UNEP Finance Initiative
Innovative financing for sustainability

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Financing renewable energy in developing countries

Drivers and barriers for private finance in sub-Saharan Africa

February 2012

A study and survey by UNEP Finance Initiative on the views, experiences and policy needs of energy financiers

United Nations Environment Programme

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Contents

Abbreviations

AfDB	African Development Bank
CAPEX	Capital expenditure
CER	Certified emission reduction
CDM	Clean Development Mechanism
CO_2	Carbon dioxide
DNA	Designated national authority
ERT	Energy for Rural Transformation
FIT	Feed-in tariff
G20	Group of Twenty
GDP	Gross domestic product
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent power producer
kWh	Kilowatt hour
LDCs	Least Developed Countries
MWh	Megawatt hour
MIGA	Multilateral Insurance Guarantee Agency
MW	Megawatt
OPEX	Operational expenditure
PPA	Power purchase agreement
PV	Photovoltaic
R&D	Research and development
RE	Renewable energy
REC	Renewable energy credit
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REN21	Renewable Energy Policy Network for the 21st Century
ROC	Renewable obligation certificate
RPS	Renewable portfolio standard
SSA	sub-Saharan Africa
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USD	United States Dollars
US EIA	United States Energy Information Administration

Acknowledgements

About the Project

This report is the result of a joint project between the Climate Change Working Group and the African Task Force of the United Nations Environment Programme Finance Initiative. It combines desktop research with a global study on renewable energy financing in developing countries and applies the results from this survey to sub-Saharan Africa.

About the African Task Force

The African Task Force (ATF) is UNEP FI's platform in Africa. ATF members are financial institutions that collaborate to drive sustainable development and address the critical environmental and social issues in Africa. The group has a mission of supporting and expanding sustainable financial practice throughout the continent.

UNEP FI's ATF members

Access Bank, Bank Muscat, BMCE Bank, Citibank South Africa, Commercial Bank of Africa, Development Bank of Southern Africa (DBSA), Ecobank Transnational, Fidelity Bank, FirstRand Group (Chair), Industrial Development Corporation (IDC), Kenya Commercial Bank, MunichRe, Nedbank, Netherlands Development Finance Company (FMO), Royal Microfinance of Zambia, Santam Limited, Société Générale, Standard Bank Group, Zenith Bank.

About the Climate Change Working Group (CCWG)

The Climate Change Working Group is a global platform of financial institutions – lenders, investors and insurers – that collaborate to understand the implications of climate change on financial performance and the roles of the finance sector in addressing climate change, as well as to advance the integration of climate change factors – both risks and opportunities – into financial decision-making.

UNEP FI's CCWG members

Access Bank, Allianz, Aviva, Axa, Bank of America Merrill Lynch, CarbonRe, Chartis Insurance, Croatian Bank for Reconstruction and Development (HBOR), Deutsche Bank (Co-Chair), Development Bank of Southern Africa, Ecobank, HSBC (Co-Chair), IL&FS, ING, Kreditanstalt für Wiederaufbau (KfW), La Compagnie Benjamin de Rothschild, MunichRe, Pax World, Trillium Investment, Sustainable Asset Management, Société Générale, Standard Bank, Standard Chartered Bank, SwissRe, UBS.

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Standard Bank
Standard Chartered Bank
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TSKB
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YES Bank

1. Executive summary

Private finance and investment for sustainable electricity access in sub-Saharan Africa[1]?

At roughly 30 gigawatts (GW), the entire generation capacity of the 47 countries of sub-Saharan Africa excluding the Republic of South Africa equals that of Argentina (EIA, 2011), and about a quarter of this installed capacity is not currently available for generation due to a variety of causes, particularly aging plants and lack of maintenance. As a result, sub-Saharan Africa has the world's lowest electricity access rate, at only 24 per cent (Eberhard et al., 2008). The rural electricity access rate is only 8 per cent, with 85 per cent of the population relying on biomass for energy (Ram, 2006).

To meet increasing demand and support economic growth, the power sector in Africa needs to install an estimated 7,000 megawatts (MW) of new generation capacity each year. Adequately financing the development of the energy sector in sub-Saharan Africa is expected to require the mobilization of funds in the order of USD 41 billion per year, which represents 6.4 per cent of the region's GDP. A large financing gap exists because the focus of much of the current spending is on maintenance and operation of the existing power infrastructure, with little remaining to fund long-term investments and to address the power supply gap (AfDB, 2010).

Therefore, in order to close this gap, the mobilization of private investment and finance, is crucial. This is a new approach given that, traditionally, the bulk of investments in infrastructure have been made by governments. However, private institutions are becoming increasingly active in a variety of roles across the energy sector in the region. For these private financiers, the risk-return profile of a project is the ultimate determinant of whether to finance or not.

Experts estimate that unless stronger commitments and effective policy measures are taken to reverse current trends, half the population in sub-Saharan Africa will still be without electricity by 2030, and the proportion of the population relying on traditional fuels for household energy needs will remain the highest among all world regions (UN-Energy/Africa, 2011).

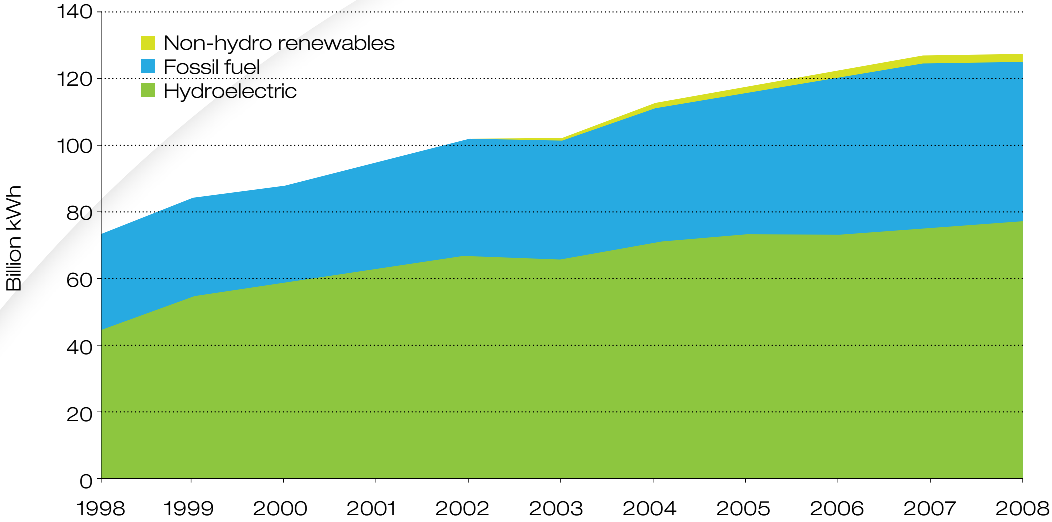
Renewable energy in sub-Saharan Africa: Trends and potential

Electricity access in sub-Saharan Africa is the lowest in the world, but investments flow into the region's electricity sector. From 1998 to 2008, the region witnessed considerable growth – 70 per cent in electricity generation (from 73 to 123 terawatt hours), which translates into an average annual growth rate of 6 per cent for the entire region (even though growth and dynamism are very unevenly spread across the countries of the region). Recent growth in the area of renewable energy has been equally strong, with total electricity generation from renewable sources growing by 72 per cent from 1998 to 2008 (from 45 to 78 terawatt hours per year). This means that 66 per cent of all new electricity generated in sub-Saharan Africa after 1998 has come from renewable sources.

1 Please note that all references to Sub-Saharan Africa in this article exclude South Africa unless otherwise stated. The countries that in this report and analysis are considered as the constituents of sub-Saharan Africa are: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Brazzaville), Congo (Kinshasa), Cote d'Ivoire (Ivory Coast), Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Electricity generation by source in sub-Saharan Africa (1998 – 2008)

Electricity generation by source in sub-Saharan Africa (1998 – 2008)



Source: United States Energy Information Administration, Country statistics, eia.gov

By far most of this growth in renewable energy has essentially meant an increase in hydro-based electricity generation. While it is a renewable resource, hydroelectric development can, under certain circumstances, result in serious environmental damage as well as social conflict, particularly in the case of large-scale, dam-based generation. It is also immediately exposed to the effects of drought, a particularly pertinent risk category in the context of sub-Saharan Africa and its exposure to climate change (UNESCA/UNEP, 2007) (NOAA, 2011). The main effort in the region over the last decade has been undoubtedly on meeting electricity demand by expanding fossil fuel or hydro-based generation. As a result, other renewable energy technologies, which may often be better suited to many African countries with only scarce hydrological and fossil fuel resources but vast wind, solar and biomass resources, have been largely neglected.

This has come at considerable opportunity costs for the region. A greater proportion of renewable energies in the regional electricity mix could offer clear benefits to communities and economic development in the region given their profile and resulting advantages:

- **Renewable energy technologies are deployable in a decentralized and modular manner –** This makes them a particularly suitable energy source for small grids or off-grid solutions, which in turn bear great potential in many rural regions where connection to the grid is either too expensive or disadvantageous for other reasons. It is estimated that 66 per cent of the population in sub-Saharan Africa lives in such regions (AfDB, 2010). According to REN21, a renewable energy policy network, "off-grid renewable solutions are increasingly acknowledged to be the cheapest and most sustainable options for rural areas in much of the developing world" (REN21, 2011).
- **Sub-Saharan Africa features considerable domestic renewable energy resources -** Most countries in the region have renewable energy potential many times the current demand which can be exploited by proven technologies (Deichmann and Meisner et al., 2010). Many parts of sub-Saharan Africa feature daily solar radiation of between 4 kWh and 6 kWh per square meter (REEEP/UNIDO, 2011),[2] the Great Rift Valley has largely untapped geothermal resources, estimated at 9,000 MW (Holm, 2010), and there is great potential for wind power around the coastal regions and eastern highlands.
- **Renewable energy is a domestic resource and offers alternatives to uncertain and increasingly pricey imports of fossil fuels that expose countries to foreign and volatile supply chains –** Imports of petroleum and coal over the last decade have steeply increased in most countries in the region. So have price levels for fossil

2 See Module 1 of the Renewable Energy and Energy Efficiency Partnership/United Nations Industrial Development Organization training package at http://africa-toolkit.reeep.org/

fuels and their volatility on international markets. For the countries analysed in this report, aggregate imports of coal have more than tripled from some 530,000 short tons in 1998 to over 1,650,000 short tons in 2008, while aggregate coal exports from the same group of countries have only increased from 240,000 to 325,000 short tons over the same period. The situation for petroleum-based products is similar if calculations ignore the six large oil-exporting countries in the region (Angola, Congo Brazzaville, Equatorial Guinea, Nigeria, Gabon and Sudan) and consider the remaining 41 countries only. While aggregate exports of petroleum-based products from this majority of countries in sub-Saharan Africa grew from 223,000 barrels per day in 1998 to 360,000 barrels per day in 2008 (a 61 per cent increase), imports grew at a much higher level, from 528,000 barrels per day in 1998 to 908,000 barrels per day in 2008 (a 72 per cent increase). Combining these trade figures with the fact that the medium- to long-term price trends for all fossil-fuels are clearly heading upward shows the potential attractiveness of exploiting domestic renewable energy sources (U.S. EIA, 2011).

- **Renewable energy technologies are approaching grid parity in certain circumstances -** Generation costs for many renewable energy technologies fall steadily and are in certain cases almost comparable with conventional generation methods. For example, solar photovoltaic generation is expected to be competitive with coal sometime between 2012 and 2014 (pv magazine, 2010) and wind power in good locations can deliver electricity at a cost below USD 69 per MWh compared to USD 67 per MWh for coal (Bloomberg, 2011).

- **Renewable energy technologies open new export opportunities and revenue streams by being eligible for carbon crediting on international carbon markets -** The deployment of renewable energy technologies can open export opportunities for countries in sub-Saharan Africa, for carbon credits through international carbon markets. Renewable energy projects qualify for the generation of carbon credits on both voluntary as well as compliance carbon markets underpinned by the some of the crediting mechanisms of the Kyoto Protocol (Clean Development Mechanism, Programmes of Activities, etc.).

What applies to electricity in general also applies in the more specific context of renewable energy technologies. For governments and countries to capitalize on these strategic benefits by achieving ambitious renewable energy objectives, such regulatory frameworks and incentive structures need to be put in place that will effectively mobilize private sector actors, including infrastructure developers, investors and financiers, to engage in the roll-out and operation of renewable energy generation at an appropriate scale. The role of the private sector in achieving any national renewable energy strategy is not only to provide the financial means to enable investment. Often many of the key skills, expertise and resources required for the roll-out, built-up and operation of generating capacity from renewable energies at scale will be found exclusively in the private sector. This is why governments, as part of their renewable energy planning, need to develop effective strategies to mobilize private sector actors for technology deployment, infrastructure development, financing and operation. And this is why this study is based on the results of a survey conducted among 38 financial institutions, primarily from the private sector, with vast experience in financing renewable energy projects in developing countries.

According to this survey, any private sector mobilization strategy aimed at deploying renewable energy technologies in developing countries at scale, will require governments and policymakers to achieve three critical steps:

1. Create a level playing field

in terms of profitability, between innovative and promising renewable technologies and conventional fossil fuel based generation options.

2. Provide easy market access

and grid access, to private sector actors on a competitive basis; without access, the required skills, technologies and financing will not move.

3. Mitigate political and regulatory investment risk

which continue to be detrimental, particularly for renewable energy technologies, even in situations where a level playing field and easy market access have been established.

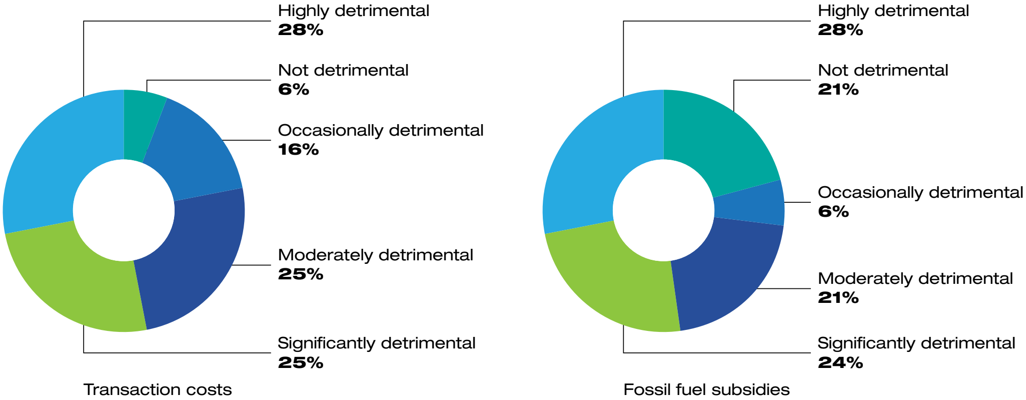
1. **Create a level playing field.** For more detail, refer to Chapter 3.

The problem

There are still many factors in developing countries ranging from the capital-intensity of renewable energy technologies, to the continued provision of subsidies to fossil fuels that make renewable energy generation in the short term, more costly or more difficult to implement than conventional fossil fuel-based technologies, particularly for large-scale generation.

Views of private finance practitioners on transaction costs and fossil fuel subsidies as barriers to renewable energy deployment in developing countries

How detrimental are transaction costs and fossil-fuel subsidies for the viability of renewable energy in developing countries?

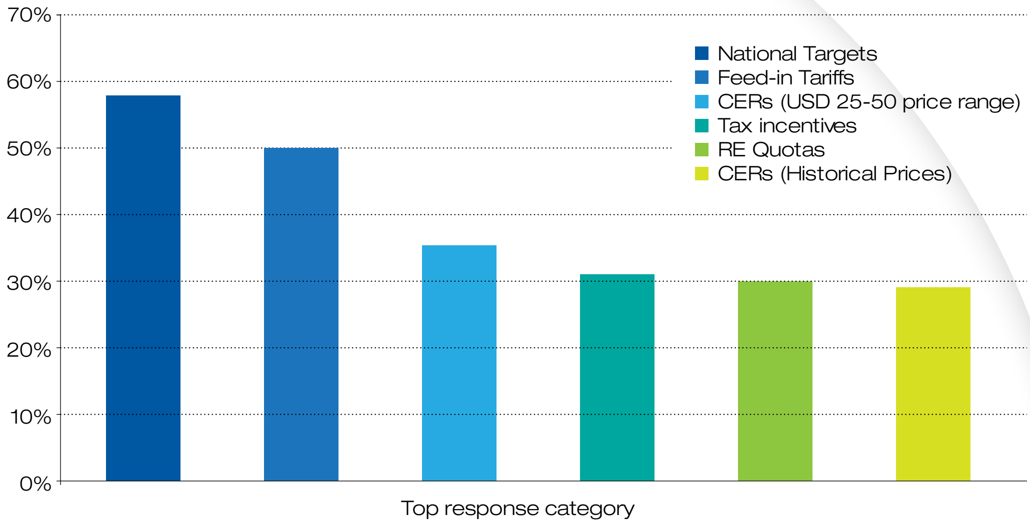


Solutions

The benefits of renewable energy generation tend to materialize in the medium to long term and accrue at the level of the entire economy, country and/or society. However, private sector actors, given their role in competitive markets will only be interested in pursuing activities that are of immediate financial interest. It can therefore be considered the role of the public sector to put in place mechanisms that render activities, which are beneficial and strategic for economy, society and country in the medium term, financially attractive to the private sector in the short term. This requires, in a first instance, the establishment of public incentive mechanisms that create for the private sector a financial ´level playing field´ between renewable and conventional energy technologies. Many such incentive mechanisms have been put in place, both in developed and developing countries, in recent years, with at times remarkable results in the mobilization of private investment for renewable energy infrastructure.

The most powerful incentive mechanisms for renewable energy deployment in developing countries, according to private finance practitioners

Which types of incentive mechanisms are "most powerful" in mobilizing private finance for renewable energy deployment in developing countries?



Only two types of public intervention are considered, by a majority of survey respondents, to be "most powerful" in unlocking private investment and finance for renewable energy in developing countries: the establishment of clear national targets for renewable energy generation and the introduction of feed-in tariffs.

Targets are considered key as they provide the backbone of any country's overall renewable energy strategy and the framework within which incentive mechanisms, such as feed-in tariffs or quotas, are placed. Most critically, clear targets and a formulated government vision provide certainty to private sector actors and make subsequent public incentive instruments more reliable and trustworthy from the perspective of financiers. Targets alone, however, without the subsequent establishment of incentives, cannot create the level playing field required in situations where renewable energy technologies have not yet achieved grid-parity. Their key added value, from a financier´s perspective, is that they achieve a reduction in regulatory risks associated with the policy incentives which renewable energy investments will ultimately have to rely on. To date, only eight countries in sub-Saharan Africa have put in place renewable energy targets for their economies.

Of all incentive instruments that can be established at the national level, feed-in tariffs are most effective, according to the energy financiers who responded to UNEP FI's survey. A vast majority of survey respondents consider all instruments to be important and powerful, but half of all respondents deem feed-in tariffs to be ´most powerful´ or of ´highest important´, while only roughly 30% of respondents attach the same degree of effectiveness to other instrument categories, including fiscal incentives and quotas. This strong preference among private finance practitioners for feed-in tariffs is most likely due to the fact that FiTs are the renewable energy policy instrument most widely used (DB Climate Change Advisors, 2010). The reason for this assessment may therefore be the longer and more proven track record of feed-in tariffs rather than issues regarding the fundamental design of the different instruments per se. To date, in sub-Saharan Africa only Kenya, Tanzania and Uganda have put in place feed-in tariffs.

