



African Union



African Development Bank



UN Economic Commission  
for Africa

## All Africa Joint Events

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All-Africa Energy Week 2012 (AAEW)

Pan-African Investment Forum (PAIF)

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Addis Ababa, Ethiopia

**“Renewable Energy for Sustainable Development:  
From Potential to Infrastructure and Services”**

## Synopsis of the Thematic Sessions

# **I. Building Public-Private Partnerships to Scale Up Resources for Climate-Friendly Investment in Africa**

## **Executive Summary**

Africa has the potential to use its vast and relatively untapped renewable energy to develop the energy sector on the continent. This is critical to the continent's future development and growth as energy, especially electricity infrastructure in sub-Saharan Africa is the least developed, accessible and reliable and on average, highest priced compared to other regions in the world. These shortcomings are even more heightened in rural areas where access to power lags behind more urban areas.

Increased expenditure on power generation is required to meet these challenges. According to the Africa Infrastructure Country Diagnostic (AICD) as much as US\$48 billion in new investment is needed annually to make up the spending shortfalls in all infrastructure sectors. Out of that US\$29 billion, or 61% is needed in the energy sector.<sup>1</sup>

The need for increased investment in the energy sector in Africa is linked to the need to counter the impact of climate change on the continent. Estimates of the costs of climate change mitigation and adaptation in developing countries vary widely, ranging from \$170 to \$475 billion per year. Africa is estimated to require \$18 billion per year for adaptation alone, in addition to the \$29 billion per year estimated by AICD to be needed over ten years to reach modest energy service delivery levels.<sup>2</sup> Furthermore, sub-Saharan African countries on average spend less than 3% of their GDP on the power sector with about 75% of the spending used as operating costs, suggesting a mere 0.75% of GDP is used in expanding power infrastructure.

Although often thought of as being capital intensive, today the costs of developing renewable energy projects compare favourably to other sources of power. However, renewable energy projects must be bankable in order to attract the necessary finance from the private sector. In response to the challenges highlighted above, there has been a growing interest in the role the private sector could play in infrastructure and public service provision, in particular through the promotion of public-private partnerships (PPPs). It is for these reasons that PPPs are increasingly being promoted as the most viable way through which to deliver renewable energy to African consumers.

It is worth noting that private participation in renewable energy development in Africa has varied enormously and produced heterogeneous results. In addition, the financial crisis of 2008 and the consequent fiscal crunch has put pressure on new public and private investments. Consequently it is ever so important and timely to find innovative solutions for scaling up private sector participation for renewable energy development on the continent.

## **Main recommendations**

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<sup>1</sup> “Foster, Vivien; Briceno-Garmendia, Cecilia. 2010. *Africa's Infrastructure : A Time for Transformation*. © World Bank. <https://openknowledge.worldbank.org/handle/10986/2692> License: CC BY 3.0 Unported.”

<sup>2</sup> “Foster, Vivien; Briceno-Garmendia, Cecilia. 2010. *Africa's Infrastructure : A Time for Transformation*. © World Bank. <https://openknowledge.worldbank.org/handle/10986/2692> License: CC BY 3.0 Unported.”

## Development Context

Renewable Energy Programs should be integrated in the broader development context.

## Stability & Context

All policy support for renewable energy development should be stable and predictable. The use of a particular policy type does not guarantee success. Each country has unique circumstances and must design and enact its own set of policies based on needs, competing interests and available resources.

## Improved Investment Climate

Market mechanisms should be encouraged and designed to ensure long-term viability of the renewable energy sector. Targeted public sector and donor support that address market failures and structural deficits can build on market forces and remove constraints which otherwise impede private sector involvement.

## Legal and Regulatory Structure

Each country should have a conducive legal environment and regulatory structure allowing for the participation of independent power producers, introduction of standardized power purchase agreements and tariff setting procedures that is clear and durable. The legal and regulatory enabling environment for Public Private Partnerships (PPPs) should be created and government policies where possible harmonized through cooperation on cross border projects and by developing harmonized technical and pool grid code standards.

## Capacity Training

Capacity training for government officials should be provided as PPP and Independent Power Project (IPP) concepts are not yet widely understood. Awareness and knowledge, once obtained, needs to be retained.

## Transmission & Interconnection

Transmission and interconnection regulation should go hand in hand with renewable energy regulation. Early attention to interconnection across national boundaries is an increasingly important factor in the overall potential of renewable energy development.

## Regional Cooperation

There should be more regional cooperation for the expansion of generation, transmission and distribution capacity and it should be ensured that regional electricity projects are bankable. This includes raising tariffs to cost-reflective levels but also may include establishing a revolving risk capital bridging facility to allow utilities to make equity contributions to projects and allowing bulk energy users to be counter parties to Power Purchase Agreements (PPAs) in addition to host utilities.

## Power Pools

The power pools should focus on increased access to electricity, including the promotion of small crossborderdistribution projects in parallel with the large regional generation and transmission schemes.

