



CLIMATE FOCUS

Towards an Energizing Partnership?

Exploring China's role as catalyst of renewable energy development in Africa

In cooperation with:

GPPi
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energy development in Africa

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Executive summary

The objective of this study is to identify and analyse opportunities to turn China's engagement in Africa into a catalyst for sustainable renewable energy development in African countries, especially South Africa, Mozambique and Uganda.

The study assesses the potential benefits and challenges related to an increasing Chinese involvement in Africa's renewable energy sector. It identifies ways in which African countries can reap the benefits while minimizing risks. The findings and recommendations derived from this study address three groups of actors:

- First, governments of African countries whose aim is to create favourable conditions for Chinese investments in their renewable energy sector while maximizing the benefits from this involvement. The political leadership of the respective African country ultimately bears responsibility for designing and implementing corresponding policy measures.
- Second, non-governmental organizations (NGOs) that promote renewable energy expansion in Africa. NGOs can take an advising and advocating role, positively influencing the policy-making process and supporting political actors in African countries to make the most of China's engagement.
- Third, governmental actors in industrialized countries that have an interest in furthering climate protection and sustainable development in Africa. These countries can play a role in supporting African countries' efforts through knowledge transfer, targeted capacity building and financial support.

To provide an informed projection of China's potential role in African renewable energy and to formulate recommendations for maximizing its benefits, the study proceeds in four steps:

- Assessment of the underlying motives guiding China's engagement in African renewable energy, linking China's renewable energy strategy with patterns of its prior engagement in Africa (Chapter 2).
- Examination of the scope and patterns of China's current renewable energy activities in Africa based on a spectrum of case studies across the African continent (Chapter 3).
- Analysis of the specific opportunities and challenges connected to China's potential engagement based on three country studies: South Africa, Mozambique and Uganda (Chapter 4).
- Deduction of recommendations for political action aimed at maximizing the benefits of China's involvement for renewable energy development in the respective country (Chapter 5).

The study distinguishes between two different types of Chinese engagement: large hydropower projects and all other renewable energy sources (solar, wind, biofuels and small hydro). China's approaches in these two areas strongly differ in relation to underlying motives and patterns of engagement.

Relevance of China's engagement

Based on the assessment of Chinese national interests in combination with China's prior approach to Africa, this study concludes that a significant expansion of China's role in Africa's renewable energy sector beyond large hydropower is possible and even likely in many African countries.

China has strongly intensified its presence in Africa over the last decade. China-Africa trade increased from USD 10.6 billion (2000) to USD 106.8 billion (2008) reflecting an annual growth of 33.5%.¹ China-Africa trade is generally balanced with Chinese exports to Africa reaching USD 50.8 billion and imports from Africa reaching USD 56 billion in 2008. By the end of 2008, Chinese investors had set up approximately 1600 companies in Africa and the cumulative net stock of Chinese investments reached USD 7.8 billion,

¹ Chinese Academy of International Trade & Economic Cooperation, *China-Africa Trade and Economic Relationship*, 2010.



representing 4.2% of China's overall outward foreign direct investment.² Chinese concessional loans to Africa have soared under the framework of the Forum on China–Africa Cooperation with Chinese pledges of USD 5 billion in 2006 and USD 10 billion in 2009 for a three-year period respectively. China's intensifying engagement in African countries provides the basis for its present and future involvement in Africa's renewable energy sector.

Regarding large hydropower, China is already a major player in African countries. During the past five years, China's financial institutions and corporate actors have engaged in an increasing number of projects across Africa. Building on its domestic experience and expertise in constructing large hydropower plants³, China has either already provided or planned to provide finance and construction capacity to more than 70 projects in 29 African countries. A World Bank Report of July 2008 entitled "Building Bridges: China's Growing Role as Infrastructure Financier for Sub-Saharan Africa" highlights the strong focus of Chinese financing on large-scale infrastructure projects in general and large hydropower installations in particular: "By the end of 2007, China was providing USD 3.3 billion toward the construction of ten major hydropower projects amounting to some 6,000 megawatts (MW) of installed capacity. Once completed, these schemes will increase the total available hydropower generation capacity in Sub-Saharan Africa by around 30 percent."⁴ With a large number of additional projects in planning, China will further expand its role in Africa's large hydro sector in the years to come.

In contrast, China's involvement in renewable other than large hydropower is still in its infancy. Exports of renewable energy equipment, Chinese foreign direct investments and concessional loans to renewable energy projects in Africa play a very limited role at this point. However, an increasing trend of Chinese involvement can be observed. Pilot projects in several African countries are planned or are underway with China's 2009 announcement to construct 100 clean energy projects across the continent pointing towards the emergence of an even broader agenda.

Motives of China's engagement (Chapter 2)

This study identifies two primary and two secondary motives behind China's engagement in African renewable energy sector. The separation between large hydro and other renewable investments is clearly highlighted by the differing motives that drive engagement in each area.

- **Resource motive:** China's investments in large hydropower projects are primarily driven by the motive of foreign natural resource acquisition. China's rapidly increasing demand for energy resources and other raw materials has outpaced its domestic supply capacity, thus calling for foreign supply. Chinese financing of large hydropower projects is usually based on resource-backed loans that are repaid through resource extraction rights transferred to Chinese companies, a method of financing known as the *Angola mode*. Thereby, China's engagement in large hydro projects follows the general pattern of China's involvement in infrastructure construction in Africa.
- **Entrepreneurial motive:** China's engagement in renewables beyond large hydro is primarily driven by entrepreneurial considerations. Chinese renewable energy developers and equipment manufacturers are intensifying their efforts to follow a *going out strategy* (Zǒuchūqū Zhànlüè) that represents a core element of China's overarching economic and industrial policy.⁵ This strategy does not merely focus on increasing exports, but relies on establishing a comprehensive presence of Chinese companies in foreign markets through asset acquisition and investments in local manufacturing capabilities. By intensifying their engagement in Africa, China's renewable energy equipment companies are following the path of other Chinese industries such as the auto part, leather and textile industries.

² Ibid.

³ For example the 18.2GW Three Gorges Dam, 15.8GW Yellow River and 12.6GW Xiluodu projects.

⁴ World Bank, Building Bridges: *China's Growing Role as Infrastructure Financier for Sub-Saharan Africa*, July 2008, p. vii.

⁵ The *going out strategy* (Zǒuchūqū Zhànlüè) was officially presented by the Central Committee of China's Communist Party in 1999 [http://www.gov.cn/node_11140/2006-03/15/content_227686.htm].



- **Reputation motive:** China's engagement in Africa's renewable energy sector increases recognition from developed nations of China as a contributor to climate change mitigation and reaffirms China's position as a lead nation among the developing world. These improvements to reputation constitute a secondary motive, rather than a main driving force behind China's involvement. However, concerns about reputation losses, for example due to violations of social and environmental standards by Chinese companies involved in large hydropower projects, play an increasingly influential role in shaping China's approach to project implementation.
- **Climate motive:** Climate change mitigation through the reduction of global greenhouse gas emissions plays a subordinate role within China's set of interests with regard to renewable energy development in Africa. Emission reduction goals do not appear to significantly drive or shape China's actions in Africa's renewable energy sector. Nonetheless, China's interests in Africa's renewable energy sector are largely consistent with broader climate protection goals and China's engagement holds significant potential for realizing GHG emission reductions independent of the objectives driving Chinese involvement.

Patterns of China's engagement (Chapter 3)

Closer examination of China's investments in Africa's renewable energy sector confirms the division between its engagement in large hydro and other renewable energy projects:

Pattern I - Large hydropower projects

Hydropower, abundant along Africa's great rivers, represents the dominant source of electricity generation for many African countries. Attracted by opportunities for large infrastructure-for-resources deals, Chinese entities play a significant role as financiers and builders of large hydropower projects in Africa. Resource-backed soft loans dispersed by the China Export-Import Bank, which are repaid through resource extraction rights transferred to Chinese companies, represent an attractive financing model for resource rich African countries to develop their hydropower generating capacity. Given China's unfaltering demand for natural resources, Chinese investments in large hydro projects in Africa are likely to increase if Chinese companies are provided with acceptable resource acquisition opportunities. On the other hand, China's lack of adherence to adequate environmental and social standards in the implementation of large hydropower projects has caused negative impacts on ecosystems and affected communities. Minimizing and managing such negative effects represents one of the central challenges posed by China's increasing engagement in Africa's renewable energy sector.

Pattern II - Other renewable energy projects

Renewable energy sources like solar, wind, biomass and small hydropower can play a positive role in expanding power generation capacity in Africa. Through local grid solutions, these sources can support electrification efforts in absence of adequate transmission systems. Driven by the entrepreneurial interests of its renewable energy industry, China is likely to increase its involvement in three capacities: as an exporter of renewable energy equipment (wind turbines, solar panels); as an investor in local equipment manufacturing in Africa; and as a financier and builder of renewable energy generating capacity (wind farms, solar power plants). China's engagement can thus provide investments and technological expertise crucial to the future development of Africa's renewable energy sector. However, positive effects for the emergence of a renewable energy market and the advancement of the domestic manufacturing sector in African countries are not automatic. Prior experiences with Chinese investments in Africa have shown that the strengthening of local capacities as well as knowledge and technology transfers often remain limited as a result of Chinese companies' tendencies to avoid deep integration into local economic structures. Maximizing the catalysing effect of Chinese investments on domestic industrial development in African countries is one of the major tasks with regard to China's increasing engagement.



Opportunities and challenges for African countries (Chapter 4)

The analysis of China's motives and patterns of engagement in combination with an examination of the situation in South Africa, Mozambique and Uganda not only yields findings specific to these focus countries, but also provides results generally applicable to most other African countries:

GENERAL CHALLENGES	GENERAL OPPORTUNITIES
<ul style="list-style-type: none"> - Weakness of existing capabilities in terms of human capital and necessary infrastructure limits the benefits African countries can derive from outside investment - Chinese companies' tendency to avoid deep integration into local economic structures, comparably low intensity of cooperation with local partners and low rates of local employment, limits the positive effects of China's engagement for domestic industry development - Chinese companies' negligence regarding adherence to adequate environmental and social standards represents a possible source of undesired impacts of Chinese renewable energy investments in African countries 	<ul style="list-style-type: none"> - China's involvement can help to remove the two most significant barriers to Africa's renewable energy development: lack of investment & technological capability - Investments in renewable energy equipment manufacturing can serve as a motor for industrial development and skilled-labour job creation in Africa - The expansion of generation capacity, primarily by hydro and solar power, can service increasing demand for electricity and reduce economic costs of under-supply in African countries - Decentralized energy generation and local grid applications can play a role in African countries' electrification efforts in the absence of sufficient transmission systems, improving rural living conditions in a sustainable way - Local grid applications supported by renewable energy sources can serve as a transitional stage towards long-term transmission grid improvements - Renewable energy development can serve to diversify African countries' energy portfolio, reducing over-reliance on volatile energy sources and/or dependence on fossil fuel imports

The specific situation in the three focus countries as illustrated in detail in Chapter 4 can be briefly summarized as follows:

COUNTRY	CHALLENGES	OPPORTUNITIES
South Africa		
Large Hydro	-	-
Other renewables	<ul style="list-style-type: none"> - South Africa's monopolistic power sector structure represents a major impediment to market entries and foreign investments. - Lack of integration of Chinese manufacturing capabilities into domestic economic structures can limit the positive effects on South Africa's industrial development. - Inexpensive Chinese equipment imports can create competitive pressure hurting the emergence of a domestic manufacturing capacity (see also opportunities). 	<ul style="list-style-type: none"> - Based on South Africa's comparably advanced industrial sector and skilled human resources, Chinese investments can spur the development of a domestic renewable energy equipment industry. - China's involvement as an exporter of cheap equipment and an investor can assist the development of off-grid solution, aiding South Africa's ambitious rural electrification goals. - China's engagement in SAF's solar power sector can complement the needed increase of generating capacity, possibly reducing the ongoing expansion of coal burning.



COUNTRY	CHALLENGES	OPPORTUNITIES
Mozambique		
Large Hydro	<ul style="list-style-type: none"> - China's investment in Mozambique's hydropower sector, specifically the Mphanda Nkuwa power plant, creates challenges regarding the implementation of social and environmental standards 	<ul style="list-style-type: none"> - China's investment in Mozambique's hydropower sector, specifically the Mphanda Nkuwa power plant, can help to secure long-term supply security and expand energy export opportunities.
Other renewables	<ul style="list-style-type: none"> - Lack of domestic capabilities in terms of human capital and necessary infrastructure limits the benefits Mozambique's domestic industry can derive from China's engagement. - Insufficient regulatory framework reduces predictability and attractiveness of renewable energy investments. - Insufficient financial resources both public and private at the national level prevents national policies and efforts for renewable energy development. 	<ul style="list-style-type: none"> - China's exports of cheap renewable energy equipment and investments in renewable energy pilot projects can facilitate the initial phase of off-grid generating capacity, increasing the rate of electrification and reducing reliance on diesel generators/fuel wood. - China can contribute to Mozambique's electrification by supporting the Mozambique Energy Fund (FUNAE) in the implementation of its renewable energy plans (capacity building, infrastructure, equipment installation).
Uganda		
Large Hydro	<ul style="list-style-type: none"> - Potential Chinese investment in Uganda's hydropower plant create challenges regarding the implementation of social and environmental standards. 	<ul style="list-style-type: none"> - Due to the long-term strategic outlook of Chinese investments in Africa and correspondingly lower risk aversion in comparison to most other foreign investors, China represents a potential financier in Uganda's hydropower development. - China's involvement in the Kikagati small-hydro project can serve as a starting point. - CNOOC's involvement in Uganda's fossil fuel deposits (Lake Albert) could open possibilities for a larger infrastructure financing deal.
Other renewables	<ul style="list-style-type: none"> - Grid losses due to technological deficits and theft as well as problems with payments collection from consumers plague Uganda's electricity sector and lower its attractiveness for outside investments. - Lack of domestic capabilities in terms of human capital and necessary infrastructure limits the benefits Uganda's domestic industry can derive from China's engagement. 	<ul style="list-style-type: none"> - Uganda's existing regulatory framework for renewable energy can serve as a solid basis for future investments. - China's exports of cheap renewable energy equipment and investments in pilot projects can facilitate the initial phase of off-grid generating capacity, increasing the rate of electrification and reducing reliance on off-grid diesel generators and fuel wood.

Recommendations (Chapter 5)

African countries can maximize the positive effects of China's engagement in Africa's renewable energy sector while minimizing negative impacts through targeted policy action. The recommendations are primarily intended for the governments' of African countries. Non-governmental organizations as well as



OECD governmental actors can play an advisory and supporting role assisting the design and implementation of policy measures.