The Clean Development Mechanism and the importance of the revenue streams created by the issuance and export of CERs is often referred to by financiers as "icing on the cake". The survey confirms that prospects of CER-revenues have not tended be a powerful incentive to finance renewable energy projects in developing countries. The survey results seem to also suggest, however, that it is not necessarily the nature and fundamental design of the CDM as an incentive instrument that has constrained its effectiveness, but rather the low prices levels at which CDM credits (CERs) have been traded. Asked about how they viewed the CDM at more meaningful CER prices of USD 25 to 50, respondents´ perspectives on the CDM change significantly, and a considerably higher potential is attributed to the CDM regarding its ability to unlock private capital and finance for renewable energy deployment.

The situation in sub-Saharan Africa

Some Sub-Saharan countries have put in place national targets for the expansion of renewable energy, and have acknowledged its importance in national development and poverty reduction plans. Despite such political support and endorsement, however, many of the same countries have to date failed to put in place the supportive policies needed to create the level playing field. Without these policies and incentives investors and independent power producers will continue to place emphasis on conventional energy options. It is interesting to note that those sub-Saharan countries that appear to lead the way in the expansion of renewable energy are those that have put in place concrete measures that go beyond political statements. Notably, these countries include Kenya, Uganda and Mauritius, and a few others.

More than 4200 CDM projects are in the global pipeline which are expected to generate 2.9 billion CERs by 2012. However, the current distribution of projects is uneven with 75% percent of registered projects located Asia Pacific and less than 1% in sub-Saharan Africa. Furthermore, to date no country in sub-Saharan Africa has put in place a price on carbon.

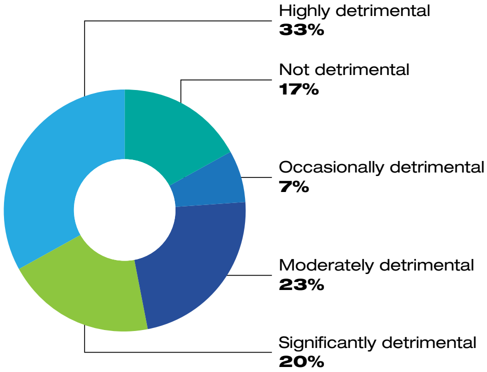
2. **Provide easy market access.** For more detail, refer to Chapter 4.

The problem

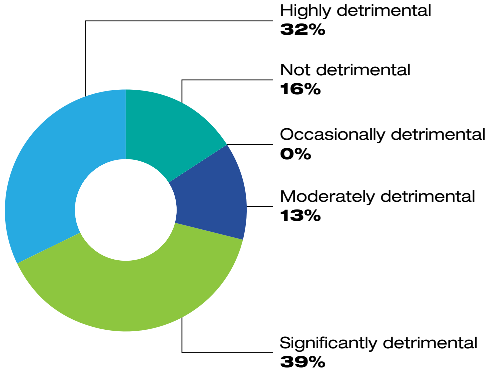
In addition to not facing a ´level playing field´, it is often the legal and regulatory set-up of a country´s electricity sector that makes the deployment of renewable energy technology burdensome for those who have the required capacity to drive it. Electricity systems frequently characterized by the domination of a state-owned national power utility with a legally endowed monopoly and a vertically integrated supply chain - or similar set-ups – by default lack the incentives and flexibility to provide easy grid and market access, on fair terms, to third-party and private sector independent power producers (IPPs). Another implication of this type of energy sector structure is that it renders energy provision susceptible to political interference, typically aimed at keeping energy prices low, which can put in danger the financial sustainability of the overall national model for power provision.

Views of private finance practitioners on unsustainably low energy prices and energy sector policies which stifle innovation, as barriers to renewable energy deployment in developing countries

How detrimental are unsustainably low energy prices and prohibitive energy sector policies for the viability of renewable energyin developing countries?



Unsustainably low energy prices



Energy sector policies

The respondents to the UNEP FI survey confirm that (i) prices which are kept unsustainably low on political grounds, as well as (ii) such features of energy sector regulation that stifle innovation, particularly the lack of access to, and competition on, electricity markets, are greatly detrimental to the engagement of private financiers and investors in the deployment of renewable energy technologies in developing countries.

Part of the solution

Market liberalization efforts which, through the vertical and horizontal unbundling of monopolistic structures, (as well as other thinkable approaches which) achieve the creation of true competition on, and access to, local electricity markets are a necessary step towards scaling up renewable energy investment from private sources according to the respondents of the UNEP FI survey. However, such steps do not suffice unless a level playing field is created simultaneously as described further above.

The situation in sub-Saharan Africa

When compared with reform processes worldwide, Sub-Saharan Africa has been the slowest to implement power sector reforms towards higher degrees of liberalisation and decentralisation. This observation is supported by the United Nations Environment Programme (UNEP) and the Economic Commission for Africa (UNEP & UNECA, 2007), and is according to the latest and most comprehensive global survey of the status of power sector reforms in developing countries (Bacon, R. and J. Besant-Jones, 2002). The survey included 48 sub-Saharan African countries and revealed that, in contrast to other regions in the developing world, overall Sub-Saharan Africa's power sector was the least reformed. Where reforms have led to the establishment of IPPs, they have tended to favor large and centralized systems in either hydroelectric or fossil-fuel-based generation. Most reform efforts in the Sub-Saharan energy sector have primarily focused on partial privatization, most often in the form of commercialization, implemented through management contracts or tariff reform, and only secondarily on liberalization, decentralization and increased competition. It is, however, these latter reform components that can ultimately enhance energy market access to IPPs.

3. Mitigate political and regulatory investment risk.
For more detail, refer to Chapter 5.

The problem

Even as renewable energy technologies become increasingly competitive and profitable, and even as access to local electricity grids and markets is increasingly enabled, the set of investment risks encountered in developing countries remain a persistent challenge. In many developing countries regulatory and macroeconomic risks tend to be so pronounced, and the return expectations of private investors therefore so commensurately high, that many in principle viable and financeable infrastructure projects are impossible to undertake.

All infrastructure projects in developing countries which feature private participation, are affected by political, regulatory and macroeconomic risks. Such projects aimed at delivering a ´public good´, such as in the area of electricity generation, are particularly exposed as they will tend to have, as immediate counterparts, either a publicly-owned utility or other types of public entities that are susceptible to political interference.

Furthermore, renewable energy projects are particularly exposed to and affected by political and regulatory risks, for a number of reasons:

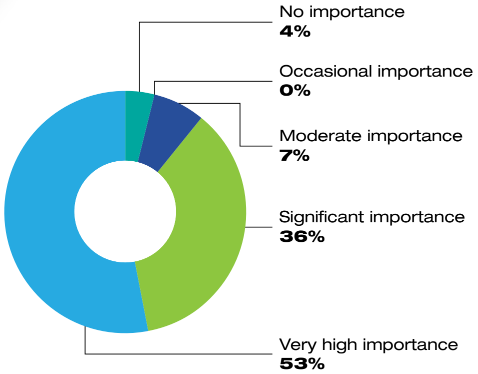
- **Reliance on public incentive mechanisms -** Until renewable energy technologies are fully competitive with conventional energy solutions, regulation and incentives are needed, as described above, to create a level playing field. Such regulation and incentives will ultimately have to be put in place by policymakers and regulators and implemented by governments under a legal framework. This key role of public actors in enabling private actors to deploy, install, operate and finance renewable energy technologies makes it imperative that project sponsors and investors can trust that these incentives will remain in place over the life-time of a project and that public institutions and the legal system are stable and can be trusted. High degrees of regulatory and political risk, however, mean that project sponsors and investors cannot and should not expect or trust in reliability and stability in public affairs.
- **The capital intensity of renewable energy technologies –** As described in more detail in Chapter 3, the capital intensity, which tends to be higher for renewable energy than for fossil-fuel based generation projects, means that the encountered investment risk landscape in developing

countries will tend to have a particularly detrimental effect on project cost structure, especially on the cost of capital, in the case of a renewable energy projects.

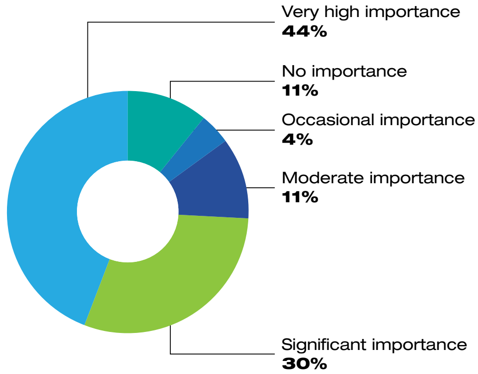
- **Technological risk -** Given their novel track record in many developing countries, particularly in sub-Saharan Africa, renewable energy projects are further exposed to a higher degree of technological risk (which relates to the likelihood of the technology used underperforming or not performing at all) than conventional, well proven technologies in the area of fossil fuel generation.

Views of private finance practitioners, as barriers to renewable energy deployment in developing countries, of:

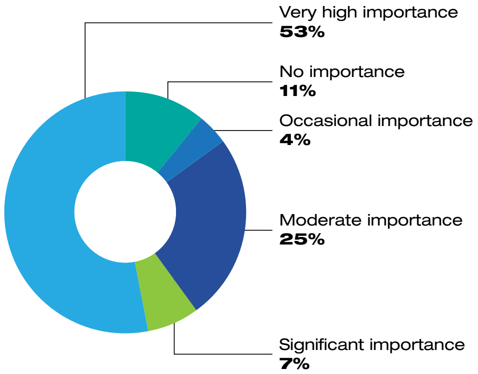
How important are the following aspects for the viability of investment in developing countries?



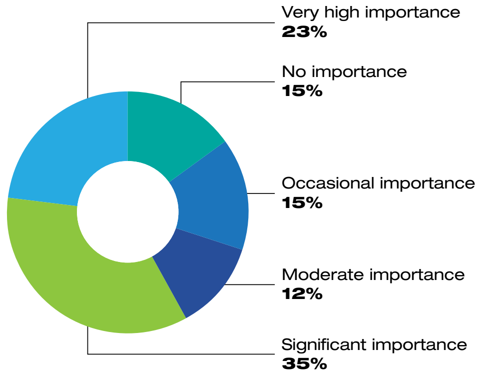
Political, economic and legal stability



Effective law enforcement



Reliability of low- carbon policy frameworks and support mechanisms



Currency risks

Solutions

Risk mitigation solutions, such as guarantees and hedging instruments, can only be effectively provided by the international community, on developmental or environmental grounds in the context of official development assistance or international climate finance. It is the international community, in the form of donor countries, development banks, international organizations or development assistance agencies that has the credibility with private sector actors to be able to offer "safety nets" in unsafe local circumstances. In the long term, however, it is only national governments and domestic political systems that can, through the initiation and implementation of more fundamental reform processes in political, economic and societal structures, reduce the fundamental drivers of the relevant risk categories."

The cases portrayed in Chapter 5 – the Multilateral Investment Guarantee Association (MIGA) and the Currency Exchange Fund – are two examples of how the international community has put in place risk mitigation solutions for risk categories which are critical to private direct investment in developing countries. While renewable energy and other decarbonisation projects can in principle access these generic international instruments, calls have been voiced recently that, in order to reach the required scale in the deployment of renewable energy and other forms of low-carbon technologies in developing countries, the set-up of similar international structure should be considered with an explicit focus on environmental and energy technologies ("Climate-MIGA"; "Climate-CEF").

2. Introduction

2.1 Private finance for renewable energy in sub-Saharan Africa – Why?

Sub-Saharan Africa[3] has the world's lowest electricity access rate, at only 26 per cent. The rural electricity access rate is only 8 per cent, with 85 per cent of the population relying on biomass for energy (Ram, 2006). Even in urban situations with in-principle access to electricity, infrastructure and services are unreliable, with frequent power outages leading to great cost and difficulties. The cost of power outages in sub-Saharan Africa typically ranges between 1 and 4 per cent of gross domestic product (GDP).

From 1998 to 2008, grid-based electricity generation growth rates were considerable, to the order of 5 per cent per annum. Yet they continue to remain well below average GDP and energy demand increases, which have been in excess of 10 per cent per year (AfDB, 2010 and US EIA, 2011). To meet increasing demand and support economic growth, the power sector in Africa needs to install an estimated 7,000 megawatts (MW) of new generation capacity each year (AfDB, 2010). Adequately financing the development of the energy sector in sub-Saharan Africa is expected to require the investment of some USD 41 billion per year, which represents 6.4 per cent of the region's GDP. This does not include the cost of clean energy (AfDB, 2010). A large financing gap exists in the power sector as the focus of much of the current spending is on maintenance and operation of the existing power infrastructure, with little remaining to fund long-term investments and to address the power supply crisis.

To close this gap, the involvement of private financiers and investors is crucial. It is a new approach given that, traditionally, the bulk of investments in infrastructure, including for electricity, have been made by governments. However, private institutions are becoming increasingly active in a variety of roles across the energy sector in the region, including as debt and equity financiers, advisers and in public-private partnerships. For these private financiers, the risk-return profile of a project is the key determinant of whether to finance or not.[4] In every investment decision, there is a wide set of variables and parameters that will influence the final verdict. Whatever these variables may be and in order to understand how they will influence the final decision, it is helpful to recognize that they will have an impact on the project essentially through their ramifications in its risk-return profile.

Financial return and risk are codependent categories: project sponsors, lenders and investors want to make a return proportional to the level of risk they undertake. As with all other classes of projects and investment, renewable energy investment becomes more likely and frequent if the perceived levels of investment risk are reduced for a given level of return, or returns are increased for any given level of risk.[5] The impressive growth in sustainable energy investment throughout the last decade in many parts of the world has been triggered by such favorable shifts in risk return.

Experts estimate that unless stronger commitments and effective policy measures are taken to reverse current trends, half the population in sub-Saharan Africa will still be without electricity by 2030, and the proportion of the population relying on traditional fuels for household energy needs will remain the highest among all world regions (UN-Energy/Africa, 2011). This challenging energy security situation contrasts

3 Eberhard et al., 2008, "Underpowered: the state of the power sector in sub-Saharan Africa", *Background Paper 6, Africa Infrastructure Country Diagnostic*, The World Bank, Washington, DC.

The World Bank, 2010, "Africa's infrastructure: a time for transformation", *The World Bank*, Washington D.C.

4 The risk-return rationale applies to both providers of equity capital ("investors") as well as lenders, but the terms and jargon used in each case do differ, and so does the emphasis put either on the "return" or the "risk" side of the equation: given that investors – as (co-)owners of the company or project concerned – can benefit from the "upside" of business development through the payout of dividends or the selling of shares, they will tend to look more evenly at both the return and risk side of any engagement, and are rather able to justify a particularly high level of risk with the prospect of correspondingly high levels of financial return (to the extent that their risk appetite allows). Lenders will typically not be affected by the upside of business, but are exposed to the downside through the risk of client default, so will tend to put more emphasis at keeping risks down rather than aiming to increase returns. Within certain limits, lenders can, however, justify higher levels of risk exposure with sufficiently high interest rates.

5 See footnote 2.

markedly with the abundant natural resources of the sub-Saharan Africa region: most countries in the region have renewable energy potential many times the current demand (Deichmann and Meisner et al., 2010), and the potential is exploitable using currently proven technologies and available know-how in electricity generation from hydropower, as well as geothermal, wind, biomass and solar energy sources.

To date, the potential and benefits of renewable energy have not been seized in the sub-Saharan African region, as shown in the next section of this report, despite the many economic, social and environmental advantages associated with it. Key benefits include the modular design of renewable energy distribution, which makes it particularly appropriate for remote and rural areas that can only be reached cost-effectively with off-grid technologies (AfDB, 2010). Most importantly, renewable energy can put an end to many countries' reliance on expensive and volatile imports of fossil fuels such as oil and coal, and can be an avenue for Africa to better exploit the economic opportunities offered by international carbon markets. This report analyses why the investments and financing needed, particularly from the private sector, in order to seize these opportunities and accelerate renewable energy deployment in sub-Saharan Africa have to date not materialized in a region that is in dire need of it.

2.2 What this report does

The focus of this report is to identify and portray current barriers to the scaling up of private investment and finance for electricity generation from renewable energy sources in the sub-Saharan region. Best practice in tackling these barriers is identified, partly from a literature review but especially from the results of a survey conducted among 36 financial institutions that are UNEP Finance Initiative members and two non-member banks (all survey respondents have experience in the field of energy infrastructure finance).[6] Promising avenues in the areas of local policy reform, incentive mechanisms and international de-risking instruments are highlighted. In particular, this report addresses the following questions:

a) Why are sub-Saharan Africa and developing countries elsewhere failing to expand electricity generation from renewable sources? What are the barriers to such expansion? What is keeping the risk-return profile of renewable energy investments in sub-Saharan Africa unattractive and projects commercially unviable?

b) What have been the experiences of private sector lenders and investors in the area of renewable energy projects in developing countries? What barriers and drivers have they encountered, and how can these experiences be of use in sub-Saharan Africa?

c) What can be learned from the modest but encouraging successes of a few sub-Saharan African countries? Can these results be replicated? What was done in these countries to improve the risk-return profile of renewable energy and unlock private finance?

2.3 The big picture - Trends and potential in sub-Saharan Africa's electricity generation

Electricity generation trends

Overall grid-connected electricity generation in the countries of sub-Saharan Africa grew by an impressive 70 per cent (from 73 to 123 terawatt-hours) in the 10 years from 1998 to 2008 (see diagram 1), translating into an average annual growth rate of 6 per cent. Coupled with population growth of 30 per cent in those same countries over the same time period, the overall result has been an increase of 31 per cent in the per capita generation of electricity across all countries concerned.

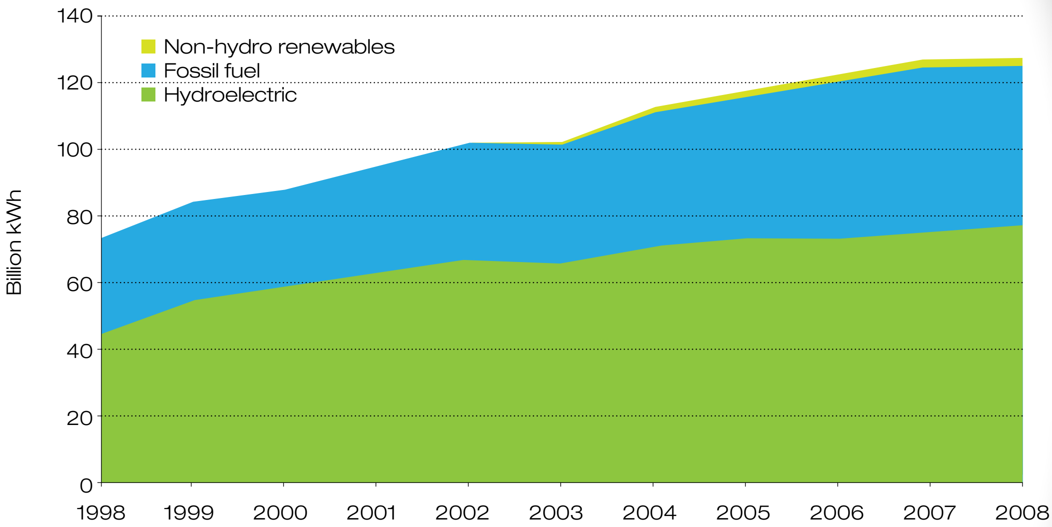
6 The survey was done on a global basis, not only among sub-Saharan African financial institutions, and its focus was on energy finance experiences made in developing countries generally, not only those countries in sub-Saharan Africa.