### Renewable Energy Technologies

Renewable energy technology and in particular solar technology is now becoming very competitive due to quickly decreasing costs. Efforts should be made to harness this opportunity across the continent.

### Rural Energy

Governments should try to strengthen and, where appropriate, establish policies on energy for ruraldevelopment, including regulatory systems to promote access to energy in rural areas, establish financialarrangements to make rural energy services affordable to the poor and promote capacity-building in localsocieties. Most importantly, the policies supporting rural electrification should not be biased towards gridextension or diesel based systems.

## II. Innovative financing mechanisms for clean energy with emphasis on energy efficiency and energy mix

### EXECUTIVE SUMMARY

For Africa to meet energy needs will require efficiently harnessing and applying a **mixture of energy sources**. When more energy is obtained from renewable sources, less primary energy is required to provide the same energy services<sup>3</sup>. To achieve desirable results from both energy mix and energy efficiency requires, among others, access to affordable RE/EE technologies and financing which has proven difficult for many African countries.

**Clean Energy Costs range from 0.08 - 0.12 US\$/KWh** for biomass gasifier to 0.14 – 2.00 US\$/KWh for domestic heat and hot water systems. Transport Biofuels have costs in the ranges of 0.20 to 1.02 US\$/Liter of bioethanol and 0.165 to 1.77 US\$/Liter of biodiesel. Commercial **investments in Energy Efficiency** can be recovered in 30 months or less<sup>4</sup>, and can be as little as US\$100, while for domestic they can be the cost of an energy efficient light bulb.

Examples of **target Areas for Potential Energy Efficiency** projects include lighting, household appliances and equipment, buildings envelope, large industries and small and medium enterprises, transport, and off-grid power generation and supply. Examples of **Potential RE/EE Programs/projects** include solar-based RE/EE, biofuels, mini-grids based on PV and hybrid systems, improved cook stoves, and biogas digesters.

**Large projects** can be funded<sup>5, 6</sup> using credit lines, soft loans, revolving funds, publicly backed guarantees, and project loan facilities while **small projects** can use formal and informal financing arrangements such as those from micro finance institutions. Other types of funds include bilateral and multilateral development assistance agencies, CDMs and green certificates. Governments can incentivize banks to use energy savings as collateral.

**Barriers to Implementation of EE** must be eliminated from key end-use markets, regulatory policies must be reformed to remove disincentives to efficiency investment, and local innovative financing mechanisms based on local conditions must be crafted. **Transport biofuels** have potential to economically empower people in rural and peri-urban areas, and thereby significantly improve **accessibility and affordability of modern energies** on sustainable basis.

### RECOMENDATIONS

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<sup>3</sup> REN21. 2012. "Renewables 2012 – Global Status Report". Renewable Energy Policy Network for the 21<sup>st</sup> Century. [www.ren21.net](http://www.ren21.net).

<sup>4</sup> UNIDO. 2011a. "Industrial Energy Efficiency for Sustainable Wealth Creation: *capturing environmental, economic and social dividends*". Industrial Development Report 2011. [http://www.recep.org/file\\_upload/5368\\_tmpphpEnxYAO.pdf](http://www.recep.org/file_upload/5368_tmpphpEnxYAO.pdf).

<sup>5</sup> UNEP. 2011. "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication". ISBN: 978-92-807-3143-9. [www.unep.org/greeneconomy](http://www.unep.org/greeneconomy).

<sup>6</sup> UNIDO. 2011a. "Industrial Energy Efficiency for Sustainable Wealth Creation: *capturing environmental, economic and social dividends*". Industrial Development Report 2011. [http://www.recep.org/file\\_upload/5368\\_tmpphpEnxYAO.pdf](http://www.recep.org/file_upload/5368_tmpphpEnxYAO.pdf).

There is a good case to show that RE and EE hold great potential for many people in Africa to access electricity and other modern forms of energy by unlocking saved energy from current consumers for other uses, and to also reduce the cost of production in industry. The following are recommendations to increase benefits from the industry:

### **Innovative sources of finance / financing mechanisms to minimise investment constraints**

While maintaining pursuit of current RE/EE sources of funds, below are recommended home-grown measures to finance RE/EE programs/projects.

- As policies of **EE and RE** are dubbed as the “twin pillars” of a sustainable energy future, they **should be promoted concurrently** because of their synergetic benefits. Projects would then also benefit from **accessing funds from multiple angles**.
- While most of the funds for EE are invested in policy development, installation of REs, capacity building, etc., funds **for sustainability, increased affordability and household level investments** are wanting. It is therefore proposed to fill-up this gap by **promoting and developing participatory biofuels industry** so as to economically empower the marginalized rural communities.
- Tangible collateral is often a problem for most people in Africa to access funds for EE projects. Since energy **savings are tangible** and they can be measured and costed over time, **they should be considered a strong collateral** by banks for existing energy consumers. Governments can incentivise banks towards this goal.
- Part of **EE savings made** by ESCOs should be **used for** (i) expansion of **RE-based energy services** and (ii) **soft loans** or similar to be accessed for small-medium RE/EE projects. Savings due to improved operating efficiency of power utilities in Africa are estimated at US\$2.7 billion a year<sup>7</sup>, an average of US\$54 million of savings per African country which can be used for RE/EE investments.