Recommendations: South Africa

The primary area of overlapping interests and capabilities between China and South Africa with regard to renewable energy is equipment manufacturing. The engagement of Chinese renewable energy equipment manufacturers can serve as a catalyst for South Africa's own industrial development and skilled-labour job creation. Complementing the area of industrial development, both countries can benefit from Chinese investments in renewable energy generation capacity, creating the necessary demand for both China's entrepreneurial aspirations and South Africa's emerging equipment manufacturing industry. The investments in renewable energy generation can be geared towards South Africa's electrification efforts, primarily focusing on off-grid and on-grid solar photovoltaic power as well as solar thermal power in accordance with South Africa's renewable energy strategy. To further attract and increase the positive impact of Chinese investments in renewable energy, the **Government of South Africa** could:

Increase SA's attractiveness for foreign (Chinese) engagement in its renewable energy sector:

1. Improve regulatory framework as the basis for economically feasible and attractive renewable energy investments, especially introducing an overarching power purchasing agreement for renewable energy.

Promote the strengths of China as a partner in South Africa's renewable energy development:

2. Stimulate the emergence of Sino-South African business-to-business partnerships in renewable energy equipment manufacturing, e.g. through JV promotion, technology licensing and industrial clustering.
3. Design a balanced trade policy for inexpensive renewable energy equipment imports especially from China, minimizing costs while protecting fledgling domestic industry.
4. Promote research and development (R&D) cooperation in renewable energy technology between Chinese and South African universities and technology research institutions.

Mitigate the weaknesses of China as a partner in South Africa's renewable energy development:

5. Regulate the set-up of Sino-South African business-to-business partnerships in order to maximize the benefits of China's involvement on South African domestic industrial development, e.g. through technology transfer provisions, local employment quotas and local content rates.

Adapt SA's capabilities and conditions to reap the full benefits from China's engagement:

6. Invest in local capabilities and conditions necessary to reap the benefits for domestic industrial development, especially targeted education as well as manufacturing infrastructure.
7. Reconsider the cost-benefit calculation of domestic renewable energy investments in light of industrial development potential, acknowledging renewable energy subsidies and tax exemptions as strategic investments in South Africa's long-term economic growth.

These activities can be integrated into a bilateral investment agreements with China's government and Chinese renewable energy companies establishing the conditions and incentives for renewable energy finance in South Africa. Bilateral agreements can be integrated into the larger framework of South-South cooperation for the implementation of nationally appropriate mitigation actions (NAMAs). This also applies to the recommendations for Mozambique and Uganda.

International NGOs could provide:

Advocacy:

1. Advocate and illustrate the benefits of renewable energy development and the necessity of a functioning regulatory framework to South African policy makers.
2. Provide advocacy and analysis demonstrating alternatives to a purely coal-based power sector.



Capacity Building:

3. Initiate knowledge transfer and capacity building regarding design and implementation of regulatory measures and renewable energy policies.
4. Provide assistance with formulating South Africa's NAMA strategy as well as corresponding MRV instruments.
5. Share best practices with regard to the design and implementation of voluntary tradable certificate schemes to improve South Africa's Tradable Renewable Energy Certification (TREC).

Information:

6. Provide assessments of renewable energy equipment manufacturing as a motor of South Africa's industrial development and economic growth, illustrating the potential economic returns of corresponding public investments.
7. Provide assessments of future renewable energy equipment export potential in Africa.
8. Advise on the expansion of Clean Development Mechanism (CDM) financing for renewable energy projects.

In addition to these measures, **developed country governments** could offer:

Financial Assistance:

1. Make available financial products that support alternatives to a purely coal-based power sector, either bilaterally or through International Financial Institutions.
2. Support the expansion of Clean Development Mechanism (CDM) financing for renewable energy projects.
3. Provide NAMA financing, for example through direct funding as well as technological support and capacity building for the South African Renewables Initiative (SARi).
4. Set up favourable (soft) lending schemes to support the necessary infusion of funds to support South African planned renewable energy investments.
5. Offer financial support for targeted capacity building in the renewable energy industrial sector: education, technological advancement, manufacturing infrastructure.
6. Grant budget support to existing renewable energy incentive structures (subsidies, tax exemptions).
7. Provide targeted finance of pilot projects in the area of localized renewable energy solutions for rural electrification.

Reputation Incentives:

1. Increase reputation benefits that China can derive from sustainable renewable energy engagement in Africa through public acknowledgement of successful examples.

Recommendations: Mozambique

China's and Mozambique's interests with regard to renewable energy most clearly meet in the area of large hydropower development in combination with resource-backed loan and investment arrangements. In addition, especially in light of an emerging Sino-South African partnership on equipment manufacturing and export, it is in both countries interest to expand off-grid renewable energy applications in Mozambique, creating additional demand for Chinese products as well as increasing Mozambique's electrification rate in absence of a sufficient transmission system. In the long-term, cooperation in transmission system expansion might be an additional area of complementary interests. To further increase Chinese engagement in renewable energy, the **Government of Mozambique** could:

Increase Mozambique's attractiveness for foreign (Chinese) engagement in its renewable energy sector:

1. Adopt the draft Renewable Energy Policy Strategy and, on this basis, design a regulatory framework that increases predictability and economic attractiveness of investments in localized renewable energy.



Promote the strengths of China as a partner in Mozambique's renewable energy development:

2. Explore possibilities for China's continuous involvement in large hydropower development, carefully assessing opportunities for larger infrastructure deals and resource-backed financing.
3. Adopt trade rules to support increasing imports of inexpensive Chinese renewable energy equipment.
4. Establish bilateral (but non-discriminatory) agreements with Chinese companies and governments to locate the production of Chinese renewable energy technology in Mozambique.
5. Involve China investments in the implementation of the renewable strategies and projects executed by the Mozambique Energy Fund (FUNAE) and seek a China-Mozambique investment agreement.
6. Explore specific lending schemes for renewable energy projects with China's government and financial institutions.
7. Consider long-term opportunities for Chinese investments in Mozambique's power transmission system and link these efforts with Chinese investment in the expansion of rural electricity access.

Mitigate the weaknesses of China as a partner in Mozambique's renewable energy development:

8. Strengthen domestic regulation on environmental and social standards for project implementation.
9. Actively cooperate with China's financial institution (especially China Ex-Im Bank) on the enforcement of standards vis-à-vis Chinese construction companies.
10. Pursue a strategy of high transparency with regard to project implementation, using the reputation lever to ensure standards adherence by Chinese companies (naming and shaming as well as positive reinforcement through public acknowledgement).

Adapt Mozambique's capabilities and conditions to reap the full benefits from China's engagement:

11. Demonstrate feasibility of localized renewable energy solution through pilot projects with a focus on small hydro, solar PV and thermal as well as sustainable use of biomass, especially for projects involving Chinese companies.

International NGOs could provide:

Advocacy:

1. Act as a mouthpiece for the Mozambican government in case of standards violations by Chinese companies to increase national and international public pressure and reputation costs.
2. Advocate and illustrate the benefits of renewable energy development and the necessity of a functioning regulatory framework to Mozambican policy makers.
3. Advocate for the adoption of Mozambique's Renewable Energy Policy Strategy as well as NAMA policies and provide assessments of envisioned measures.

Capacity Building:

4. Share best practices with regard to the design of specific social and environmental standards for large hydropower projects on the basis of existing international principles.
5. Provide capacity building for monitoring and enforcement of social and environmental standards.
6. Initiate knowledge transfer and capacity building regarding design and implementation of regulatory measures and renewable energy policies.
7. Support Mozambique in defining a NAMAs strategy, identifying sectors and pilot projects and funding actions required to implement the NAMA.

Information:

8. Monitor large hydropower project implementation, providing independent assessments and recommendations for social and environmental costs reduction.
9. Advise on the expansion of CDM financing for renewable energy projects.
10. Support Mozambique in the identification of most promising NAMAs sectors and measures and on how to access international climate finance.



In addition to these measures, **developed country governments** could offer:

Financial Assistance:

1. Provide co-financing to existing multilateral programs to accelerate access to energy and the expansion of renewable energy in Mozambique (e.g. the World Bank's "Energy Development and Access Project for Mozambique").
2. Support the expansion of Clean Development Mechanism (CDM) financing for renewable energy projects.
3. Set up favourable (soft) lending schemes to support the necessary infusion of funds to support planned renewable energy investments.
4. Join forces with other developed countries already supporting Mozambique in the development of renewable energy, increasing impact through common projects and strategies.
5. Seek comparable partnerships with Chinese governmental actors and financial institutions.
6. Integrate specific credit lines and lending mechanisms for renewable energy development in Mozambique into the portfolio of national development financing institutions (KfW etc) and environmental funds (Fond Français pour l'Environnement etc)
7. Provide targeted finance of pilot projects in the area of localized renewable energy solutions for rural electrification, either bilaterally or through multilateral mechanisms.
8. Grant budget support to future renewable energy incentive structures (subsidies, tax exemptions).

Reputation Incentives:

9. As in the case of the other countries, increasing the reputation benefits for China can help to intensify China's engagement regarding sustainable renewable energy engagement in Africa.

Recommendations: Uganda

Areas of complementary interests between China and Uganda with regard to renewable energy development are similar to the case of Mozambique. Opportunities for sizeable renewable capacity expansion can be found in the large hydropower development. Uganda's existing regulatory framework for renewable energy development provides it with a head start with regard to off-grid renewable energy applications to reach its ambitious electrification goals in absence of a sufficient transmission system. In the long-term, given Uganda's current economic trajectory, cooperation in equipment manufacturing might be an additional area of complementary interests. To further support renewable energy finance and deployment by Chinese actors, the **Government of Uganda** could:

Increase Uganda's attractiveness for foreign (Chinese) engagement in its renewable energy sector:

1. Expand and capitalize on the existing regulatory framework for renewable energy development.
2. Reconsider political priorities in light of potential Chinese involvement in solar power expansion, giving more emphasis to solar PV and solar thermal power.

Promote the strengths of China as a partner in Uganda's renewable energy development:

3. Explore possibilities for China's involvement in large hydropower development.
4. Adopt trade rules to support increasing imports of inexpensive Chinese renewable energy equipment.

Mitigate the weaknesses of China as a partner in Uganda's renewable energy development:

5. Strengthen domestic regulation on environmental and social standards for project implementation.
6. Actively cooperate with China's financial institution (especially China Ex-Im Bank) on the enforcement of standards vis-à-vis Chinese construction companies.
7. Pursue a strategy of high transparency with regard to project implementation, using the reputation lever to ensure standards adherence by Chinese companies (naming and shaming as well as positive reinforcement through public acknowledgement).



Adapt Uganda's capabilities and conditions to reap the full benefits from China's engagement:

8. Demonstrate feasibility of localized renewable energy solutions through pilot projects.
9. Consider long-term investments in advanced manufacturing capabilities and human capital to prepare for the potential emergence of a renewable energy equipment industry.

International NGOs could provide: (also see recommendations for Mozambique)

Advocacy:

- 1.-2. Publicize standards violations by Chinese companies and advocate a functioning regulatory framework for renewable energy development.

Capacity Building:

- 3.-4. Support Uganda with the design, monitoring and support of social and environmental standards for large hydropower projects.
- 5.-6. Provide assistance with the design and implementation of regulatory measures and the formulation of the Ugandan NAMA strategy.

Information:

- 7.-8. Monitor large hydropower project implementation, support social and environmental costs reduction, and advise on the expansion of CDM financing for renewable energy projects.

In addition to these measures, **developed country governments** could offer: (also see recommendations for Mozambique)

Financial Assistance:

- 1.-3. Provide co-financing to existing multilateral programs, and set up alliances for renewable energy development and financing with other developed countries as well as emerging economies like China.
- 4.-5. Support CDM expansion for renewable energy projects and provide favourable (soft) lending schemes for renewable energy investments.
- 6.-7. Design lending mechanisms for renewable energy development and integrate credit lines into the portfolios of national development banks and environmental funds.
- 8.-9. Provide targeted finance of pilot projects for rural electrification and budget support to future renewable energy incentive structures (subsidies, tax exemptions).

Reputation Incentives:

10. See recommendations for South Africa and Mozambique.

Recommendations: China

China can actively seize the opportunities in Africa's renewable energy market while being conscious of possible threats:

1. Acknowledge and act on the opportunities of an engagement in Africa's renewable energy sector.
2. Realize these benefits by a significant increase in investments and business activities in Africa's renewable energy sector.
3. Balance the preeminent entrepreneurial and resource motives with a stronger focus on reputational gains and climate protection.
4. Be aware of the potential economic and political backlash connected to the disregard of social and environmental standards when engaging in Africa.
5. Understand and use adherence to internationally accepted standards as well as ensuring real benefits to African countries as a way to support Chinese companies going global strategy and establish Chinese companies as international brands.



6. Encourage African countries to work towards improving the investment environment and regulatory framework in the renewable energy sector by expressing general interest in renewable energy investments.

International NGOs could provide:

7. Make the case towards China of how beneficial increased Chinese investments can be in the four discussed dimensions.
8. Substantiate this claim by further and more specific studies on the beneficial effects of Chinese renewable energy investments in Africa for China.
9. Increase reputation benefits that China can derive from sustainable renewable energy engagement in Africa through public acknowledgment of successful examples.
10. Offer support to China in expanding and improving environmental and social guidelines for international investments as a unique opportunity to further environmental objectives in China as well as Africa.

In addition to these measures, **developed country governments** could offer:

11. Increase reputation benefits that China can derive from sustainable renewable energy engagement in Africa through public acknowledgment of successful examples.
12. Try to engage China in Sino-African-OECD triangular business partnerships in the renewable energy sector in order to facilitate investments, improve standard adherence and mitigate the costs for OECD companies deriving from increasing competition.
13. Consult with China on possibilities for cooperation on the project as well as the broader strategic level based on a shared interest in expanding and developing Africa's renewable energy sector.



1. Introduction

On 8 November 2009, at the fourth Forum on China–Africa Cooperation (FOCAC) in Sharm el-Sheikh, Chinese Premier Wen Jiabao laid out a comprehensive road map for China's continued engagement in Africa. Upon closer inspection, one detail of this speech was particularly striking. Wen announced that China would construct 100 clean energy projects across the continent focusing on solar power, biogas and small hydropower. A commitment to small-scale energy projects in Africa's infant renewable sector is a break from China's traditional African investments which center on major infrastructure projects such as railways, highways or bridges. It also differs from the previous pattern of China's engagement in Africa's renewable power sector which featured a clear focus on the construction of large hydropower plants. Nevertheless, China's clean energy pledge to Africa is by no means coincidental. In fact, it ties together the role of renewable energy in China's overall economic strategy and the pattern of China's past involvement in Africa. Taking note of the combination of interests that lies behind the detail of Wen Jiabao's speech reveals the early signs of a trend that can exert considerable influence on the future of Africa's energy development.