Despite the low starting point of only 128 kilowatt-hours average generation per capita in 1998 and 73 terawatt-hours of total generation in that same year, these developments are encouraging; in comparison, total electricity generation in Latin America and the Caribbean grew "only" by 44 per cent in that same time period.[7] The expansion of electricity provision, however, has been very unevenly spread throughout the region, as shown in diagrams 1 and 2.

Recent growth in the area of renewable energy has been equally strong, with total electricity generation from renewable sources growing by 72 per cent from 1998 to 2008 (from 45 to 78 terawatt-hours per year). This means that 66 per cent of all new electricity generated in sub-Saharan Africa after 1998 has come from renewable sources.

Diagram 1: electricity generation by source in sub-Saharan Africa (1998-2008)

Electricity generation by source in sub-Saharan Africa (1998 – 2008)



Source: United States Energy Information Administration, Country statistics, eia.gov

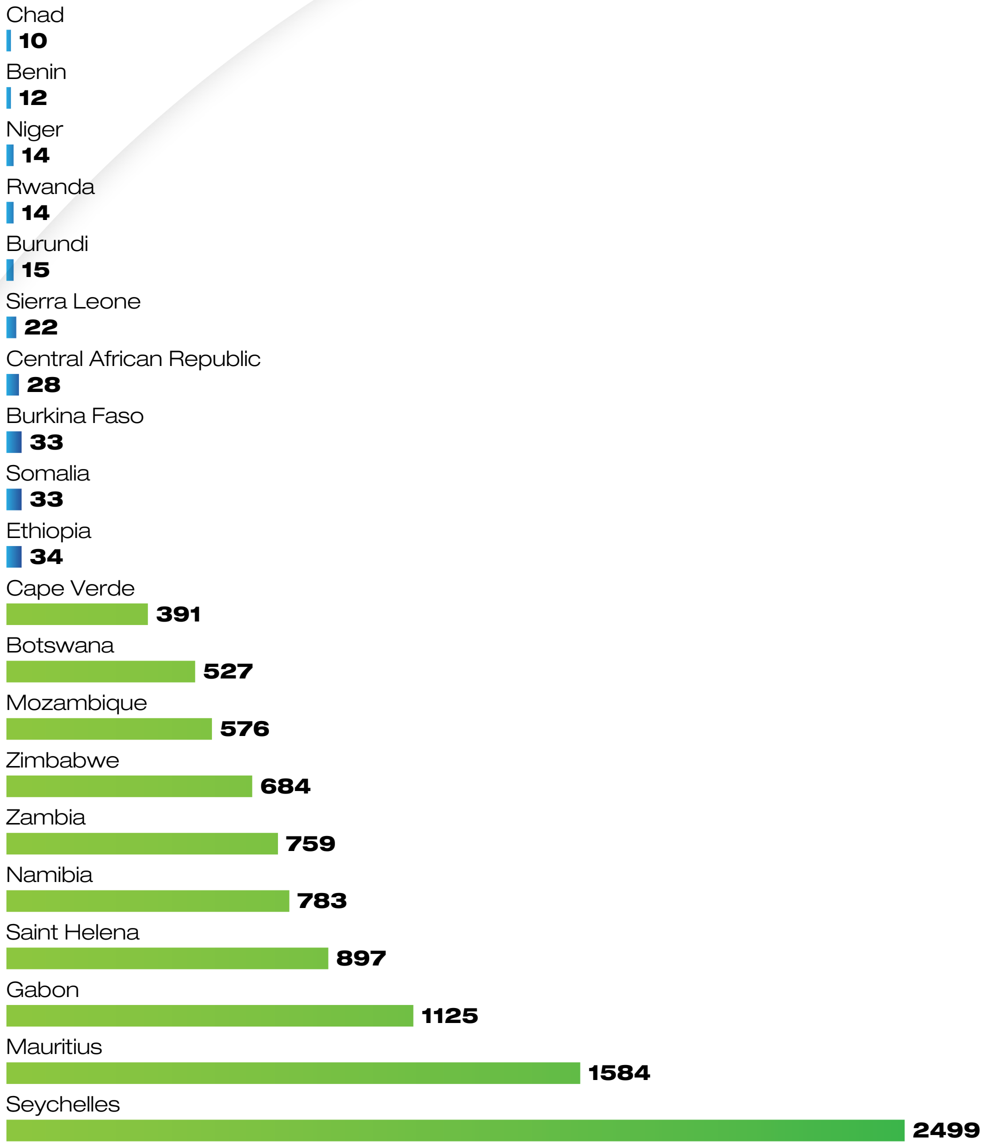
However, most of this growth in renewable energy has essentially meant an increase in hydro-based electricity generation. While it is a renewable resource, hydropower can also be considered a conventional type of electricity generation: in terms of costs it is competitive with fossil fuel-based generation, and represents a mature and proven technology with a long track record; it is therefore deployable and financeable with relative ease. Furthermore, hydroelectric development can result, under certain circumstances, in serious environmental damage as well as social conflict, particularly in the case of large-scale, dam-based generation, and it is immediately exposed to the effects of drought, a particularly pertinent risk category in a sub-Saharan context (UNESCA/UNEP, 2007).

Other, more innovative forms of renewable energy technologies demonstrate large potential at less social and environmental cost, and are often better suited to many African countries with only scarce hydrological but vast wind, solar, biomass or other renewable energy resources.

7 It should be noted that this analysis only makes use of generation-related data and ignores data on actual electricity consumption, hence ignoring cross-boundary transfers of electricity.

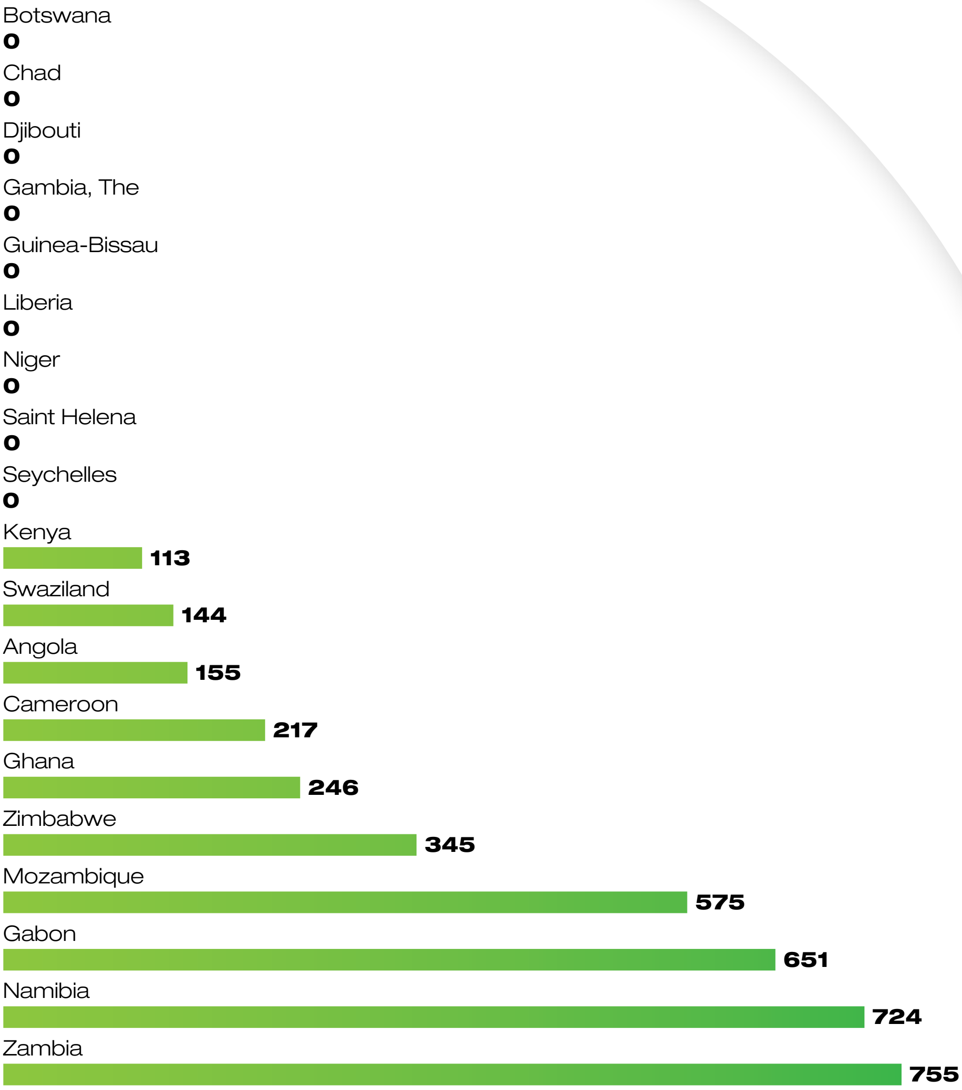
Diagrams 2 and 3: Bottom and top 10 countries in electricity generation per capita and in electricity generation from renewable sources per capita

Top and last ten countries in average generation per capita in kwh per year (1998-2008)



Source: United States Energy Information Administration, Country statistics, eia.gov

Average generation of electricity from renewable sources per capita and year in kwh (1998-2008)



Source: United States Energy Information Administration, Country statistics, eia.gov

In contrast to the developments seen in hydro-based electricity generation, the current status of non-hydro electricity generation from renewable sources in sub-Saharan African countries is very modest. According to data from the United States Energy Information Agency (US EIA, 2011) this type of electricity is generated only in a handful of countries, including Kenya (an average of 1 terawatt-hour per year in 1998-2008), Ivory Coast (an average of 58 GWh per year), Senegal (an average of 50 GWh per year), Gabon (7 GWh per year), Ethiopia (7 GWh per year), Cape Verde (2 GWh per year), Togo (2 GWh per year) and Eritrea (0.7 GWh per year), despite potentially large wind, sun radiation or biomass resources.

Regional potential of electricity generation from renewable energy sources

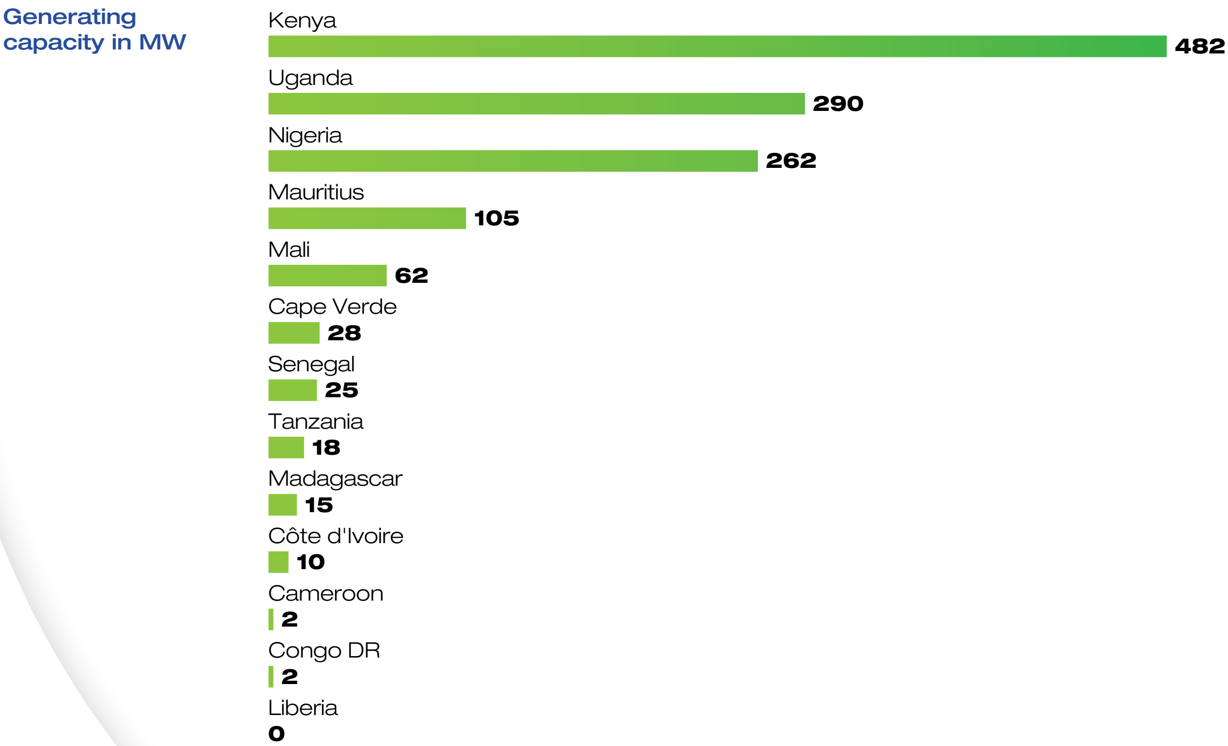
- The region has excellent solar power potential. Many parts of sub-Saharan Africa have daily solar radiation of between 4 kWh and 6 kWh per square meter (REEEP/UNIDO, 2011).[8] Solar power has the advantage of being deployable in a decentralized and modular manner, which makes it a good choice for both smaller and larger scale off-grid solutions.

8 See Module 1 of the Renewable Energy and Energy Efficiency Partnership/United Nations Industrial Development Organization training package at http://africa-toolkit.reeep.org/

- The region also has large geothermal potential. The Great Rift Valley, located in eastern Africa, is an area with high geothermal activity. It is estimated that around 9,000 MW could be generated from geothermal energy in this area, yet the installed capacity in Kenya and Ethiopia – the two main exploiters of this region – is far less, with 167 MW and 7.3 MW respectively (Holm et al., 2010).
- Wind speeds in Africa are best around the coastal regions and the eastern highlands. Countries like Cape Verde, Kenya, Madagascar, Mauritania, Sudan and Chad have great potential: Mauritania's is almost four times its annual energy consumption, while Sudan's is equivalent to 90 per cent of its annual energy needs.[9] Yet despite sub-Saharan Africa's vast wind energy potential, 97 per cent of the continent's installed capacity is located in North Africa. New projects in sub-Saharan Africa are emerging, however, particularly as a result of more frequent and intense droughts becoming a threat to hydro-based electricity generation.
- Sub-Saharan Africa has much potential for the generation of electricicty from biomass. By only using 30 % of the residues from agriculture and 10 % of the residues from the wood processing industry in sub-Saharan Africa, it is estimated that an additional capacity of 15,000 MW could be fueled (Dasappa, 2011).

Despite promising potential across the continent, the only sub-Saharan African country where electricity generation from renewable, non-hydro energy sources has played a significant role over the last decade is Kenya. In 2008 one fifth (21 per cent) of the national electricity portfolio came from non-hydro renewable sources, while all renewable energy taken together, including hydro, reached an impressive 62 per cent. The role that renewable, non-hydro energy technologies have played in all other countries of the region has, at best, been marginal. Recent data from the current pipeline of CDM projects, however, appears to suggest that increased renewable energy interest has more recently started to materialize in the region.

Diagram 4: Total renewable energy capacity in the 2011 Clean Development Mechanism pipeline per country



Source: UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC), CDM/JI Pipeline and Database

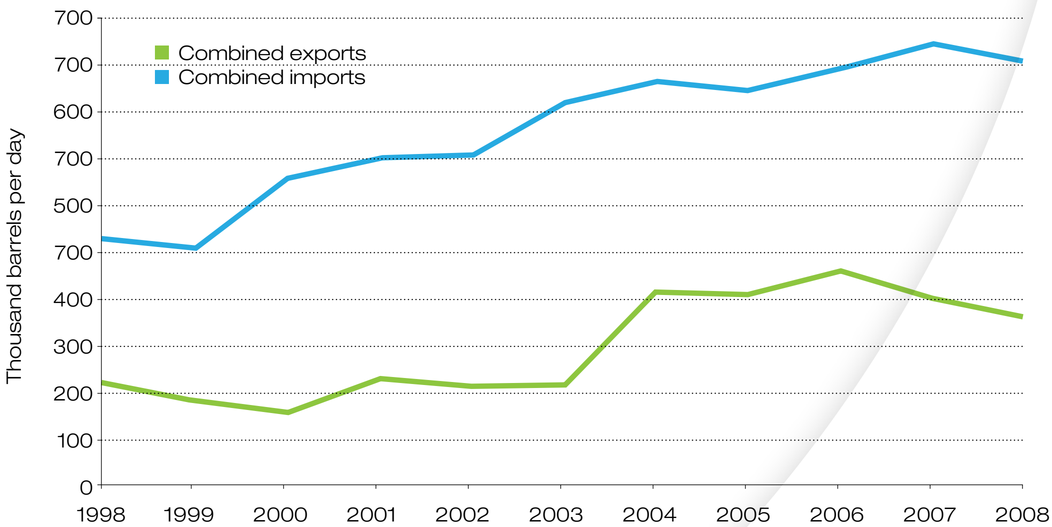
9 Source: http://www.afdb.org/en/blogs/energy-strategy/post/wind-energy-in-africa-a-sustainable-business-8332/

Key benefits of renewable energy in a sub-Saharan African context

As described above, there is great potential for the development of generating capacity from renewable energy in the region. Renewable energy technologies are deployable in a decentralized and modular manner. This makes them a particularly suitable energy source for small grids or off-grid solutions, which in turn bear great potential in many rural regions where connection to the grid is too expensive. Electrifying the 66 per cent of Africans living in rural areas would, in a majority of instances, require large and costly grid infrastructure expansion (AfDB, 2010). Even though extensions of existing grids should be encouraged in sub-Saharan Africa, "off-grid renewable solutions are increasingly acknowledged to be the cheapest and most sustainable options for rural areas in much of the developing world," according to REN21, a renewable energy policy network (REN21, 2011). Additionally, mini-grid solutions provide higher efficiency in electricity distribution – an intractable problem in sub-Saharan Africa with distribution losses nearing 20 per cent of total electricity consumption per year between 2000 and 2008, compared to 8 per cent in North America and Europe (US EIA, 2011).

