Energy planning indicators in the Economic Community of West African States.

Nathan C. Lee[1] and Vítor Leal[2]
[1]PhD Student contact nathan.lee@fe.up.pt, [2]Assistant Professor
IDMEC, Institute of Mechanical Engineering, Faculty of Engineering, University of Porto, Porto, Portugal.

Abstract: This work presents an assessment of the objectives, attributes, and indicators found in 14 energy planning (EP) documents of the Economic Community of Western African States (ECOWAS). The indicators found in the ECOWAS EP documents are juxtaposed with those used in EP documents of developed countries in an evaluation of their specificity. The ECOWAS EP documents are found to express multiple objectives within social, economic, and environmental themes. The EP activities are not equipped with indicators which link objectives set for the plan through to monitoring and evaluation activities. Few similarities are established between indicators used in ECOWAS EP documents and those used in the activities of more developed countries. The work shines light on room for development as well as specificities in the EP activities of the region.

1 Introduction

EP activities in developing[1] countries have recently received increased attention, and access to modern energy services[2] has been acknowledged as an essential ingredient for sustainable development. (Modi, 2004) (The World Bank & UNDP, 2005) (ECOWAS, 2006) (GNESD, 2007) (Banerjee & et al., 2008) (IEA, 2010) (Kaygusuz, 2011) (Kaygusuz, 2012). In light of the role which energy access plays in development, developing countries, economic communities and international aid organizations alike have set ambitious targets for increased access to modern energies(Brew-Hammond, 2010). Reaching these targets will require the enactment of policies and programs based on EP activities which are multi-sectorial and include economic, social, and environmental objectives in addition to energy sector development objectives(ECOWAS, 2006) A broad view of the role which energy plays in development is vital to developing countries which typically have limited resources and are looking for large impacts from investments to achieve development goals (Cabraal & et al., 2005).

Major financial and developmental aid organizations now include Strategic Environmental Assessment (SEA) -type requirements for lending and development programs (Chaker & et al., 2006). Assessment activities require metrics and procedures to identify and evaluate social, economic and environmental impacts, preferably compared to a "no plan" future rather than to the present situation.

General sets of sustainable energy indicators have been presented by Vera and Langlois (2007) & International Atomic Energy Agency (IAEA) (2005) and Patlitzianas et al. (2008). The European Environment Agency (2005) presented indicators for use in the context of the European Union. Indicators for local EP were presented by Neves and Leal (2010). There is a lack of evidence to suggest that a universal set of indicators is sufficient or if a specific set of indicators is needed for EP activities in different countries, especially taking into account a country's development level and other possible considerations. A single clear set of EP indicators is not yet widely accepted and sets have been proposed for more specific applications. Indicators describing a country's transition to modern energy were explored by Kemmler and Spreng (2007). The sets for measuring the impacts of energy reforms for the specific countries of Mexico and of Guatamala, developing nations of Central America, were presented by Sheinbaum-Pardo et al. (2012) and Foster and Tre (2000) respectively. The World Bank presents a review of African Development through a large set of African Development Indicators which include some details of the energy sector (The World Bank, 2011b). The United Nations presented a set of general sustainable development indicators for African countries (UN Economic Commission for Africa, 2009). The Poor People's Energy Outlook presented indicators more specific to developing countries with considerations for energy's importance for earning a living and the importance of energy at the household level (Practical Action, 2012). Specific sets of indicators for EP activities in Sub-Saharan Africa or in ECOWAS have not been presented.

The aim of this work is to provide an assessment of the *Objectives* set for EP activities, the *Attributes* employed in energy plan formulation, and the *Indicators* used to measure outcomes, as found in the EP practices of ECOWAS member. This work also assesses the level of specificity in the *Indicators* employed.

2 The ECOWAS

2.1 Socio-Economic Situation

ECOWAS consists of 15 countries of the Sub-Saharan West African region. The 15 member states are Cape Verde, Senegal, The Gambia, Mali, Niger, Nigeria, Togo, Benin, Sierra Leone, Ivory Coast, Liberia, Burkina Faso, Guinea-Bissau, Guinea, and Ghana. The ECOWAS region covers roughly 17% of the area of the African continent. The largest states, Mali and Niger, have areas over 1.2million km^2, while The Gambia and Cape Verde, cover 10.6 thousand km^2

[1] Definitions for developed countries differ among international organizations based on their classification needs. The World Bank classifies according to Gross National Income (GNI) per capita (The World Bank, 2011a). The International Monetary Fund (IMF) refers to emerging and developing countries, with classification by per capita income, export diversification, and degree of integration into the world financial system (IMF, 2012). The United Nations employs the Human Development Index (HDI) distribution, which considers GNI, life-expectancy at birth, and measures of actual and expected years of schooling (UNDP, 2011). See Nielsen (2011) for a discussion of country development level definitions & evaluation methods. Here developed refers to countries of the Organisation for Economic Co-operation and Development (OECD) countries.