China's renewable energy strategy is driven by an interplay of motives ranging from energy security and international reputation to China's climate change vulnerability and its desire to move its pattern of economic development up the value chain. In all of these areas, China's renewable energy strategy is linked to its engagement in Africa. Large hydropower projects, the dominant feature of China's role in Africa's power sector, are usually financed through resource-backed loans and thus directly tied to China's efforts to secure access to African natural resources. As such, large hydropower projects closely follow the pattern of other Chinese-led infrastructure projects in Africa. In contrast, the clean energy pledge of Sharm el-Sheikh points to a new and fundamentally different pattern of possible Chinese engagement in the form of investments in wind and solar power, biogas and small hydropower. This infant trend is not driven by resource considerations, but by the important role that green technology development and manufacturing plays in China's long term economic policy planning: To sustain its unprecedented economic growth, China has to alter its economic model, moving from cheap labour manufacturing to domestic innovation and the production of globally competitive goods. The expansion of green technology capabilities has become a central element of China's efforts to achieve this transformation. By now, China's renewable energy equipment industry is ready to follow China's going-out strategy and to establish a presence on foreign markets that includes but goes beyond increased exports. Africa has traditionally been a testing ground and spring board for China's companies to embark on a global expansion strategy. In light of China's efforts to transform its economic model through the advancement of its green technology industry, moving into the African renewable energy sector is a logical next step.

The increasing dynamic behind China's engagement in Africa's renewables sector, relating to large hydro as well as other renewable sources, provides major opportunities for the economic advancement of African countries. Most parts of Africa possess abundant renewable energy resources that remain largely untapped. National power sectors in Africa are often characterized by insufficient generation capacity, poor transmission infrastructure and low electrification rates all of which are major impediments to economic development. Increased use of available clean energy potential can play a significant role in increasing electrification rates while opening a development path of resource conservation and climate sustainability. However, the expansion of renewables is technologically and financially demanding and often stifled by monetary constraints and lack of technological experience. China can deliver both of these essential ingredients, closing the investment and technology gap and thereby becoming a catalyst for unleashing the potential of renewable energy development in Africa.

Despite these promising perspectives, China's engagement in Africa's renewable sector raises a number of concerns regarding the standards of social and environmental sustainability, accountability and good governance against which its involvement is measured. Equally important for the assessment of China's engagement in Africa's renewable energy sector is the question of the extent to which the motives driving



China's involvement are compatible with the expectations of African countries and the broader objectives of sustainable development and climate protection. China will enter Africa's renewable energy sector guided by a set of national interests. These interests will on the one hand lend a strong dynamic to China's engagement, but will also shape the ways in which China implements clean energy projects. African countries are facing the dual challenge of reaping the positive impulses of Chinese investments in their renewable energy sector, while at the same time protecting themselves against undesired effects of China's engagement.

This analysis sets out to examine China's potential role in the future of Africa's renewable energy sector based on an assessment of the link between China's renewable energy strategy and the patterns of its prior engagement with African countries (Chapter 2) as well as an examination of the specific features of previous Chinese project implementation in Africa's renewable energy sector (Chapter 3). The analysis of how China's engagement might impact the renewable energy sectors of three specific countries, namely South Africa, Mozambique and Uganda (Chapter 4), will provide concrete insights on how China's approach corresponds to the interests and needs of these countries. Chapter 5 will summarize the opportunities and challenges of China's prospective engagement in Africa's clean energy sector, identify the strategic focus areas where the interests and expectation of China and African countries overlap and provide recommendations outlining the ways to maximize the benefits of China's role as a catalyst of renewable energy expansion in Africa while minimizing and managing potential negative impacts.

The primary beneficiaries of these recommendations are African countries aiming at maximizing the benefits of China's involvement for their domestic renewable energy expansion. Secondly, the recommendations are also intended for governmental, business and civil society actors in OECD countries, such as the World Wildlife Fund (WWF), who want to support African countries' efforts in renewable energy expansion. Ultimately, most of the concrete measures presented by this study will have to be implemented by African governments with other actors taking an assisting role.



2. Four motives: China's interests in Africa's renewable energy sector

Two particularly dynamic aspects of China's contemporary policy making are its renewable energy agenda and its engagement in Africa. The links between the two trends create the impetus for an increasing Chinese engagement in Africa's renewable energy sector. China is already a major player in Africa's large hydropower sector, either providing or planning to provide finance and construction capacity to more than 70 projects in 29 African countries. China's clean energy initiative under the framework of Forum on China-Africa Cooperation indicates an expansion of China's approach to other renewable energy sources. HydroChina signed agreements for wind farm development in Ethiopia in 2009; Yingli Solar garnered worldwide attention as a sponsor of the South African FIFA World Cup 2010; China's Suntech Power will help to develop a 100 MW solar power plant in South Africa; China Longyuan Power signed joint investment agreements for African wind power development and announced plans to build a modern blade and turbine manufacturing facility in South Africa. China's renewable energy strategy for Africa is still unfolding, but a clear dynamic can be observed. In order to develop a projection of how China's renewable energy activities in Africa will evolve in the future it is essential to understand the motives that drive China's engagement.

2.1. The resource motive

- Securing supply of energy and other natural resources is one of the central objectives of China's policy-making.
- Resource acquisition plays an important role for China's engagement in Africa.
- Following the pattern of China's investments in African infrastructure projects, Chinese financing of large hydropower projects is often provided as an infrastructure-for-resources deal.

China's rapidly rising demand for natural resources is a central aspect of its renewable energy policy as well as its approach to Africa. Especially after China became a net oil importer during the early 1990s, concerns about the security of energy supply and China's growing dependence on foreign fuel rose to the top of the political agenda. Today, China has turned into the world largest consumer of energy⁶ and its resource demand has far outpaced its domestic supply capacities. Securing long-term energy supply security has turned into one of the primary objectives of China's policy planning.

China's lack of energy security motivated the diversification of its energy mix and the expansion of domestic power generation capacity. Renewable energy sources became a main component of the efforts to secure long-term energy supply security and reduced dependence on foreign fuels. At the same time, concerns about energy security also shaped China's engagement in Africa. Despite efforts to expand its renewable energy capacity, China will depend on fossil fuel imports for the foreseeable future. One way of securing a steady stream of resource imports are investments in resource acquisition, mining concessions and long-term supply agreements with resource rich African countries. With Africa currently accounting for one third of China's total oil imports, securing energy resources is a particularly important aspect of China's involvement in the region.

The link between China's demand for natural resources and its engagement in Africa's renewable energy sector lies primarily in Africa's large hydropower projects. Following the pattern of other large

⁶ Netherlands Environmental Assessment Agency (PBL), Country Dossier China; International Energy Agency (IEA), *China overtakes the United States to become world's largest energy consumer* (20 July 2010); the IEA figures have been contested as "unreliable" by China's National Energy Administration (NEA), see Xinhua News Agency, *China dismisses IEA analysis of it being world's top energy user* (20 July 2010).

infrastructure projects, Chinese financing for hydropower projects is usually provided through a resource-based loan agreement, directly securing a natural resource inflow to China in return for the financing and construction of hydroelectric power plants. This so-called *Angola mode* of infrastructure financing can be depicted as follows:

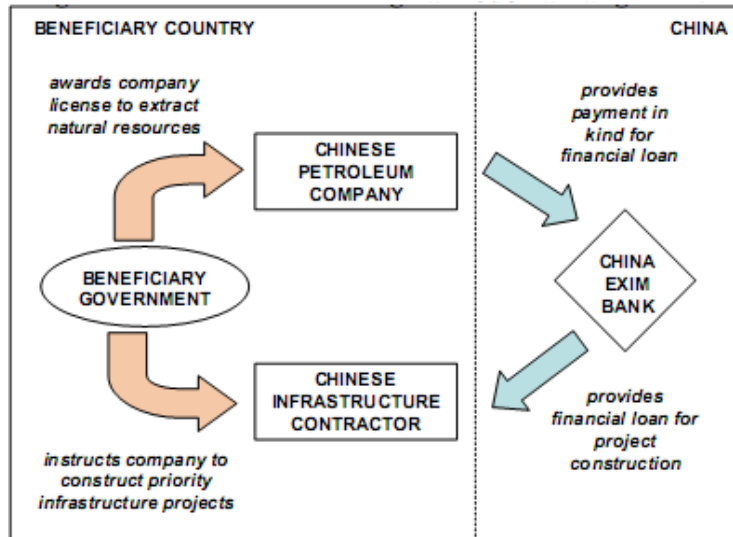


Figure 1: So called Angola mode of infrastructure financing. Source: World Bank, *Building Bridges: China's Growing Role*

2.2. The entrepreneurial motive

- Development and manufacturing of advanced renewable energy equipment (solar panels, wind turbines etc) plays a crucial role in China's long-term economic strategy.
- Chinese renewable energy equipment manufacturers are ready to expand beyond their domestic sphere, establishing themselves as multinational corporations with a strong presence in foreign markets.
- Africa has served as a primary destination and testing ground for Chinese companies' foreign investment strategies in the past.
- Chinese renewable energy equipment manufacturers are likely to enter African markets not only as exporters, but also by building local manufacturing capacities.

China's renewable energy strategy in Africa beyond large hydropower is driven by the crucial role of advanced renewable energy technology in China's long-term economic planning. The model of economic development that China has been following since the beginning of the opening and reform era, based on cheap labour, low-skill manufacturing and export of resource intensive goods, is outdated. The viability of China's economic growth depends on its ability to move its economy up the value chain to the next stage of economic development. The *change of China's economic development pattern*⁷ stands at the very top of China's political agenda.

A crucial component of China's economic strategy is the ability to produce technologically advanced and globally competitive goods. Instead of focusing on traditional technologies and attempting to catch-up to

⁷ “转变经济发展方式”- see for example: “十二五”期间加快转变经济发展方式的重要着力点” (The 12th Five Year Plan accelerates the change of important aspects of the economic development pattern), Website of the Central People's Government of the PRC, 16 October 2010, http://www.gov.cn/jrzq/2010-10/16/content_1723905.htm.



the developed world's decades-long head start, China's leadership has embraced green technology innovation as an instrument of quick economic advancement. This strategy is based on the "recognition that by investing in [...] green growth underpinned by emerging green technologies, China has an opportunity to leapfrog over decades of traditional development".⁸ Consequently, deliberations on green economic development became one of the most vibrant political debates in China, prominently discussed by China's leading economists.⁹ In China's economic policy planning, a green economic revolution has already begun and China plans to be ahead of the curve this time.

Manufacturing renewable energy equipment is categorized as one of China's seven *strategic industries*¹⁰ that receive comprehensive state support to produce globally competitive products. Supported by public investments and legislative incentive structures, China carefully developed its domestic innovation and manufacturing capacities in this sector. The next step for renewable energy manufacturing firms is to follow the ambitious *going out strategy* towards which China's industrial policy has been geared since the late 1990s.¹¹ While China is already producing almost all of its solar power equipment for international export, mere export manufacturing will not be enough to move beyond the current pattern of economic growth. Instead, China's renewable energy companies, from solar to wind and biogas, will have to build a presence on markets around the globe by investing in the acquisition of foreign assets, creating production capacities abroad and getting involved in all stages of renewable energy development in foreign countries. Following the example of other industry sectors, China's renewable energy companies are aiming to become multinational corporations with global reach and brand recognition. Especially in China's growing wind turbine manufacturing sector, a fundamental shift from a domestic to an international focus seems to be afoot. Shi Pengfei, vice president of the Chinese Wind Energy Association, announced in April 2010: "The localization of China's wind power equipment manufacturing industry has been completed and relevant Chinese enterprises are 'going global' this year."¹²

Africa has played a central role as testing ground and spring board for China's *going out strategy* for several years.¹³ Western observers focussing on China's grab of African land and natural resources tend to neglect the large Chinese investments in Africa's manufacturing sector. Building up Africa as an importer of Chinese products and as a destination where Chinese companies can impose a full-fledged presence in a foreign market is a central feature of China's approach to Africa. In the past, several branches of Chinese industry, especially auto parts, leather, plastics and textiles¹⁴, have established a strong presence in African markets not only through increasing exports, but also by investing in local manufacturing capabilities. After

⁸ UNDP China, *China and a sustainable future: Towards a low carbon economy and society*, Human Development Report 2009/2010, p. 16.

⁹ For an extensive exploration of China's low-carbon development path see 庄贵阳, *低碳经济-气候变化背景下中国的发展之路*, 2007 (Zhuang Guiyang, *Low-carbon economy – China's development path in the face of climate change*, China Meteorological Press, 2007).

On the debate on low-carbon development see Hu Angang, *How Will China Build a Well-off Society for All of Its Citizens?*, in: *China Business Review* 50, 50–55, 2003; Lin Yifu, *Rebalancing Equity and Efficiency for Sustained Growth*, in: Song Ligang and Wing Thye Woo (eds.), *China's dilemma: economic growth, the environment and climate change*, 2008, p. 90–93; Wang Shaoguang et al, *The Social Instability Behind the Economic Prosperity*, *Chinese Economy* No. 5, p.5–10, 2003; Fang Gang (ed.), *Toward a Low Carbon Development: China and the World*, China Economic Publishing House, 2010.

¹⁰ Reuters, *China targets seven strategic industries for growth*, 8 September 2010.

¹¹ Under the framework of the *going out strategy*, officially initiated in 1999 (see for example 更好地实施“走出去”战略, http://www.gov.cn/node_11140/2006-03/15/content_227686.htm), Chinese Foreign Direct Investments rose from USD 3 billion in 1991 to USD 92 billion in 2007.

¹² Economy, Elizabeth, Statement before the U.S.-China Economic & Security Review Commission, United States House of Representatives, Second Session, 111th Congress, 8 April 2010.

¹³ Brautigam, Deborah, *The Dragon's Gift*, Oxford University Press, New York: 2009, pp. 87.

¹⁴ Deborah Brautigam's seminal work on China-Africa Relations *The Dragon's Gift* provides a vivid account of the development of China's leather as well as textile industry in Africa.



reaching a similar stage in their development, China's renewable energy equipment manufacturers are now likely to follow the same path.

In some cases, especially in the textile sector, Chinese exports and local manufacturing of inexpensive consumer products have put African domestic producers under competitive pressure, forcing comprehensive industrial restructuring and job losses in African countries.¹⁵ Due to the absence of significant renewable energy equipment manufacturing in Africa, similar threats to existing domestic industry are less of a concern in this sector. However, the impact of China's involvement on the future development of a viable renewable energy equipment industry in Africa represents one of the crucial determinants of China's engagement and will be examined more closely in the following chapters.

2.3. The reputation motive

- China strives to improve its international reputation as a *responsible stakeholder* in order to maintain an international environment that does not disrupt its domestic development path.
- International climate policy has become one of the most prominent fields in which international reputation can be gained or lost.
- China's role as a promoter of renewable energy development in Africa can offer it recognition as a contributor to international efforts of mitigating climate change.
- China's investments in Africa's renewable energy sector can reaffirm its position as a lead nation among developing countries, protecting vulnerable countries from the impacts of global warming and fostering their economic development.