Furthermore, renewable energy generation can increasing energy security, by diversifying the existing energy portfolio and reducing dependence on imports of fossil-fuels.[10] The countries of Sub-Saharan Africa may, in aggregate terms, export five times the volume of oil (crude and refined products combined) than they import. However, if one disregards the 6 largest oil-exporting countries in the region (Angola, Congo Brazzaville, Equatorial Guinea, Nigeria, Gabon and Sudan), and analyses the situation for the remaining 40+ countries, the picture changes: not only are total imports significantly larger than total exports, imports are also growing faster than exports – while aggregate exports of petroleum based products grew by 61 per cent from 223 thousand barrels per day in 1998 to 360 thousand barrels per day in 2008, imports grew by 72 per cent from a much higher level at 528 thousand barrels per day in 1998 to 908 thousand barrels per day in 2008.[11]

Diagram 5: Total exports and imports of crude and refined petroleum products combined, excluding African oil-exporting countries (Angola, Congo Brazzaville, Equatorila Guinea, Nigeria, Gabon, Sudan; in thousand barrels per day)

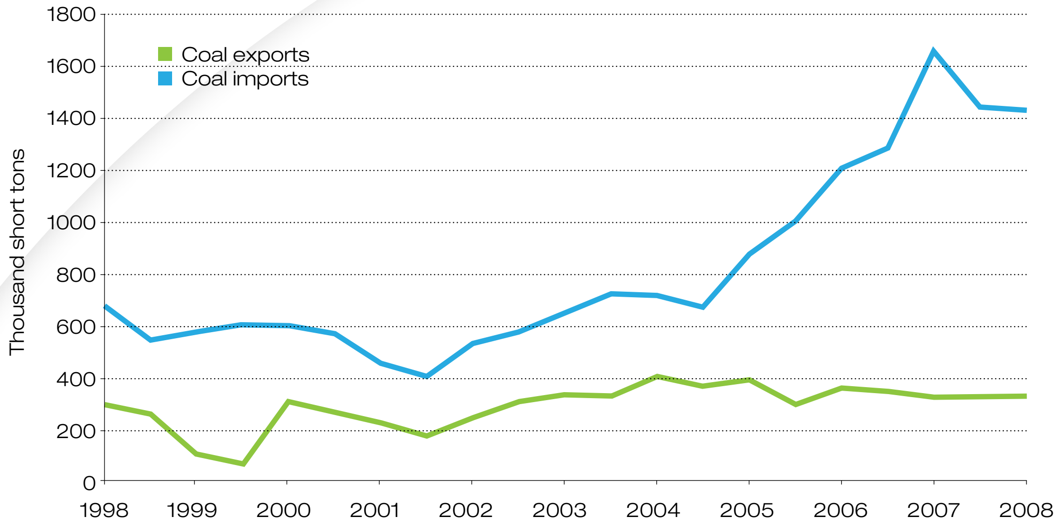


Source: United States Energy Information Administration, Country statistics, eia.gov

10 Module 1 of http://africa-toolkit.reeep.org/

11 The import numbers presented represent the overall import of petroleum products and do not represent the oil consumption for electrification needs.

Diagram 6: Imports and exports of coal in sub-Saharan Africa between 1998 and 2008 (in thousand short tons)



Source: United States Energy Information Administration, Country statistics, eia.gov

Further, the countries in region are, on aggregate terms, net importers of coal. In 2010, the total imports of coal into the countries of the region exceeded 1.4 million short tons, compared to total exports of 325,000 short tons. Diagram 6 shows how the imports and exports of coal have developed between 1990 and 2010. As can be seen, the exports of coal from sub-Saharan African countries have remained relatively stable over this time period, whereas the imports have increased drastically, further deepening the regions dependence on coal.

These observations raise important questions regarding the merely marginal uptake of non-hydro renewable energy technologies in the region despite immense potential and many advantages. The next sections of this report explore this by providing an overview and discussion of the barriers faced by the proponents of renewable energy technologies including, in particular, their financial backers.

3. Barriers and drivers - Part 1: The cost, profitability and competitiveness of renewable energy options in sub-Saharan Africa

In this section, focus is put on the overall costs, profitability and competitiveness of renewable energy relative to fossil fuel-based generation in sub-Saharan Africa. Section 3.1 outlines the main problematic aspects in this area. Sections 3.2 and 3.3 examine potential ways forward and solutions in the area of policy measures, both nationally and internationally, based on the results of the underlying UNEP FI survey.

3.1 The problem

The cost of electricity generation per se

The financial return of any energy investment will be driven by the profitability of the underlying technology, and the extent to which it is competitive with other technologies is critical. In the context of electricity generated for large, centralized grids, it is still the case that in a complete policy vacuum, and even considering "total life-cycle" costs, electricity generation from renewable sources is generally more expensive than from conventional sources (UNEP FI & Partners, 2011).

Nonetheless, costs for renewable energy generation continue to steadily decrease and certain technologies are already competitive, or at 'grid parity', with conventional forms of electricity generation in many parts of the world. In South Africa, solar photovoltaic (PV) generation is expected to be fully competitive with conventional coal-fired generation at some point between 2012 and 2014 (pv magazine, 2010). In windy locations, wind-based generation can deliver electricity at a cost below USD 69 per MWh, which is comparable to the average cost of coal-fired generation at approximately USD 67 per MWh (Bloomberg, 2011).

The relative competitiveness of certain forms of renewable energy generation, including solar and wind, is typically improved further where end-users are not yet connected to and are relatively far from the centralized grid, which is the case with most of the rural populations in the region. In much of sub-Saharan Africa, only between 2 and 5 per cent of the rural population is connected to the grid. In comparison, this figure is 98 per cent for Thailand (Martinot et al, 2002). In such situations, small grids or off-grid energy provision (e.g. rooftop PV installations or solar water heaters), when based on locally available renewable energy sources, can be considerably more cost-efficient than large-scale grid build-out and expansion (AfDB, 2008 and Deichmann and Meisner et al., 2010).

In sub-Saharan Africa, the average cost of electricity generation in general is exceptionally high, due to the small size of electricity markets and the resulting lack of economies of scale. The situation is further deteriorated by the dependence on often expensive oil/diesel imports as well as drought exposed hydro generation and inefficiencies such as low historic levels of maintenance investment as well as electricity losses in generation and distribution. The average electricity generation cost in sub-Saharan Africa amounts to USD 0.18 per kilowatt-hour. This is more than double when compared to the tariffs found in South Asia of USD 0.04 per kilowatt-hour and USD 0.07 in East Asia (AfDB, 2010). This means that in the quest for the quick expansion of energy access, particularly to poor communities, and in light of tight public budgets with only limited interest from private investors, cost minimization and cost efficiency are high priorities for policymakers, developers and the local population. In the past hydro-based, gas- and coal-fired generation have often been the most cost-efficient options, therefore making them the preferred political choice.

The cost of electricity generation is also highly relevant to energy poverty in sub-Saharan Africa, where large parts of the population live at the subsistence level. Often, even if access to electricity is provided, whether the local population can afford it is an additional challenge. When aiming to expand electrification, the political priority will not only be to provide energy access to as many unserviced people as possible, but to do so in such ways that increase the affordability of electricity. Against such circumstances, it is foreseeable that, in the context of grid-based energy supply, the most cost-efficient technologies, typically not renewable energies, will be politically favoured.

Box 1: Off-grid energy solutions

About 66 per cent of Africa's population lives in rural areas. The vast majority has no access to electricity and only a small proportion can be added to the grid at an acceptable cost (AfDB 2010). Those without access to the grid but with access to finance – or private wealth – have in the past turned to diesel generators for electrification. Although a practical solution, the ever rising price of oil has significantly increased the cost of keeping the generators running. Renewable energy technologies can provide a good alternative for expensive grid expansion or costly diesel generators and may have the potential to unlock new pockets of finance.

With 80% of the population living on USD 2.50 (The World Bank, 2011) or less per day, the choice of electricity source will often be motivated by costs. Although diesel generators have a lower CAPEX, their OPEX has increased sharply over recent years due to increasing oil prices. In a recent comparative study, researchers from the European Commission and UNEP evaluated the costs of running a diesel-powered generator versus a mini-grid photovoltaic (PV) system (Szabó et al., 2011).[12] Taking into account the different purchasing costs, diesel prices and geographical differences in solar radiation, amongst others, the researchers concluded that in many rural areas the price per kWh generated by a solar PV system is equal to or better than the costs of running a diesel generator. Other research on decentralized wind energy solutions has similarly shown that in large areas in Ethiopia, Kenya and Ghana wind-powered systems are cost competitive with power from an extended central grid (The World Bank, 2010).[13]

These outcomes should not result in the conclusion that decentralized renewable energy technologies are by default the cheaper option – indeed, as the reports show, this will depend on local circumstances. Nevertheless, with falling prices for renewable energy technologies and with mounting fossil fuel prices, small-scale renewable solutions are an increasingly attractive investment for those individuals, companies or governments seeking electrification or alternatives to expensive grid expansion.

Finance, then, becomes an important tool to make the purchase burden acceptable by spreading it over a number of years. With many medium- and small-sized African banks not able to finance large-scale renewable energy projects because of their limited balance sheet, decentralized smaller scale solutions could form an opportunity to invest in this market and could thus open up new pockets of finance.

"One of our important businesses in sub-Saharan Africa is supplying small, off-grid solar solutions for homeowners, private companies and governments. In many parts of the region, people rely on diesel-powered generators for electricity. As the price of diesel is high, replacing these generators with solar panels or integrating the two types of technology into a hybrid system becomes a competitive choice. A solar-diesel hybrid system can save up to 60 per cent of the costs of fuel over the course of a year.

To fund these systems, we hope to see the adoption of innovative financing solutions, such as microfinance options that have been successful in other markets. In Bangladesh, for example, local distributors were able to sell 200,000 home systems through microfinancing."

Allen Chen, Regional Director for Africa, Suntech

The capital intensity of renewable energy options in a challenging risk landscape

In more advanced economies, renewable energy technologies are becoming increasingly competitive on the back of innovation as well as the long-term upward price trends for fossil and nuclear fuels.[14] In other words, much of the competitiveness gains of renewable energy technologies are attributable to their relatively favourable OPEX profile (the level of ongoing operations-related expenditure), while in terms of CAPEX (up-front capital investment expenditure) renewable energy technologies tend to feature a higher level of

12 Szabó, S. et al. 2011, "Energy solutions in rural Africa: mapping electrification costs of distributed solar and diesel generation versus grid extension", 2011 Environ. Res. Lett. 6 034002.

13 World Bank, 2010, Policy Research Paper 5193: "The Economics of Renewable Energy Expansion in Rural sub-Saharan Africa", January 2010.

14 The price of oil in 2009, for instance, was USD 59.21 per barrel and is predicted to be USD 135.22 per barrel in 2035, an increase of 125 per cent. The price of natural gas was USD 3.33 per 1,000 cubic feet in 2009 and is predicted to be USD 8.06 in 2035, an increase of 142 per cent.

capital intensity. However, the circumstances in many countries in sub-Saharan Africa will mean that the CAPEX associated with different energy options will often play a more important role than the corresponding OPEX in financial assessment and decision-making processes. This will result in preferential treatment of technologies that are relatively low in CAPEX and relatively high in OPEX.

Such regional circumstances in particular include a variety of investment-related risks (country, regulatory, commercial and market) that will be more pronounced in sub-Saharan Africa and other developing countries than in developed countries or emerging economies (see Section 5 below). These risks will immediately increase the return expectations of investors and thus any project's cost of capital. This will discourage capital-intensive energy options and encourage less capital-intensive, conventional energy technologies. Higher risks associated with the novelty of most non-hydro renewable energy technologies will also contribute to higher return expectations from investors, more so in developing countries than in mature markets given the longer track record of the relevant technologies in the latter.

"For local commercial banks, the long-term funding possibilities are limited, primarily because the main source of funding is short-term customer deposits, especially where projects are denominated in foreign currency. Therefore Commercial Bank of Africa (CBA) focuses on providing working capital to a number of projects in Kenya. Generally, the extent to which commercial banks in Kenya are able to participate in such projects is driven by the single borrower limit [set by the Kenyan Central Bank at 25% of core capital]. In the case of CBA this is slightly under USD 20 million, hence dictating the size of projects that the Bank can undertake."

Jeremy Ngunze, Group Head of Business Management, Commercial Bank of Africa

Further, projects with high capital expenditures require relative easy access to capital, in order to be viable. However, in almost all the sub-Saharan African countries, capital markets are not as mature as in many other countries, making it difficult to get private financing. During the last few decades, many sub-Saharan African governments have taken advantage of a relatively easy access to concessional finance, which partly can explain the poorly developed bond markets. The bond markets in sub-Saharan Africa are characterized by illiquidity, lack of depth and small size. These inefficiencies have to be addressed in order to lower the cost of capital in Africa and making investments more attractive. A well functioning debt market will be even more important if concessional finance dries up as a result of the unstable situation of the global economy, which is a concern that has been raised (Adelegan and Radzewicz-Bak, 2009).

High transaction costs

The relatively high transaction costs in implementing renewable energy technologies result from some key characteristics of the technologies or projects at hand. Renewable energy projects are typically smaller than conventional energy projects, automatically leading to increased transaction costs which tend to be fixed. The transaction costs per kilowatt of electricity produced from a central coal plant, for instance, will be lower than the sum of the costs of the many thousands of transactions required for comparable capacity from solar home systems. Faced with a choice, private sector actors and investors will be wary of the latter (UN Technical Cooperation, 2011).

Renewable energy projects will often require additional information, which may not be readily available at any given moment, including historic weather-related data such as wind, sun radiation and precipitation. While such data can be easily obtained in developed countries, there is a large gap in the availability of this data in developing countries, particularly in those of the sub-Saharan region.[15]

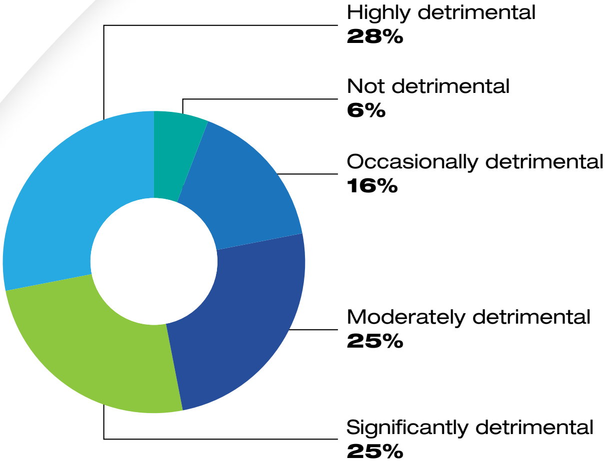
General unfamiliarity with renewable energy technologies or uncertainties over their performance – particularly problematic in countries with an insufficient track record – will often translate into projects requiring additional time or attention to permitting and financing. For these reasons, the transaction costs of renewable energy projects, including resource assessment, sitting, permitting, planning, developing project proposals, assembling financing packages, and negotiating power-purchase contracts with utilities, may be much larger on a per kilowatt capacity basis than for conventional power plants.

15 UNEP, in collaboration with a number of partners, has developed the Solar and Wind Energy Resource Atlases (http://swera.unep.net), which improve access to, and understanding of, information relevant to solar and wind energy project development through high-resolution maps of solar and wind energy resources.

As shown in diagram 7 , the importance of transaction costs as a barrier to the further deployment of renewable energy technologies in developing countries is confirmed by the views of those energy financiers that participated in the UNEP FI survey on "Financing low-carbon energy technologies and infrastructure in developing countries".

Diagram 7: The views of private finance practitioners on transaction costs

How detrimental are transaction costs to the viability of renewable energy in developing countries?



Fossil fuel subsidies

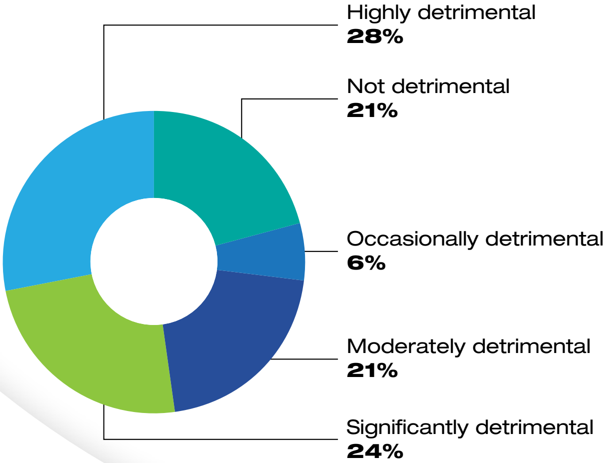
The G20, among others, has addressed the global problem of subsidies for fossil fuel-based generation. Countries in sub-Saharan Africa are no exception to the problem as shown by Ghana and Nigeria. Fossil fuel subsidies further deteriorate the competitiveness of renewable energy technologies, especially since the two energy options do not enjoy equal public support (UNEP FI & Partners, 2011 and Beck and Martinot, 2004). The International Energy Agency put global figures for fossil fuel subsidies at USD 312 billion per year (in 2009), compared to USD 57 billion for renewable energy (IEA, 2011).

There are many types of fossil-fuel subsides: direct budgetary transfers, tax incentives, research and development spending, liability insurance, leases, land rights-of-way, waste disposal, and guarantees to mitigate project financing or fuel price risks (Beck and Martinot, 2004). Regardless of their shape or form, these subsidies work to lower the price of energy generated from fossil fuels, artificially making them more competitive relative to renewable energy alternatives.

As shown in diagram 8, fossil fuel subsidies are detrimental to the further deployment of renewable energy technologies in developing countries as confirmed by the views of those energy financiers who participated in the UNEP FI survey on "Financing low-carbon energy technologies and infrastructure in developing countries".

Diagram 8: The views of private finance practitioners on fossil fuel subsidies

How detrimental are fossil fuel subsidies to the viability of renewable energy in developing countries?



3.2 Policy solutions at the national level

A wide variety of policy measures can be deployed with the objective of levelling the playing field for and, hence, the financial competitiveness of renewable energy technologies. The question of which specific combination of these policy measures will lead to the most effective and most cost-efficient results is subject to the local socio-economic circumstances, the natural endowment with renewable energy, the best suited technologies, as well as the national goals for renewable energy expansion. The following are the main categories of public incentives for renewable energy (UN-Energy/Africa, 2011).

National renewable energy targets

Renewable energy targets are government requirements to derive a certain portion of energy generation or consumption from renewable sources. And according to REN21, a renewable energy policy network, "targets are usually set as a percentage of the primary energy and/or electricity generation mix" (REN21, 2006). Renewable energy targets have been set in many jurisdictions at national and sub-national levels, and provide a goal to be aimed for through the implementation of policy instruments. They are a critical component of any renewable energy policy package as they provide clarity and a higher degree of certainty in terms of "where the journey" is going to private sector actors. They increase the reliability and trustworthiness, and ultimately the effectiveness of mobilizing private investment in any policy instruments subsequently put in place.

More than 25 developing countries have put renewable energy targets in place, including 13 countries in Africa. Of these, 8 countries are from sub-Saharan Africa other than the Republic of South Africa.

Table 1: Renewable energy targets of sub-Saharan countries

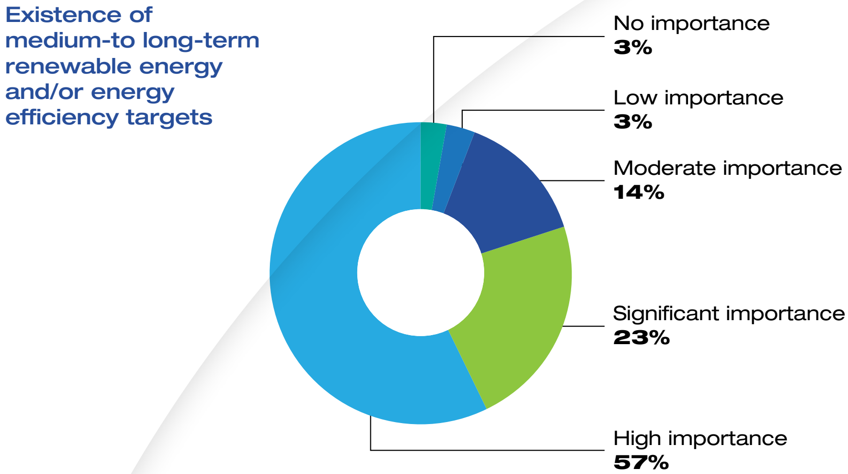
Country	Renewable energy target	Target year
Cameroon	50% / 80%	2015 / 2020
Cape Verde	50%	2020
Ghana	10%	2020
Madagascar	75%	2020
Mauritius	65%	2028
Niger (the)	10%	2020
Nigeria	7%	2025
Rwanda	90%	2012

Source: REN21, 2011

To date, long-term policy targets, which can then be strived for through the implementation of a variety of policy instruments described below, have proven to be strong drivers for the expansion of renewable energy investments (REN21, 2011).

