Committee of Ten Policy Brief

Nº 3 / 2010

Financing of Sustainable Energy Solutions

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African Development Bank
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AFRICAN DEVELOPMENT BANK GROUP

Financing of Sustainable Energy Solutions

COMMITTEE OF TEN MEETING
WASHINGTON, DC OCTOBER 2010

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1. Introduction

Africa's strong economic performance over the past ten years, as well as its projected economic growth, mean ever-increasing energy demands across the continent. Unfortunately, power supply has not kept pace. It has become imperative to take definite steps to end energy insecurity and to set Africa on a sustainable energy path. Given its abundant natural resources and the many innovative environment-related financing instruments available, Africa has the opportunity to grow under a low-carbon, clean energy path that not only bridges its energy gap, but also attracts significant private investment in the energy sector in support of strong growth, job creation, and poverty reduction on the continent.

The key challenges facing Africa's power sector are inadequate generation capacity, limited electrification, low power consumption, unreliable services, high costs, and a financing gap of approximately $23 billion a year. These challenges call for a paradigm shift in the development of the power sector that seeks to use the vast renewable resources of the continent, including hydro-potential (estimated around 1,750 TWh), geothermal (estimated at 9,000 MW), wind, and solar. These renewable, sustainable sources of energy are best positioned to respond to the access needs of Africa's large rural population which can only be reached in the medium term by off-grid technologies. Moreover, they can provide the necessary scale to avoid reliance on costly small-scale national power systems, which are heavily reliant on expensive oil-based generation.

By choosing to invest in clean energy solutions, Africa can tap into existing concessionary resources that reduce the costs and risks of such investments. An example of such concessionary resources are the US$4.3 billion Clean Technology Funds, which will leverage at least five times that value in clean energy solutions, including energy efficiency, renewable energy, and sustainable transport investments. Twelve middle-income countries and the Middle East and North Africa region (Morocco, Algeria, Tunisia, and Egypt) will see those investments materialize over the next seven years.

Nonetheless, given the huge financing gap and the high costs of clean energy solutions, a portfolio of financing sources will have to be considered and sustained to meet current and future demand. This paper summarizes the public finance sources and measures to attract private investments in the sector. It also discusses other innovative financing mechanisms designed to raise additional funds, and ways to optimize both private and public, financing methods. Finally, it examines the role of multilateral development banks (MDB) that, in addition to applying their own financing mechanisms, can facilitate large-scale regional energy projects and help raise Africa's influence and voice in the allocation, administration and absorption of global climate-related resources.

2. Africa's power sector: challenges and opportunities

2.1 Africa's current power deficits and investment opportunities

Recent studies show that 80 percent of the world's 1.5 billion people without electricity live in mostly rural areas of Sub-Saharan Africa (SSA). It is estimated that only one in four Africans has access to electricity. Chronic power shortages plague 30 African countries. The entire installed generation capacity of 48 Sub Saharan African countries is 68 gigawatts, no more than Spain's. Outside of South Africa, power consumption is barely one percent of the level in high income countries (Tables 1 and 2).

Given that rural areas account for about two-thirds of the population and only 15 percent of the rural population lives within 10 kilometers of a substation (or within 5 kilometers of the medium-voltage line), only a small proportion of rural population can be added to the electricity grid at relatively low cost. As much as 41 percent of the rural population currently living in areas considered isolated or remote from the grid will only be reachable in the medium term by off-grid technologies.

Table 1. Energy Deficit in SSA's low income countries (LIC) and sub-regions

	SSA's LICs	Other LICs	ECOWAS	EAC	SADC	Central
Energy						
Electrical generating capacity *	*37*	*326*	*31*	*24*	*175*	*44*
Access to electricity **	*16*	*41*	*18*	*7*	*21*	*18*

Source: Yepes et al. 2008 **Notes:** * MW per 1 million people (2003). ** Percent of households with access (2002-2004).

Table 2. SSA's Energy Deficit compared to Asia

	SSA	South Asia	East Asia	SSA Oil Exporters	SSA Oil Importers
Energy					
Electrical generating capacity *	*70*	*154*	*231*	*66*	*71*
Access to electricity **	*18*	*44*	*57*	*26*	*16*

Source: Yepes et al. 2008 **Notes:** * MW per 1 million people (2003). ** Percent of households with access (2002-2004).