In light of its increasingly export-reliant and trade-oriented model of economic growth, presenting itself as a responsible member of the international community has gradually turned into one of the central objectives of Chinese foreign policy making.¹⁶ In the 1990s, the arena of international climate politics became one of the most visible platforms of global governance, presenting opportunities for gaining as well as risks of losing international reputation. China participated in the United Nations Framework Convention on Climate Change (UNFCCC) to present itself as a constructive member of the international community.¹⁷

Due to the rise of its CO₂ emissions, the international arena of climate change politics has turned from a playground into a minefield for China. On the one hand, developed nations exert pressure on China to take a more active role in global emission reductions. On the other hand, China finds itself in a contradictory role regarding its relationship with the rest of the developing world. Traditionally, China has played the part of the G77 advocate on climate justice, defending developing nations' entitlement to a path of economic development unhampered by the ecological responsibilities that developed nations had previously evaded. However, China now also falls into the category of climate culprits, emitting greenhouse gases to the detriment of the poorest and most vulnerable. China's rising emission levels make it more difficult to credibly act as advocate for the G77 on climate issues. China's difficulties to reconcile its traditional role with changing realities was prominently displayed during the 2009 Copenhagen climate negotiations that saw China facing criticism from developed and developing countries alike.¹⁸ China was more successful in exhibiting its dynamic domestic climate policy agenda during the 2010 Cancun climate negotiations, regaining some of the credibility lost in Copenhagen. Nevertheless, China's leadership remains burdened by

¹⁵ Lyman, Princeton N., *China's Rising Role in Africa*, Presentation to the US-China Commission, 21 July 2005, <http://www.cfr.org/china/chinas-rising-role-africa/p8436>.

¹⁶ See for example Gill, Bates, *Rising Star: China's New Security Diplomacy*, Brookings Institution Press, 2007.

¹⁷ Yang Zhang and Zheng Yongnian, *New Development in China's Climate Change Policy*, University of New South Wales Faculty of Law Research Series, paper no. 73, p. 8, 2007.

¹⁸ Conrad, Björn, *China in Copenhagen – Reconciling the 'Beijing Climate Revolution' and the 'Copenhagen Obstinacy'*, in: *The China Quarterly*, Cambridge University Press, 2011.



the task of squaring its domestic interests with increasing international expectations in the climate policy arena, and must find ways to remedy this incompatibility.

Increased Chinese engagement in Africa's renewable energy sector presents exactly that sort of opportunity, promising international acknowledgement while serving China's national interests. On the one hand, promoting renewable energy development in Africa can offer China recognition from developed nations as a contributor to international climate change mitigation. On the other hand, investing in Africa's renewable energy sector can reaffirm China's position as a lead nation among the developing world, making a commitment to protecting the most vulnerable countries from the impacts of global warming while simultaneously fostering their economic development. Playing a constructive part in Africa's renewable energy development can be an important step for China to redefine its role in the international climate arena.

At the same time, China's engagement in Africa has caused significant reputation damage in the past. China has drawn heavy international criticism for the politically unconditional nature of China's investments bolstering human rights abusing regimes, the lack of environmental safeguards as well as the insufficient labour and social standards that limit the domestic economic benefits of China's engagement. The way in which China approaches this dichotomy between potential reputation benefits and risks with regard to large hydropower construction as well as investments in other renewables represents one of the central criterion against which China's evolving role in Africa's renewables sector needs to be assessed. As the following chapters will illustrate, an increasing positive influence of reputation concerns on Chinese companies' approach to project implementation in Africa can be observed.

2.4. The climate motive

- China's political leadership is well aware of China's vulnerability to global temperature increases resulting in a genuine interest to decrease present and future global GHG emissions.
- China's involvement in Africa's renewable energy sector is in principle consistent with GHG reduction goals, but the importance of climate protection as a motive of China's engagement is limited.
- Climate or environmental protection considerations have not played a visible role in shaping China's strategy towards Africa in the past.
- Several indicators point towards a gradually increasing relevance of environmental considerations in China's overseas investment behaviour.

China's first National Assessment Report on Climate Change¹⁹ (2006) provides an overview of the potentially devastating consequences of climate change on China's agriculture, ecosystems, water resources, coastal zones and social and economic stability²⁰, bringing "public concerns and awareness of climate change to a new height"²¹. With growing awareness of its climate vulnerability, China has acquired a stake in the reduction of GHG emissions domestically as well as globally. China's international engagement in climate-relevant activities can therefore be interpreted as an effort to reduce global GHG emissions not only for reputation but also for genuine climate protection reasons.

Africa's current contribution to global carbon emissions from energy generation, industry and transport is minimal, cumulatively accounting for only 2.5% of the global CO₂ emissions from fossil fuel from 1980–2005²². In 2008, total CO₂ emissions from the African continent amounted to approximately 650 million

¹⁹ Commissioned by the Ministry of Science and Technology, the China Meteorological Administration, and the Chinese Academy of Sciences.

²⁰ Drafting Panel of the National Assessment Report on Climate Change, 2006, "China's National Assessment Report on Climate Change", Beijing, Science Press.

²¹ Yang Zhang and Zheng Yongnian, *New Development in China's Climate Change Policy*, University of New South Wales Faculty of Law Research Series, paper no. 73, p. 4, 2007.

²² Canadell, J. et al, *Anthropogenic CO₂ emissions in Africa*, in: *Biogeosciences*, 6, 463–468, 2009.



tons, less than Germany alone with around 800 million tons.²³ In light of Africa's low overall emission levels, efforts to reduce significant amounts of current emissions in Africa mainly focus on the reorientation of South Africa's coal power sector that accounts for the largest part of all African CO₂ emissions (about 350 million tons/year) and contributed 1.48% to global emissions²⁴ placing South Africa 13th on the world's largest emitters list.²⁵ While the potential for current emission reductions is relatively limited in Africa, the development of renewable energy solutions across the African continent can play a role in avoiding future emissions. Changes to the pattern of economic growth that industrialized nations followed in the past can still be implemented in Africa at relatively low costs, preventing carbon lock-in effects and providing a more sustainable path for industrial development.

A crucial aspect of Africa's contribution to climate change is the net emissions resulting from rapid deforestation. The CO₂ stock stored in African countries amounts to roughly 60 billion tons. Net emissions from deforestation in the twelve most densely wooded African countries amount to around 1 billion tons yearly.²⁶ A significant share of deforestation is caused by the reliance on fuel wood and wood charcoal for cooking and heating in vast parts of Africa. While the potential of replacing fuel wood with off-grid renewable energy is limited due to the high cost of using electricity for thermal applications, immediate replacement opportunities include solar water heaters and cookers, biogas digesters as well as sustainable ways of charcoal production. China as the world's largest producer and exporter of solar thermal applications is already playing a dominant role in Africa's expanding water heater market.

China's growing engagement in Africa's renewable energy sector is in principle consistent with the objective of global emission reductions. China's involvement opens opportunities to foster the development of local grid solutions and contribute to the replacement of fuel wood across the region. In addition, China's activities can help to more specifically decrease South Africa's dependence on coal power generation. However, climate protection does not appear to represent a dominant objective shaping China's economic and political behaviour in Africa's energy sector. China's previous investment record in Africa, featuring a lack of environmental standards for project implementation, has diminished the credibility of China's engagement regarding environmental protection in Africa. In addition, Chinese companies and financial institutions are equally drawn to financing traditional energy sources including the coal power sector in South Africa, directly countervailing its renewable energy investments in the country. The relevance of climate protection as driving force for China's engagement in Africa's renewable energy sector consequently appears to be limited.

²³ Unmüßig, Barbara and Cramer, Stefan, *Climate Change in Africa*, GIGA Focus Afrika 2/2008.

²⁴ UN Statistics Division, "Carbon dioxide emissions (CO₂), thousand metric tons of CO₂ (CDIAC)", [<http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749>].

²⁵ One other area in which significant emission reductions are possible in Africa is the termination of gas flaring in Angola and Nigeria that account for approximately 100 million tons of CO₂ emissions per year.

²⁶ FAO (Food and Agriculture Organisation of the United Nations) (2007): Africa, in: FAO (eds.): *State of the World's Forests 2007*, Rome, www.fao.org/docrep/009/a0773e/a0773e00.htm.



3. Two patterns: China's evolving role in Africa's renewable energy sector

During the past decade, China has expanded its presence in Africa at a staggering pace. China-Africa trade increased from USD 10.6 billion in 2000 to USD 106.8 billion in 2008 reflecting an annual growth of 33.5%²⁷. Chinese exports to Africa reached USD 50.8 billion and imports from Africa USD 56 billion in 2008. In 2007 Chinese construction companies earned revenues of USD 12.6 billion on projects in African countries²⁸. By the end of 2008, Chinese investors had set up roughly 1600 companies in Africa and the cumulative net stock of Chinese investments reached USD 7.8 billion, representing 4.2% of China's overall FDI²⁹. Chinese concessional loans to Africa have soared under the framework of the Forum on China–Africa Cooperation (FOCAC) with Chinese pledges of USD 5 billion (2006) and USD 10 billion (2009). China's intensifying engagement in African countries provides the basis for China's present and future involvement in Africa's renewable energy sector.

China's role in Africa's renewable energy sector is two-fold: First, it involves construction of large hydropower stations. Second, it encompasses attempts by Chinese companies to unlock new business opportunities with regard to other renewables like solar, wind, small hydro and biogas. Regarding these two forms of engagement, Chinese companies follow two distinctively different approaches. While large hydro projects are mostly connected to China's motive of resource acquisition, its engagement in other renewables serves as a component of Chinese companies' international expansion strategy.

3.1. The dominant pattern – Large Hydropower

- Large hydropower projects are the primary area of China's renewable energy activities in Africa and will remain the dominant factor in the foreseeable future.
- China's investments in large hydropower projects follow the logic of resource acquisition like China's other major infrastructure investments in Africa.
- Main features are resource-backed financing, a politically unconditional nature and a controversial lack of adherence to social and environmental standards.
- China's engagement in the hydropower sector opens opportunities for many African countries to achieve major generating capacity expansion, but also comes with significant risk for negative social and environmental externalities.

Africa was a latecomer to large hydroelectric projects even though the energy potential of Africa's large rivers is significant. Africa's technically usable hydropower potential has been estimated at 1.75 million GWh/year,³⁰ but only 5-8% of this potential is being harnessed.³¹ Vijaya Ramachandra of the Center for Global Development states that "we have seen probably three decades now of extreme underinvestment in power projects in Africa"³². Chinese companies like Sinohydro have been closing this gap since the turn of the millennium. The database maintained by the NGO International Rivers lists more than 70 hydropower

²⁷ Chinese Academy of International Trade and Economic Cooperation, *China-Africa Trade and Economic Relationship – Annual Report 2010*.

²⁸ Ibid, pp. 279.

²⁹ Ibid.

³⁰ Bartle, A. (ed.), 2001 *Hydropower and Dams - World Atlas and Industry Guide*, Sutton: Aqua-Media International, 2001.

³¹ Brautigam, Deborah, *The Dragon's Gift*, Oxford University Press, New York: 2009, p. 302

³² V. Ramachandra on *Voice of America News*, November 4, 2008.



projects with Chinese involvement in Africa.³³ Project sizes range from smaller endeavours like the four plants to be completed in Ghana's Western region with a capacity of 250 MW, to mega plants like Gibe III & IV currently being constructed on Ethiopia's Omo river with close to 2000 MW capacity each. China's hydropower activities will constitute the dominant facet of China's involvement in Africa's renewable energy sector for the foreseeable future. A 2008 World Bank Report, confirming China's growing role in Africa's hydropower sector, concludes that, "the emergence of China as a major financier of hydro schemes is a trend of great strategic importance for the African power sector."³⁴

Table 1: Selected African hydropower projects with Chinese involvement

Project	Country	Capacity	Financing	Contractor	Status
Mambila	Nigeria	2,600 MW	USD 1 billion, China Ex-Im Bank	China Geo-engineering Corporation	Commissioning expected 2011
Merowe	Sudan	1,250 MW	USD 1.2 billion, China Ex-Im Bank, Arab peninsula funders	USD 1.2 billion, China Ex-Im Bank, Arab peninsula funders	Under construction
Zungeru	Nigeria	950 MW	USD 2 billion, China Ex-Im Bank	Sinohydro, ICFC	Commissioning expected 2011
Souapiti	Guinea	750 MW	USD 1 billion, China Ex-Im Bank	Chalco and Sinohydro	Under construction
Kafue	Zambia	600- 750 MW	USD 1.5 billion, Copperbelt Energy Corp, Mopani Copper Mines, China Ex-Im Bank, IFC, China Development Bank	Sinohydro	Agreement yet to be signed in 2011

Table 2: Selected African hydropower projects without Chinese involvement

Project	Country	Capacity	Financing	Contractor	Status
Aswan	Egypt	2100MW retrofit	Russia, USA, UK	LMZ Siemens – Germany	commissioned in 2003
Inga I and II	DR Congo	1,800MW retrofit	World Bank – AfDB – EIB	Siemens – Germany	commissioned in 2007
Akosombo	Ghana	1,020MW retrofit	World Bank	VA tech – Austria	Commissioned in 2006
Jebba	Nigeria	600 MW	World Bank	Torno – Italy	Commissioned in 1986
Baynes	Angola/Namibia	480 MW	KfW	Electrobras – Brazil	2015

Feature 1 – Resource-backed financing

- Chinese large hydro projects in Africa are generally financed through resource-backed loans by the China Ex-Im Bank stipulating repayment through the transfer of resource extraction rights.
- For many resource rich African countries, resource-backed loans represent an attractive and feasible financing model to develop their hydropower generating capacity.

³³ International Rivers: *Chinese dams in Africa* [<http://www.internationalrivers.org/en/africa/chinese-dams-africa>].

³⁴ World Bank, *Building Bridges: China's Growing Role as Infrastructure Financier for Sub-Sahara Africa*, July 2008, p. 17.



- Resource-backed loans undermine the stability of the international system of development loans as they bypass loan repayment rules.
- On the other hand, OECD concerns about China's focus on African natural resources often exaggerate the overall extent of China's involvement in resource acquisition.

Example I: Belinga hydropower plant (Gabon)

On 24 May 2008, the China Machinery and Electric Equipment Export & Import Company (CMEC) entered into an agreement with the Government of Gabon for the construction of the USD 754 million Belinga hydroelectric dam project at Kongou Falls. The dam is part of a larger infrastructure-for-resources deal that will supply energy to the Belinga iron ore deposit located 500 km east of Libreville. CMEC is also building the Belinga mine itself as well as 560 km of rail from Belinga to Santa Clara and a deep-water port in Santa Clara facilitating the transport of the mined iron ore. The funding for the entire infrastructure package is provided in loans by the China Ex-Im Bank. In return, CMEC gained the rights to exploit the mine and China's domestic industry will be the primary recipient of the ore extracts used to repay the loans. This kind of all-encompassing involvement, with hydropower projects being part of a larger resource deal, is typical of China's hydropower activities in Africa.

As the example of the Belinga project illustrates, China's hydropower activities in Africa are closely entwined with the motive of resource acquisition. Many infrastructure projects in resource rich African countries are financed through resource-backed loans dispersed by the China Ex-Im Bank. These loans are mainly repaid by the transfer of resource extraction rights to Chinese companies ranging from energy resources to minerals and agricultural products. The Congo River Dam in the Republic of Congo is backed by crude oil guarantees, financing for the Bui Dam in Ghana will be repaid by cocoa exports and the loan for the Souapiti Dam in Guinea is linked to bauxite mining rights. This model is generally referred to as the *Angola mode* of financing.