The energy financiers who participated in the UNEP FI survey confirm that governments and policymakers must have a clear vision, including through the setting up of long-term and interim targets, of the future role of renewable energy in the national energy mix, as shown in diagram 9. In fact, a majority of respondents agree that national targets for renewable energy as well as an overall government vision of a low-carbon energy economy are of "highest importance' for the mobilization of private investment and finance".

Diagram 9: The views of private finance practitioners on the importance of renewable energy targets and government vision



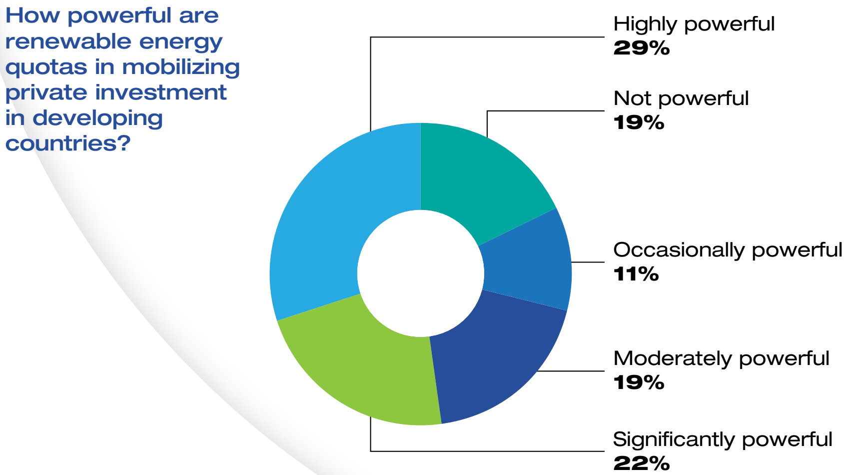
Energy quotas

A quota-scheme, sometimes called a renewable portfolio standard (RPS), requires power generators and utilities to generate and supply a predetermined proportion of electricity from renewable energy sources. Such obligations are often combined with tradable renewable energy credits (RECs) or renewable obligation certificates (ROCs). These are certificates awarded to renewable energy generators that can be used to meet the required renewable energy targets specified in the RPS. Any excess certificates can be sold to other generators or utilities that need them to comply with regulation.

A central benefit of the quota-scheme, vis-à-vis other forms of regulatory support for renewable energy, is that it can reduce the macroeconomic costs associated with expanding renewable energy capacity. This is possible by allowing flexibility as to where and by whom renewable energy is generated. The RECs and ROCs awarded to energy generators essentially constitute a market mechanism that works to ensure sustainable energy is being generated in the least expensive manner possible.

The impact of energy quotas on the investment climate for renewable energy is twofold. Firstly, the quota creates a minimum and steady level of overall demand for renewable energy technologies and projects. The immediate result is a less volatile and risky market. Secondly, where a scheme of tradable ROCs or RECs is put in place, renewable energy projects can earn revenues based on the sales of such credits in addition to revenues based on electricity sales. This adds an additional layer of potential return for a given level of risk, improving the overall financial profile of renewable energy projects.

Diagram 10: The views of private finance practitioners on the importance of renewable energy quotas for the viability of private investment in developing countries



Some quota schemes have proven to be effective in the promotion of renewable energy (IPCC, 2011) and the sentiment among the respondents of the UNEP FI survey is that quota schemes can be an important driver of private sector investment for renewable energy. **However, as presented in the next section, the energy financiers who participated in the survey do not see quota schemes as being as powerful as feed-in tariffs as a policy instrument**. One explanation for this assessment could be that quota-schemes have not yet been introduced in many countries. Therefore, financiers may not be sufficiently informed of, or have experience with, their potential benefits. Until early 2010, only 9 jurisdictions in developing countries had put in place quota-based policies for renewable energy development, most of them in a number of Indian states. No such policy instrument had been put in place in sub-Saharan Africa (REN21, 2010).

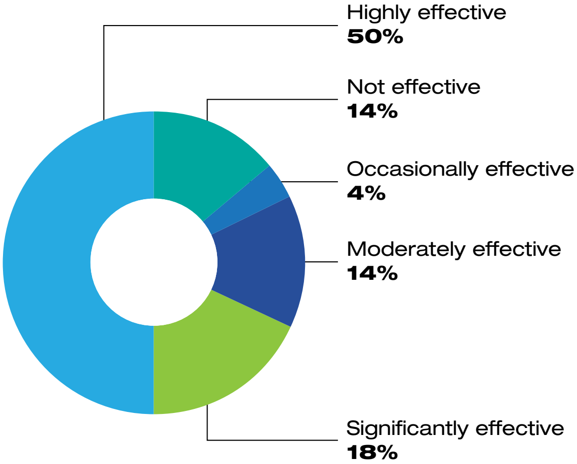
Feed-in tariffs (as an example of output-based incentives)

A feed-in tariff (FIT) is a policy instrument where long-term purchase contracts are offered to renewable energy producers at a fixed price or with a fixed premium to the market price. When a fixed premium is chosen, the output price offered to suppliers is often given a ceiling and a floor price. For potential financiers, output-based incentive systems such as FITs can considerably enhance the risk-return profile of renewable energy projects. First, the disadvantages associated with the costs of renewable energy sources are compensated for by providing an above-market price premium, which enhances the profitability of projects and returns on investment. Second, market risk can be entirely mitigated as FITs and other renewable energy production incentives are mostly offered at a predetermined level and over a predetermined number of years. This allows medium- to long-term certainty on prices and revenues, and revenue projections become more accurate, which can be particularly effective given the extreme volatility of energy prices (Weron, 2007).

Until early 2010, more than 30 jurisdictions in developing countries, either at the national or sub-national level, had put FITs in place. In sub-Saharan Africa, however, this had only been the case in Mauritius (1988), Uganda (2007), the United Republic of Tanzania (2008) and Kenya (2008) (REN21, 2010). For more information about the Kenyan feed-in tariff, see box 1.

Diagram 11: The views of private finance practitioners on the effectiveness of FITs in mobilizing private finance for renewable energy in developing countries

How effective are FITs in mobilizing private investment for renewable energy in developing countries?



Several studies have provided evidence that some FITs have effectively increased renewable energy investments and financing (IPCC, 2011).

This is confirmed strongly by the results of the UNEP FI survey, as detailed in diagram 11: respondents consider FITs to currently be the strongest policy instrument in leveraging private investment and finance for renewable energy. One important concern has, however, been raised by survey participants: the implementation of FITs might be more difficult in off-grid contexts, meaning that grid connectivity is often considered a precondition for this type of public support mechanism to take full effect.

Box 2: Kenya and its feed-in tariffs

In 2008, the Kenyan government started the implementation of a feed-in tariff scheme in order to accelerate the expansion of renewable energy power generation within the country. The types of energy sources covered by the scheme included hydro, wind and biomass. Power purchase agreements were set up with predetermined prices for each of the energy sources for a specified installed capacity and over a timespan of 15 years (IEA, 2011b).

Two years later, in January of 2010, the FIT scheme was revised to include more energy sources. Solar and geothermal sources for power and heat production, as well as biomass for heat and biofuels were included under the tariff scheme. In addition, the terms of the power purchase agreements were modified, with the timespan of the contracts lengthened to 20 years, and the prices offered were increased (IEA, 2011c). A summary of the 2008 and 2010 feed-in tariffs can be seen in table 2.

The feed-in tariff is expected to bring additional benefits to Kenya, including energy poverty reduction and job creation. The FIT scheme will encourage an estimated additional energy generation capacity of 1,300 MW. This represents a significant increase in Kenya's energy generation capabilities, more than doubling the present capacity (Kenyan Ministry of Energy, 2011), allowing access to electricity for a larger part of the total population and reducing energy poverty (UNEP, 2011b). Increased investment in renewable energy will also mean an increase in jobs as the local population will be given employment opportunities at all stages of electricity generation, from power plant construction and grid connection to operation and maintenance. The employment-related benefits of the scheme are expected to be particularly strong given Kenya's large potential for electricity generation from biomass, especially from sugarcane bagasse, as well as the generally high labour-intensity of biomass-fired generation (AFREPREN/FWD, 2009).

The feed-in tariff in Kenya is relatively new, and it may be too early to fully evaluate its benefits and shortcomings. Initial results appear promising as presented above. In addition to the existence of an FIT scheme, another fact makes renewable energy investment and financing in Kenya attractive from a private sector perspective: certain renewable energy options – most notably biomass, wind and hydro – have already become financially superior to diesel-based generation (Mendonça and Jacobs, 2009), which is a significant source of energy in Kenya. KenGen, the state-owned power producer, has a 120 MW diesel-fuelled power plant connected to the grid and an additional off-grid capacity of about 4.7 MW (KenGen, 2011).

Table 2: Kenyan feed-in tariffs in 2008 and 2010[16]

	Wind	Hydro	Biomass	Solar	Geothermal
2008 Feed-in tariff	Maximum of USD 0.09 per kWh up to 50 MW capacity	Maximum of USD 0.06 to 0.12 per kWh for 0.05 MW to 10 MW capacity	Maximum of USD 0.045 to 0.07 up to 40 MW capacity	-	-
2010 Feed-in tariff	Maximum of USD 0.12 per kWh for 0.5 to 100 MW capacity	Maximum of USD 0.06 to 0.12 per kWh for 0.5 MW to 10 MW capacity	Maximum of USD 0.06 to 0.08 per kWh for 0.5 to 100 MW capacity	Maximum of USD 0.20 per kWh for 0.5 to 10 MW capacity	Maximum of USD 0.085 per kWh up to 70 MW capacity

Grants, rebates and fiscal incentives

Grants and rebates such as capital subsidies are other types of public support mechanisms that promote the mobilization of private finance for renewable energy. Another category is tax incentives. Examples include tax credits given to renewable energy generators, or sales tax exemptions for equipment used for renewable

16 For more in-depth description of the policies, see the data sources in IEA, 2011b and IEA, 2011c.

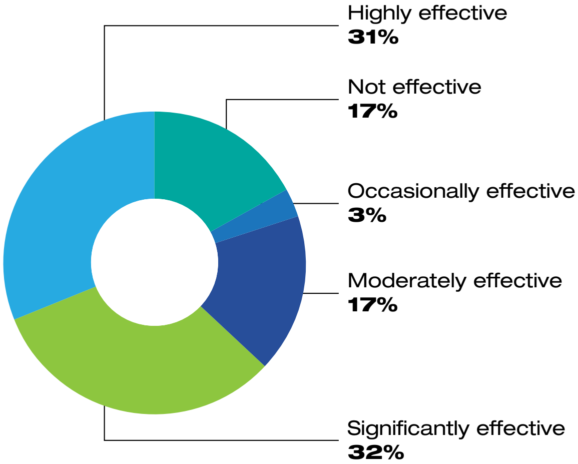
energy generation. By reducing the tax costs of projects, these incentives increase the profitability of a given project and/or technology and thus the returns on investment for any given level of investment risk.

The potential of grants and rebates is well recognized, and a total of 17 countries in Africa, 11 in sub-Saharan Africa, had some types of financial incentives for renewable energy projects at the end of 2010 (REN21, 2011). Experience thus far has proven grants and rebates to be effective in several different developing countries (UNIDO, 2009).

As shown in diagram 12, the effectiveness of tax incentives on the further deployment of renewable energy technologies in developing countries is confirmed by the views of those energy financiers who participated in the UNEP FI survey on "Financing low-carbon energy technologies and infrastructure in developing countries".

Diagram 12: The views of finance practitioners on the effectiveness of tax incentives in mobilizing private finance for renewable energy in developing countries

How effective are tax incentives in leveraging private financing for renewable energy projects in developing countries?



A price on carbon

Renewable energy technologies can, as described earlier, financially outperform conventional technologies in certain circumstances, like in rural, off-grid contexts. However, if the comparison is done on a total cost basis, including environmental and social externalities, the case for renewable energy is even stronger and corresponding technologies become considerably more competitive in other markets, including in centralized grid systems. In many jurisdictions worldwide, the internalization of such costs is accounted for by putting a price on carbon, be it through carbon taxes or the establishment of emissions trading schemes. For a variety of reasons such measures are difficult to justify politically in developing countries, particularly those less advanced, given poverty eradication priorities coupled with the fact that resulting environmental benefits are of global reach while the costs of internalization are borne locally. A softer approach consists of putting a price on carbon as an incentive only in the event of carbon reductions, as is the case in the Clean Development Mechanism (CDM) under the Kyoto Protocol (see more elaboration on the CDM further below).

Emissions trading schemes (usually referred to as "cap and trade" systems) put a cap on the amount of greenhouse gas emissions allowed for specific sectors of the economy as a whole, as well as for individual companies within the same sectors. These caps are subsequently reduced over time. If an entity emits in excess of its assigned amount, additional allowances can be acquired by purchasing them on an open market, in the same way that utilities can comply with their renewable energy quotas by purchasing RECs or ROCs in certain energy quota schemes. It is assumed that macroeconomically such market mechanisms ensure emissions reductions will be achieved in the most cost-efficient way. Operative emissions trading schemes can be found in the EU-27, New Zealand, 10 states in the United States and in Tokyo, Japan. Furthermore, an emissions trading scheme is currently being implemented in Australia (UNEP FI & Partners, 2011).

Carbon taxes levy a fixed amount of tax per ton of carbon dioxide emitted. The rationale is that the market is steered away from high-emission fossil fuels into more low-carbon alternatives in order to avoid taxes. Carbon tax schemes are currently used in seven European countries, India, Costa Rica, the Canadian province of Québec and the US city of Boulder, Colorado (Sbs, 2011).

By forcing the internalization of environmental and social costs, a meaningful carbon price creates a level playing field between renewable and conventional energy options. The risk-adjusted investment returns of the former increase relative to those of the latter as a carbon price entails costs only for conventional technologies, not, however for zero- and low-carbon technologies. Under a cap and trade system or an international crediting mechanism, a price on carbon can also offer positive incentives by creating new, carbon credit-based revenue streams for renewable energy projects.

3.3 Policy solutions at the international level

International carbon markets / the Clean Development Mechanism

As described above, one of the most significant barriers to a more systematic deployment of renewable energy technologies lies in the incompleteness of most cost-benefit analyses. When comparing renewable energy with conventional options, the environmental costs of the latter are not taken into account because they are not borne by project participants, and these externalities are not internalized. As such, one of the key competitive advantages of renewable energy technologies, its carbon efficiency, is not assigned the monetary value it might deserve and, therefore, they are put at a disadvantage. The internalization of the environmental and social costs associated with greenhouse gas emissions can be achieved through a price on carbon, established either through a carbon tax or emissions trading as described above.

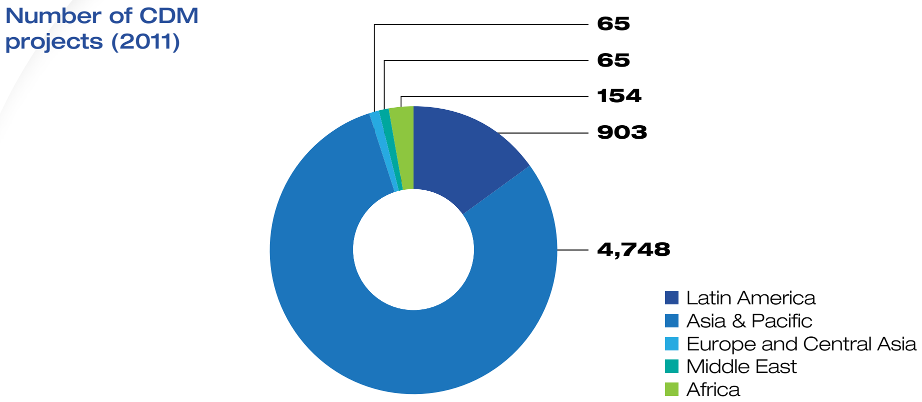
In the whole of Africa there is currently not one jurisdiction that has put a price on carbon emissions. However, what is possible in Africa, and all other developing regions and countries, is the production and export of greenhouse gas reductions to developed countries in the form of carbon credits. Under certain circumstances, projects that reduce or avoid emissions relative to a business-as-usual baseline can have the difference securitized into carbon credits. These can be sold to governments or companies in industrialized countries and used by them for compliance with emissions reduction commitments under the Kyoto Protocol or under domestic emissions trading schemes such as the European cap and trade system. This is currently happening under the Clean Development Mechanism (CDM) of the Kyoto Protocol.

From a developed country or company perspective, this can reduce the cost of compliance as emissions reductions are cheaper in developing countries. From the perspective of project developers and investors in developing countries, this represents a revenue stream that provides a concrete incentive for renewable energy projects.

Despite originally high expectations that this mechanism could create a level playing field for renewable energy and other types of low-carbon technologies in developing countries, its potential has not been fully realized and commercial renewable energy finance has only been mobilized modestly. This is a result of several issues that are either related to: (i) the CDM's ability to catalyse investment specifically into renewable energy technologies, or (ii) the uptake of opportunities offered by the CDM specifically in sub-Saharan Africa. Africa may come third in the absolute number of CDM projects in the pipeline, but considering its size, it scores worst of all regions of the world as measured by certified emission reductions (CERs) in the pipeline per capita. For more on the shortcomings of the CDM, please refer to box 2.

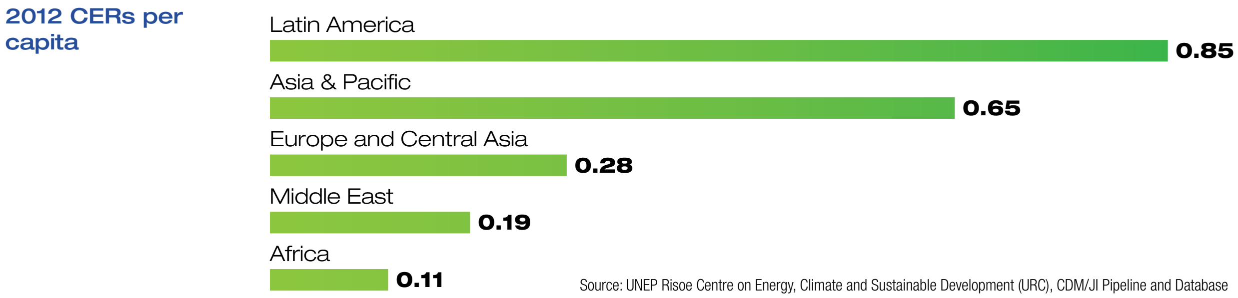
To date more than 4,200 CDM projects are in the global pipeline. They are expected to generate 2.9 billion CERs by 2012. However, the current distribution of projects is uneven, with 75 per cent of registered projects located Asia Pacific and less than 1 per cent in sub-Saharan Africa (UNEP RISOE, 2011).