[2] Modern Energy here refers to energy carriers such as gas for cooking and electricity for lighting and other services. This implies access to clean cooking facilities and electricity for lighting and other appliances and uses. This is a definition at a household or basic services level. Of course it leaves out important factors including productive purposes eg. industry and transport. There is no common definition for *access*, Brew-Hammond (2010) presents a review of definitions, here *access* refers to availability of modern energy services in an area.

and 4 thousand km^2 respectively (The World Bank, 2011b). There is one island nation, Cape Verde, and 3 landlocked states, Mali, Niger, and Burkina Faso.

In 2010 the ECOWAS population was 301 million, and forecasted to reach 342 million by 2015 (UN Population Div of Dept. of Eco. & Soc. Affairs, 2012). The population of Nigeria was 158 million while that of Ghana, the 2nd largest population, was 24 million. The remaining states had populations between 1 and 16 million. Cape Verde had fewer than 500 thousand people (UN Population Div of Dept. of Eco. & Soc. Affairs, 2012).

13 states were classified as Low Human Development by the UNDP, with the exception of Cape Verde and Ghana, which were classified as Medium Human Development(UNDP, 2012b). All the members were classified by the World Bank as part of the low income group, except for Cape Verde in the lower middle income group (The World Bank, 2011c). The ECOWAS countries were classified by the IMF as Emerging and Developing Economies, and 13 of them held the status of Heavily Indebted Poor Countries(IMF, 2011).

2.2 Energy Planning Situation

In Sub-Saharan Africa roughly 17% of the population has modern energy access, and this rate varies greatly between urban and rural populations(UNDP & WHO, 2009). Targets have been set to reach; 100% access to modern cooking fuel, 60% access to energy for productive purposes, and 66% access to individual electricity supplies (ECOWAS, 2006). ECOWAS is not unique in the setting of ambitious targets which have also been set by other actors in the region (Brew-Hammond, 2010).

Recent efforts, to increase modern energy access, in ECOWAS have been seen in the implementation of plans, policies, and programs by member states, however, these efforts have been seen as ineffective (Kemausuor & et al., 2011). For Ghana, Kemausuor & et al (2011) described the need for coherent national energy policies which involve input from a wide selection of the public with precise targets and strategies which are clearly described to reach these targets.

In addition to EP, The ECOWAS Environmental Policy 2008 requires states to carry out environmental studies or impact assessments on investments and actions with potential environmental impacts (The ECOWAS Commission, 2008). ECOWAS states including Benin, Ghana and Sierra Leone have been active in SEA activities in updates of their Poverty Reduction Strategy Papers (PRS) and other projects. Some states have set regulations requiring SEA for large infrastructure planning activities (OECD, 2012) (Ghanian Environmental Protection Agency, 1999).

3 Methodology

3.1 Document Gathering

An online search was conducted for EP[3] documents for multi-state regions, countries, or cities/municipalities available from governments, government institutions, international organizations and academic research journals from all ECOWAS members. When searching an array of online sources and following references cited, a point was reached when no new documents were recoverable online. An initial collection process gathered 56 documents. From this set, policy and program specific documents were eliminated, and the remaining EP documents which included energy demand forecasts resulted in the 14 documents reviewed here.

There are limitations to an internet search for documents, as not all EP documents are available on government, institution, and other websites for countries in the ECOWAS region.

The 14 EP documents recovered are listed in Table 1. The Document Numbers included are used throughout this report to avoid confusion. No preferential order was given to documents in the list. Of the 15 member countries only 6 member states were not represented. These were Burkina Faso, Ivory Coast, Guinea, Guinea Bissau, Mali, and Niger. Documents were recovered for the remaining 9 countries. For Nigeria, Cape Verde, and Ghana 2 documents were found.