By adopting a system of resource-backed financing, China is building on its own experiences. During the 1970s, Japan gained access to China's natural resources through the same system. For China, this experience served as a model of how two countries of different development levels can enter into a mutually beneficial relationship. China mirrored this approach when engaging resource rich African countries. In the case of many hydropower projects, the system of resource-backed loans was considerably profitable for those large Chinese state-owned enterprises (SOEs), such as Sinohydro, to which the construction contracts were awarded. Similar resource-backed loans are financing a variety of infrastructure projects in many resource rich African countries like Angola, the Democratic Republic of Congo, or Equatorial Guinea.

The focus on resources gives rise to fears that China is locking up African resources. It is important to note three factors: China provides loans to virtually all African countries whether resource-rich or resource-poor; China's National Oil Companies are minor players in all African countries except Sudan in comparison to large multinationals like Exxon Mobile, Shell or Chevron³⁵; resource-backed infrastructure deals are only one of several ways China is engaged in Africa. Indeed, according to China-Africa expert Deborah Brautigam, a Nigerian diplomat noted "The Chinese are trying to get involved in every sector of our economy. If you look at the West, it's oil, oil, oil and nothing else."³⁶

³⁵ Downs, Erica S., The Fact and Fiction of Sino-African Energy Relations, *China Security*, Vol. 3 No. 3 Summer 2007, pp. 42 – 68.

³⁶ Brautigam, Deborah, *The Dragon's Gift*, Oxford University Press, New York: 2009, pp. 279.



The advantage of resource-backed loans from the lender's perspective is that direct loan repayment in confirmed resources guarantees a high rate of credit amortization since revenues from resources are not monetized and therefore cannot be spent for other purposes than loan repayment. This, however, poses a problem for international financial institutions like the IMF and the World Bank, which are understood to be *privileged creditors*, meaning that their loans need to be repaid before other lenders' loans. Since repayment for Chinese resource-backed loans is channelled around the African country's state budget, this rule is often bypassed undermining the system of internationally coordinated loan provision to African countries.

Table 3: African infrastructure projects with Chinese resource-backed financing. Source: World Bank – PPIAF Chinese Projects Database, 2007

Country	Year	Status	Natural Resource	Project	Chinese Financing
Rep. Congo	2001	construction	Oil	Congo River Dam, backed by crude oil guarantees	USD 280 m
Sudan	2001	completed	Oil	El Gaili Power Plant, oil serving as collateral	USD 128 m
Angola	2004	completed	Oil	Repair of infrastructure, oil backed loan	USD 1020 m
Nigeria	2005	construction	Oil	Papalanto gas turbine power plant, backed by crude oil guarantees	USD 298 m
Guinea	2006	agreement	Bauxite	Souapiti Dam, linked to mining revenues	USD 1000 m
Gabon	2006	agreement	Iron	Belinga dam and iron ore reserves, backed by iron ore guarantees	Not available
Zimbabwe	2006	agreement	Chromium	Thermal power station in Dande, backed by chromium guarantees	Not available
Ghana	2007	construction	Cocoa	Bui dam, partly repaid in cocoa exports	USD 562 m

Feature 2 – Environmental and social standards

- China's hydropower construction has a poor record for adherence to internationally recognized environmental and social standards and regulations.
- Positive changes have been made to China's regulatory framework for the implementation of large infrastructure projects in China and abroad.
- Implementation of these improved standards by Chinese companies remains insufficient.
- African countries have the opportunity to significantly influence the project implementation behaviour of Chinese large hydropower construction companies.

Example II: Bui hydropower plant (Ghana)

The Bui hydropower project, located on the Black Volta River of Ghana, was originally planned in the 1960s, but concerns about the environmental impacts of the dam halted its realization. Low-interests loans, dispersed by the China Ex-Im Bank in 2007, revived the endeavour and Sinohydro started construction of the 400 MW plant for USD 622 million. The reservoir of the plant will submerge approximately a quarter of the 181,000 ha Bui National Park adversely impacting the habitats of Ghana's rare black hippopotamus as well as several other species. Critics have pointed to the insufficient environmental impact analysis preceding the project. The Bui project illustrates another point of criticism regarding China's involvement in Africa's hydro sector: negligence of environmental and social standards.



Large hydropower projects always come with environmental and social costs. Negative social effects include the dislocation of inhabitants as well as possible adverse effects to farming and fishing through the alteration of water flows. Environmental impacts range from animal habitat destruction to deforestation and landscape erosion as well as GHG emissions from decaying organic materials. These effects of large hydropower projects have to be weighed against their economic, social and environmental benefits. In industrialized nations the feasible hydropower locations have already been developed over the past 100 years and almost no new plants are built. In African countries, however, significant potential for hydropower installations exist and the benefits of additional generating capacity for the country's economic development are still high. International standards and regulations for comprehensive hydro dam assessment, most prominently the criteria put forward by the World Commission on Dams (WCD) in 2000, provide widely accepted guidelines for hydropower project financing and implementation that can also provide a blueprint for dam projects in Africa.

Critics of China's role in Africa's hydropower sector frequently accuse China of violating environmental and social standards and disregarding the results of impact assessments. In fact, many of the hydropower projects financed and constructed by Chinese entities have a poor record in terms of the standards applied. Several of these projects had been previously rejected by international financial institutions and OECD investors due to the results of social and environmental impact assessments. Some research reports on hydropower project implementation suggest that Chinese developers have paid little attention to these impact assessments, basing project implementation on profitability criteria alone.³⁷ In addition, the lack of appropriate resettlement plans considerably aggravates the situation of affected communities, such was the case of the Merowe hydropower project in Sudan (see feature 3). Based on prior experiences, excessive social and environmental costs represent one of the main obstacles to turning China's engagement in Africa's hydropower into a catalyst of beneficial and sustainable energy sector development for African countries.

However, China's patterns of behaviour in this area are gradually changing, providing new opportunities for minimizing negative effects. Regarding the implementation of large hydro projects, the increasing weight of the reputation motive as described in Chapter 2 becomes most evident. Chinese governmental actors have started to react to the reputation risks and costs of disregarding internationally accepted project implementation standards. However, as in virtually all areas of foreign policy making, China remains reluctant to subordinate to internationally imposed rules. Instead, Chinese governmental actors have created national guidelines pertaining to the social and environmental sustainability of Chinese enterprises' investments abroad. Most notably, these efforts include the *Guidelines for Environmental and Social Impact Assessments of the China Export and Import Bank's Loan Projects* (2007) as well as the overseas investment guidelines for Chinese companies currently under development by the Ministry of Commerce and the Ministry of Environmental Protection.³⁸ The guidelines of the Ex-Im Bank that apply to virtually all Chinese large hydro activities in Africa can be characterized as follows:

- Comparable with the Equator Principles³⁹, the Ex-Im Bank guidelines provide a general set of principles that mandate the implementation of social and environmental assessments as an obligatory part of project planning. Both guidelines do not spell out the specific framework for the assessment themselves. The Equator Principles refer to the corresponding assessment rules of the World Bank and International Finance Corporation (IFC).⁴⁰ The Ex-Im Bank's guidelines point to China's national legal

³⁷ Morrissey, James, *Livelihoods at Risk: The Case of The Mphanda Dam*, 2006.

³⁸ Ding Qinfeng, *Green norms for oversea investments soon*, China Daily, 9 July 2010.

³⁹ The Equator Principles are a set of voluntary rules developed by the private banking sector to guide project financing decisions with regard to social and environmental impacts of the respective project: <http://www.equator-principles.com/>.

⁴⁰ Namely: IFC Performance Standards on Social and Environmental Sustainability; IFC Industry-Specific Environmental, Health and Safety (EHS) Guidelines; World Bank Pollution Prevention and Abatement Handbook (PPAH).



- framework for project evaluation⁴¹, but also include an explicit reference to “regulations and procedures for the environmental and social assessments of international financial organizations”.⁴²
- In contrast to the Equator Principles, which distinguish between OECD and non-OECD countries regarding the applicability of domestic regulation, the Ex-Im Bank’s guidelines declare the national stipulations of the project’s host country as the primarily applicable framework for impact assessments. Only if domestic regulation on impact assessment does not exist in the respective country, the guidelines refer back to the Chinese legal framework. This strong obligation for Chinese companies to adhere to national stipulations of the host country represents a loophole in case of insufficient regulation on the part of the African country, but at the same time opens an opportunity for African countries to directly control Chinese companies’ conduct.
 - Overall, the Ex-Im Bank guidelines closely mirror comparable international principles, highlighting the importance of mandatory assessment of environmental damages and related impacts on human health and safety as well as the project’s impacts on the socio-economic environment and natural resource situation as well as the obligation of implementing entities to devise and report measures to reduce negative impacts in all project planning phases.
 - In particular, the guidelines underline the importance of the local population’s rights to land and resources, mandate the adequate management of resettlement procedures and stipulate mechanisms of public consultation in cases of serious negative impacts on the local environment.
 - The Ex-Im Banks integrates the adherence to these principles into its loan-giving procedure, including pre-loan and loan-period reporting and review, and reserves the bank’s right to deny, suspend or revoke funding on the basis of the assessment reports and monitoring of adherence.

In theory, the new principles governing the Ex-Im Bank’s loan dispersion procedure with regard to environmental and social concerns provide a solid legal basis for adjusting the business practices of Chinese hydropower developers in Africa to internationally acceptable norms. As such, the 2008 guidelines represent a notable milestone for the future development of China’s role in Africa’s large hydro sector. However, the implementation of these guidelines and adherence by Chinese companies still remains insufficient. Creating the necessary monitoring and enforcement mechanisms requires active cooperation of the relevant responsible African agency and the Chinese regulatory bodies. In addition, African countries have the opportunity to increase pressure on Chinese companies by matching the Ex-Im Bank’s guidelines with corresponding domestic regulation.

The Belinga hydropower project in Gabon (see feature 1) provides an illustrative example for the difficulties as well as the potential of these new guidelines. The Belinga project, which threatened the biodiversity of the Ivindo National Park, violated standards proposed by the China Ex-Im Bank. Despite these violations construction was not prevented, pointing to insufficiencies with the implementation of regulatory provisions. However, the existence of these rules gave domestic and international civil society actors grounds to address their complaints directly to the China Ex-Im Bank with reference to its own environmental stipulations. This backlash led the China Ex-Im Bank to temporarily suspend loan transfers to the Belinga project pending the results of further impact assessments.

The assessment of a WWF expert in South Africa⁴³ confirmed a positive dynamic based on changing regulatory stipulations. In his opinion, Chinese hydropower developers have become noticeably more attentive to environmental and social standards in the recent past. On balance, managing the hidden costs of large hydropower projects with Chinese involvement and gearing project implementation towards internationally accepted standards appears to be possible where appropriate actions to enforce regulatory adherence are taken by both sides. Emerging standards on the Chinese side provide a promising starting point.

⁴¹ Namely: People’s Republic of China’s Environmental Impact Assessment (EIA) Act; People’s Republic of China’s Environmental Protection Law; Environmental Management for Construction Project Ordinance.

⁴² China Export and Import Bank (China Ex-Im Bank), *Guidelines for Environmental and Social Impact Assessments of the China Export and Import Bank’s (China Ex-Im Bank) Loan Projects*, August 2008.

⁴³ Saliem Fakir, WWF South Africa.



Feature 3 – Politically unconditional investments

- China's practice of politically unconditional investments and aid in the renewable energy sector undermines the Western good governance agenda in Africa.
- Chinese companies are less risk averse than their OECD counterparts when it comes to business dealings in politically unpredictable countries.
- Reputation costs are gaining weight with regard to Chinese political as well as investment decisions.

Example III: Merowe hydropower plant (Sudan)

On 3 March 2009, Sudan's President Omar al-Bashir inaugurated the 1250 MW Merowe hydropower Plant built on the Nile River in northern Sudan. In 2003, China's largest hydropower corporation Sinohydro had won the construction bid for the USD 1.8 billion project. China Ex-Im Bank, in conjunction with several investors from countries of the Arabian Peninsula, provided the project financing. The hydropower plant became a focal point for international as well as local protests regarding human rights violations in the context of the project. More than 50,000 people were resettled from fertile Nile Valley land to arid desert regions. The lack of proper resettlement plans and consultation with affected communities sparked public protests against the dam constructions that were repressed by the Sudanese government. The Merowe hydropower project illustrates one of the central points of criticism towards China's politically unconditional approach to Africa.

China refrains from attaching political preconditions to Chinese project financing in developing countries. This stands in opposition to the good governance agenda promoted by OECD countries. To facilitate democratic reforms and political accountability in African countries, OECD governments tie their aid to corresponding conditions and put limits on private companies' investments in African countries with questionable political systems and practices. The conditionality of Western involvement opens business opportunities for Chinese companies that do not impose comparable political conditions. The Merowe hydropower project in Sudan is one example of how Chinese players benefit from non-adherence to the Western good governance agenda.

This is in spite of the fact that Western actors have often failed to live up to their own standards and China's behaviour is only one of several factors obstructing the emergence of good governance. China's *no strings attached* approach undermines OECD efforts to reduce corruption, autocratic practices and human rights violations in Africa. However, for Chinese actors politically unconditional investments have turned into a double-edged sword. Whilst it opens a spectrum of largely uncontested business opportunities for Chinese companies, close relations with autocratically ruled African states carry considerable risks. First, the reputation risk to China's image as a responsible member of the international community. Second, the reputation risk to Chinese companies trying to establish themselves as international brands. Third, the economic risk of political instability that comes with business endeavours in unpredictable countries.

The economic risks of political instability are consistently mentioned by Chinese investors as a main barrier to business in Africa. Nevertheless, Chinese investors have been more open to risk-taking than their OECD counterparts. Trusting in the protective effects of China's good political relations with unstable states, Chinese companies often do business where Western companies deem the circumstances too insecure. The political and economic risk of reputation losses have, however, started to have an impact on China's approach. In particular, the attempts of Chinese companies to establish themselves on global markets have heightened awareness of reputation costs. The gradual shift of China's stance vis-à-vis the al-Bashir regime



in Sudan, ultimately removing the country from the list of destinations eligible for subsidized investments, has been the most prominent example of this adaptive process.

3.2. The emerging pattern - Renewable energy equipment manufacturing

- Renewable energy resources are abundant but underutilized and can become a valuable component of power sector development in Africa.
- Africa's renewable energy potential corresponds with the commercial interests of Chinese renewable energy equipment manufacturers.
- Main features are increasing exports of Chinese renewable energy equipment to Africa, increasing Chinese interest in local manufacturing capacities, intensifying Chinese role in renewable energy capacity development

Renewable energy sources beyond large hydropower such as wind and solar power are abundant in many African countries. Large parts of Africa receive almost full-year sunlight amounting to an average irradiation of about 2200 kWh/m²/yr in most parts of the continent.⁴⁴ Significant wind power potential is available especially in the western coastal regions, but the continent features less than 600 MW (2009) of installed wind capacity.⁴⁵ With less than 20% of Africa's population enjoying access to electricity⁴⁶ the opportunities for local grid applications of renewable energy sources constitute a promising component for power sector reforms across Africa. In addition to electricity generation, solar thermal appliances play a special role in the African market. Solar water heaters represent a particularly promising alternative to the widespread burning of fuel wood and charcoal and therefore have a strong potential for reducing African GHG emissions deriving from deforestation.