Diagram 13: Africa and the CDM - number of CDM projects[17]



Source: UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC), CDM/JI Pipeline and Database

Diagram 14: Africa and the CDM - CERs per capita



Source: UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC), CDM/JI Pipeline and Database

Box 3: CDM shortcomings

CDM shortcomings in the promotion of renewable energy technologies

Some characteristics of renewable energy projects lessen the impact that CDM revenues have on their viability and financial attractiveness.

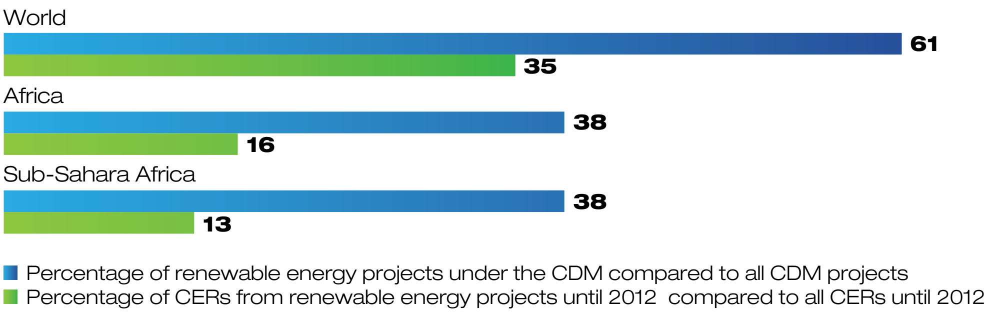
- The high upfront capital investment required, for instance, including the transaction costs mentioned above, makes CDM revenue per unit of investment small compared with other leaner but less innovative CDM project classes, such as the flaring of landfill methane or the destruction of industrial greenhouse gases (World Future Council, 2009). This is exacerbated by the relatively low prices at which certified emission reductions (CERs, the carbon credits generated by CDM projects) have been historically traded in the past. Furthermore, renewable energy avoids CO_2 emissions while other project classes reduce the emission of gases with a higher global warming potency, producing a corresponding multiplier effect on the amount of carbon credits generated (Willis and Wilder, 2006). Therefore, only the most advanced and profitable renewable energy technologies, such as onshore wind, have benefited from the CDM, while newer, high-potential technologies, such as solar PV and geothermal, have rather been left aside.
- The volatility of CER prices on international markets and their sensitivity to political decisions in developed countries run counter to the need of renewable energy investors for minimum levels of revenue certainty over the medium- to long-term. An additional but fundamental uncertainty is related to the question of whether the Kyoto Protocol, and with it the CDM, will continue to exist after 2012, and the question of which countries will be eligible to host CDM projects from 2013 onwards, despite the progress made at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties 16 in Cancún (UNEP FI & Partners, 2011). This insecurity is particularly pertinent for renewable energy projects given their long repayment times when compared to other CDM project classes.
- The complicated and time-consuming administrative process whereby a project is registered as a CDM activity (such as application, registration and monitoring procedures) creates transaction costs that are prohibitively high, particularly for renewable energy projects that already have to cope with high transaction costs (UNEP FI, 2011).

17 In this diagram, Africa comprises the entire continent, including the countries in the Maghreb, which for fundamental socio-economic reasons have generated the bulk of CDM projects on the continent and attracted the bulk of commercial carbon finance. Fifty per cent of all African CDM projects are fund in this handful of countries.

- Emissions reduction projects in developing countries can only qualify as CDM projects if they are additional, meaning if they would not have occurred in a business-as-usual scenario, without the prospect of earning CDM carbon revenues. Previous sections have highlighted the importance of national supporting policies for the upscaled deployment of renewable energy technologies. Until recently, the existence of national renewable energy incentives made it more difficult to prove "additionality", which in turn made it more difficult for governments to justify the implementation of critical national incentives, such as feed-in tariffs. This issue has been resolved with the UNFCCC's CDM Executive Board stating that policies implemented after 2001 should not be considered in the determination of CDM project baselines (World Future Council, 2009).

Diagram 15: Renewable energy projects in the CDM by region

Renewable energy projects in the CDM by region



CDM shortcomings in the promotion of decarbonization projects in sub-Saharan Africa

Many countries in sub-Saharan Africa have recently witnessed notable economic growth. However, has the CDM met expectations and been instrumental in ensuring that this growth takes place in a low-carbon manner? The answer is no given that Africa as whole, including the main CDM player on the continent, South Africa, will barely supply 3 per cent of global CER volumes by 2012 (UNEP RISOE, 2011). What has prevented the CDM from achieving its full potential in the countries of sub-Saharan Africa? What becomes clear is that many of the barriers to CDM project development are in fact congruent with those identified in this section purely in a renewable energy context: challenging risk landscapes, weak institutions, unreliable or lacking regulation, unstable macroeconomic conditions, a lack of technical and managerial expertise both on public and private sides and a lack of law enforcement. These factors too often make CDM projects unviable and unbankable for private sector actors. There are, however, some CDM-specific barriers that explain the continent's failure in mobilizing commercial carbon finance:

- An essential pre-condition for an effective CDM market is a well-functioning designated national authority (DNA). Decisions must be fast and transparent; too often they are still perceived as arbitrary. Capacity building as well as experience sharing with other DNAs in the region (and beyond) can be instrumental in equipping DNAs with the needed know-how to effectively carry out their tasks. More specifically, there is often a lack of reliable and transparent decision-making processes by African DNAs and other public authorities involved (including clear guidelines and transparent approval processes) within acceptable timeframes, elements that are key to making a country an attractive destination for carbon investment and finance. A further critical issue appears to be the institutional anchorage of DNAs and in particular their proximity to private sector promotion services and agencies in order to firmly embed climate change efforts within a broader economic development strategy (UNEP FI, 2011).

- The lack of business-as-usual emissions data needed to define of project baselines often makes it impossible to undertake CDM projects even when easy emissions reduction opportunities have been identified. There is evidence that some methane capture projects are actually flaring the methane rather than using it for electricity generation because there is a lack of data on the national grid emissions needed for baseline construction (UNEP FI, 2011). This gap could be a promising target for international support as demonstrated by the activities of the World Bank's Energy for Rural Transformation (ERT) programme in Uganda where, through interviews, field visits and comprehensive surveys of installed generation capacity, including dispersed diesel generators, average energy efficiency levels in production and distribution were determined and emission baselines calculated.

- The absence of an existing national track record and meaningful pipeline of CDM projects leads to a general lack of local experience (including lack of technical, managerial and financial expertise) as well as an inability to benchmark with other projects. These factors slow down project design and implementation considerably (UNEP FI, 2011).

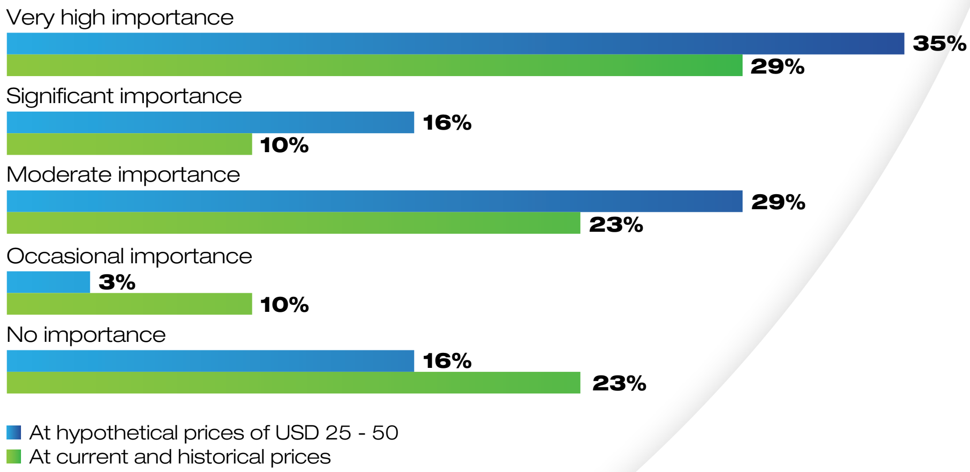
Despite these barriers, however, it seems that the CDM has played a role in most non-hydroelectric, grid-based renewable energy development in sub-Saharan Africa. However, it cannot be said to have played a role in the astonishing development of hydroelectric projects in certain countries because they are large-scale and therefore ineligible as CDM projects. On the one hand, 100 per cent of the wind energy capacity of Cape Verde (28 MW), the total renewable energy in Senegal, and almost half of Kenya's non-hydroelectric renewable energy capacity are underpinned by the CDM. On the other hand, the spectacular growth in hydroelectric capacity in countries such as Mozambique, Angola and Zimbabwe happened outside of the CDM.

What can be concluded is that while the CDM might have played a role in much of the renewable, non-hydroelectric capacity development the continent has seen, it has failed to truly shift the African energy sector overall onto a more low-carbon path of development. The fact that such non-hydro renewable energy development almost exclusively took place in countries that feature national renewable energy policies, and that the CDM is in principle available to all countries, appears to highlight the current and historic importance of national policies/instruments and the role of the CDM in providing rather auxiliary support (at least in light of the modest CER prices and overall CDM-related uncertainties observed over the last few years).

Respondents to the UNEP FI survey seem to indeed perceive the role of the CDM, at historic and current CER prices, as rather secondary and auxiliary (many respondents referring to CER-based revenues as "icing on the cake"). While 41% of respondents assess the role of the CDM to be of "very high" or "significant importance", 58% assess it to be of only "moderate" to "no importance". Their assessment changes, however, if instead of referring to real CER prices (both historic and current), one assumes CER prices in the range of USD 25-50. In this case, 55% of respondents considered the role of the CDM to be of "very high" or "significant importance", while 49% still considered it to be of only "moderate" to "no importance". An interpretation that can be made is that the CDM per se (and other crediting-based mechanisms) could be effective and important in mobilizing private finance, as long as implemented differently than has been the case in the past.

Diagram 16: the views of private finance practitioners on the effectiveness of the CDM in mobilizing private finance for renewable energy in developing countries, at (i) current and historic CER prices, and (ii) hypothetical CER prices of USD 25-50

How important has the CDM been in mobilizing private finance for renewable energy in developing countries? How important could it be?



"From a local point of view, the CDM has not really gained significant momentum and thus has failed in stimulating major renewable energy investments. The carbon credits that can be earned are important, but there are problems that lessen their impact. This is a relatively new concept and there are few organizations locally that are able to buy carbon credits. There is no effective legislation governing CDMs and a related tax regime for income related to carbon credits. There are specific examples though of firms that have used their carbon credits to refinance projects such as KenGen (Kenya's electricity generation company)."

Jeremy Ngunze, Group Head of Business Management, Commercial Bank of Africa

4. Barriers and drivers - Part 2: Energy sector structure in sub-Saharan Africa

Section 4 focuses on the structure of the energy sector in sub-Saharan Africa. Section 4.1 outlines the problem of the current situation and section 4.2 describes solutions that have worked in the past in developing countries. In section 4.3, energy sector reform is linked to the policy needs presented in section 3.

4.1 The problem

The lack of renewable energy capacity or the environmentally unsustainable nature of electricity generation is only one of many challenges confronting the local energy sector in many developing countries, including most of sub-Saharan Africa. The need to shift from carbon-intensive to carbon-efficient and sustainable options is a relatively new challenge and needs to be viewed within the context of the broader history of the energy sector as well as alongside the current efforts to respond to the other, more immediate challenges being faced.

In developing countries these more immediate challenges include, fundamentally: (i) the limited scope and coverage of energy infrastructure in terms of both geographic area and users; a large gap in generating capacity; (ii) the obsoleteness of the employed technologies and poor state of the overall energy infrastructure; (iii) the low levels of resource efficiency that lead to high costs per unit of output, which - given low affordability levels among local populations – are often kept down through subsidies from already constrained public budgets; and (iv) the manipulation of electricity prices for political reasons.[18] This chain of problems can most often be traced back to the overall inefficiency as well as the run-down and unsustainable finances of government-owned utilities and the resulting lack of much needed investment for expansion or refurbishment.

A key historic characteristic of the energy sector in developing countries, including most of those in sub-Saharan Africa (SSA), frequently the domination of a state-owned national power utility with a legally endowed monopoly and a vertically integrated supply chain that encompasses power generation, transmission, distribution, and customer services.[19] This type of system lacks, by default, the incentive and flexibility to provide easy grid and market access, on equitable terms, to third-party and private sector independent power producers (IPPs). Another implication of this type of energy sector structure is that it renders energy provision susceptible to political interference, typically aimed at keeping energy prices low, which can put the financial sustainability of the overall national model for power provision in danger.

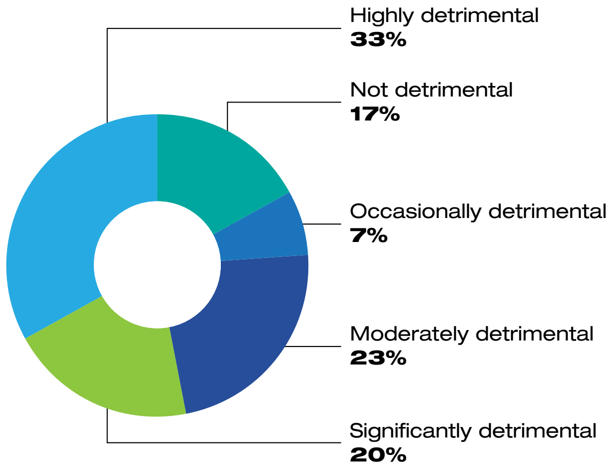
As shown in diagram 17, the energy financiers who participated in the UNEP FI survey clearly agree that electricity prices that, for political reasons, are kept below the costs of generation are detrimental to the development and financing of renewable energy technologies in developing countries.

18 Bacon, R. (1995). "Privatization and Reform in the Global Electricity Supply Industry." Annual review of energy and the environment 20(1): 119-143.
World Energy Council. (1998). The Benefits and Deficiencies of Energy Sector Liberalisation, Volume I. London. World Energy Council. p. 121.
Patterson, W. (1999). Transforming Electricity: the Coming Generation of Change. London, Earthscan., p. 203.
International Energy Agency (1999). Electricity Market Reform: An IEA Handbook. Paris, OECD/IEA. pg. 106.

19 Bacon, R. and J. Besant-Jones (2002).

Diagram 17: The views of private finance practitioners on unsustainably low energy prices for the viability of renewable energy in developing countries

How detrimental are unsustainably low energy prices for the viability of renewable energy technologies in developing countries?



4.2 Energy sector reform as part of the solution

One approach to solving what appears to be a vicious circle has typically been a reform process comprising elements of decentralization (horizontally, vertically or both) and privatization. If successful, this approach usually enhances resource efficiency, attracts capital investment into technologies and infrastructure, and increases competition in an energy market. Further, such reform is expected to create more innovation, wider coverage, better service, lower but financially sustainable prices, and more sustainable public finances.

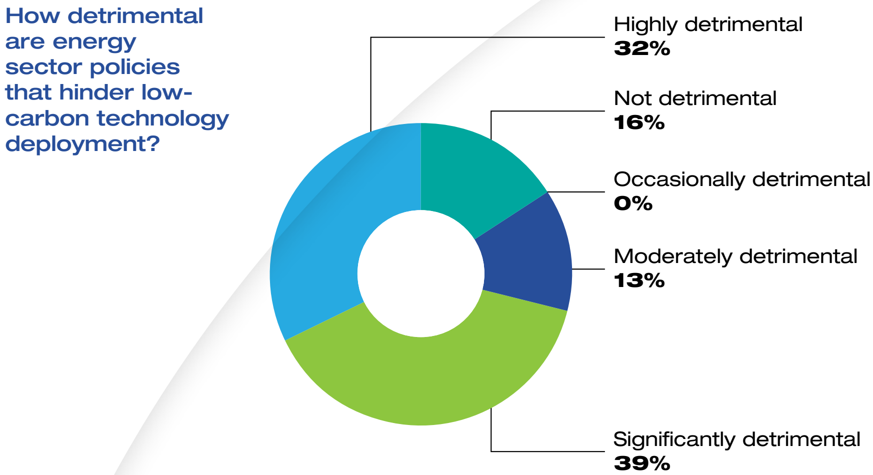
Such energy reform typically involves several components, particularly: (i) restructuring the electric power supply chain to enable the introduction of competition, through the unbundling of vertically or horizontally integrated companies; (ii) privatizing the unbundled electricity generators and distributors into dispersed ownership, as competition is unlikely to develop effectively between entities that are under common ownership - whether state or private; (iii) developing a regulatory framework for the power market that is applied transparently by an agency that operates independently from influence by government, electricity suppliers or consumers; and (iv) focusing the government's role on policy formation and execution (Bacon and Besant-Jones, 2002).

4.3 The need for renewable energy policies

Whether or not energy sector reform – along the lines set out above – will lead to the expected results is not the subject of this study. But it appears that such reform can have fundamental implications on the uptake and development of renewable energy. What is critical here is that it is usually private sector electricity companies and IPPs that have the ability and expertise not only to mobilize investment at speed and scale, as well as to install and operate new energy infrastructure, but to also do this in the specific context of renewable energy technologies.

As shown in diagram 18, the energy financiers who participated in the UNEP FI survey clearly agree that broad energy sector policies that result in difficult grid or market access, monopolistic ownership of electricity generation and transmission, lack of competition, etc., are detrimental to the development and financing of renewable energy technologies in developing countries.

Diagram 18: The views of private finance practitioners on energy sector policies that hinder low-carbon technology deployment (difficult grid or market access, monopolistic ownership of electricity generation and transmission, etc.)



Yet it is equally important to factor in that IPPs and private sector companies have the expertise, capacity and skills not only in the area of renewable energies, but also, to the same or even greater degree, in fossil fuel-based or other areas of conventional electricity generation. Therefore, while broader energy sector reform can be conducive, or may even be a key requirement for the rapid uptake of renewable energy, it can turn out to be counterproductive if such reforms are not complemented with a set of dedicated renewable energy policies and incentives. This is shown by evidence from sub-Saharan Africa where energy sector reform and upscaled IPP initiatives led to increased fossil fuel-based rather than renewable energy generation (UNESCA/UNEP, 2007), with negative implications for the overall need for fossil fuel imports and the balance of the overall energy mix. Therefore, energy sector reform can at the same time be a catalyst and a key requirement for the scaling up of renewable energy technologies in developing countries; notwithstanding and given the continued financial inferiority of renewable energy relative to conventional technologies in many grid-connected contexts, it can also be a double-edged sword.

As investors, IPPs will be guided first and foremost by the risk-return profile of investments. Given the lower overall cost structure of fossil-fuel projects in the short term and the particularities of the sub-Saharan Africa risk landscape, conventional technologies have scored and will continue to score better in terms of risk-return. A purely financial assessment of risk and return by private sector actors will, in a complete policy vacuum, typically not consider broader, long-term costs and benefits of renewable energy, such as: the need for a strategic orientation of the national electricity mix in light of resource scarcities; the financial competitiveness of renewable energies in the long term given the more favourable OPEX profiles; and the environmental and social benefits given their carbon efficiency and the fact that renewable energy systems can be developed in a modular and off-grid manner that is more appropriate for rural areas.