### **Technologies and R&D**

All basic RE technologies are mature and their costs are progressively decreasing, thus improving affordability. Their promotion should however be country-specific, depending on the RE mix available or viable.

R&D needs to be supported to internalise the RE/EE industry in Africa, and to also progressively reduce the costs of technologies. Sub-regional and international collaboration should be encouraged to reduce R&D costs, and to avoid costs of “re-inventing the wheel”.

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<sup>7</sup> **Motes W. 2011.** “Global Food and Agriculture Productivity: The Investment Challenge “. A Review by Global Harvest Initiative. January. <http://www.globalharvestinitiative.org/wp-content/uploads/2012/08/Motes-The-Investment-Gap-Jan-31-2011.pdf>.

Sectoral networks should be promoted to improve information flow and development of sectoral databases, which will also help monitor progress in RE/EE implementation.

### Project target areas with high EE impacts

Project target areas with high EE impacts that can be implemented include:

- **lighting** by e.g. promoting energy saving bulbs and installing RE energy systems;
- **household appliances and equipment** in mostly urban and peri-urban areas by e.g. promoting use of energy-efficient appliances such as improved cookstoves, promoting pre-paid meters, as well as installing RE systems;
- **buildings envelope**<sup>8</sup> by e.g. retrofitting, refurbishing, design standards for energy-efficient buildings, as well as installation of RE energy systems;
- **large industries and small and medium enterprises (SMEs)** by e.g. use of energy-efficient processes, installing better meters and sub-meters, fixing leaking steam pipes, reducing use of compressed air, and incentivizing RE consumption;
- **transport** by e.g. use of public transport and use of biofuels (bioethanol, biodiesel and biogas);
- **electricity utilities and power services companies** by e.g. Government providing them with incentives to install energy-efficient power generation and distribution facilities;
- **off-grid power generation and supply** by e.g. providing incentives to invest in renewable energies which favor decentralized systems;
- **cross sectoral** by appropriately applying combinations of EE technologies; and
- **Research, Development, Demonstration and Deployment** to promote local innovations as well as reduce RE/EE technology costs, by funding R&D activities and programs.

### Potential RE/EE programs/projects

Taking into account the Africa regional situation including availability of energy resources, their distribution, their affordability, on-going RE/EE programs, as well as regional energy disparity factors, the RE/EE programs/projects can be proposed as follows:

- **Solar-based RE/EE:** Solar PV Pico systems (SPS) and solar home systems (SHS) for lighting solutions in urban, peri-urban and rural areas. These are

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<sup>8</sup><http://climate-l.iisd.org/news/gef-approves-un-habitatunep-east-africa-energy-efficient-project/>

popular, and several projects are on-going mostly financed by cooperating partners. These also facilitate demand side and supply side EE through off-grid power supply.

- **Biofuels:** Mostly bioethanol, using participatory and drought tolerant feedstocks such as cassava, agave and sweet sorghum for *economic empowerment of rural and peri-urban population to improve affordability of EE measures as well as access multiple energies* from the same feedstocks including liquid, gaseous and solid biofuels, as well as electricity<sup>9</sup>.
- **Mini-grids based on PV and hybrid systems (including small hydro and wind):** which are gaining popularity in villages that are sufficiently dense and well-off<sup>10</sup>.
- **Improved Cook Stoves** with use of biomass-waste briquettes and biogas (e.g. Malawi), as well as ethanol (e.g. Mozambique and Nigeria).
- **Geothermal Heat and Power:** Following successes of thermal projects in Kenya and Ethiopia, countries of the African Rift Valley should derive inspiration and promote projects<sup>11</sup>.
- **Biomass Power Plants:** Generating power and heat with e.g. bagasse-based CHP plants, such as taking place in Kenya, Mauritius, Tanzania, Uganda, and Zimbabwe.
- **Small Scale Hydro Power Plants** which include pico (<5 kW), micro (5 – 100 kW), mini (100 – 1,000 kW) and small (1,000 – 30,000 kW)<sup>12</sup>, to exploit the enormous potential existing mostly in Sub-Saharan Africa.

**Biogas Digesters**, small and large, in rural areas, e.g. households owning 2–3 cows

<sup>9</sup>UNECA. 2011. "Biofuels Development in Africa: *technology options and related policy and regulatory issues*". Report of the United Nations Economic Commission for Africa (UNECA) - Regional Integration, Infrastructure and Trade Division.

<sup>10</sup>REN21. 2012. "Renewables 2012 – Global Status Report". Renewable Energy Policy Network for the 21<sup>st</sup> Century. [www.ren21.net](http://www.ren21.net).