Table 1. Energy planning documents reviewed

Document Number	Document Name	Country
D1	National Energy Plan	Cape Verde
D2	Strategic National Energy Plan	Ghana
D3	Strategy for the Supply of Energy Necessary for the Achievement of the MDGs	Benin
D4	Master Plan for Renewable Energy based Electricity Generation in The Gambia	The Gambia
D5	Assessment of Energy Options and Strategies for Nigeria: Energy Demand, Supply and Environmental Analysis for Sustainable Energy Development (2000-2030).	Nigeria
D6	Economics of Greenhouse Gas Emissions	Senegal
D7	Electricity Demand Forecasting in Nigeria using Time Series Model.	Nigeria
D8	Simplified Power System Master Plan - A Primer for Decisionmaking	Liberia
D9	Support Program for the Control of Traditional Energies and the Promotion of Renewable Energies in Togo	Togo
D10	The Sierra Leone Energy Sector: Prospects & Challenges	Sierra Leone
D11	Assessing Policy Options for Increasing the Use of Renewable Energy for Sustainable Development: Modelling Energy Scenarios for Ghana	Ghana
D12	Update of the Revised Master Plan for the Generation and Transmission of Electricity	West African Power Pool (WAPP)
D13	Renewable Energy Masterplan	Nigeria
D14	Renewable Energy Plan of Cape Verde	Cape Verde

3.2 Matrix of Evaluation

To establish an understanding of the EP activities 3 questions are asked for each of the documents reviewed. A 4th question is asked in an effort to explore the level of specificity of indicators employed in the documents.

[3] Here *planning document* is considered to be a purposeful strategy of design, with coordinated priorities, options and measures that elaborate and implement policies and objectives. *Policy* is a general course of action or proposed overall direction that a government will pursue and that guides ongoing decision making. *Programs* are organized agendas, proposals, and activities which implement certain aspects of policies to achieve these goals (Sadler & Verheem, 1996).

Table 2. Matrix of evaluation

What *Objectives* are set for the EP activities?	What *Attributes* are employed in the formulation of energy plans?	What *Indicators* are used to measure the attributes considered?	Can a generic set of indicators be applied or should these be specific accounting for a country's development level?
1	2	3	4

4 Results

4.1 Objectives set for the EP activities

The EP Objectives set the purposes for which the activity is undertaken and should be reflected throughout the EP process.

A total of 43 objectives were recovered from the initial review. These objectives were filtered down to a unique set of 21 objectives, separated according to Social, Economic and Environmental themes. Objectives, such as *providing reliable electricity*, it could be argued, can fit into multiple themes, but here they are aligned with the theme in which the objective would have the largest implications. Objectives not aligned with these themes were considered to be Undetermined.

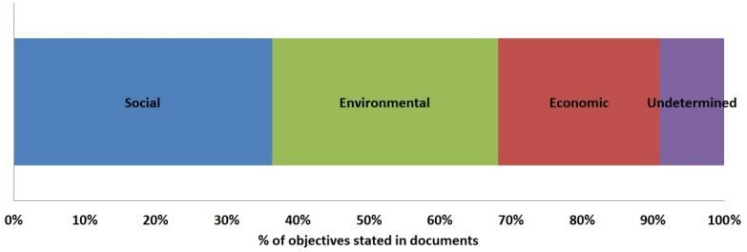

Figure 1. Proportion of document objectives by theme type

Of the list of 21 objectives identified, the most common objectives declared in the documents fell into Social and Environmental themes, representing just below 70% of the stated objectives. Figure 1 presents the shares of each of the themes based on the number of times which each of the 21 unique objectives was cited by the documents.

A number of common objectives were found. The most widely stated objective, within the Social theme, was *to improve access to modern energy services be it in urban, peri-urban, rural areas*, and was stated in 6 of the documents. Also under the Social theme 4 documents had objectives related to *ensuring reliable energy supplies to populations*, and 2 of the documents had objectives to *provide affordable energy* as well as *to strengthen institutional and human resource capacity and R&D in energy development*. Under the Economic theme, 3 documents had objectives of *guaranteeing national economic growth and competitiveness*, 2 documents had the objective of *guaranteeing security of energy supply*. Within the Environmental theme, 6 documents had objectives pertaining to *minimizing environmental & health impact of production, transformation, and use of energy*, 4 documents had objectives of *increasing the use of renewable energy and energy efficient technologies for energy and electricity*. The objective of *improving institutional and regulatory management of energy sources and governance in the energy sector* was included in the undetermined category and was stated in 3 of the documents.

