of the various conferences, several countries have set up dedicated institutions for scientific research.

Regional organizations in Africa have realized that the continent cannot achieve any serious development without substantial investment in building capacity for science, technology and innovation. The ECOWAS called for the first ever Conference of Ministers in charge of Science and Technology in 2004 to draft a framework document for science and technology. This high level conference recommended equipping the ECOWAS with a viable policy on science and technology for the development of agriculture, transport and communications,

industry, health, energy, education, human resources as well as the preservation of the environment.

A situation analysis in the member states reveals, for various reasons, a very low contribution to socioeconomic wellbeing. These reasons include among others (ECOWAS 2013):

- The lack of a National Policy document on science and technology in most member states.
- Institutional and organizational failures in the member states.
- Lack of synergy and coherence between the vision and the various research activities.
- Very low investment in Research and Development. (about 0,34% of GDP in 2008 when emerging economies are at above 1% the recommended Africa Union Threshold).

From the situation analysis, it appeared critical to undertake specific actions that would feed in the regional policy on science technology and innovation. These actions included among others:

- Develop and implement a policy for science, technology and innovation in each member state.
- Improve the institutional framework for the management of science technology and innovation.
- Establish a mechanism for the enhancement of research outputs.
- Improve bilateral, regional as well as multilateral cooperation between research institutes, universities and industries.

The ECOWAS policy on science, technology and innovation has the following main objectives:

- Develop and implement a policy for science, technology and innovation in each member state.
- Strengthen the financial capacities of science and technology research institutions.
- Build technical and human capacities in science and technology.
- Create and develop intellectual property.
- Disseminate research results, promote scientific culture and local knowledge.
- Promote the development and transfer of technology.
- Promote the private sector's participation in the development of science and technology.
- Create a conducive environment for scientific and technological innovation;
- Promote regional and international cooperation.
- Promote data management and define key indicators for science and technology.
- Mainstream science and technology in all sectoral policies.

Unlike the regional energy policy which was thought through and led to the adoption of a protocol by Heads of States, the regional policy on science, technology and innovation is at an infant stage. It is yet to be adopted by the highest authority of ECOWAS. It is clear from the situation analysis that a lot needs to be done if the region is to have a coherent and realistic regional policy on technology and innovation. Countries are yet to internalize the idea that developing a national policy on technology and innovation is part of the steps toward development.

It is only when such consciousness arises at the national level that efforts will be made to mobilize domestic resources (taxation) for science, technology and innovation. For the time being the region is just a passive consumer of imported technology.

Taxation and ECOWAS' Regional Energy Policy

Taxation affects the pricing of resources and specifically energy. It could be attractive or a deterrent to investors. Following Iwayemi, 1998, energy pricing policy should be grounded on three basic principles: i) it should allow the company to cover its production and delivery costs including its replacement investment, and guarantee a rate of return no less than what other producers in the economy can obtain with comparable degree of risks; ii) the relative price structure should encourage competition in the energy market; iii) prices should be allowed to perform their allocative function, which implies that they should reflect the marginal benefit in the next best use.

Taxes and direct income transfers are considered to be more appropriate than price subsidies for the objective of social and regional equity. It is said that current subsidy distortions among supply options encourage investments in cheaper conventional technology and discourage investments with high upfront capital costs (typically in Renewable Energy Technologies). Thus there has been a bias towards grid extension which forecloses decentralized options (ECREEE 2012b). Although national energy policies are not very specific in terms of taxation, there are a few instances where Feed-in-Tariffs or other forms of incentive schemes are indicated, especially in the case of renewable energy. Examples include Cape Verde and Senegal where such incentives have been introduced (ECREEE 2012b). The Ghanaian parliament passed a bill to introduce Feed-in-Tariffs (FIT) to encourage the adoption and use of renewable energy. In addition to this FIT, some countries (Cape Verde, Benin, Burkina Faso, Gambia, Mali, Niger, Senegal, and Togo) have introduced Tax exemptions for the import of Photovoltaic (PV) panels and renewable energy equipment in general (ECREEE 2012b).

At the regional level, all issues related to taxation with respect to ECOWAS regional energy policy are dealt with in the ECOWAS' Energy Protocol adopted by the Authority of Heads of States in 2003 under its Article 21. The ECOWAS Energy Protocol addresses taxation measures affecting contracting parties and how disputes arising from these issues could be resolved. For instance Article 7(3) stipulates that "Each Contracting Party undertakes that its provisions relating to transport of Energy Materials and Products and the use of Energy Transport Facilities shall treat Energy Materials and Products in Transit in no less favorable a manner than its provisions treat such materials and products originating in or destined for its own Area, unless an existing international agreement provides otherwise. Contracting Parties shall, subject to paragraphs (6) and (7) below, secure established flows of Energy Materials and Products to, from or between the Areas of other Contracting Parties. (...)

(6) A Contracting Party through whose Area Energy Materials and Products transit shall not, in the event of a dispute over any matter arising from that Transit, interrupt or reduce, permit any entity subject to its control to interrupt or reduce, or require any entity subject to its jurisdiction to interrupt or reduce the existing flow of Energy Materials and Products prior to the conclusion of the dispute resolution procedures set out in paragraph (7), except where this is specifically provided for in a contract or other agreement governing such Transit or permitted in accordance with the conciliator's decision.