As illustrated in Chapter 2, the potential for renewable energy development in Africa resonates strongly with China's efforts to establish Chinese companies as leading green technology suppliers on global markets. Following this entrepreneurial motive, China's potential role in Africa's renewable energy development has three components: the export of renewable energy equipment, the investment in local manufacturing capabilities as well as the promotion of renewable energy capacity development.

Feature 1 – Export of renewable energy equipment to Africa

- Chinese companies are expanding their export activities of renewable energy products on African markets, especially targeting off-grid renewable energy applications in rural areas.
- Facing a saturated domestic market and fierce competition on European and US markets, Chinese wind turbine manufacturers are moving into African markets.
- China's rapidly growing solar water heater manufacturing sector is intensifying its exports into African countries.
- Comparably inexpensive Chinese renewable energy equipment can increase profitability of renewable energy in Africa and thereby ease the early stages of renewable energy development.

⁴⁴ Viebahn, Peter et al., The potential role of concentrated solar power (CSP) in Africa and Europe, in: Energy Policy (2010). See also <http://www.scidev.net/en/opinions/africa-time-to-go-solar.html>.

⁴⁵ <http://uk.reuters.com/article/idUKLU12685120090630>

⁴⁶ <http://www.un.org/ecosocdev/geninfo/afrec/vol20no3/203-solar-power.html>



Example IV: Solar panel distribution agreement (Tanzania)

On 15 April 2010, Tanzania's largest solar power equipment contractor REX Investment Limited (RIL) announced a comprehensive partnership agreement with China's largest PV manufacturer Suntech Power. RIL will act as the exclusive distributor of imported Suntech 1 MW solar panels, supplying solar power equipment to the Tanzanian market as well as to neighbouring countries in East and Central Africa. The focus of RIL's and Suntech's sales strategy is on untapped demand in rural communities not connected to the national power grids. The partnership not only illustrates intensifying export activities of Chinese renewable energy manufacturers vying for infant African markets, but also highlights the potential of off-grid renewable energy applications in Africa's rural regions.

The rapidly intensifying export activities of China's renewable energy equipment manufacturers have garnered international attention.⁴⁷ Chinese companies are on track to produce about half of the world's solar panels and wind turbines in 2010. Almost all of the Chinese produced PV equipment is exported. In 2009, Chinese exporters sold USD10.7 billion worth of solar cells⁴⁸, especially in the United States and Germany. But with increasing output and simultaneous weakening of demand in industrialized countries in the wake of the global financial crisis, Chinese companies are increasingly targeting the African off-grid market as example IV illustrates.

Beyond PV, Chinese wind turbine manufacturers have a particularly strong interest in increasing their exports to Africa. Due to the rapid expansion of China's turbine manufacturing capacity in combination with bottlenecks of power grid development which inversely slow China's domestic demand, China's wind equipment market reached momentary saturation⁴⁹ at the beginning of 2010. Approximately 40% of China's wind turbine factories' output capacity had been idle due to over-capacity⁵⁰ and China's manufacturers are naturally looking for alternative markets abroad. Consequently, "China saw a new trend of increasing exports of turbines and spare parts."⁵¹ China's manufacture of wind power equipment has just concluded its phase of domestic development and is now on the verge of entering international markets on a significant scale. Underdeveloped wind power sectors where there is limited presence of European and US competitors provide promising export markets for Chinese companies.

Another rapidly growing industrial sector that increasingly looks towards foreign markets is China's solar water heater manufacturing. China is not only the largest domestic market for solar water heaters (SWH) with an installed base of 125 million square meters, but Chinese manufacturers are also producing two thirds of the global annual output and are holding 95% of core solar water heating technology patents.⁵² Similar to the wind turbine manufacturing sector, Chinese SWH companies have begun to increase their export activities in recent years, beginning "to export low-cost solar hot water systems to developing countries in Africa."⁵³ In 2007, China's SWH exports grew 28% amounting USD 65 million, with the products going to 50 countries in Africa, Europe, the United States, and Southeast Asia.

Corresponding to China's overall strategy of adjusting the pattern of its economic development, government policies are in place to promote the export activities of Chinese renewable energy

⁴⁷ Bradsher, Keith, On Clean Energy, *China Skirts Rules*, New York Times, 8 September 210.

⁴⁸ <http://www.suite101.com/content/chinas-solar-power-energy-product-sales-and-dealers-a302997>

⁴⁹ Economy, Elizabeth, Statement before the U.S.-China Economic & Security Review Commission, United States House of Representatives, Second Session, 111th Congress, 8 April 2010.

⁵⁰ "China Idles 40% of Wind power Turbine Output Capacity", Bloomberg, March 11, 2010.

⁵¹ REN21, *Renewables 2010 – Global Status Report*, September 2010, p. 30.

⁵² http://www.atimes.com/atimes/China_Business/KJ29Cb02.html

⁵³ REN21, *Renewables 2010 – Global Status Report*, September 2010, p. 33.



manufacturers. China increasingly incorporates renewable energy projects into the portfolio of Chinese aid and loans to African countries, fostering the development of Africa's renewable energy market and thereby creating additional demand for Chinese renewable energy equipment exports. China's pledge to build 100 clean energy projects across Africa under the framework of the Forum on China–Africa Cooperation is a first step in this direction. In turn, increasing availability of inexpensive Chinese renewable energy equipment can increase profitability of renewable energy in African countries thereby speeding the early stages of renewable energy sector development.

Feature 2 – Manufacture of renewable energy equipment in Africa

- Creating overseas production capacity in Africa has been a central component of China's *going out strategy* in the past and is strongly supported by Chinese government policies.
- Chinese renewable energy equipment manufacturers, following the foreign expansion strategy, are increasingly looking for opportunities to build renewable energy manufacturing capabilities in African countries.
- Chinese investments in a local renewable energy manufacture can serve as a catalyst for industrial development and the emergence of domestic renewable energy capabilities in African countries.

Example V: Attempts to establish PV manufacturing capacity (Kenya/South Africa)

As early as August 2007, Chinese PV manufacturer Beijing Tianpu Xianxing Enterprises and the Kenyan company Electrogen Technologies announced a joint venture to build Kenya's first PV manufacturing plant in Nairobi. The announcement spurred great expectations about solar power manufacture becoming a driver of Kenya's industrial development and renewable energy market. Two years later however, the business endeavour collapsed. The necessary demand for solar equipment had not materialized. Despite its failure, the example illustrates the willingness and interest of Chinese companies to invest in renewable energy manufacturing capabilities in African countries. Signs of solar panel manufacturer Yingli searching for opportunities to build a manufacturing plant in South Africa underline the continuation of this trend as well as Longyuan's plans to build a modern blade and turbine manufacturing facility in South Africa.

Technology exports to Africa will be an important component of China's role in Africa's renewable energy sector. However, for China's renewable energy equipment industry mere exporting activities will not be enough. Its global strategy demands that more *dragon heads* (national champions), meaning "sophisticated, high-value added, brand-name companies with their own intellectual property"⁵⁴, become globally competitive multinational firms. From the beginning, Africa has played a central role in this strategy as a prime destination for Chinese firms to expand abroad. The Ex-Im Bank as well as the National Development and Reform Commission (NDRC) dispersed large volume low-cost loans in order to support companies' investments in local production capacity in African countries. National champions, from telecommunications company Huawei to large engineering corporations like the Beijing Construction Engineering Group, have not only received the necessary line of credit, but also diplomatic support, tax exemptions, fast-track bureaucratic procedures and help with investment risk assessments in order to support their international activities in Africa. The strategy showed success with China's investments in Africa's manufacturing sector exceeding mining investments in 2005.

By now, China's renewable energy companies, especially PV manufacturers, are fully benefiting from the system of governmental support mechanisms which facilitate international investments. While the first

⁵⁴ Brautigam, Deborah, *The Dragon's Gift*, Oxford University Press, New York: 2009, p. 87.



attempt in Kenya failed, initial indicators point towards the continuation of Chinese efforts to establish PV production capacities in Africa. The same is true for wind turbine manufacturing with Longyuan planning to establish local production capacities in South Africa. China's renewable energy industry is on the move in Africa, carrying the potential to spur the expansion of African renewable energy equipment manufacture and thereby provide impetus for Africa's renewable energy sector expansion.

Whether or not increased Chinese manufacturing capacity in Africa will create local innovation and domestic renewable energy manufacturing capabilities will be a decisive factor in transforming China's interests in Africa's renewable energy sector into tangible benefits for African countries. Prior experiences with Chinese investments in Africa have shown that knowledge and technology transfers often remain limited as a result of Chinese companies' tendency to avoid deep integration into local economic structures, comparably low intensity of cooperation with local partners and low rates of local employment at least with regard to key positions of responsibility.

However, positive examples also exist, for instance in Mauritius and Nigeria, where "multiple cases of spillovers from ethnic Chinese manufacturing to African investors"⁵⁵ that facilitated domestic industrial advancement can be observed. These examples illustrate how China's commercial engagement can significantly aid the industrial transition in African countries. Such a positive influence is exerted through demonstration effects within the framework of Sino-African joint ventures as well as through the improved qualifications and experience of local workers employed in Chinese production sites. Promoting these positive spillover effects will be one of the essential instruments for seizing the benefits of China's engagement in Africa's renewable energy sectors.

Feature 3 – Building renewable energy generating capacity

- Chinese power companies are increasingly engaged in the construction of renewable energy generating capacity in Africa such as wind farms or solar power plants.
- China's renewable energy equipment manufacturers depend on domestic African demand for their products in order to establish a presence in the African market.
- Chinese investments in the expansion of installed renewable energy capacity in Africa create the demand for renewable energy equipment that Chinese companies need in order to become profitable.

Example VI: Wind power generation development (Ethiopia)

In September 2009, the Ethiopian Electric Power Corporation (EEP) signed a major power construction deal with several Chinese companies which, in addition to the building contracts for the large Genale Dawa 3 and Chemoga Yeda hydropower projects, also included an agreement with China HydroPower to develop several wind farms with an installed capacity of 51 MW each. Ethiopia's electricity sector is almost fully dependent on large hydropower and suffers from frequent undersupply due to droughts. Wind power expansion has been identified as one of the options for the diversification of power generation. The wind farms will be financed through the China Ex-Im Bank.

Complementing equipment exports to Africa and the establishment of manufacturing capacities in Africa, the final building block of China's engagement in Africa's renewables is the financing and construction of renewable energy generating capacity. The expansion of installed renewable energy capacity in Africa has been obstructed by financial as well as technological limitations. Chinese financing mechanisms and the engagement of experienced Chinese power project developers can fill this gap. First, projects like the wind farm in Ethiopia or solar power plants in South Africa are already under way, putting China's tool kit of

⁵⁵ Ibid, p. 224.



official development aid and investment promotion mechanisms to good use. From the perspective of Chinese renewable energy companies, this final building block is of crucial importance. As the example of the failed Kenyan PV manufacturing plant illustrated, the infant African renewable energy sector does not yet generate substantial demand for renewable energy equipment. Investing in renewable energy generating capacity creates the demand for renewable energy equipment. Chinese companies need to become profitable in African markets. All three components of China's engagement –equipment exports, manufacturing and generation capacity development– need to come together to spur the emergence of the vibrant African renewable energy market Chinese companies search.



4. Country studies – South Africa, Uganda and Mozambique

The common ground between China's interests in Africa's renewable energy sector and the potential of renewable energy to facilitate sustainable economic development in Africa promises benefits to both parties. In order to turn this potential into tangible benefits, corresponding political actions are required. African countries can facilitate this process through country specific strategies putting into place the necessary mechanisms to create further incentives for China's engagement. For the development of such strategies, the specific characteristics of each country need to be taken into account, guided by the following questions:

Domestic energy sector:

- What can the country gain from renewable energy?
- What are the country's national objectives and policies with regard to renewable energy?
- What are the country's strengths that can foster renewable energy development?
- What are the country's weaknesses restraining renewable energy development?

China's current and potential role:

- What is China's current role in the country's energy sector?
- What can China's involvement contribute to renewable energy development in the country?

The following chapter will provide an analysis for the specific case studies of South Africa, Mozambique and Uganda. Annexes I-III provide detailed country briefings for additional background information on the three countries and their respective energy sectors.

4.1. South Africa

The electricity emergency of 2008,⁵⁶ resulting in rolling blackouts and energy rationing for industrial users, revealed South Africa's energy sector as the Achilles' heel of its economic development. The monopoly market structure dominated by parastatal utility Eskom in combination with political inaction has proven to be unable to fulfil the energy needs of South Africa's evolving economy. Heavily coal-dependent and plagued with deficient operational infrastructure, South Africa's power sector is energy inefficient and greenhouse gas (GHG) emission intensive. In view of the country's economic aspirations as well as its increasing international responsibilities regarding climate protection, a transformation of South Africa's energy sector is needed. Seizing the country's renewable energy potential, especially its solar power resources, would play a valuable role in this endeavour.

Question 1: What can South Africa gain from renewable energy?

- Renewable energy development can expand power generation capacity needed to cover rapidly increasing demand, reduce load shedding and secure further economic growth.
- Renewable energy development can complement and thereby reduce the expansion of coal power generation, decreasing CO₂ emissions and securing long-term stability of energy supply.
- Renewable technology manufacturing can serve as a motor for industrial development and skilled-labour job creation.
- Localized off-grid renewable energy solution can aid South Africa's ongoing electrification efforts despite the deficiencies of its power transmission system.

⁵⁶ Bearak, Barry, Power Failures Outrage South Africa, New York Times, 31 January 2008, http://www.nytimes.com/2008/01/31/world/africa/31safrica.html?_r=1



Currently, South Africa's power sector is in constant danger of undersupply, featuring narrow reserve margins that increase the risk of load shedding at significant economic costs. The lack of flexibility in South Africa's energy market as well as the lack of foresight by political decision-makers has prevented the power market from structurally adapting to South Africa's economic growth, increasing electrification rate and corresponding rise in energy demand. An estimated doubling of installed capacity by 2025 is necessary to service rising energy consumption. However, a purely coal-based expansion of generating capacity constitutes an undesirable solution from a climate protection perspective. In order to reconcile its economic ambitions with its increasing commitment to emission reductions, South Africa needs to dramatically reduce its coal dependence. Intensified utilization of renewable energy sources, specifically abundant potential for solar photovoltaic as well as thermal power, will induce the necessary adjustment of South Africa's energy sector in a sustainable way. Reducing the need for further expansion of coal burning can mitigate additional CO₂ emissions and local pollution as well as reduce water intensity of power generation and environmental costs of coal mining.