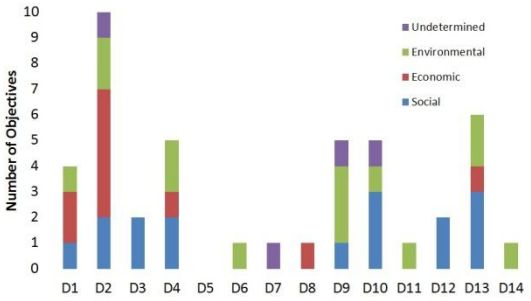

Figure 2. Disaggregation of objectives by theme type

The multi-dimensionality of the objectives in EP activities was examined to see the degree to which EP activities included objectives of different theme types. The disaggregation of objectives by theme type is presented in Figure 2. Of the 15 documents reviewed 8 included more than 1 objective, and 6 stated objectives falling into more than 1 theme type. There were at least 4 documents which included all 3 themes of Social, Economic and Environmental objectives. Environmentally themed objectives were the most commonly stated objectives, followed by Social objectives with 9 and 8 of the documents respectively citing at least 1 objective of these themes types.

4.2 Attributes employed

Attributes are quantifiable parameters used to pre-assess the achievement of an objective in a certain plan alternative, and are important in ensuring that objectives are linked into the actual EP process.

The attributes found or inferred were disaggregated by their respective objective theme types as well as the documents which consider them. Two types of attributes were found in the documents; the first were *diagnosis attributes* used to provide an understanding of a current situation or projection, but not used to compare alternatives. Next were *decision process attributes* used in the process of comparing alternatives.

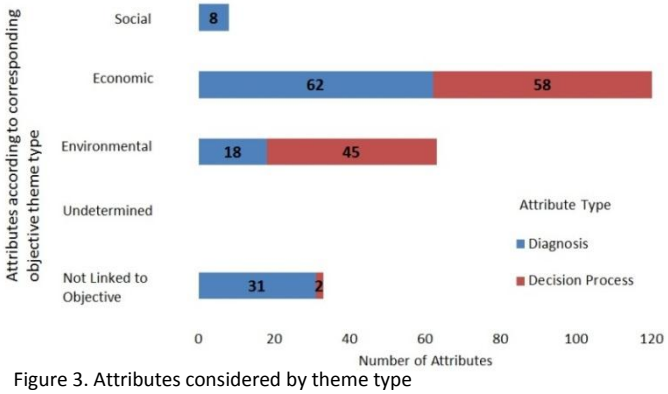

Figure 3. Attributes considered by theme type

A breakdown of attributes by theme and purpose is presented in Figure 3. Attributes linked to Economic objectives were the most numerous, with 125 attributes recorded. Economic attributes were found in all of the documents with identified attributes. Following this are attributes linked to Environmental objectives, with 68 attributes, found in 6 of the documents. Attributes linked to Social objectives were found in only 2 of the documents. 8 of the documents had attributes which were not clearly linked to objectives. Only 1 document D2, from Ghana, had attributes linked to all 3 objective theme types.
Diagnosis attributes were the most common, with 76 attributes. *Diagnosis attributes*, were less common, with 58 attributes. However 27, of the 58 were from a single document, D6 from Senegal. This indicates that the majority of attributes were not used in decision processes assessing alternatives, but rather solely to describe a single future forecast.

4.3 Indicators used

For this work, indicators are considered to be quantifiable parameters used to evaluate the outcomes of actions of the EP activity in relation to the achievement the objectives set. Indicators provide a description of the energy system, and changes in their values overtime provide information as to the progress, or opposite, in relation to the planning activities and the decisions made (Vera & Langlois, 2007). Without indicators, the monitoring and evaluation of EP activities is greatly hindered.

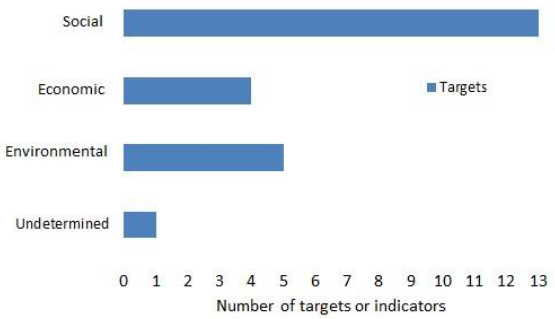

Figure 4 Targets by objective theme type

None of the EP documents reviewed included any indicators with the specific purpose of monitoring or evaluation of the plan after implementation. While no indicators were cited, targets were cited in the documents as desired outcomes, and the majority of targets were related to Social objectives.