(7) The following provisions shall apply to a dispute envisioned by paragraph (6), but only following the exhaustion of all relevant contractual or other dispute resolution remedies previously agreed between the Contracting Parties party to the dispute or between any entity referred to in paragraph (6) and an entity of another Contracting Party to the dispute:" (see Protocol)

As it could be seen above, the protocol makes provision to taxation measures other than those on income or capital. Article 29[10] of the protocol goes further to

10 (2) Trade in Energy Materials and Products and Energy-Related Equipment between Contracting Parties at least one of which is not a member of the WTO shall be governed, subject to the exceptions and rules provided for in Annex D, by the provisions of the WTO Agreement, as applied and practiced with regard to Energy Materials and Products and Energy-Related Equipment by members of the WTO among themselves, as if all Contracting Parties were members of the WTO. (3) Each signatory to this Protocol, and each state or Regional Economic Integration Organization acceding to this Protocol, shall on the date of its signature or of its deposit of its instrument of accession provide to the Executive Secretariat of ECOWAS a list of all customs duties and other charges levied on Energy Materials and Products at the time of importation or exportation, notifying the level of such duties and charges applied on such date of signature or deposit. Any changes to such duties or other charges shall be notified to the Executive Secretariat of ECOWAS, which shall inform the Contracting Parties of such changes. (4) Each Contracting Party shall endeavor not to increase any customs duty or tariff rate or other charge levied at the time of importation or exportation: (a) in the case of the importation of Energy Materials and Products listed in Annex A or Energy-Related Equipment listed in the document to be adopted by the Meeting of Energy Ministers under the terms of Article 30 of this Protocol and described in Part I of the Schedule relating to the Contracting Party referred to in article II of the GATT 1994, above the level set forth in that Schedule, if the Contracting Party is a member of the WTO; (b) in the case of the exportation of Energy Materials and Products listed in Annex A or Energy-Related Equipment listed in the document to be adopted by the Meeting of Energy Ministers under the terms of Article 30 of this Protocol, and that of their importation if

address trade in Energy materials and products and Energy-Related Equipment between Contracting Parties at least one of which is not a member of the WTO. In such instances and subject to the exceptions and rules provided for in Annex D in the Protocol, the provisions of the WTO Agreement shall prevail.

Issues pertaining to expropriation are also addressed in the protocol. Indeed, under Article 13 of the protocol when such issue arises, (i) The Investor or the Contracting Party alleging expropriation shall refer the issue of whether the tax is an expropriation or whether the tax is discriminatory to the relevant Competent Tax Authority. Failing such referral by the Investor or the Contracting Party, bodies called upon to settle disputes shall make a referral to the relevant Competent Tax Authorities; (ii) The Competent Tax Authorities shall, within a period of six months of such referral, strive to resolve the issues so referred. Where non-discrimination issues are concerned, the Competent Tax Authorities shall apply the nondiscrimination provisions of the relevant tax convention or, if there is no non-discrimination provision in the relevant tax convention applicable to the tax or no such tax convention is in force between the Contracting Parties concerned, they shall apply the non-discrimination principles under the Model Tax Convention on Income and Capital of the Organization for Economic Co-operation and Development or any other model agreed upon by the Contracting Parties; (iii) Bodies called upon to settle disputes may take into account any conclusions arrived at by the Competent Tax Authorities regarding whether the tax is an expropriation. Such bodies shall take into account any conclusions arrived at within the six-month period prescribed by the Competent Tax

the Contracting Party is not a member of the WTO, above the level most recently notified to the Executive Secretariat of ECOWAS, except as permitted by the provisions made applicable by paragraph (2). (5) A Contracting Party may increase such customs duty or other charge above the level referred to in paragraph (4) only if: (a) in the case of a customs duty or other charge levied at the time of importation, such action is not inconsistent with the applicable provisions of the WTO Agreement, other than those provisions of the WTO Agreement listed in Annex D; or (b) it has, to the fullest extent practicable under its legislative procedures, notified the Executive Secretariat of ECOWAS of its proposal for such an increase, given other interested Contracting Parties reasonable opportunity for consultation with respect to its proposal, and accorded consideration to any representations from such Contracting Parties. (6) In respect of trade between Contracting Parties at least one of which is not a member of the WTO, no such Contracting Party shall increase any customs duty or charge of any kind imposed on or in connection with importation or exportation of Energy Materials and Products listed in Annex A or Energy-Related Equipment listed in the document to be adopted by the Meeting of Energy Ministers under the terms of Article 30 of this Protocol above the lowest of the levels applied on the date of the decision by the Meeting of Energy Ministers to list the particular item in the relevant Annex or document.

Authorities regarding whether the tax is discriminatory. Such bodies may also take into account any conclusions arrived at by the Competent Tax Authorities after the expiry of the six-month period; (iv) Under no circumstances shall involvement of the Competent Tax Authorities, beyond the end of the six-month period, lead to a delay of proceedings.

Conclusion and Recommendations

Conclusions

The paper has tried to provide a better understanding of the political economy of regional energy as well as technology policy formulation and analyze taxation aspects of the regional energy policy. The following conclusions result from the paper:

On energy:

- Low access to energy in ECOWAS member states.
- Countries have attempted to develop national energy policy documents. Not all countries have actually succeeded in drafting a national energy policy document.
- The institutional framework at the national level is made up of several actors. This multiplicity of actors could be detrimental to the development of the energy sector.
- At the regional level the institutional framework of the energy sector is made up of four institutions outside the ECOWAS Commission each of which is autonomous in its operation. This can lead to coordination hitches.
- The ECOWAS energy protocol makes provisions to address all issues related to taxation measures other than tax on income and / or capital.

On Technology/Innovation:

- Lack of national policy documents on science, technology / innovation.
- Regional policy on science, technology / innovation is at an infant stage and it is yet to be adopted by the Authority of Heads of State.
- No protocol exists to provide guidance on scientific and technological development in the region.

Recommendations

- Disseminate widely the ECOWAS Energy Protocol to ensure compliance and avoid unnecessary arbitration that could be costly.
- Rationalize the institutional set up at both national and regional levels of the energy sector.
- Fast-track the adoption of a regional policy on science, technology/ innovation.

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