Emerging best-practices in the region

Some countries in sub-Saharan Africa has relatively successfully scaled-up renewable energy through changing energy market structures and introduced incentives. Among them are:

Uganda
Uganda scores highly both in terms of its renewable energy capacity in the current CDM pipeline as well as the comparably advanced state of its dedicated renewable energy policy. The latter has been praised for its sophistication and the consideration of lessons learnt from experiences abroad covering tariffs for wind, solar PV, biomass, biogas, landfill gas, differentiating wisely between size categories of hydro-power generation, and providing both yearly and cumulative caps on each technology. Together with the development of an effective institutional infrastructure for management of the CDM, the scheme seems to only quite recently show a considerable spurt in renewable energy activity (UNEP FI, 2011). In 2008 Uganda had 550 MW of total installed capacity, of which 315 MW were hydro-based. In 2010 there were 300 MW of renewable energy in the CDM pipeline, comprising new terrain for Uganda in the area of biomass, including the controversial Bujagali dam project of 250 MW, and only 17 MW worth of registered projects.

Mauritius
The Mauritian experience in co-generation is one of the success stories in the energy sector in Africa. Since 2002, biomass based electricity co-generation from sugar estates has stood at 40% (over half of it from bagasse) of the total electricity demand in country (AFREPREN, 2011). Mauritius has, over a period of nearly two decades, developed a feed-in pricing policy on co-generated power, which has been the key driver for increased production of bagasse co-generated power (AFREPREN/FWD, 2009).

Tanzania, that currently carries 18 MW of new capacity in its CDM portfolio, offers a feed-in tariff to hydro-electricity generators and grid-access to IPPs through long-term PPAs with the vertically integrated public monopolist.

Cape Verde, which has recently seen wind generation development in the order of 30 MW, had previously but in place an ambitious plan for wind energy development as well as regulation allowing the import of renewable energy equipment, such as solar panels and wind generators, with tax exemptions (REEEP, 2011).

Nigeria, Senegal, Mali and Ivory Coast have established regulatory support, mostly of fiscal nature, for renewable energy generation, and made IPP generation possible through different grid-access models.

"In order to promote private financing of renewable energy in sub-Saharan Africa, there are a few issues that have to be addressed. First of all, there needs to be a legislative and regulatory framework for renewable energy in place in the country in question. It is important that this framework make it easy for IPPs to flourish in the market. Without this framework, it is unlikely that the local utility will have a credit profile that is attractive enough to receive the necessary credit enhancements needed. There also needs to be a fairly clear visibility of the market in the medium to long term so that investors are certain that the government will not back out of agreements. Ideally, appropriate instruments are also in place, such as a feed-in tariffs, tax incentives or subsidies. If all this is in place then it is likely that financing can be provided."

Daniel Zinman, Senior Transactor, Rand Merchant Bank

5. Barriers and drivers - Part 3: Financial risks in a renewable energy and sub-Saharan African context

Section 5 deals with financial risk. In section 5.1, the risk landscape in sub-Saharan Africa and risks related to renewable energy are outlined. Section 5.2 presents two of the many international entities which offer risk mitigation solutions to investors in developing countries.

5.1 Risk landscape in sub-Saharan Africa

In addition to the fact that in a policy vacuum renewable energy technologies continue to be relatively expensive, it is the accumulation of a variety of significant investment risks that makes the financing of renewable energy investments difficult in a developing country context. Firstly, the general risk associated with the novelty of renewable energy technologies is particularly pronounced in developing countries that lack the track record, overall business infrastructure and professional expertise in these technologies. Secondly, this risk is exacerbated by such investment risks that are typical for developing countries: political risk, currency risk, and commercial risk induced by the poor creditworthiness of state owned utilities that carry the payment obligations to buy generated power under power purchase agreements (PPAs) (AfDB, 2010). The poor creditworthiness is often explained by poor billing and payment collection systems, limited innovation, and prices that reflect neither costs nor demand, but are determined on political grounds. The accumulation of these factors worsens the risk profile of investment, and the return expectations of potential developers and their financial backers reach prohibitive levels. This is particularly detrimental to renewable energy technology given its capital intensity as discussed above in section 3.1.

The main non-technology risk categories that characterize the investment climate in developing countries, including those in sub-Saharan Africa, are presented in detail below (UNEP and Partners, 2009).

Country and political risk

This risk category encompasses risk of expropriation, breach of contract, war and civil disturbance. As vague and all-comprising this category of risk may be, it is critical for foreign investors and financial institutions. It will often act as an early selection filter in many financial decision-making processes, and on the basis of broader macroeconomic, political or legal concerns, it often hinders the implementation of otherwise promising and high-potential projects on the ground (Baldwin, 2006).

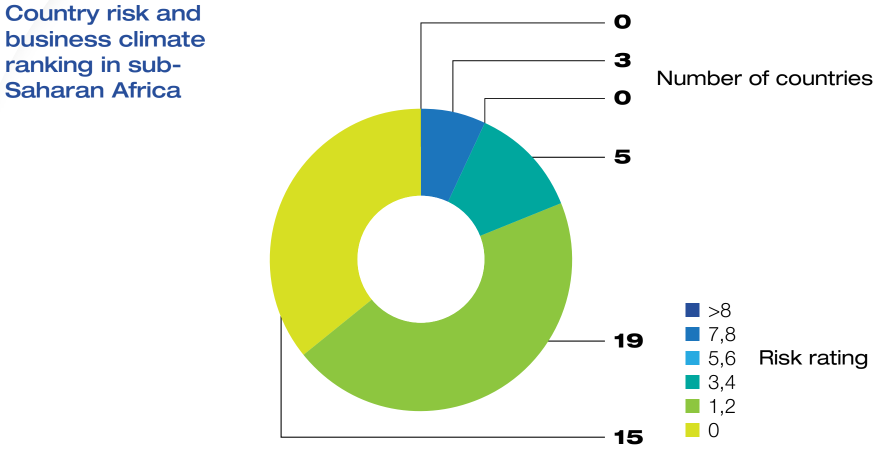
Based on a composite indicator that combines country ratings with respect to "country risk" and "business climate", diagram 19 gives an indication of how countries in sub-Saharan Africa currently perform, on a scale from 0 to 12. The bulk of the countries analysed (34) find themselves in the two lowest possible categories; while five countries make it to the third worst category (out of six categories). Only three countries[20] make it into the second highest category.

"Especially the robustness of the contractual structure as well as neutrality in the legal system are critical factors for RMB when determining the attractiveness of different countries, and if country/political risk insurances are needed. Since government entities often are the counterparties in renewable energy deals, it is important that the bank can enforce contracts if they should default. One way to improve the possibilities of enforcement and neutrality is by writing arbitration clauses into contracts so eventual disputes can be settled by a third party."

Daniel Zinman, Senior Transactor, Rand Merchant Bank

20 Botswana, Mauritius, Namibia

Diagram 19: Distribution of countries in sub-Saharan Africa according to country risk and business climate ratings



Several studies point to the close link between country risk and related aspects of public governance (including quality of administration, public accountability and political stability) to levels of private investment, and especially, but not only, foreign direct investment (Ramcharran, 1999) (Asyan, Ersoy, 2007). **This rationale is strongly confirmed by the UNEP FI survey among energy financiers both in terms of the importance of the overall stability of the legal and political frameworks as well as with regards to the degree of law enforcement, as shown in diagrams 20 and 21**. When compared, as a whole to all other macro-regions of the world, sub-Saharan Africa is the most risky (Ferrari and Rolfini, 2008).

Diagram 20: The views of private finance practitioners on the importance of political, economic and legal stability for the viability of renewable energy investment in developing countries

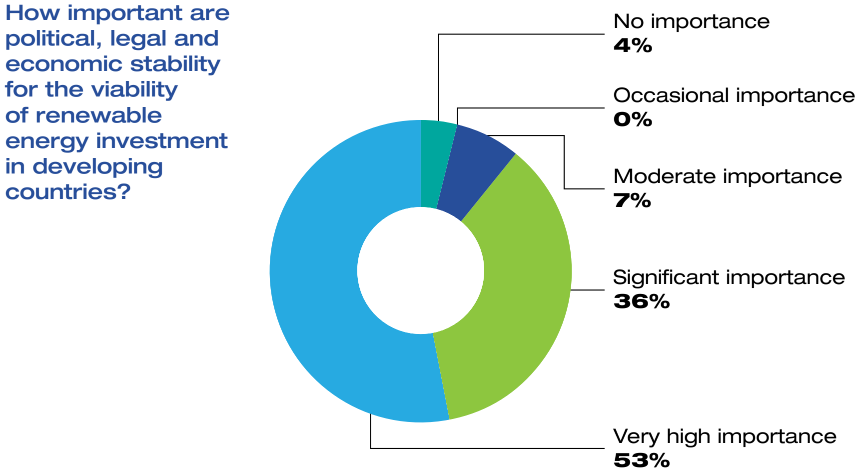
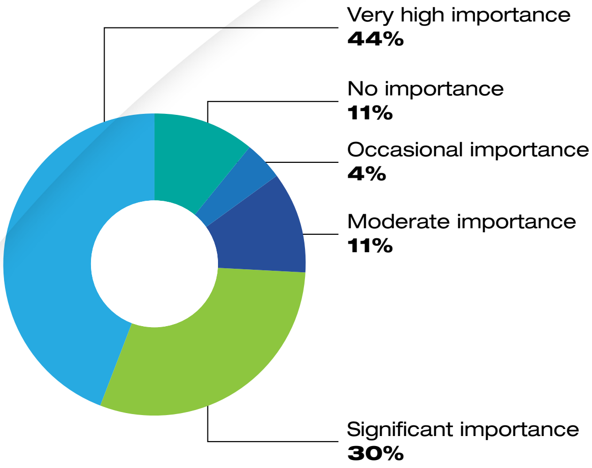


Diagram 21: The views of private finance practitioners on the importance of effective law enforcement for the viability of renewable energy in developing countries

How important is the effectiveness of law enforcement for the viability of renewable energy in developing countries?



Political risk in sub-Saharan Africa, more than in any other part of the world, is seen to be not only rooted in the potential behaviour of governments and other official actors, but in that of any organization or individual with political aims. Even relatively advanced states in the region cannot always claim control of their entire sovereign territory (Baldwin, 2006). In such vacuums of public authority, potential threats to investments are: competing investors, non-governmental organizations, militia groups, individual politicians or specific arms of a government.

However, it should be noted that not all types of investment risk are of equal importance to all financial institutions. Many of the bigger African banks have operations in a number of sub-Saharan African countries, which tends to reduce risk overall simply by making institutions more diversified. For example, currency risk (discussed below) will not be as significant for an African banking company if it has an existing and operating subsidiary or branch in the country where the investment opportunity exists. Overall, country and political risks will tend to play a lesser role for pan-African banks than for entirely foreign institutions as the former will likely have a considerably better understanding of local political, legal and judicial situations than the latter.

Low-carbon policy risk

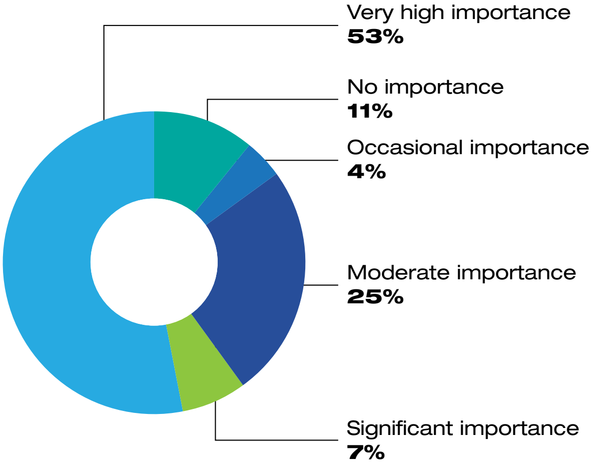
Low-carbon policy risk pertains to the possibility that policies underpinning investments in renewable energy projects (such as the policies and mechanisms outlined in section 3) might be altered or reversed. In addition to operating in an overall difficult and risky political, legal and macro-economic context, renewable energy technologies in developing countries are also exposed to more specific regulatory risks, given, as seen above, their frequent reliance on public support mechanisms and incentives. In the case that such concrete incentives are discontinued, or even reversed retroactively, renewable energy projects suddenly become unviable and investors are left with stranded assets.

Low-carbon policy risk is essentially the component under regulatory risk that applies specifically to renewable energy projects and other decarbonization efforts. It relates to the question of how credible and reliable public policies, regulation and incentives are over the appropriate timeframes, and how effectively they are implemented by government agencies (Helm, Hepburn et al., 2003). Such risks have also materialized in developed country regions such as Europe, where the German, Spanish and Czech feed-in tariff levels were suddenly corrected, at times entirely discontinued or reversed retroactively. The reason for these corrections was partly the over-generous design of the feed-tariffs in the first place, which allowed investors to seize overly high and unjustified returns (Konttinen, 2010). In the Czech Republic a tax of 28 per cent on solar photovoltaic revenues was introduced in 2010, with retroactive effect, leading to loss of investor confidence and trust in ongoing national regulation and promotion of renewable energy technologies (Renewable Energy Focus, 2010).

Given the political instability, frequent lack of law enforcement or implementation of regulation in many developing countries, even if supportive policies for renewable energies are put in place, private initiative and investment will only materialize if the continuity of such policies is ensured. This can be achieved through so-called grandfather clauses that can prevent the discontinuation of policies when there are changes in public administration, for instance after elections. Establishing regulatory agencies that are independent from the central government and thus less exposed to political tactics can also contribute to the continuity and stability of regulation (Kirkpatrick and Parker, 2005).

Diagram 22: The views of private finance practitioners on the importance of the reliability of low-carbon policy frameworks and support mechanisms for the viability of renewable energy finance in developing countries

How important is the reliability and trustworthiness of low-carbon policy frameworks and support instruments for the viability of investment in developing countries?

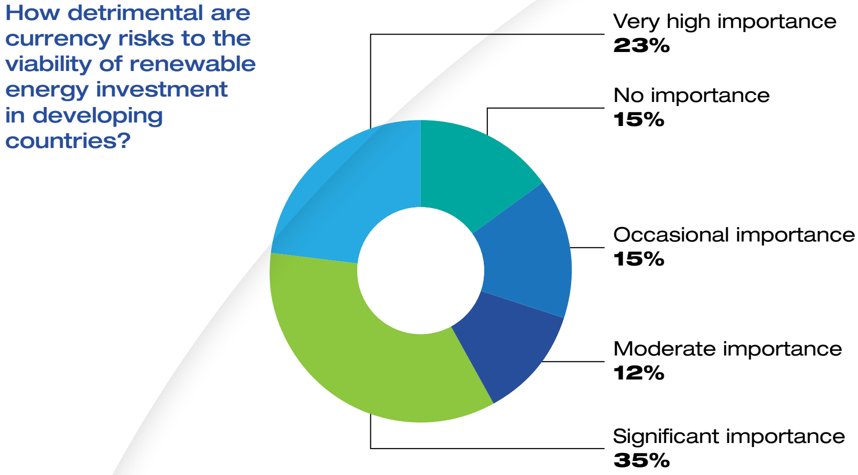


The reliability and trustworthiness of renewable energy policy frameworks over the medium- and long-term are considered to be vital from the private-sector perspective. Fifty-three per cent of survey participants considered it to be of very high importance.

Currency risk

Currency risk is a trivial but critical risk class for foreign financiers considering engage in investments in sub-Saharan Africa and particularly Least Developed Countries (LDCs) where currencies and financial markets are weak and volatile which makes capital investments, particularly those related to infrastructure, reliant on foreign financing. Currency risks are especially pertinent for projects delivering a public good to local populations, such as electricity or water, given that project cash flows are mostly denominated in local currency while debt service or dividend payments are expected in hard currency. In addition, there is a lack of commercial markets for currency risk hedging instruments for less widely circulated currencies.

Diagram 23: The views of private finance practitioners on how detrimental currency risks are to the viability of renewable energy investment in developing countries



Renewable energy technologies are affected particularly strongly by foreign exchange risk given their novelty and short track record, especially in those countries with volatile currencies. The result is a lack of technology know-how among local financial institutions and a heavier reliance on foreign finance than in the context of conventional technologies.

5.2 Risk mitigation instruments

In order to overcome some of the risks mentioned above, a variety of financial instruments have been put in place to transfer risks to a third party such as a government, company or development bank or agency. These have not been developed specifically in a renewable energy context but in the broader area of infrastructure investments in developing countries and are instruments of official development assistance. Notably, the Multilateral Insurance Guarantee Agency and the Currency Exchange Fund are two international bodies that offer risk mitigation solutions for private investment in developing countries and are displayed in the following section as examples.

Multilateral Insurance Guarantee Agency

The Multilateral Insurance Guarantee Agency (MIGA) is a member of the World Bank Group. Its mandate is to encourage foreign direct investments in developing countries in order to "help support economic growth, reduce poverty, and improve people's lives" (MIGA, 2011c). MIGA provides country risk guarantees to investors and financiers from the private sector for a fee.

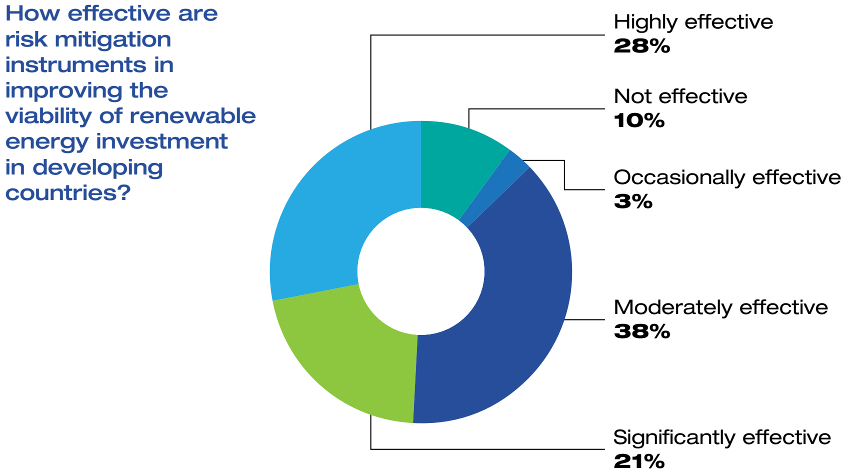
There are five different risk categories that MIGA provides insurance coverage for (MIGA, 2011b):

- **Currency inconvertibility and transfer restriction** – This scheme protects against losses arising from (i) an impossibility to convert project revenue, denominated in local currency, into Dollar, Euro or Yen; and/or (ii) an impossibility to transfer funds from the host country abroad.
- **Expropriation** – This scheme protects against losses arising from an expropriation, by government, of funds and/or a nationalization of assets.
- **Breach of contract** – This scheme protects against losses arising from a breach of contract with government in the case that reparations are not awarded through normal measures e.g. arbitration.
- **War, terrorism and civil disturbance** – This scheme enables investors to protect their assets and businesses against losses which would occur as a result of certain types of violence within the host country.

- **Non-honoring of sovereign financial obligations** – This scheme protects against losses arising from a default, by the host government, on certain financial obligations or guarantees provided to the project concerned.

Many of the insurance products provided by organizations like MIGA are niche products, and they are not likely to vastly increase investments on their own (MIGA, 2001a). However, given that they do provide a certain degree of protection against the major political and country risks which are critical barriers to foreign direct investments in developing countries, 49 per cent of the respondents to the UNEP FI survey think that the availability of these risk mitigants is either of high or significant importance for a favourable investment decision.