4.4 Specificity of EP Indicators

Neves and Leal (2010) presented two sets of energy sustainability indicators for local EP. These sets were used in this work as references in an evaluation of the specificity of indicators found in ECOWAS member plans. The first list consists of 59 unique energy based indicators, resulting from a literature review of sustainability indicators. The second list resulted from a methodology of refinement of the first list to a final list consisting of 8 core and 18 complimentary local energy based indicators.
A comparison was made between the indicators presented by Neves and Leal (2010) with those in the ECOWAS documents, and presented in Table 3. As no indicators were found in the EP documents, the attributes used in the ECOWAS EP documents are considered here. It is assumed that if monitoring activities were conducted they would include some version or combination of the attributes used in the EP activity.
The majority of the indicators in the first reference set were not found in the ECOWAS documents. A total of 22 of the 59 indicators were identified in the ECOWAS planning documents, and the majority of these were used in just 4 EP documents. The more common corresponding indicators in the ECOWAS documents included; *Renewable energy share in energy and electricity,* A*nnual energy consumption, total and by main use category* which were both found in 7 of the documents. Also, *GHG emission from energy production and use per capita and per unit of GDP* was found in 5 of the documents. The majority of the indicators found in the 2nd reference set of indicators reviewed were also not encountered in the ECOWAS EP documents. 7 of the 26 energy based indicators presented were found in the ECOWAS EP documents. Only 2 of the EP documents reviewed included 4 of the indicators, D2 and D11 both from Ghana, and the rest of the documents used less than 4 or none of the indicators. The 2 most widely employed indicators were both environmentally themed, and consisted of *Renewable energy share in energy and electricity* and *GHG emission from energy use per capita and per unit of GDP, and by sector* found in 7 and 5 of the documents respectively. This 2nd comparison is not presented here due to space restrictions.

5 Conclusions

The assessment of the Objectives, Attributes, and Indicators has shown that EP documents from ECOWAS members express multiple objectives falling into more than one of the three themes of sustainability. Objectives falling into Environmental and Social themes were the most common. There was a disconnection between the Objectives set and the Attributes used in the planning process, and although Economic objectives were the least commonly stated in the documents, attributes connected to Economic objectives were the most common. Attributes linked to Environmental objectives, the most frequently stated objectives, were the second most common attribute. Attributes which were linked to Social objectives, the second most widely stated objective theme, were uncommon in the documents. Decision process attributes were not as common as those used to provide simple diagnosis of the current situation or a single future scenario; this implies a lack of decision processes in EP activities deciding between alternatives or consideration of multiple future scenarios.
Monitoring and evaluation intentions are absent from the EP activities of the region. No indicators were found in the EP documents, and so any measure of impact of the EP activity, post implementation, would not be possible. It must be noted that one document, D2 from Ghana, stated that SEA activities would be completed with the plan, however

no SEA or monitoring plan was provided together with the plan. The Ghanaian Environmental Protection Agency requires SEA activities to be completed with energy sector projects of this scale (Ghanian Environmental Protection Agency, 1999).The citing of EP Objectives, the translation of these into Attributes ensuring a link to the EP activity and finally the development of Indicators allowing for monitoring and evaluation provides a structure for EP activities, and without a structure it may be difficult to ensure that an EP activity will achieve Objectives or further development goals. The lack of Indicators in the EP activities, and the apparent disconnection between Objectives set and the Attributes employed in the planning process shows that there remains room for development in the EP activities of the region to ensure that they include these structures.

It is noted that the lack of indicators in the activities affected the evaluation of specificity conducted with indicators employed in more developed countries. There were few similarities between the attributes in the document reviewed and those presented in Neves and Leal (2010). Only 3 of these indicators were commonly cited in the documents. These included indicators pertaining to renewable energy shares, annual energy consumptions, and GHG emissions. This may represent a specificity of the indicators to developed countries, but it also may represent a gap in EP activities of the region for energy based indicators and a need to develop more specific sets. Interestingly Documents 1 and 2, from Cape Verde and Ghana respectively, both employed the largest number of indicators on the list. They are also the 2 ECOWAS member states classified as Medium Human Development by the UNDP. The specificity of the indicators should also be assessed, from the other side, to evaluate those used in the ECOWAS member states but not in the list presented from Neves and Leal (2010), and attributes such as *new connections to the grid*, *trend in marginal costs of electricity*, *capacity to maintain and operate new technologies* attest to the specificity of attributes to regional objectives.