Inadequate power supplies also mean losses in forgone sales and damaged equipment for the private sector: six percent of turnover on average for formal enterprises, and as much as 16 percent of turnover for informal enterprises unable to provide their own backstop generation (Foster and Steinbuks, 2008). For those enterprises that can invest in backup generators the costs can easily run to US$0.40 per kilowatt-hour or several times higher than the utility's costs of generating power (Foster and Steinbuks 2008). Power outages are quite frequent and vary widely across countries: in Senegal they account for 25 days a

year, in Tanzania 63 days, and in Burundi 144 days. The overall economic costs of power shortages typically range between one and four percent of GDP.

While half of the countries in Sub-Saharan Africa achieved GDP growth rates in excess of 4.5 percent and their demand for power grew at a similar pace between 2001 and 2005, the supply of power expanded only 1.2 percent annually. In order to meet suppressed demand, keep pace with projected economic growth, and provide additional capacity to support the rollout of electrification, the power sector in Africa must install 7,000 megawatts of new generation capacity each year.

2.2 High costs of producing power in Africa

The average total cost of producing power in Africa is exceptionally high: US$0.18 per kilowatt-hour with an average effective tariff of US$0.14 per kilowatt-hour when compared with tariffs of US$0.04 per kilowatt-hour in South Asia and $0.07 in East Asia. These exceptionally high costs are mostly due to the small scale of most national power systems and the widespread reliance on expensive oil-based generation. High production cost is just one of numerous inefficiencies; others include less than full implementation of the fiscal budgets allocated for investment in energy, insufficient maintenance, inefficiencies and losses during the distribution phase, and pricing of electricity below the cost as is done is South Africa, which encourages wasteful consumption. Full cost-recovery tariffs could be affordable already in countries with efficient large-scale hydropower- or coal-based systems, but not in those relying on small-scale oil-based plants. If regional power trade becomes a reality, generation costs will fall, and full cost-recovery tariffs could be affordable in much of Africa.

2.3 Africa's energy deficit financing gap

Total infrastructure financing needs for SSA are estimated to be US$93.3 billion annually. Financing needs of the energy sector alone are US$41 billion (6.4 percent of the region's GDP) a year; this estimate does not include the cost of clean and sustainable energy.

The total spending needs of the power sector in SSA when compared with the existing spending levels of US$11.6 billion/year, make the investment backlog become clear (Table 3). The adoption of high-cost generation solutions skews existing spending toward operating expenditure, leaving only US$4.6 billion a year to fund the long-term investments needed to address the continent's power supply crisis. While more than half comes from domestic public finance, investments are also financed by external sources, the most significant being non-OECD countries. This funding accounts for US$1.1 billion a year, or 24 percent, mostly from the Export-Import Bank of China, with ODA assistance accounting for US$0.7 billion a year (15 percent) and private capital flows for US$0.5 billion a year (11 percent).

Table 3. Financing Flows to the Power Sector in SSA
US$ billion annually

Country type	Operation and maintenance	Capital spending					Total spending
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total	
Sub-Saharan Africa	7.00	2.40	0.70	1.10	0.50	4.60	11.60

Source: Briceno-Garmendia, Smits, and Foster 2008. **Note:** Operation and maintenance includes other current expenditures. ODA=official development assistance; OECD=Organization for Economic Co-operation and Development; PPI=private participation in infrastructure. Totals may not add exactly because of rounding errors.

The financing gap could be reduced by US$3.3 billion a year if power utilities' operating inefficiencies were addressed, by US$2.2 billion a year if improvements were made in cost recovery, and by US$0.3 billion a year if capital budgets were better executed. However, even with all inefficiencies eliminated, a sizable power sector financing gap of US$23 billion a year would remain (Table 4).

Table 4. Composition of Power Sector Funding Gap in SSA

Country type	US$ billions annually			Percentage of SSA's GDP		
	Capital expenditure gap	Operation and maintenance gap	Total gap	Capital expenditure gap	Operation and maintenance gap	Total gap
Sub-Saharan Africa	17.6	5.6	23.2	2.7	0.9	3.6

Source: Briceno-Garmendia, Smits, and Foster 2008; Yepes, Pierce, and Foster 2008.
Note: Totals do not add because efficiency gains cannot be carried across country groups.