<sup>11</sup>UNIDO. 2011a. "Industrial Energy Efficiency for Sustainable Wealth Creation: *capturing environmental, economic and social dividends*". Industrial Development Report 2011. [http://www.recep.org/file\\_upload/5368\\_tmpphpEnxYAO.pdf](http://www.recep.org/file_upload/5368_tmpphpEnxYAO.pdf).

<sup>12</sup>ECREEE. 2012a. "Report on the ECREEE Workshop on the ECOWAS Program for Small-Scale Hydro Power". ECOWAS Regional Workshop on Small Scale Hydro Power. Held at Golden Gate Hotel, Monrovia, Liberia. 16th to 20th of April. Website: <http://small-hydro.ecreee.org>.



## Paper III: Green Investment & Emerging Governance Issues

### Executive Summary

1. In this study an attempt to explore the potential for green investment (GI) in Africa as well as its governance implications is made. In addition, the study attempted to highlight the implications of GI for inclusive growth such as youth employment and addressing gender bias. Given the paucity of data in the area, the study is based on analysis and compilation of the available evidence on Africa.
2. The main drivers of GI over the last decade include global economic growth, increasing prices of fossil fuels, technology advances, policy support, and increasing demand of populations for a cleaner environment. The rapid rate of growth GI coupled with the driving factors, if well managed, provides an opportunity to achieve the needed investment at global level.
3. The study noted the enormous potential for GI in Africa. Africa is endowed with vast renewable sources of energy that are largely underutilized. Out of the estimated 1750 TWH of hydroelectric power and 14000 MW of geothermal energy only 5 percent and 0.6 percent are exploited. Furthermore, the continent has the highest energy intensity per unit of GDP that approximately exceeds the World average by more than 60 percent reflecting the inefficiency in energy use. The potential of renewable electricity sources of Africa and the Middle East together will put the regions to be the top in electricity production in 2050. Similarly, the continent has huge untapped potential in geothermal energy and carbon.
4. This potential combined with the depressing fact that 70 percent of Sub-Saharan Africa's population is living without access to clean and safe energy shows the potential for green investment.
5. However, in Africa, GI remained minor, being about 1 percent of global investments in 2009. Notwithstanding this, the continent achieved the largest percent increase in renewable energy investment in 2010 among developing country regions apart from China, India, and Brazil as a result of strong performances in Egypt and Kenya. Total investment rose to \$3.6 billion. Thus, the future of the GI in the continent is promising.
6. The study noted, however, that realizing the continent's green economy potential is a challenge. In general, **capacity**, both in terms of skill (including lack of regional coordination), **governance**, and **finance**, are some of the major constraints generally put forward for the underutilization of renewable resources that explains lower GI in Africa. In short, the high initial/startup costs for the transition to green growth, the fact that many in Africa do not own technologies, skill, institutions and the human capital required are challenges to exploit the potential of the green economy.

7. Thus, boosting GI is a timely issue in Africa. This requires understanding the underlying factors that drives GI and should be followed by subsequent efforts from government, private sector and civil society. The study noted (a) energy-saving innovation, (b) the contextual factors that includes the incentives and the interplay of macroeconomic policies, environmental policy, economic policy, and technological policy alongside civil society's influence on firm behavior, (c) the generally accepted determinants of investment such as the cost of capital, Profit, (d) higher price of fossil fuel technologies and lower subsidy to non-renewable sources, (e) geophysical conditions such supply of sunshine and water, (f) specific public interventions, feed-in-tariffs and carbon pricing mechanisms as well as (g) the recent economic growth and population growth in Africa are found to be an important factors that determine GI.
8. The study also noted that GI in Africa is also getting a boost from FDI although the magnitude is not that significant. The share of African GI share in total FDI flows to the continent is not more than 2 to 4 percent in 2011. This is extremely small amount and shows the great potential that Africa and foreign investors in Africa have in this area. In the context of such FDI, China's role in Africa's GI is becoming important
9. Having these potential, the study noted, the need to think about the governance structure through which GI could be a source of new investment project for the private sector as well as its potential for inclusive growth and poverty reduction. However, there is the challenge of articulating the role of PPP in the emerging GI (and the emerging green economy).
10. The study noted that from a political and national interest perspective, the legitimacy and acceptance of a green governance structure in developing countries in general and Africa in particular requires ownership of this green agenda. Then, building the required governance framework will logically follow. Thus, the primary feature of a governance framework for green investment in Africa need to be informed by the issue of sustainable development, job creation and poverty reduction.
11. The study also noted that engagement of the private sector in GI is very costly. This downward pressures to private sector participation are further challenged by the different types of risks involved in GI. These include policy, transactional, capacity and project risks. This underscores the significance of governance to ensure private sector participation in green economy by overcoming these challenges. In addition, governance issues also arise in attracting more GI to the continent.
12. Here, the implication is that **capacity building** works, sound *legal and regulatory framework*, and **transparency** particularly with regards to financial accountability are crucial to realize the potential of PPPs in GI. To deal with these issues:

- PPPs shall begin with careful groundwork and preparation, including a comprehensive feasibility study and economic evaluation for each potential partnership project.
  - international aspect of GI governance structure is an important vehicle that need to be exploited by African countries.
  - African governments have a role to play that promotes green investment too. Removing barriers to green investment such as high import duties for renewable technology and using Feed-in-Tariff mechanism that would guarantee the return from renewable investment can be implemented by these governments.
  - working on addressing tenure insecurity and ambiguity in property rights (say, on carbon projects) are also within the reaches of many African countries.
1. In general, achieving high level of GI requires ***policy support, innovative financial mechanisms, and national and international policy reforms***. This in turn requires a ***creative governance structure***, strong commitment and capacity which will facilitate the engagement of the private sector in GI. Once such policy measures are taken, the next stage is *to design an implementation a managerial capacity and appropriate financing schemes* which is central for effective PPP.
  2. However, the principle for institutional and capacity building noted above should be tailored to suit the uniqueness of the green economy. In this regard the following three guiding principles are important for effectiveness of PPPs in green economy in Africa:
    - creating awareness about climate change and the importance of green economy in the broader context of sustainable development in Africa.
    - recognition of the costly, and perhaps less profitable nature of the GI in Africa
    - creating awareness about globally available financing and addressing the lack of institutions and capacity to exploit these opportunities. In addition, Africa's resource constraint problem could be addressed through innovate financing which may take the form using land and natural resource rent as well as designing and using risk mitigating mechanism.
  3. Having the above three principles countries could use various modalities of PPPs to motivate the private sector to engage in green projects.
  4. Finally, for PPPs in GI to be successful they have to bring *inclusive growth*. Africa remains with persistent high level of unemployment, where youth

unemployment is a major challenge in the continent. This points to the importance of the job creating capacity of green investment for its success.

5. The study has shown that, while quantitative estimates of the number of green jobs that could be generated in different sectors are not possible with current data, its potential in industry, transport, building , agriculture and forestry generally ranges from good to excellent. Realization of this potential green jobs has the following *challenges, however*:
  - the pace of progress, access to green jobs and job quality is very slow.
  - too few of the green jobs that are being created go to those who need them most.
  - the transition for enterprises and workers who will be adversely affected by the transformation to a green economy is not clear and could be a difficult one.
  - Finally, there exists unsustainable business practices and that often such business remain more profitable.
6. To address some of these challenges the study suggested: (a) assessing the potential for green jobs and monitoring progress, (b) closing the skills gaps which are acting as a binding constraint on the greening of economies, (c) encouraging labour-management initiatives for greening workplaces, (d) providing stable policy frameworks, prices and incentives to correct market failures and managing externalized environmental and social costs, and finally (e) scaling up GI and innovative financing of green investment through appropriate incentives.
7. Be that as it may, the sustainability of green jobs depends not only on their environmental benefits but also on their social content, particularly their contributions to increasing social equity. This can be done by focusing on gender and youth employment.
8. Thus, with regard to *gender issues*, most green jobs are expected to be in the secondary sectors (of construction, manufacturing and energy production), where women are significantly underrepresented. Men also dominate the better paid jobs in engineering, financial and business services, where the bulk of green service positions are likely to be created. In addition, the differential impacts of climate change normally increases women's vulnerability that is already driven by several causes. Thus, there is a need to encourage gender-sensitive green investment/economy. For this there is a need to focus on the following policy direction.
  - reducing gender gaps in human capital.
  - closing gender gaps in access to economic opportunities, earnings, employment and productivity.

- shrinking gender differences in voice and agency within society.
  - Finally, limiting the reproduction of gender inequality across generations
9. With regard to the challenge of *youth unemployment* in the continent which is about three times higher than in other age groups there is a need to begin by, accelerated implementation of existing instruments- such as Africa Youth Charter, Beijing Plan of Action, etc that are important to promote youth led adaptation and mitigation in climate change and job creation. Viable options for Africa currently include forestry and renewable energy as the task here is not that complicated. In addition, carbon credit trading are other innovative financing schemes for GI which could be directed at job creation.
  10. In sum, an incentive schemes that encourage GI with excellent content on addressing youth unemployment and gender bias is essential. It is only when GI is framed in such inclusive growth and sustainable development context that it will be successful in the continent

## IV. STRATEGY FOR THE DEVELOPMENT OF REGIONAL HYDROPOWER PROJECTS

### Executive Summary

The «Hydro 2020 Initiative» aims at contributing to the development of African hydropower resources in view to provide reliable and affordable energy supply for the African socio-economic progress. In this regard, its main objectives are: i) elaboration of policies adapted to promote the resource; ii) reinforcement of continental organisations capacities; iii) structuring of dialogue between AU, RECs and countries.

The proposed strategy will focus on: i) the definition of "regional projects" and an analysis of their types; ii) An analysis of barriers in the implementation of regional hydroelectric projects; iii) A review of possible measures to overcome the problems faced by regional hydroelectric projects; iv) the stakeholders' roles at continental and regional levels.