Future work may include a further assessment of energy based indicators and the proposal of a set of indicators which would aid actors involved in EP activities in the region and a method to include these in EP activities. As there was an apparent disconnection between EP objectives and the actual planning activity as well as monitoring and evaluation activities, the SEA activity may help to provide structure to EP activities. SEA activities linking them to multi-sectorial policy objectives and ensuring the incorporation of indicators allowing for monitoring and evaluation may aid in structuring EP activities in the region and ensuring their sustainability.

Table 3 Assessment of attributes found in ECOWAS plans with indicators proposed by Neves & Leal (2010).

Energy Based Sustainability Indicators (Neves & Leal 2010)	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	Count
Share of households (or population) without electricity or commercial energy	√	√	√												3
Share of household income spent on fuel and electricity															0
Household energy use for each income group and corresponding fuel mix															0
Accident fatalities per energy produced by fuel chain															0
Energy use per capita														√(14)	1
Energy use per unit of GDP															0
Efficiency of energy conversion and distribution															0
Reserves-to-production ratio															0
Resources-to-production ratio															0
Industrial energy intensities															0
Agricultural energy intensities															0
Service/commercial energy intensities		√													1
Household energy intensities		√													1
Transport energy intensities															0
Fuel shares in energy and electricity	√	√				√			√						4
Non-carbon energy share in energy and electricity											√(9)	√(11)			2
Renewable energy share in energy and electricity	√	√		√							√	√(11)	√	√	7
End-use energy prices by fuel and by sector											√ (10)				1
Net energy import dependency		√							√(8)		√			√	4
Stocks of critical fuels per corresponding fuel consumption		√													1
GHG emissions from energy production and use, per capita and per unit of GDP	√(1)	√(1)							√(1)		√(1)			√(1)	5
Ambient concentrations of air pollutants in urban areas															0
Air pollutant emissions from energy systems	√	√				√									3
Contaminant discharges in liquid effluents from energy systems															0
Oil discharges into coastal waters															0
Soil area where acidification exceeds critical load															0
Rate of deforestation attributed to energy use															0
Ratio of solid waste generation to units of energy produced															0
Ratio of solid waste properly disposed of to total generated solid waste															0
Ratio of solid radioactive waste to units of energy produced															0
Ratio of solid radioactive waste awaiting disposal to total generated solid radioactive waste															0
Average satisfaction with the local community															0
Business demography															0
Attendance at community group meetings															0
GHG emissions by sector						√			√						2
Combined heat and power generation															0
Energy consumption by transport mode	√														1
Access to public transport															0
External costs of transport activities															0
Emissions of air pollutants from transport activities	√														1
Share of major proposals with an impact assessment															0
Responses to EC internet public consultations															0
E-government on-line availability															0
E-government usage by individuals: total															0
CO2 removed by sinks						√									1
External costs of energy use															0
Energy tax revenue															0
Road share of inland freight transport															0
Modal split of freight transport	√(2)														1
Freight transport prices by mode															0
Investment in transport infrastructure by mode															0
Annual energy consumption, total and by main user category	√	√(4)		√(4)		√		√(7)				√(12)		√(13)	7
Modal split of passenger transport	√(2)														1
Percentage of population using solid fuels for cooking		√(5)													1
Eco-efficiency of economic activitie															0
Use of cleaner and alternative fuels		√(6)													1
Projections of GHG emissions and removals and policies and measures	√					√					√			√	4
Global and European temperature															0
Atmospheric GHG concentrations															0
Count	11	12	1	2	0	6	0	1	4	0	6	3	1	6	