Closing this large financing gap will require improving the creditworthiness of utilities and sustaining the recent increase in external finance to the sector. New major non-OECD power financiers, particularly Chinese and Indian export-import banks, have emerged and increased their investments from almost nothing to an average of US$2 billion a year in 2005–07, mostly in large hydropower projects. ODA to the power sector has also risen substantially in 2005-2007, averaging US$1.5 billion a year and reaching a peak of US$2.3 billion in 2007. Private sector investments in Africa's power sector is still rare, averaging about $1 billion a year between 2005–2007 with the bulk of such investments going into 3,000 megawatts of independent power projects.

3. Public finance sources and private sector role in financing clean energy

3.1 Potential public finance sources

While private sources will play an increasingly important role in financing clean energy projects, low returns to private sector investors so far imply that a substantial portion of expenditures will need to be covered from public sources. Potential public sources considered herein include domestic taxation, official development assistance (ODA), emerging donors, and innovative forms of financing from carbon markets, taxation on the aviation and maritime sectors, and the Tobin tax. They can be assessed according to their revenue raising potential, additionality, efficiency, practicality, and reliability.

3.1.1 National public finance sources

Over the longer term, domestic revenue mobilization, in particular though better tax policies and strengthening tax administration, is the most viable financing basis for development expenditures, including those on sustainable energy. Reduced aid dependence will be even more important in the aftermath of the global financial crisis, with official aid projected to decline.

Many African economies have strengthened tax collection since the early 1990s; it increased from 22 percent of GDP in 1990 to 27 percent in 2007. Despite this progress, tax-to-GDP ratios are still very low in some countries, especially fragile ones (10.1 percent of GDP in Sierra Leone in 2008 and 7.9 percent of GDP in Central African Republic), pointing to vast untapped potential. In these least developed countries, less emphasis should be placed on short term tax efficiency and more on developing the private sector and generating growth as a basis for income taxation over the medium term. High and complex taxes constrain entrepreneurship and private sector development.

African countries can also mobilize resources by developing further their banking sectors. With the right incentives, they can capitalize on future flows such as remittances to finance investment, and initiate innovative ways to 'bank the unbanked'.

3.1.2. International public finance sources

A) Official Development Assistance (ODA)

Most of the contributions to the existing 21 major climate funds are counted as ODA. The global pledges for additional development financing have been slow to materialize. Beyond climate change needs, the delivery of pledged external resources has continuously fallen short of Gleneagles commitments and external aid is likely to decline further in the future. For example, In summer 2010, DAC was still US$17 billion (in 2004 dollars) short of the aggregate commitments. These developments have raised importance of emerging donors, such as China.

B) Emerging Donors

In the last 10 years, Chinese foreign direct investment (FDI) to Africa has markedly increased. Specifically, Chinese infrastructure finance commitments in sub-Saharan Africa increased from US$0.5 billion in 2001 to US$7.1 billion in 2006 and US$4.5 billion in 2007. While Chinese investments have brought about many benefits for the continent, they are often concentrated in environmentally sensitive sectors (e.g., oil and gas, mining, hydropower) or backed by natural resources, such as in Sudan, Angola, and Nigeria, where Chinese investments were backed by oil. Projects are sometimes located in ecologically fragile regions or in areas that have been protected as national parks.

Greater consideration for the environmental impact of the Chinese investment would not only support economic prosperity and social stability in Africa, but also move Chinese activities up the technological and economic value chain. The Chinese government has already recognized this and has begun to factor this aspect into its policy towards Africa. For example, China Exim Bank has strengthened its environmental standards and has even dropped some projects because of environment considerations.

3.1.3 Innovative forms to raise ***additional*** funds

A) Carbon markets public revenues

Three main mechanisms fall under this option: 1) auctioning part of assigned amount units (AAUs) to countries with emission reduction targets, 2) earmarking revenues from emission allowances in countries with emission trading schemes (ETS), and 3) taxes on international offset projects such as Clean Development Mechanism (CDM). Estimated revenues from this source are US$10-70 billion.