At the same time, the expansion of South Africa's renewable energy manufacturing sector promises beneficial impulses for the country's further economic development, providing business opportunities for domestic manufacturing of technologically advanced goods and the creation of skilled-labour jobs. Given its level of development, economic capabilities and comparably advanced manufacturing sector, South Africa is the primary candidate to become a hub for renewable energy equipment manufacturing and export for a growing African renewable energy market. Renewable energy equipment, from wind turbines to solar panels or water heaters can become a forward looking and value adding component of South Africa's mid-term industrial development.

In addition, smaller-scale renewable energy generation used for local grid installations can aid South Africa in achieving its ambitious plans to reach a 100% electrification rate by 2012 despite the deficiencies of its power transmission system. Localized electricity generation, especially from solar PV and biomass, can become a catalyst for poverty alleviation and rural development. Complementing sustainable electricity generation, South Africa's continuing efforts to expand household usage of solar thermal power can play a significant role in bolstering energy availability and increasing living standards.

Question 2: What are South Africa's national objectives and policies with regard to renewable energy

- South Africa has formulated ambitious mid- and long-term goals for GHG emission reductions and renewable energy development.
- A number of policies have been initiated in order to achieve an expansion of renewable energy capacity.
- Policies have not yet yielded adequate results measured against South Africa's declared targets.
- Policy effectiveness is suffering from insufficient financial means as well as flaws in policy design.

South Africa's political leadership is beginning to acknowledge the potential of renewable energy for the country's mid-term social and economic development. South Africa's 2003 *White Paper on Renewable Energy* highlights the potential of renewable energy and puts forward a target of 10,000 GWh in 2013, equalling 4% of electricity generation. In 2010, South Africa submitted GHG reduction targets of a reduction of 34% and 42% by 2020 and 2025 as guidepost for its Nationally Appropriate Mitigation Actions (NAMA).

Solar power, identified as the "most readily accessible resource in South Africa"⁵⁷ plays a central role in South Africa's renewable energy strategy. Photovoltaic systems are expected to supply 14% of electricity generation by 2050. In addition, South Africa has announced a target of one million solar water heaters

⁵⁷ Republic of South Africa - Department of Energy,
http://www.energy.gov.za/files/esources/renewables/r_solar.html.



(SWH) to be installed by 2014. SWH systems are expected to supply 43TWh/yr of heat by 2030. Beyond solar power, sustainable use of biofuels represents a central aspect of South Africa's renewable energy expansion plans, aiming to increase the share of renewable biomass in the energy mix from 9% to 16% and to achieve a 2% biofuel penetration of national liquid fuel supply by 2013. While South Africa has not specified policy measures to concretise the submitted NAMAs, its domestic renewable energy strategy includes the following building blocks:

- **Renewable Energy Feed-in Tariff (REFIT):** Approved in 2009, South Africa's REFIT scheme determines the price for power generated by registered renewable energy facilities to be paid by public utility Eskom. The REFIT is meant to provide economic incentives as well as planning reliability to renewable energy investors. However, South Africa's REFIT in its current form does not entail a general Power Purchase Agreement (PPA) obligating Eskom to purchase electricity generated from renewable sources by independent power producers (IPP). Thus far, no new capacities have gone online under the REFIT scheme because the IPPs and Eskom could not agree on respective PPAs. This seriously counteracts the purpose of the REFIT and undermines its effectiveness as a policy instrument.
- **Solar Water Heating promotion:** The high acquisition cost of SWHs is the main barrier to widespread application in South Africa. In 2008, South Africa's Eskom introduced an incentive scheme to promote the large-scale introduction of solar water heating. The programme, funded by a direct levy on electricity consumer bills, provides a 50% rebate on solar water heater purchases. In addition, a number of internationally funded pilot programmes for SWH promotion have been conducted.
- **Capital subsidies:** Renewable energy generation projects above 1MW are eligible for capital subsidies granted by the Renewable Energy Subsidy Governance Committee (SGC) of the DoE. Subsidies are administered by the Renewable Energy Finance and Subsidy Office (REFSO) established in 2005. In the 2009/10 budget, the office had a modest financing capability of R10 million (approx. USD 1.5million). To date, REFSO has dispersed subsidies to six projects with a total installed capacity of 23.9 MW.
- **Tax exemptions:** Revenues earned through the UNFCCC Clean Development Mechanism (CDM) are exempt from tax payments increasing the attractiveness of implementing CDM projects in South Africa. Other sizeable tax exemptions are a 50 percent fuel tax exemption for biodiesel and a 100 percent exemption for bioethanol.
- **Tradable Certificates:** CDM financing remains at a low level in South Africa. As of 2010, only three renewable energy projects with a modest emission reduction of 275.000t of CO₂e were registered by the CDM Executive Board. Aiming to complement the CDM, South Africa's DoE is setting up a voluntary system of Tradable Renewable Energy Certification (TREC) in order to provide an additional revenue stream for renewable energy IPPs. The CDM can also be complemented by the development of NAMAs that can be submitted for international support to bilateral and multilateral development partners.
- **Policy development:** Funded by the World Bank, South Africa's DoE is implementing a renewable energy market transformation (REMT) programme. The initiative aims at improving South Africa's regulatory and policy framework for renewable energy and developing effective project support and financing mechanisms to make investments in renewable energy economically viable. In accordance with its declared goals REMT focuses on renewable power generation and solar water heaters.

South Africa's policy and financing framework features the important building blocks for successful renewable energy promotion. However, several of the policies are limited in their effectiveness either because they are backed by insufficient financial means, e.g. capital subsidy dispersion, or they have flaws in policy design, e.g. the lack of a PPA to back feed-in tariffs. Consequently, South Africa's renewable energy activities have not yielded adequate results as of yet with the notable exception of Eskom's SWH rebate programme that resulted in a significant increase in SWH purchases.⁵⁸ The following sections will take a closer look at the strengths and weaknesses of South Africa's approach to renewable energy expansion.

⁵⁸ Kevin Bennett interviewed by Kruschen Govender, *Possibilities for renewable energy in South Africa*, 18 March 2008, http://www.tradeinvestsa.co.za/feature_articles/316476.htm.



Question 3: What are South Africa's strengths that can foster renewable energy development?

- South Africa possesses significant solar power resources.
- South Africa features developed economic structures and relatively advanced manufacturing and technological capabilities.
- South Africa possesses relatively high levels of education and available skilled human resources.
- Political awareness of the need for reform and potential of renewable energy expansion is increasing and a first set of policy mechanisms has been initiated.

South Africa's major domestic renewable energy resource is abundant solar radiation (estimated 550GW) complemented by a moderate wind power potential (estimated 30 GW). In addition, the country imports hydroelectric power through the Southern African Power Pool (SAPP).

Shaken by the 2008 power shortages and faced with the inability of the Eskom dominated South African power sector to reliably cover the rising energy demands of the country's growing economy, the South African government has begun to acknowledge the importance of renewable energy development. The target of 4% renewable energy generation by 2013 as well as South Africa's ambitious NAMAs highlight this trend. As described in the previous section, a set of regulatory measures and financial instruments have been initiated. Despite the opposition of various political and economic interest groups, an increasing amount of political attention is being paid to the potential of South Africa's renewable energy resources.

In comparison to other African countries, South Africa provides a number of favourable conditions for the emergence of a vibrant renewable energy equipment manufacturing industry. The educational system provides a workforce of skilled labour and the manufacturing sector already includes technologically advanced branches of production like machinery and electronics. As such, an emerging renewable energy manufacturing sector could be integrated into existing industrial structures with relative ease. For solar water heaters, South Africa already has an emerging domestic manufacturing base that produces roughly 60% of the national demand with the rest being imported mainly from Europe. The current expansion of SWH capacity can thus directly benefit South Africa's industrial development.

In particular, in combination with the country's export capabilities, its manufacturing capability represents one of the most powerful strengths of potential South African renewable energy development. The possibility of turning renewable energy equipment manufacturing into a tool and motor of forward looking and sustainable economic growth is however not yet adequately reflected in South Africa's current policy-making.

Question 4: What are South Africa's weaknesses restraining renewable energy development?

- The power sector structure restrains renewable energy development, due to a lack of liberalization with quasi-monopolistic provider Eskom and corresponding market entry barriers for IPPs.
- Strong vested interests in the energy and coal mining sectors favour retaining existing structures.
- Abundance and price advantage of coal strengthens industrial inertia.
- Artificially low electricity prices caused by over-investments during the 1980s as well as persistently high subsidies on electricity costs reduce benefits from renewable energy development.
- The regulatory framework is insufficiently backed by financial means and features weaknesses in design.
- Outside as well as inside investments in the renewable energy sector are low due to market structure and a lack of public funds.
- Insufficient technological know-how and research and development (R&D) capacity in the renewable energy sector leads to high risk in investment in manufacturing as well as generation.



- Outdated infrastructure in all areas of the power sector impedes addition of on-grid generation capacity.

The structure of South Africa's power market, with the parastatal utility Eskom dominating all parts of the power sector and supplying 95% of electricity, remains one of the main obstacles to renewable energy expansion. The highly loss-making Eskom (USD 1.35 billion in 2008), which struggles to maintain its existing capacities, is not in a position to drive a fundamental power sector transformation from within while the quasi-monopolistic market structure hampers market entry of IPPs and thereby limits private investment. Earlier attempts of energy market liberalization in the late 1990s were ultimately blocked by vested interests. Also today, powerful interest groups like the National Union of Mineworkers (NUM) oppose an Eskom privatization and energy market liberalization. South Africa's artificially low electricity prices that were caused by South Africa's abundant coal resources and overinvestments during the 1970s and 1980s and are now backed by substantial electricity cost subsidies further reduce the economic attractiveness of renewable energy investments. On the other hand, pressures to restructure South Africa's power sector are mounting in light of energy supply insecurity and massively increasing electricity prices. South Africa's ability to implement plans for comprehensive energy sector liberalization will be one of the decisive factors for future renewable energy development.

South Africa faces an enormous investment challenge to finance the upgrading of its deficient infrastructure and create momentum for on-grid as well as off-grid expansion of renewable energy. At the moment, private as well as public investments in South Africa's renewable sector are limited. South Africa is not a primary receiver of Official Development Assistance (ODA) with total ODA amounting to USD 800 million in 2007-08, a mere 1.5% of its overall budget. Few of these funds were directed towards the energy sector. CDM revenues channelled into renewable energy development are limited as well. Capital subsidies financed through domestic public funds are modest with the REFSO merely dispersing USD 1.5 million during the 2009/2010 fiscal year. The gap in public financing is not bridged by private investments. Hampered by market structure, corporate investments in clean energy amounted to a mere USD 125 million in 2009.⁵⁹

Closing the technology and knowledge gap constitutes another prerequisite for sizeable increases in installed renewable energy capacity. In all areas of renewable energy development, from manufacturing to installation and maintenance, specialized technological expertise will be essential. South Africa possesses the education structures and a sophisticated manufacturing sector essential for developing the technological expertise necessary for a viable renewable energy sector. Despite this advantage, targeted efforts will be required to close the renewable energy technology gap.

South Africa's regulatory framework for renewable energy promotion has seen significant developments in recent years. However, the implementation of instruments still stands at its beginning. Most importantly, the absence of a comprehensive Power Purchasing Agreement undermines the effectiveness of the REFIT as one of the crucial building blocks of a viable renewable energy strategy. Vested interests in the power sector have shielded Eskom from purchasing obligations, creating considerable uncertainty for potential private renewable energy developers and investors. The monopolistic structure of the market in combination with insufficient regulatory stipulations limits the impact of existing policy instruments. For South Africa to reach its ambitious renewable energy targets, improvements to the regulatory framework are necessary.

Question 5: What is China's current role in South Africa's energy sector?

- Both countries have intensified their economic and political relations.
- China's primary role is of an importer of South African coal.

⁵⁹ Carbon Disclosure Project, *Corporate Clean Energy Investment Trends in Brazil, China, India and South Africa*, 2010, p.7.



- Clear dynamic towards an expanding Chinese involvement in South Africa's wind and solar power sector can be observed in recent years.

Driven by rapidly expanding economic and trade ties, China and South Africa have intensified their bilateral relations in recent years. This trend culminated in August 2010 with the signing of a comprehensive strategic partnership between the two countries, incorporating a wide spectrum of bilateral agreements on political and economic issues. Since 2009, China has been South Africa's largest export destination mainly due to China's import of raw materials such as iron ore, refined iron and steel. Trade between China and South Africa in 2010 is estimated to total USD 35 billion compared to USD 13 billion in 2006.⁶⁰

China's primary role in South Africa's energy sector is of an importer of South African coal. In the first nine months of 2010, China's imports of South African coal surged to 4.8 million tons in comparison to 1.5 million tons during the entire year of 2009. South Africa's total coal exports for 2010 amounted to 63.5 million tons with 25% going to European and 59% to Asian markets. In addition, Chinese financial institutions signalled interest in financing South Africa's Medupi coal plant, which ultimately received a USD 3.75 billion loan from the World Bank in April 2010.

There had been no tangible Chinese engagement in South Africa's renewable energy sector until recently. However, in 2010 an increasing dynamic towards an intensified Chinese role in South Africa's wind and solar power development became obvious: Yingli Solar established visibility in South Africa as one of the main sponsors of the 2010 FIFA World Cup in South Africa. China's Suntech Power Holding signed a Memorandum of Understanding with Umsimbithi Holdings to jointly seek opportunities for solar power development in South Africa and confirmed plans to build a 100 MW solar power plant. In December 2010, Mulilo Renewable Energy (MRE) entered into an agreement with China Longyuan Corporation for the development of six wind parks in South Africa with a total capacity of 1,500 MW. It is foreseen that the first phase of the project will start commissioning in 2011 and will become operational in June 2012.⁶¹ Longyuan also revealed plans to build a modern blade and turbine manufacturing facility in Western Cape.

Question 6: What can China's involvement contribute to renewable energy development in South Africa?

- Following its entrepreneurial motive, China can play an important role for closing South Africa's investment and technology gap.
- China as a potent investor and partner can play a major role in building South Africa's renewable energy manufacturing sector and export capabilities.
- China as an exporter of comparably inexpensive renewable energy equipment can reduce the costs of on-grid and off-grid generation capacity, but also increases competitive pressure within South Africa's infant domestic industry.
- China can act as a financier and partner for the installation of on-grid and off-grid renewable generation capacity.

Following its entrepreneurial motive (see Chapter 2), Chinese engagement can become a decisive factor in turning renewable energy development into a powerful tool for South African economic growth and sustainable energy sector development. As a WWF expert⁶² of South Africa's energy sector claims, Chinese companies can "unlock the potential" of renewable energy development in South Africa by closing the investment and technology gap. South Africa has the opportunity to become a manufacturing and regional export hub of renewable energy equipment in the growing Sub-Saharan market.⁶³ Chinese companies and

⁶⁰ South African Department of Trade and Industry Economic Database, <http://www.dti.gov.za>.