(1) Greenhouse gas emissions from energy production and use. Does not include by sector or per capita
(2) A projection of vehicle type and vehicle consumption is made by road, maritime & air, but not a modal split by freight and passenger
(3) Included in discussion but no attribute or target specified
(4) Does not include main user category, is devided by fuel type
(5) Woodfuel energy intensity per urban & rural household [*assumed* tons/household]
(6) Use of manganese instead of ethanol as addative to gasoline, Sulfer conent of diesel [ppm],
(7) Annual electrical energy, fuelwood demand [MWh, ton]
(8) Ratio of electrical energy imported to domestic [%]
(9) Annual primary energy supply by energy source [%], Annual electrical energy generation by primary energy source [TWh]
(10) Annual trend in marginal cost of electricity [indexed to 2005 cost]
(11) Annual share of electrical energy generated by primary energy
(12) Annual electrical energy consumption [MWh]
(13) Annual electrical energy demand by sector [MWh]
(14) Electrical Energy Use per capita

6 Acknowledgements

This work has been developed under the financial support of the Fundação para a Ciência e Tecnologia scholarship (SFRH/BD/51585/2011).

7 References

UN Population Div of Dept. of Eco. & Soc. Affairs. (2012). *World Population Prospects: The 2010 Revision*. Retrieved from http://esa.un.org/unpd/wpp/index.htm

A.A. Mati, e. a. (2009). Electricity Demand Forecasting in Nigeria using Time Series Model. *The Pacific Journal of Science and Technology, 10*(2).

Banerjee, S., & et al. (2008). *Access, Affordability and Alternatives: Modern Infrastructure Services in Sub-Saharan Africa.* Africa Infrastructure Diagnostic.

Brew-Hammond, A. (2010). Energy access in Africa: Challenges ahead. *Energy Policy, 38*, 2291-2301.

Cabraal, R., & et al. (2005). Productive Uses of Energy for Rural Development. *Annu. Rev. Environ. Resour., 30*, 117-144.

Chaker, A., & et al. (2006). A review of strategic environmental assessment in 12 selected countries. *Environmental Impact Assessment Review, 26*, 15-56.

ECOWAS. (2006). *White Paper for a Regional Policy: Geared towards increasing access to energy services for rural and periurban populations in order to acheive the Millenium Development Goals.* Naimey, Niger.

EEA. (2005). *European Environment Agency core set of indicators guide.*

Energy Commission. (2006). *Strategic National Energy Plan: 2006-2020.* Republic of Ghana.

Energy Commission of Nigeria & IAEA. (2006). *Assessment of Energy Options and Strategies for Nigeria: Energy Demand, Supply and Environmental Analysis for Sustainable Energy Development (2000-2030)Part 1 Energy Demand Projections.* Technical Report No. ECN/ EPA/04/01. [Original Document Was not Available] Information from Nigeria's Experience On The Application Of Iaea's Energy Models (Maed & Wasp) For National Energy Planning., A. S. Sambo et al. Energy Commission of Nigeria. raining Meeting / Workshop on Exchange of Experience in Using IAEA's Energy Models and Assessment of Further Training Needs, held at the Korea Atomic Energy Research Institute, Daejon,Republic of Korea 2006.

Energy Commission of Nigeria & United Nations Development Programme. (n.d.). *Renewable Energy Master Plan.* Federal Republic of Nigeria.

Enrique Rodríguez Flores. (2010). *Master Plan for Renewable Energy based Electricity Generation in The Gambia.* University of Kessel.

Foster, V., & Tre, J. (2000). *Measuring the impact of energy interventions oon the poor- an illustration from Guatamala.* London: Infrastructure for Development: Private Solutions and the Poor.

Gesto Energia S.A. (2011). *Plano energético renovável de Cabo Verde.* Portugal.

Ghanian Environmental Protection Agency. (1999). *Environmental assessment regulations 1999.*

GNESD. (2007). *Global Network on Energy for Sust. Development, Reaching the Millennium Development Goals and beyond, Access to modern forms of energy as a prerequisite.*

IAEA. (2005). *Energy Indicators for Sustainable Development: Guidelines and Methodologies.* United Nations Department of Economic and Social Affairs, International Energy Agency, Eurostat, & European Environment Agency. Vienna: International Atomic Energy Agency.

IEA. (2010). *Energy poverty: How to make modern energy access universal? Special early excerpt of the World Energy Outlook 2010 for the UN General Assembly on the Millennium Development Goals.*

IMF. (2011). *World Economic Outlook (WEO): Slowing Growth, Rising Risks.*

IMF. (2012). *Frequently Asked Questions, World Economic Outlook.*

Kaygusuz, K. (2011). Energy Services and energy poverty for sustainable rural development. *Renewable and Sustainable Energy Reviews, 15*, 936-947.