The implementation of continental and regional programmes and projects was in the past mainly hindered by a lack of integrated policies. Fortunately, the adoption of the Programme for Infrastructure Development in Africa (PIDA) in January 2012 by the AU Assembly is considered as starting point of the achievement of cross-border energy integration and will strengthen the capacity of regional specialized institutions such as Regional Power Pools (RPPs) and River Basin Organizations (RBOs). In the context of the hydropower strategy, the retained definition of "regional project" is:

***"A project has a regional character when its implementation has an impact on at least two countries"***

The Regional projects face the following problems:

- *Political*: disagreements between neighbouring countries for the development of the resources.;
- *Legal / regulatory*: lack of legal and regulatory frameworks that may restrict cross-border energy trade ;
- *Environmental and social*: the large projects often have significant impacts. Failure to comply with international standards, especially in the implementation phase, leads to delays that may impede the success of projects;

- *Technical*: The project preparation is very complex and often inadequate due to lack of funds;
- *Financial*: hydropower projects are capital intensive and frequently face the risk of frequent cost overruns and / or unforeseen construction delays;
- *Risk management*: countries often do not understand that risk mitigation is the first priority of private investors. They will not invest unless they are assured that all risks are identified and mitigated.

However it is possible to overcome these problems with appropriate measures, as shown by the experience of several African countries and by the international experience.

Hence, several African countries have undertaken energy sector reforms in order to improve the governance and the efficiency of the public utilities. Furthermore, it is recommended to gradually introduce elements of competitiveness in supply as well as to enable within a reasonable time, the possibility for large consumers, especially industries, to purchase from producers on the short term basis.

To strengthen regional and continental coordination a mechanism at two levels could be considered:

- **At regional level**: the Regional Economic Communities (RECs) and RPPs should be responsible for promoting projects included in their development plans which should be included at same time in the plans of the countries. RECs should establish special purpose vehicle (SPV) for the development of regional projects and strengthen their capacity to handle properly complex projects; Optimal legal / regulatory frameworks for the development of hydropower projects should be prioritized.
- **At Continental level**: the AUC should continue to play the coordination role and will ensure that PIDA will remain the anchorage of regional projects. In addition, human, financial and logistical resources should be provided to the AUC Department of Energy.

The social environmental problems can be mitigated by the adoption of best international practices, particularly with regard to the stakeholders' consultation process. To harmonize the management of environmental issues, in the medium long term, it should be envisaged the set-up of an AU Environment Agency.

Regarding the technical problems, it is suggested to create funds dedicated to the preparation of hydroelectric projects.

Project financing issues can be mitigated by innovative funding schemes including mobilization of domestic savings, international capital market, infrastructures investment funds and Public Private Partnerships (PPPs).

Overcoming the commercial challenges is also crucial to ensure regional projects implementation. To that end, the viability of the end buyers such as public utilities is essential. Mitigation of risk payment failure should be properly addressed.

To attract more **private investors** in regional projects (in the form of a Public private Partnership) it is necessary to take measures in terms of governance: improvement of the business climate, the investors' perception and a better project plan.

To address the complexity of the regional projects, increased by the presence of private investors, it will be necessary to promote the best practices, such as the development of concession models that would reduce the development period of projects. The Ruzizi 3 project under development in the Great Lakes region by Burundi, Democratic Republic of Congo and Rwanda, for example, could serve as a reference.

Many of the risks associated with a project developed by the private investor are mitigated by guarantees provided by multilateral institutions. In this respect, it would be useful to deepen the idea of an African Guarantee Agency.

All these measures are combined in a "road map" for the next 10 years. Some of the measures involve actions at the whole continent under the authority of the AU; others are more regional and require action by the RECs and PPPs. Finally, a series of measures requires actions by the countries concerned by the projects. Among the key recommendations:

- The organization of a biennial workshop on hydro projects;
- The need to assess the feasibility of a specific fund for the preparation of large hydropower projects;
- strengthening of RPPs and RBOs;
- Strengthening of regional planning and set-up of a mechanism to select the best projects to develop in PPP;
- Several measures to rationalize the power sector and measures to attract private investors.



Given the ambitious objectives of the “ Hydropower 2020 Initiative”, many of the recommended actions should be implemented in the short term (1-3 years), while others should be in the medium term (3-5 years). In the long term, the establishment of competitive regional power markets will facilitate the investments and the exchanges of power between countries and more investments.

## V. GUIDELINES FOR INSTITUTING HARMONIZED GEOTHERMAL POLICY, LEGISLATIVE, REGULATORY AND INSTITUTIONAL MECHANISMS.

### Executive Summary

With a population of about 980 million, Africa produced 1,179 million tons of oil equivalent of energy in 2008. 51% of this was exported and 47% consumed within the continent. Households and commerce accounted for 62% of the consumption, with agriculture and industry, the productive economic sectors, consuming only 24%. Electricity generation capacity was 129 GW with only 16% based on renewable energy sources, mainly hydropower, and produced about 600 TWh of energy. These figures show that energy production and consumption in Africa are the lowest in the world.