AAU is amount of carbon country is permitted to emit. Part of this amount can be auctioned, with revenues used for climate change adaption. This source is viewed as one of the most attractive in number of aspects, in particular the amount raised.

Carbon finance can contribute to co-financing new renewable energy infrastructure. As a market-based (and legally enforceable) mechanism, it is more predictable than budget aid and can help generate efficiency gains and bring down cost of renewable energy. So far though, returns on private sector-financed projects tend to be low, underscoring the need for public-private partnerships.

Regarding CDMs, so far they have delivered only minimal results in Africa, with only two percent of all CDM projects originating on the continent. The main reasons are: 1) high cost of doing business in Africa; 2) low per capita emission which reduces scope for savings; 3) the CDM framework does not address forestry and land use charges, areas where Africa has substantial potential for reductions; and 4) Africa specific needs are not taken into account (e.g. shortage of technical capacity).

B) Taxation from aviation and maritime sectors

Significant revenue (US$29-38 billion) could be generated from taxation from aviation and maritime sectors in an efficient, automatic and predictable manner. This source of funding has not generated much political controversies. For Africa, the following issues with this mechanism are of concern: (i) exporting firms could lose some competitiveness in foreign markets; (ii) unless this compensation is focused on small and least developed countries, large industrial nations would receive the bulk of it.

C) Financial transaction tax

The financial transaction tax could generate substantial resources in predictable manner (estimated range is from US$25-45 billion). It is considered politically difficult to implement since it would need to be implemented by all countries simultaneously (or at least by all major financial centers).

Summary – public finance sources

On balance, carbon markets revenues (the AAU scheme in particular) in combination with taxation from aviation and maritime sectors seem to be the most appropriate options for mobilizing climate finance resources at the required scale. Nonetheless, no single source can close the entire gap. A variety of sources, private and public, bilateral and multilateral, including some innovative forms, will be needed to generate sufficient funding and maximize strengths of each, while offsetting weaknesses.

3.2 Assessment of the role of the private sector

Private financiers and developers look beyond transaction-specific characteristics when making investment decisions. In selecting projects, private developers also consider the wider political, legal, and economic contexts which govern a project. 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. An improving investment climate extends to policy areas including: 1) improving regulatory environments that facilitate business registration, 2) contract enforcement, 3) simplified tax codes, 4) property ownership, 5) supplying trained local labor, and 6) financial sector reforms which allow convertibility and repatriation of earnings.

Governments creating PPP units attract more private sector investment. Successful partnerships between state and private actors that go beyond business reforms create environments conducive to investment. The best PPP units have established programs of prioritized investment opportunities with features including clear political support, a proper legal and regulatory structure, a transparent procurement framework, and support services to facilitate implementing project timetables. These features reduce uncertainty, lower the risk profile, and improve project viability.

As a result, governments should invest resources to build transactional capacity within government bodies to negotiate contractual agreements which reflect appropriate risk allocation and reward sharing between stakeholders. For renewable energy in particular, technical capacity is required to properly price and reflect the economic and financial value of environmental and natural resources. Bankable project documentation that suitably allocates costs and risks to appropriate parties is essential to boost private investor confidence. This can only be achieved when concession and off-take agreements are negotiated within a transparent framework governed by an independent regulatory authority.

The African Development Bank has a number of financing instruments aimed at providing technical assistance and financial support to make projects bankable. Among those, a new Sustainable Energy Fund for Africa (SEFA), is about to be launched. SEFA will provide grants to support equity investments and technical assistance for Small and Medium Enterprises to offset project preparation costs, including financing adequate feasibility studies, land acquisitions, and social and environmental assessments.

A) Mitigating political and commercial risk

There a number of factors that limit private financiers' appetite for long term exposure to renewable energy projects in emerging and frontier markets, including political risk, refinancing risk, and commercial risk introduced by the poor creditworthiness of state-owned utilities that have the payment obligations to buy generated power under power purchase agreements.