Diagram 24: The views of private finance practitioners on the importance of risk mitigation instruments for the viability of renewable energy investment in developing countries



The Currency Exchange Fund

As described in section 5.1, there is a lack of commercially available risk hedging instruments for many of the currencies in sub-Saharan African countries. These types of hedging instruments can often be crucial to a company's ability to conduct business in foreign markets. To address this problem and in order to help catalyse private investment in such countries, the Currency Exchange Fund was founded. The Fund offers currency and interest swaps in many emerging markets, including most of sub-Saharan Africa. Funding is provided by a wide variety of organizations, including development finance institutions, commercial banks and development banks (TCX Fund, 2011c).

However, there are a few countries in the region where even the Currency Exchange Fund does not offer hedging products. These countries are Liberia, Malawi, Sierra Leone, Guinea, Somalia, the Sudan, Eritrea and Zimbabwe (since the Zimbabwean dollar was abandoned in 2009) (TCX Fund, 2011b).

The introduction of these derivatives provides foreign investors with security concerning exchange rates over the medium and long term. Commercial institutions at the moment in many countries cannot offer this security. With a committed capital of USD 700 billion (TCX Fund, 2011a) the fund acts as a driver in many developing markets.

6. Policy recommendations

- When developing renewable energy deployment strategies in developing countries, governments and national policymakers, as well as any other institutions and organizations involved at the international level, have to pay attention to all three "activity blocks" outlined above. These activity blocks are complementary to each other, build on each other, and therefore need to be considered, designed and implemented in an integrated, rather than isolated, manner.

1. Create a level playing field

- **Formulate a national energy vision with clear renewable energy targets**

  The first step for any government must be the definition of a vision for the country's energy future, including the role that renewable energy technologies are expected to play. From the perspective of private sector financiers the definition and setting of clear and legally binding national targets for renewable energy technologies is central. It also provides the legal framework within which incentive mechanisms (see next bullet point) can be subsequently implemented and against which their effectiveness and efficiency can be continually assessed. The definition and setting-up of a government vision on energy and renewable energy targets does not require investment or cost money but requires political will, determination and commitment. They are important because they reassure the private sector of what direction national authorities are taking for the country's energy journey.

- **Put in place incentive mechanisms for renewable energy technologies**

  Governments need to improve the risk-return profile of renewable energy relative to conventional, particularly fossil fuel-based, technologies and projects within their jurisdictions. For any level of risk, this can be done by improving return expectations, in other words the profitability of renewable energy projects. A wide suite of public incentive mechanisms are available and have built up a track record in both developed and developing countries in recent years. Each type of incentive mechanism has advantages and disadvantages, and which incentive mechanism, or combination of incentive mechanisms, will be most effective and efficient will depend on the local circumstances of the country and energy sector at hand, as well as on the nature and ambition of the corresponding national renewable energy targets.

- **Phase out fossil fuel subsidies to fund the required incentive mechanisms for renewable energy**

  The set up and operation of incentive mechanisms requires, however, government channelling of financial resources into renewable energy deployment. Ultimately, renewable energy project and technology incentives will have to be borne by either tax payers or energy consumers. This raises financial and political difficulties in developing countries where large parts of the population are poor and cannot be burdened with the additional costs of renewable energy deployment. A readily available source of government funding in many developing countries is, however, the still significant flows of public subsidies to fossil fuels. Switching the flow of subsidies from fossil fuels to renewable energies is easily justifiable for the strategic reasons and social benefits renewable energies bring, as outlined above. If additional resources need to be raised nationally, it should and can be done in ways that put the burden on the economic elites of the country rather than the poor segments of society.

- **(i) Use international climate finance efficiently and effectively by unlocking and leveraging much greater volumes of private capital. (ii) Institute international carbon markets with meaningful carbon prices as a strong and efficient driver for private low-carbon investment in developing countries.**

Critical and promising sources of funding for the deployment, at scale, of renewable energy technologies in developing countries are, ultimately, international given the limits of available financial resources in developing countries nationally. At the international level there are two types of funding:

(i) Resources made available by developed countries from government budgets in the form of bilateral or multilateral official development assistance or international climate finance, channelled through development and environmental agencies, including a number of funding vehicles established under or through the United Nations Framework Convention on Climate Change (UNFCCC), most notably the recent Green Climate Fund. These resources ultimately come from tax payers in developed countries and need to be used efficiently, particularly because they are increasingly scarce in light of austerity efforts in these countries. A wide body of evidence suggests that highest efficiency and effectiveness are achieved if such international resources are used towards leveraging private capital at quantities several times the volume of the original public finance, for instance by financing the additional cost of incentive mechanisms for renewable energies in developing countries, as described in this report. This should be a strong area of focus for the Green Climate Fund and, particularly, its Private Sector Facility.

(ii) Resources mobilised in a more decentralized and dispersed manner, through international carbon markets, particularly through the Clean Development Mechanism and other crediting mechanisms under international law. The mobilization of these resources does not require immediate government budgeting as resources ultimately come from greenhouse gas (GHG) emitters in developed countries rather than tax payers. Through the mobilization of commercial carbon finance, the CDM has in the past enabled, the implementation of thousands of entirely private sector-financed decarbonization solutions, including renewable energy projects, in developing countries. The full potential of the CDM has not fully been exploited, according to the UNEP FI survey, but this has been the result of low prices for CDM credits (certified emission reduction - CER) rather than of fundamental flaws in its design. The international community should, therefore, ensure that the international carbon markets that exist today expand, and that credit prices embark on a clear upward trend, reaching levels of USD 25 to 50 as quickly as possible. Given that the CDM, as well as the international and national institutions backing it, already exist and that considerable public investment has been made in setting it up and making it operational over the last decade, the international community should focus on reinstituting it as a key driver of private renewable energy and low-carbon investment in developing countries.

2. Provide easy market access

Make market access key

A level playing field for renewable energy technologies will not help unless renewable energy proponents, developers and financiers have access to national electricity markets and grids with reasonable ease. Market liberalization efforts that, through the vertical and horizontal unbundling of monopolistic structures, achieve the creation of true competition on, and access to, local electricity markets can be a necessary step towards scaling up renewable energy investment from private sources. This is true as long as they are accompanied by incentive mechanisms for renewable energy. If such reform processes are not possible or desirable, other leaner approaches can be tried, such as the institutionalization of systematic issuances of long-term power purchase agreements (PPAs) between the central utility and independent renewable energy power producers.

3. Mitigate political and regulatory investment risk

Reform political, economic and societal structures to reduce risk

In the long term, national governments and domestic political systems have to reduce the fundamental drivers of the political and regulatory risk landscape in developing countries through the initiation and implementation of essential reform processes in political, economic and societal structures (such as addressing cultures of corruption, establishing standards of transparency in public administration, and improving law enforcement).

Put in place international risk mitigation instruments with an explicit climate change mandate

Mitigating investment risks, particularly those of a political and regulatory nature, requires the attention and involvement of the international community. In fact, the international community has put in place risk mitigation institutions and instruments aimed at facilitating private investment in developing countries over the last decades. These instruments, both existing and new, need to be expanded to cover political and regulatory risks explicitly for renewable energy and other low-carbon technologies in developing countries. Funding made available through the Private Sector Facility of the Green Climate Fund, for instance, as well as through other international vehicles for climate finance, should be used for the setting up of investment risk mitigation instruments specifically in a climate change context, such as a "climate-focused Multilateral Insurance Guarantee Agency" (Climate-MIGA), or a "climate focused Currency Exchange Fund" (Climate-CEF).

References

Adelegan, O.J. and B. Radzewicz-Bak, 2009, "What Determines Bond Market Development in Sub-Saharan Africa?", IMF Working Paper.

AfDB, 2008, "Clean energy investment framework for Africa", Operations Policies and Compliance Department.

AfDB, 2010, Committee of Ten Policy Brief: Financing of Sustainable Energy Solutions. Committee of Ten Policy Brief. 3.

AFREPREN/FWD, 2009, The Role of Feed-in Tariff Policy in Renewable Energy Development in Developing Countries: A Toolkit for Parliamentarians.

Aysan, A. and Z. Ersoy, 2007, "What Types of Perceived Governance Indicators Matter the Most for Private Investment in Middle East and North Africa." *Economics Bulletin* 5(8): 1-16.

Bacon, R., 1995, "Privatization and Reform in the Global Electricity Supply Industry." *Annual review of energy and the environment* 20(1): 119-143.

Bacon, R. and J. Besant-Jones, 2002, Global Electric Power Reform, Privatization, and Liberalization of the Electric Power Industry in Developing Countries. Energy & Mining Sector Board Discussion Paper Series. Washington DC, World Bank. 2.

Baldwin, L., 2006, "Political Risk in Sub-Saharan Africa." *Infrastructure Journal Online* 41: 35-38.

Beck, F. and E. Martinot, 2004. "Renewable Energy Policies and Barriers." *Encyclopedia of Energy*.

C. Cleveland, Elseviser. 5: 365-383.

Dasappa, S., "Potential of biomass energy for electricity generation in sub-Saharan Africa", *Energy for Sustainable Development*, Volume 15, Issue 3, September 2011, p. 203–213.

Deichmann, U. and C. Meisner et al., 2010, "The Economics of Renewable Energy Expansion in Rural sub-Saharan Africa". World Bank Policy Research Working Paper. Washington DC, World Bank. 5193.

Eberhard et al., 2008, "Underpowered: the state of the power sector in sub-Saharan Africa", *Background Paper 6, Africa Infrastructure Country Diagnostic*, The World Bank, Washington, DC.

Ferrari, F. and R. Rolfini, 2008, Investing in a Dangerous World: a New Political Risk Index. SACE Working Paper, SACE Group. 06.

Gaul, M., F. Kölling and M. Schröder, 2011, "Policy and regulatory framework conditions for small hydro power in Sub-Saharan Africa", EUEI PDF/GTZ discussion paper, p.6.

Helm, D. and C. Hepburn et al., 2003, "Credible Carbon Policy." *Oxford Review of Economic Policy* 19(3): 438-450.

Holm, A. et al., 2010, "Geothermal Energy: International Market Update", GEA.

IEA, 1999, *Electricity Market Reform: An IEA Handbook*. Paris, OECD/IEA.

IEA, 2011a, *Clean Energy Progress Report*, Paris, OECD/IEA.

IPCC, 2011, *IPCC Special Report on Renewable Energy Sources and Climate*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Karekezi, S. and W. Kithyoma, 2003, "Renewable Energy in Africa: Prospects and Limits", The Workshop for African Energy Experts on Operationalizing the NEPAD Energy Initiative.

Kenyan Ministry of Energy, 2011, "Scaling up renewable energy program: Investment plan for Kenya". Updated draft May 2011.

KfW, 2005, Financing Renewable Energy: Instruments, Strategies, Practice Approaches. KfW Discussion Paper. Frankfurt, KfW. 38.

Kirkpatrick C. and D. Parker, 2005, Towards Better Regulation? Assessing the Impact of Regulatory Reform in Developing Countries. CRC Workshop. University of Manchester.

Konttinen, P., 2010, "Calm the Feed-in Frenzy." from http://www.renewableenergyworld.com/rea/news/article/2010/06/calm-the-feed-in-frenzy.

Martinot, E, et al., 2002, "Renewable energy markets in developing countries," *Annual Review of Energy and the Environment* 27: p. 309-348.

Mendonça M. and D. Jacobs, 2009, "Feed-in tariffs go global", Renewable Energy World Magazine, July-August Issue.

Metcalf G. and D. Weisbach, 2009, "The Design of a Carbon Tax", *Harvard Environmental Law Review*, Volume 33, Cambridge, USA.

MIGA, 2011a, "World Investment and political risk", International Bank for Reconstruction and Development/The World Bank, Washington DC.

NOAA, 2011. Africa's Extremely Prolonged Drought. [online] (27 July 2011) Available at: http://www.nnvl.noaa.gov/MediaDetail2.php?MediaID=789&MediaTypeID=1 [Accessed 15 February 2012].

Patterson, W., 1999, *Transforming Electricity: the Coming Generation of Change*. London, Earthscan.

Pindyck, R., 2004, "Volatility in natural gas and oil markets", *The Journal of Energy and Development*, Volume 30, No. 1.

Ram, B., 2006, "Renewable Energy Development in Africa- Challenges, Opportunities, Way Forward".

Ramcharran, H., 1999, "Foreign Direct Investment and Country Risk: Further Empirical Evidence." *Global Economic Review* 28(3): 49-59.

REN21, 2006, "Changing Climates: The Role of Renewable Energy in a Carbon-Constrained World", UNEP/REN21

REN21, 2010, "Renewables 2010 Global Status Report". Paris, REN21 Secretariat.

REN21, 2011, "Renewables 2011 Global Status Report". Paris, REN21 Secretariat.

Szabó, S. et al. 2011, "Energy solutions in rural Africa: mapping electrification costs of distributed solar and diesel generation versus grid extension", *2011 Environ. Res*. Lett. 6034002.

The World Bank, 2011a, "Global Economic Prospects", Volume 3, International Bank for Reconstruction and Development/The World Bank, Washington DC.

The World Bank, 2010a, "Africa's infrastructure: a time for transformation", *The World Bank*, Washington D.C.

World Bank, 2010b, "The Economics of Renewable Energy Expansion in Rural sub-Saharan Africa", *Policy Research Paper 5193*: January 2010.

UN-Energy/Africa, 2011, "Energy for Sustainable Development: Policy Options for Africa". Publication to CSD15.

UNEP, 2011a, *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers*.

UNEP and Partners, 2009, *Catalysing Low-carbon Growth in Developing Economies: Public Finance Mechanisms to Scale Up Private Sector Investment in Climate Solution*.

UNEP FI and Partners, 2011, *Investment-grade climate change policy: Financing the transition to the low carbon economy*.

UNEP FI, 2011, *And Yet It Moves*.

UNESCA/UNEP, 2007, "Making Africa's Power Sector Sustainable: An Analysis of Power Sector Reforms in Africa". Addis Ababa, UN-Energy/Africa.

UNFCCC, 1998, "Kyoto Protocol to the United Nations Framework on Climate Change".

UNFCCC, 2006, *Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol on its first session*.

UNIDO, 2009, "Scaling Up Renewable Energy in Africa", 12th Ordinary Session of Heads of State and Governments of the African Union, Addis Ababa, Ethiopia.

Weron, R., 2007, *Modeling and Forecasting Electricity Loads and Prices: A Statistical Approach*, John Wiley & Sons, Ltd., Chichester, p26.

Willis, M. and M. Wilder, 2006, "The Clean Development Mechanism: Special Considerations for Renewable Energy Projects", Renewable Energy and International Law Project.

World Energy Council, 1998, *The Benefits and Deficiencies of Energy Sector Liberalisation*. Volume I. London. World Energy Council. p. 121.

World Future Council, 2009, "Unleashing Renewable Energy Power in Developing Countries: Proposal for a Global Renewable Energy Policy Fund". Hamburg.

Electronic references

AFREPREN, 2011, "Potential and Status of Biomass Cogeneration." from http://www.afrepren.org/cogen/documents/one_stop_info/Potential%20and%20Status%20of%20Biomass%20Cogeneration.pdf.

Bloomberg, 2011, "Wind Turbine Prices Below 1 Million Euros a Megawatt". [online] Available at: <http://www.bloomberg.com/news/2011-02-07/wind-turbine-prices-fall-below-1-million-euros-per-megawatt-bnef-says.html> [Accessed 21 November 2011].

IEA, 2011b, "Feed-in Tariffs for Renewable Energy Resource Generated Electricity". [online] Available at: <http://www.iea.org/textbase/pm/?mode=re&action=deta

il&id=4358> [Accessed 21 November 2011].

IEA, 2011c, "Revised Feed-in-Tariffs for Renewable Energy". [online] Available at: < http://www.iea.org/textbase/pm/?mode=re&id=4563&action=detail> [Accessed 21 November 2011].

KenGen, 2011, "Our business, Power plants". [online] Available at: <http://www.kengen.co.ke/> [Accessed 21 November 2011].

Miga, 2011b, "Types of coverage". [online] Available at: < http://www.miga.org/Investmentguarantees/index.cfm?stid=1797#toc1> [Accessed 21 November 2011].

Miga, 2011c, "Who we are: Overview". [online] Available at: <http://www.miga.org/whoweare/index.cfm> [Accessed 21 November 2011].

pv magazine, 2010, "South Africa: Grid parity within sight, but Refit needs to be implemented soon". [online] Available at: <http://www.pv-magazine.com/news/details/beitrag/south-africa--grid-parity-within-sight--but-refit-needs-to-be-implemented-soon_100000754/> [Accessed 21 November 2011].

REEEP, 2010, "Policy DB Details: Cape Verde". [online] Available at: <http://www.reeep.org//index.php?id=9353&text=policydatabase&special=viewitem&cid=123> [Accessed 21 November 2011].

REEEP/UNIDO, 2011, "Sustainable Energy Regulation and Policymaking for Africa", Module 1, [online] Available at: <http://africa-toolkit.reeep.org/> [Accessed 21 November 2011].

Renewable Energy Focus. (2010). "Czech Tax on Solar PV Revenues." [online] Available at: <http://www.renewableenergyfocus.com/view/14645/czech-tax-on-solar-pv-revenues/> [Accessed 21 November 2011].

Reuters, 2010, "Factbox - Carbon trading schemes around the world". [online] Available at: <http://uk.reuters.com/article/2010/02/11/carbon-schemesidUKLC68557920100211> [Accessed 21 November 2011].

Sbs, 2011, "Factbox: Carbon taxes around the world". [online] Available at: <http://www.sbs.com.au/news/article/1492651/factbox-carbon-taxes-around-the-world> [Accessed 21 November 2011].

TCX Fund, 2011a, "Facts and figures". [online] Available at: < https://www.tcxfund.com/about-tcx/facts-and-figures> [Accessed 21 November 2011].

TCX Fund, 2011b, "TCX Geographic coverage". [online] Available at: <https://www.tcxfund.com/tcx-geographic-coverage> [Accessed 21 November 2011].

TCX Fund, 2011c, "Investors". [online] Available at: <https://www.tcxfund.com/partners/investors> [Accessed 21 November 2011].

The World Bank, (2011b): "World Development Indicators" (Edition: August 2011). *ESDS International*, University of Manchester, [online] Available at: <http://dx.doi.org/10.5257/wb/wdi/2011-04> [Accessed 16 February 2012].

UNEP, 2011b, "Success Stories: Feed-in tariffs in Kenya". [online] Available at: <http://www.unep.org/greeneconomy/SuccessStories/FeedintariffsinKenya/tabid/29864/Default.aspx > [Accessed 21 November 2011].

UNEP RISOE, 2011, CDM pipeline data, [online] Available at: <http://cdmpipeline.org/> [Accessed 3 March 2011].

UN Technical Cooperation, 2011, "Capacity-building for Rapid Commercialisation of Renewable Energy". [online] Available at: < http://esa.un.org/techcoop/flagship.asp?Code=CPR97G31> [Accessed 21 November 2011].

US EIA, 2011, "International Energy Statistics". [online] Available at: <http://www.eia.doe.gov/cfapps/ipdbproject/iedindex3.cfm?tid=2&pid=2&aid=12&cid=r6,&syid=1998&eyid=2008&unit=BKWH> [Accessed 1 March 2011].

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