In Eastern Africa, the energy situation is the least developed in the continent, as illustrated by the low access to, and per capita consumption of electricity:

	Eastern Africa	SSA	Africa	World
Access to electricity (% of population)	15	20	30	87
Per capita consumption (KWh/year)	68	107	124	2782

Moreover only 16% Africa's electricity supply is based on renewable energy sources, 82% of it relying on fossil fuels. Imported petroleum use dominates in Sub-Sahara Africa (SSA), also resorted to for emergency management in much of the AUC-Regional Geothermal Program (RGP) region. Electricity supply is thus limited to the few large urban centers, which nevertheless experience frequent load shading entailing appreciable losses to the GDPs. Rural populations rely on traditional biomass fuel use with the attendant deterioration of the natural and social environment: deforestation, decline of agricultural soil fertility, the adverse effects of particulate pollutants on health, etc.

The above described energy poverty of Africa is considered paradoxical as it prevails in the midst of plentiful renewable energy potential. The statement is truer for Eastern Africa, which makes up most of the AUC-RGP region:

	Renewable energy potentials, averages of estimates, TWh/yr)				
	Wind	Solar	Geotherma	Hydro	Biomass
AUC-RGP Region	2,500	30,000	125	1,635	6
Africa (IRENA 2010)	6,000	160,000	125	1,844	8

The Eastern Africa Power Pool (EAPP) seeks to interconnect the national electric power supply systems of the countries in Eastern and Northeastern Africa with a view to creating a unified power supply system. The large regional electricity markets are sought for accommodating multiple providers and consumers of electricity and for raising the reliability, quantity, quality and security of power supply at lower cost. Planned to be in place by the early 2020s, the EAPP plan envisages the powering of the regional interconnections by large additions of generation capacity by the use of renewable energy resources, mainly hydropower, supported by wind power and geothermal energy, in the process also displacing fossil fuel use in power generation.

The Southern Africa Power Pool (SAPP) is also active in a similar manner in sub-regions which include AU-RGP subscribing countries which lie outside the East Africa sub-region: Democratic Republic of Congo, Malawi and Zambia.

This is the energy resource development and utilization context in which the AUC-RGP is intended to be implemented. Specifically the AUC-RGP seeks to support the development of the large geothermal energy potential of the EARS region for improving the energy mix and for providing base load power to the region and its power pool.

The EAPP is made possible and numerous regional interconnections and large scale hydropower development are under implementation because the foundations for them were laid by the ten subscribing countries agreeing to harmonize their policies and regulatory mechanisms with the intent of eventually creating a single regional electricity regulator and to plan the development of their energy systems coherently with the regional plan.

In similar fashion, the implementation of the AUC-RGP is sought to be based on regionally harmonized national policies, legislations, regulations and institutional setups which will allow the rapid development and utilization in power development of the regions considerable geothermal resources in an optimal manner with the participation of public and private investment. Based on consultations during the 1<sup>st</sup> meeting of the Regional Geothermal Working Group (RGWG) of experts held in Kampala, Uganda during 19-23 September 2011, this document presents recommendations on policy, legislations, regulations and institutional setups for consideration during a 2<sup>nd</sup> meeting of the Working Group, and the production of a

final set of guidelines which the countries of the AUC-RGP region may follow in formulating their policies, legislations and regulations, and for mandating and developing their institutions for the support and management of the development and utilization of their geothermal resources.

Accordingly, the following recommendations are made:

In order to render geothermal resource development and utilization an integral aspect of energy development and utilization, the policies which apply to geothermal resources are recommended to be made part of the overall energy policies of the countries. The part of the policy dealing with geothermal energy should be as outlined below:

- Government wishes to promote and support geothermal resource development and utilization in accordance with the national socio-economic development policies and plans and as part of the long term electric power development plan. It intends to create conditions which will equitably reward public and private investment in the geothermal resource effort and support it with the generation and provision of the essential resource information through its geologic exploration institution, by providing budgetary allocations augmented by external technical and financial assistance. It will put in place geothermal development legislation and the institutional means of regulating the development and utilization of the resources;
- A separate geothermal legislation should have the form and content which will ensure long term, low cost, reliable power supply to consumers, in a manner which will appropriately balance economic benefits and environmental protection, and the provision of fair compensation to developers for the investments that they make and the risks which they assume. Resource ownership, rights of access to it as well as stable market and economic conditions for its development and utilization, including the Feed in Tariff system, will be subject to law. Specialized public and private investment will be encouraged in any aspect of the chain of operations which make up the overall process of geothermal resource exploration and development, and electricity production and dispatch to consumers;
- In addition to a fully empowered and financed geologic exploration institution, the government will empower its regulatory instruments for

regulating the geothermal energy industry within the overall energy regulatory framework. Countries may opt for one of two possible regulatory systems which may provide for either unified or separate regulatory systems for the geothermal resources aspect as mineral resources, and the electricity aspect as an energy commodity. Regulations will define the licensing and operational details which will govern geothermal resource development and utilization for power generation. An independent regulatory institution will be charged with the tasks of technical and economic regulation of the geothermal resources development and the electricity generation operations;