Kaygusuz, K. (2012). Energy for Sustainable development: A case of developing countries. *Renewable and Sustainable Energy Reviews, 16*, 1116-1126.

Kemausuor, F., & et al. (2011). A review of trends, policies and plans for increasing energy access in Ghana. *Renewable and Sustainable Energy Reviews, 19*, 5143–5154.

Kemmler, A., & Spreng, D. (2007). Energy indicators for tracking sustainability in developing countries. *Energy Policy*(35), 2466–2480.

Ministério da Economia Crescimento e Competitividade. (2004). *Plano Energético Nacional.* República de Cabo Verde.

Ministry of Economic Development and Finances & Ministry of Energy Mines and Water. (2006). *Strategy for the Supply of Energy Necessary for the Achievement of the MDGs.* Republic of Benin.

Ministry of Energy & Power. (2006). *The Sierra Leone Energy Sector: Prospects & Challenges.* Sierra Leone.

Ministry of Environmental and Nature Protecion & Department of the Environment. (2001). *Economics of Greenhouse Gas Emissions, Country Study Series Senegal.* Denmark: UNEP Collaborating Centre on Energy and Environment. Risø National Laboratory.

Ministry of the Environment and of Forest Resources Ministry of Mines Energy Water The Food and Agricultural Organization & United Nations. (2008). *Programme d'appui a la maitrise des energies traditionnelles et de promotion des energies renouvelables au Togo.* Republic of Togo.

Modi, V. (2004). *Energy Services for the Poor.* Commissioned Paper for the Millennium Project Task Force 1.

Neves, A., & Leal, V. (2010). Energy sustainability indicators for local energy planning: Review of current practices and derivation of a new framework. *Renewable and Sustainable Energy Reviews, 14*, 2723-2735.

Nielsen, L. (2011). *Classifications of Countries Based on Their Level of Development: How it is Done and How it Could be Done.* IMF Working Paper, International Monetary Fund (IMF).

Norwegian Agency for Development Cooperation (Norad) & Ministry of Lands Mines & Energy. (2009). *Simplified Power System Master Plan - A Primer for Decisionmaking.* Liberia.

OECD. (2012). *Strategic Environmental Assessment in Development Practice, a review of recent experience.*

Patlitzianas, K., & et al. (2008). Sustainable energy policy indicators: Review and recommendations. *Renewable Energy, 33*, 966-973.

Practical Action. (2012). *Poor people's energy outlook.* Warwickshire, UK: Practical Action Publishing Ltd.

Sadler, B., & Verheem, R. (1996). *Strategic Environmental Assessment 53: Status, Challenges and Future Directions,.* Ministry of Housing, Spatial Planning and the Environment, The Netherlands, and the International Study of Effectiveness of Environmental Assessment.

Sheinbaum-Pardo, C., & et al. (2012). Mexican energy policy and sustainability indicators. *Energy Policy, 46*, 278-283.

The ECOWAS Commission. (2008). *ECOWAS Environmental Policy.* Environmental Directorate, Abuja, Nigeria.

The World Bank. (2011a). Retrieved from How we classify countries: http://data.worldbank.org/about/country-classifications

The World Bank. (2011b). *African Development Indicators.* Washington, DC.

The World Bank. (2011c). Retrieved from Country and Lending Groups: data.worldbank.org/about/country-classifications/country-and-lending-groups

The World Bank, & UNDP. (2005). *Energy Services for the Millennium Development Goals.*

UN Economic Commission for Africa. (2009). *Sustainable development report on Africa : managing land-based resources for sustainable development.*

UNDP & WHO. (2009). *The energy access situation in developing countries, A review focusing on the least developed countries and Sub-Saharan Africa.* New York.

UNDP. (2011). *United Nations Development Program - International Human Development Indicators.*

UNDP. (2012). *International Human Development Indicators.*

UN-Energy & Energy Commission of Ghana. (2006). *Assessing Policy Options for Increasing the Use of Renewable Energy for Sustainable Development: Modelling Energy Scenarios for Ghana.* UN-Energy.

Vera, I., & Langlois, L. (2007). Energy indicators for sustainable development. *Energy, 32*, 875–882.

West African Electrical Energy Exchange System West African Power Pool ECOWAS General Secretariat & Tractebel Engineering. (2011). *Update of the Revised Master Plan for the Generation and Transmission of Electricity.* Belgium.