Some government-owned electricity utilities perform reasonably well, but the majority of utilities require some level of government support in order to remain financially viable. Common problems afflicting profitability include poor billing and payment collection systems, limited innovation, and prices which reflect neither costs nor demand. In many African countries where electrification rates are low, governments prefer to enforce average prices which are lower than average costs in order to increase accessibility. Eventually this causes the utility to experience financial distress and cut back on maintenance or investment. In systems where the public sector still has the responsibility for providing transmission and distribution infrastructure, this can inhibit private participation if the ancillary infrastructure to evacuate and distribute power is unavailable or overloaded. Technical losses are higher when ancillary infrastructure is improperly maintained, resulting in less revenue collection while the utility must still fulfill payment obligations for undistributed but generated power.

When there is exposure to commercial risks related to the utility's financial and technical performance, lenders will seek credit enhancement from other sources to backstop the utility's payment obligations. This can range from an open-ended government guarantee of the utility's debt obligations, to having three to six months of utility payment obligations under the off-take agreement backstopped by a letter of credit issued by commercial banks. In the case of the government guarantee, lenders consider the government's creditworthiness. Government guarantees, however, create contingent

liabilities for governments and ultimately have debt sustainability implications. Requiring the utility to borrow on the back of letters of credit will require the utility to have stable financial performance.

Multilateral banks offer a number of instruments to mitigate political and commercial risk in order to encourage private investment and improve the terms of the commercial debt. Partial risk guarantees cover specified political risk events, including covering losses incurred by commercial lenders caused by a government or government-owned entity failing to perform its obligations. Partial credit guarantees support sovereign borrowing from member countries, and can be used to facilitate commercial bank issuance of letters of credit to backstop a pre-specified amount of the utility's payment obligations with respect to a particular project. Political risk insurance covering private investors' equity, quasi-equity, and non-equity direct investments can also be sought, covering any combination of transfer restriction, expropriation, war and civil disturbance, and breach of contract.

B) Optimizing financing strategies

Most renewable energy projects are greenfield investments. Costs associated with initial capital expenditure outlays during construction and maintenance during operation phases are reflected in the tariff negotiated in the off-take agreement. The tariff impacts the revenue the project is expected to earn during the concession period, and must be sufficient to service debt and provide a minimum return for equity investors. Electricity generated from renewable energy sources is typically more expensive than electricity generated from conventional sources. Thermal power has lower capital expenditures compared to renewable energy but higher operating costs due to dependence on external fuel sources. While exposure to volatile commodity prices can be mitigated with long term fuel supply agreements, so long as the fuel source is finite, there can never be a sustainable solution. In contrast, renewable energy has the advantage of providing a stable fuel source for power generation. Renewable energy technologies, however, are generally at an earlier stage of market development. Innovation drives up project risk and costs and results in higher initial capital expenditure outlay.

A combination of financing options is required to offset the high cost of generation associated with new or untested technology and ensure the sale of competitively-priced power. A blend of concessional financing with commercial financing can play a key role in subsidizing generation tariffs which would otherwise be too high and make the green energy too expensive for off-takers to purchase. The Clean Technology Fund (CTF) was developed to finance demonstration, deployment, and transfer of low carbon technologies with significant potential for GHG emissions savings. Approximately US$ 4.3 billion has been pledged in CTF resources, to be used as concessional financing in order to help countries buy down costs of public and private sector investment in low carbon development.

Clean energy projects may also be eligible to sell carbon credits under the CDM, providing a supplemental revenue stream for project developers. The additional cash flow supplements the lower revenue earned from an affordable tariff.

4. The role of the African Development Bank and other MDBs and IFIs

MDBs have the experience and capacity to catalyze public and private funds to deploy finance for clean energy. In addition to their mandate to support country-led development processes, MDBs have the capacity to mobilize additional concessional and innovative finance; facilitate the development and utilization of market-based financing mechanisms; leverage private sector resources; support accelerated development and deployment of new technologies; and support policy research, knowledge, and capacity building. Their comparative advantage is the capacity to use a full array of instruments to support simultaneously the development and strengthening of institutional and regulatory capacity and frameworks, as well as finance for investments. Significant to Africa's energy deficit is the MDBs' privileged role in facilitating large-scale regional projects.