- ERC (Kenya) maintains that, eight years after coming into force, the policy and regulatory instruments enshrined in Sessional Paper No. 4 on Energy of 2004<sup>13</sup>, and as practiced, to be still wanting in some respects. Nevertheless, it embodies the best practice which exists in the AUC-RGP region. It is the product of 22 years of experience in, and evolution in tandem with, the development, use and regulation of the now thriving Kenyan geothermal industry. It should be learned from in the region;
- It should be remembered that the transfer, adaptation, ownership and use of a technology which is a novelty for most countries of the AUC-RGP region, and the development of the capabilities required in the management and regulation of its development and use are products of well thought-out planning and continuing effort and should not be expected to occur in a short time, but to evolve at about the same speed as the advance of the practical aspects of geothermal exploration, development and use. The capabilities can grow and mature only in the context of the growth and maturation of the works of the geothermal projects. Academic and practical training are essential, but they can only augment and ground in theory, the practical knowledge, experience and skills which are developed during systematic project implementation. Collaboration within the region and with institutions from the outside world is indispensable for effective project implementation and for the development of capabilities. The national institutions are the incubators of the human and technical infrastructure capabilities and of the institutions themselves.

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## **IV. AFRICA BIOENERGY POLICY FRAMEWORK AND GUIDELINES**

### **Executive Summary**

This document outlines an African Sustainable Bioenergy Framework that is aimed to provide basic, though essential, principles and guidelines for Regional Economic Communities (CERs) and African Union (AU) member states to develop policies and regulations that can promote a viable sustainable bioenergy sector.

It integrates the previous work of the NEPAD-Planning and Coordination Agency, UN-Economic Commission for Africa (UNECA) and different RECs in the subject. In 2011, the African Union Commission (AUC) and ECA initiated a process for the development of a framework and guidelines for bioenergy development in Africa with a view to promoting energy security and access, enhancing livelihoods and fostering rural development. This initiative involved two validation workshops that brought together key experts from AU member states, RECs, UN agencies, African Development Bank, academia, Non-Government Organizations and Community Based Organizations. The final outcome of the initiative will be then presented before the formal policy makers and AU Organs for consideration and adoption.

A pan African bioenergy framework is justified by the recognition that bioenergy has a potential of contributing to African cross-border energy trade. In order to facilitate this, such bioenergy framework should ensure that countries' policies and actions are harmonised, and should lead to the development of shared and agreed upon standards, codes, behaviours, etc. for a common bioenergy market.

Indeed the world faces a serious energy challenge. The ever rising and fluctuating cost of fossil fuel internationally as well as mounting concerns over supply sustainability have forced major world economies, which are also major importers of fossil fuel, to examine renewable and cheaper options that can complement fossil fuel to meet their energy demands and security. Bioenergy has emerged as one of the most suitable renewable alternatives to co-exist with fossil fuel as their quality constituents match petroleum based products while being likely to pollute less and contribute significantly to rural development and economic growth.

However, strong policies are needed to create a sustainable bioenergy sector as changes in land use and crop production affect directly the availability and price of food, especially for the poor; food and energy are intricately linked. Consequently,

the food crisis of 2007 and 2008 with its profound consequences that caused serious social turmoil, unrests and street protests in several African countries were partially linked to the upcoming biofuels market that diverted food crops to energy production; impacting negatively the price of imported crops such as wheat, corn, meat, etc. The 2012 summer draught and expected failing agricultural yields in the US and some other major cereals producing countries can exacerbate the pressure on food prices and availability and the food versus energy competition globally in the coming months and years.

The food versus energy competition is also witnessed in term of land tenure. The social and environmental consequences in terms of depletion of biodiversity, water resources, soil fertility and landscape have not yet been measured. Arguably, Africa is still to benefit from the maturing bioenergy market.

There is an urgent need to define and adopt sustainability criteria that could enhance issues related to food security; rural development; poverty alleviation; land right and tenure, environmental protection, social equity and wellbeing, cultural heritage and macro-economic impacts. The framework document is presented as follows:

- The rationale for the development of a coordinated, harmonized pan African framework because of the great importance of working together to address the constraints but also maximize the benefits of the unfolding bioenergy sector as none of the African countries or region, taken alone, will be able to solve it individually. Bioenergy is a cross border issue because of its importance and its socio economic and environmental implications;
- The conceptual framework to better understand bioenergy in the African context and its economic, social and environmental implications;
- The key issues and policy options for developing a modern and sustainable bioenergy sector; including a set of sustainability criteria;
- The process for designing and developing sustainable bioenergy policy;
- The various mechanisms necessary for the implementation of bioenergy policies;
- The needs for monitoring the development and implementation of bioenergy policies, and related methodologies and feedbacks systems; and

- The bioenergy framework and the way forward providing recommendations for establishing necessary conditions for the effective development and implementation of bioenergy policies.