Over the past five years, MDBs demand-side energy efficiency financing has more than doubled, reaching US$3 billion in 2009.Supply-side energy efficiency financing has trebled, reaching US$1.9 billion, while renewable energy financing has close to quadrupled from US$1.1 billion in 2006 to US$4.2 billion. The leverage ratio of total project cost to MDB financing ranged between 3.3 and 3.8 with an average leverage ratio over the period 2006 to 2009 of 3.4. About half of the MDB financing was targeted to the private sector.

These efforts have been supported through the mobilization and deployment of global climate financing instruments, in particular the Climate Investment Funds (CIF) and the Global Environment Facility (GEF). Recent conservative estimates indicate a significant expected growth in MDB renewable energy financing, which can increase from US$4.2 billion in 2009 to US$5.9 billion in 2012. However, MDB clean energy financing results over this period will depend to a significant extent on the sustained availability of concessional funding. Such funding is required in the form of grants to support technical assistance and capacity building and in the form of concessional financing to address market distortions.

The African Development Bank (AfDB) is proposing to establish a special fund, the Africa Green Fund (AGF) as a financing mechanism for addressing Africa's low carbon growth needs, including the development of its clean energy potential. The AGF would predominantly be financed from the resources allocated to Africa from the pledges under the Copenhagen Accord. The location of this funding mechanism in Africa has the potential to enhance African countries' resource ownership, African participation in the decision-making processes regarding fund usage, and the principle of equity and fairness in the allocation of resources.

5. Policy recommendations

A number of recommendations follow from the foregoing analysis of the challenges and opportunities associated with financing sustainable clean energy in Africa. They include the following:

- **Combine instruments**. Significant scale and transformational impacts can be achieved by linking project interventions to policy in a programmatic way. Combining resources across climate financing instruments not only supports scaling up but can stimulate transformational processes.

- **Promote new and additional concessional funds for clean energy**. This will be a key determinant to further scale up clean energy financing activity particularly in the absence of a significant strengthening of the climate framework, including the carbon markets. Current committed donor finance, plus projected CDM funding through 2012, amount to less than US$8 billion per year.

- **Address regulatory risk.** This remains a high priority in a number of countries, particularly with respect to renewable energy. Guarantee of grid access, adequate tariff levels, and clear rules to pass through the incremental costs of renewable energy are key to scale up market penetration, particularly for independent power plants.

- **Consider adoption of feed-in tariffs**. Feed-in tariffs are mandated by legislation and ensure that IPPs cover the cost of generation plus a reasonable return for equity investors to incentivize developers to invest. The Kenyan government introduced feed-in tariffs for wind, biomass, and small hydropower generation in March 2008, with guaranteed prices for 15 years. Algeria and Mauritius also have feed-in tariffs, while Nigeria and Ghana are making plans to introduce them. The national energy regulator of South Africa, NERSA, introduced separate feed-in tariffs for wind, solar, and small hydro in March 2009 following a consultation paper, public hearings, and deliberations with major stakeholders. The tariffs are set at above-market rates and are guaranteed for a period of 20 years.

- **Create incentives for new technologies**. African governments should help promote the development of local green technology industries and encourage the transfer and diffusion of technologies from other parts of the world. For example, Ghana ceased subsidizing petroleum products in 2005 and diverted those resources to developing clean technology. This has the benefit of lining up with the 2009 G20 pledge to phase out subsidizing fossil fuels in the medium term. Another option could be to relax import barriers, such as high import duties on products used in renewable energy production. Yet another option could be to promote the domestic production of renewable energy components, like solar panels or wind turbines, to ensure sustainable development of green technology domestically.

6. Key messages

- The energy gap in Africa together with the continent's natural resources should be viewed as opportunity: 1) for private sector investment, 2) for accelerating growth and reducing poverty if the gap is closed, and 3) for embarking on green growth path.

- Given the urgent and enormous financing needs, a mixture of financing instruments/sources will be needed to address them. The private sector will need to contribute and innovative sources of financing will need to be found. At the same time, the public sector has a vital role to play, also through crowding in private resources.

- Africa is well positioned to embark on clean energy growth path and climate-compatible development. Africa's perspectives must be taken into account more when global environment-related funds are disbursed. Africa's leadership requested that 40 percent of the resources in the Copenhagen Accord should be allocated to Africa and the allocation managed by the AfDB. In response, AfDB is setting up the Africa Green Fund to receive and manage these resources.

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