⁶¹ SouthAfrica.info, *SA, Chinese firm invests in green energy*, 6 December 2010, <http://www.southafrica.info/business/investing/mulilo-061210.htm>.

⁶² Saliem Fakir, WWF South Africa.

⁶³ Energy Matters, *South Africa's Renewable Energy Gold Rush*, 2 November 2010, http://www.energymatters.com.au/index.php?main_page=news_article&article_id=1149.



their objective to establish a presence in foreign markets can be a potent partner in this endeavour. Driven by long-term strategy and backed by Chinese public financing mechanisms that lower the risk of investment, Chinese companies have the interest and capacity to invest in domestic renewable energy manufacturing in South Africa. In return, South Africa possesses all the fundamental prerequisites for building a strong renewable energy equipment manufacturing base quickly and efficiently. This strong overlap of interests and capabilities creates ample opportunity for extensive business-to-business partnerships. Through joint ventures, technology licensing or research and development partnerships, Chinese companies can infuse significant technological advancement into South Africa's industrial sector. This effect can be complemented by Sino-South African cooperative research between universities and scientific institutions. Several accounts of Chinese companies searching for opportunities to set up PV manufacturing plants in South Africa as well as Longyuan's plans to build a modern blade and turbine manufacturing facility in Western Cape already signal the growing dynamic behind such a development in the near term future. Chapter 5 will discuss strategic policy options for South Africa to seize this particularly promising opportunity and to maximize China's engagement as a catalyst of domestic industrial advancement.

Chinese companies will also enter the South African market as an exporter of renewable energy equipment. On the one hand, China can provide goods with significant price advantages in comparison to other international imports decreasing the cost of renewable energy generation. This is already the case with off-grid and on-grid solar power equipment such as water heaters and solar panels. In the case of SWH, Chinese exports can even serve to mitigate supply bottlenecks since, as Kevin Bennett of Cape Town Energy Research Centre put it, "these products are flying off the shelves and it is currently difficult to meet the growing demand for these products."⁶⁴ Regarding wind power equipment, European suppliers are still holding their ground against growing Chinese competition, but the cost advantages of Chinese products are increasing with the rapidly growing maturity of China's wind manufacturing capabilities. Lowering the price of renewable energy can facilitate capacity expansion thereby also creating the needed demand to support an emerging domestic equipment manufacturing sector. On the other hand, inexpensive Chinese exports can put additional competitive pressure on fledgling domestic industries, constricting their emergence during the initial phase of development. South Africa will have to carefully balance its political actions in this regard in order to seize the benefits of cheap equipment imports while preventing domestic industrial development to be choked early on.

A third way in which China can play a role in South Africa's renewable energy sector: as an investor in South African renewable energy generating capacity, especially in form of wind farms and solar power plants. From the South African perspective, outside investments in generating capacity are urgently needed in order to close the funding gap that restricts the effectiveness of national renewable energy policies. Expanding installed capacity is not only a benefit in itself, but is also necessary to create the demand for the emergence of an equipment manufacturing industry. Vice versa, from the Chinese perspective investments in South Africa's renewable energy capacity has to be seen not only as a risky investment in South Africa's unpredictable energy sector. It is also part of an overall effort to create international markets for Chinese renewable energy equipment that provide more favourable conditions for Chinese products than the highly contested OECD markets. This also highlights one of the fundamental differences between Chinese companies and other investors. Their entrance into the South African renewable energy market is one building block of a long-term global strategy for Chinese renewable energy companies. As a strategically important and politically supported aspect of China's overall economic development, this strategy is heavily backed by Chinese public funds as well as political and diplomatic support. As a result, the investment calculation by Chinese companies for engaging in South Africa's renewable energy sector is not solely focused on and limited to short- to mid-term profitability of investments. This enduring approach to investments creates a higher tolerance for short-term uncertainties and a stronger focus on the underlying factors that will decide the failure or success of South Africa's renewable energy market.

⁶⁴ Kevin Bennett interviewed by Kruschen Govender, *Possibilities for renewable energy in South Africa*, 18 March 2008, http://www.tradeinvestsa.co.za/feature_articles/316476.htm.



There are strong interests driving Chinese engagement in a long-term and all-encompassing approach of state-guided economic development despite risky conditions. However, Chinese players are also well aware of the unpredictability and limitations of the South African energy market. In particular, the lack of market liberalization considerably limits all companies' radii of activity and influences the decisions of Chinese market players. Recommendations to overcome these limitations and thereby further China's engagement in South Africa's renewable energy sector will be presented in Chapter 5.

4.2. Mozambique

In Mozambique, the majority of generated energy is exported while only 12% of the population has access to electricity themselves. Non-diversified power generation in combination with an insufficient power transmission and distribution system and widely dispersed human settlement patterns keep Mozambique's electrification rate low. Dominated by the 2,075 MW Cahora Bassa dam on the Zambezi River, the largest part of Mozambique's generated power is exported through the Southern Africa Power Pool (SAPP) supplying the energy-hungry economy of South Africa. While Mozambique's vast untapped hydropower resources will play a major role in expanding generation capacity in view of rising domestic and regional demand, other renewable energy sources provide opportunities for localization of generation that can help solve the country's electrification challenge.

Question 1: What can Mozambique gain from renewable energy?

- Utilization of its vast hydropower resources can secure long-term supply in a time of fast economic growth, increasing energy export opportunities and potential for rural electrification.
- Expansion of off-grid, localized solutions based on alternative renewable energy like wind, solar, biomass and small hydro can help to increase electrification in a sustainable manner.
- Localized renewable energy can reduce the use of off-grid diesel generators for electrification and, e.g. through solar thermal applications, decrease the dependence on fuel wood and charcoal.
- Use of renewable technology manufacturing can serve as a motor for industrial development and skilled-labour job creation.
- Diversification of the renewable energy portfolio can reduce one-sided dependence on large hydropower faced with increasing volatility of hydropower availability.

Large hydroelectric power generation will remain the central pillar of Mozambique's energy sector for the foreseeable future. The vast potential along the Zambezi River can provide long-term energy supply security for the growing domestic economy while large parts of Mozambique's generated power can still be profitably exported through the SAPP, mainly to South Africa. In addition to the Cahora Bassa dam, the long-term supply with abundant large hydropower is to be secured through a second large hydro dam project, the Mphanda Nkuwa dam, which will be constructed by an international consortium with financing from the China Ex-Im Bank. The construction of the Mphanda Nkuwa power station has raised concerns as to the project's environmental and social costs⁶⁵. In order to minimize the undesired effects of the project, Mozambique's government will have to hold the China Ex-Im Bank responsible for ensuring adherence to the Ex-Im Bank's environmental and social assessment guidelines as discussed in Chapter 2.

While large hydropower is the most important source of renewable energy for Mozambique, its generation is concentrated in few locations requiring long-distance transmission to the respective points-of-use. The absence of a comprehensive power transmission and distribution system in such a large country featuring a widely dispersed pattern of human settlement leads to a low electrification rate of 12% overall and only 1-2% of the rural population. Local generators, primarily fuelled with diesel, cover some of the energy demand although most remain without electricity. Localized off-grid use of small- to medium-scale renewable energy generation provides a promising way to increase electrification rates and living standards in a sustainable way. Complementing off-grid electrification schemes, the expansion of solar thermal application can help reduce the heavy reliance on fuel wood and charcoal.

⁶⁵ Morrissey, James, *Livelihoods at Risk: The Case of The Mphanda Dam*, 2006.



In the longer term, the expansion of Mozambique's renewable energy sector can also provide impulses for the country's industrial development, providing opportunities for domestic manufacturing of renewable energy equipment. In comparison to South Africa, however, Mozambique will not be able to provide an equally advanced manufacturing sector and corresponding infrastructures, technological expertise and human capital needed for the emergence of a sophisticated renewable energy technology sector. In Mozambique, renewable energy equipment manufacturing will not present an opportunity for industrial development as comprehensive as in the case of South Africa. Conversely, low labour costs make Mozambique an attractive location for the lower-skill aspects of renewable energy product manufacturing processes, providing a potential niche for renewable energy related industrial development in Mozambique as well.

In the long-term, an expansion of the on-grid electrification system in Mozambique in conjunction with a diversification of the renewable energy portfolio can also serve to reduce one-sided dependence on hydropower, balancing seasonal volatility of supply as well as long-term disruptions of water flow patterns due to climate change. While other renewable energy sources like wind and solar are also exposed to supply volatility, the short, intra-day intermittence cycles of these energy sources means they are still able to counter-act the week- or months-long cycles of hydropower supply variation.

Question 2: What are Mozambique's national objectives and policies with regard to renewable energy?

- Mozambique has not formulated NAMAs or GHG emission reduction goals and no comprehensive policy framework for renewable energy development exists as of yet.
- However, increasing political attention to energy sector development has led to the inclusion of renewable energy components in Mozambique's Poverty Reduction Strategy (PARPA).
- Rural electrification is one of the main objectives of the government
- In the absence of CDM finance, ODA represents a central source of funding for Mozambique's energy sector development.

Featuring a negligible level of GHG emissions⁶⁶, Mozambique has not put forward NAMAs to the UNFCCC and no targets for GHG emission reductions or renewable energy development have been formulated. At this point, the *Bio-combustible Policy Strategy* remains the only specific renewable energy policy in Mozambique. However, increasing political attention towards renewable energy can be observed. Mozambique's government is currently reviewing a draft *Renewable Energy Policy Strategy* (REPS). A number of pilot projects for renewable energy generation have been implemented on an explorative basis, mainly through Mozambique's Fundo Nacional de Energia (FUNAE). Most importantly, renewable energy promotion was included as one aspect of Mozambique's Poverty Reduction Strategy (PARPA) developed in cooperation with the African Development Bank.

Mozambique does not participate in carbon financing through the CDM to any sizeable degree. Consequently, the main source of international finance for Mozambique's energy sector development is ODA from donor countries and multilateral sources. In the absence of a comprehensive renewable energy policy framework, the PARPA acts as the strategic guidepost for international investments in Mozambique's renewable energy development. ODA sponsored projects in Mozambique's energy sector follow the strategic objectives put forward in the energy related sections of the PARPA including expansion of off-grid renewable energy, creating a generation and transmission master plan, building the North-South (Backbone) transmission line and implementing the national strategy on biofuels. Since 2000, 61 ODA projects on "Energy Generation and Supply" were registered, amounting to commitments of USD

⁶⁶ The US Department of Energy's Carbon Dioxide Information Analysis Center estimates Mozambique's CO₂ emissions at 2.6 million metric tons, representing less than 0.01% of the global total (<http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749&crd=>).

511.6 million.⁶⁷ Projects include energy sector reform support, rural electrification and transmission, decentralized energy systems, as well as technical assistance to the Cahora Bassa hydro electric dam. For the period of 2005-2010, ODA flows into the energy sector accounted for approximately 4% of overall ODA flows to Mozambique.

For example, the Mozambique Energy Reform and Access Program lead by the World Bank provides extensive support to the country's renewable energy efforts. In addition, donors such as Germany, Norway (mainly in the field of hydropower), Denmark and Spain have developed corresponding assistance programs. A number of emerging economies have established relationships with Mozambique in the field of renewable energies as well. Whereas Brazil provides capacity building on biofuels, India has recently set up a joint venture in Mozambique for the production of solar equipment in the country⁶⁸.

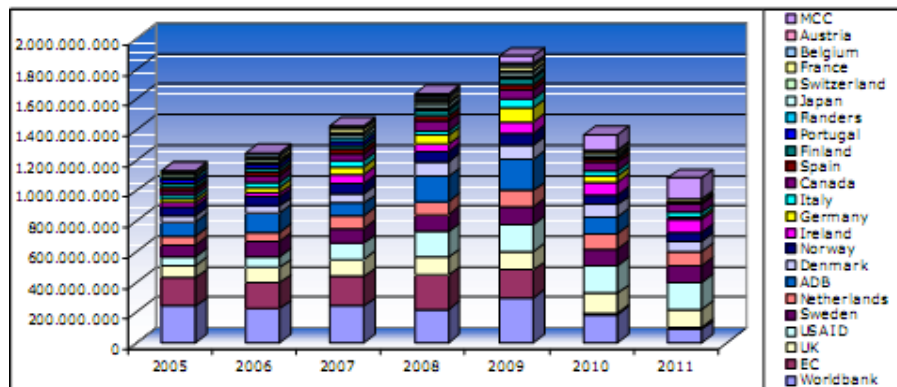


Figure 2: ODA Flows in Mozambique. Source: Mozambique Donor Atlas 2008 (ODAmoz)

Question 3: What are Mozambique's strengths that can foster renewable energy development?

- Mozambique has vast hydropower potential for large-scale and micro/mini applications.
- Mozambique features a large biomass potential and existing political framework for biomass utilization (biocombustible policy strategy).
- Test projects for off-grid and local grid renewable energy solutions implemented through FUNAE (primary focus on solar PV as well as wind powered water pumps) exist.
- Wind power potential exists along the long coastline.
- Mozambique puts political emphasis on energy sector development as prerequisite for sustained economic development (primary focus on large hydro).
- Mozambique increasingly integrates renewable energy potential into political planning; incorporation of renewable energy expansion into Mozambique's Poverty Reduction Strategy (PARPA).
- Off-grid renewable energy technologies are recognized as a key component for the provision of electricity to rural areas.

Mozambique's large hydropower endowment is at the core of its renewable energy potential. Beyond large hydropower projects like Cahora Bassa and Mphanda Nkuwa, the Zambezi River offers largely untapped potential for geographically more flexible small hydro installations that can supply local electrification efforts without the environmental and social costs of large hydro dams. Small-hydro projects are promoted by new investment regulations within the framework of Mozambique's 2009 Energy Policy Strategy, but a lack of financing and implementation capacity has prevented a trend towards small hydro.

⁶⁷ Official Development Assistance to Mozambique Database: <http://mozambique.odadata.ampdev.net/reports/sectors/229>.

⁶⁸ <http://www.trust.org/alertnet/news/mozambique-solar-factory-to-expand-power-access>



In principal, the potential of renewables beyond hydro, specifically with regard to off-grid application, has been identified by Mozambique's political leadership and is increasingly integrated into mid-term policy planning, such as its PARPA. In this, a focal point has been the development of biomass utilization beyond the often unsustainable and health averse domestic burning of fuel wood. Mozambican agricultural biomass resources are comparably large (eucalyptus, grasses, cassava and other starch crops, sugar cane and jatropha). The government has announced plans to increase utilization of the energy potential of agricultural waste through co-generation power plants. In addition, first experiments with off-grid solar PV and wind power have begun in Mozambique. A number of internationally financed rural electrification projects are increasingly including renewable energy, particularly through the support of Mozambique's Fundo Nacional de Energia (FUNAE). International donors like the EU, Norad, Danida, the Worldbank and GEF have also supported off-grid renewable energy pilot projects that can serve as a platform for renewable energy development in Mozambique.

Question 4: What are Mozambique's weaknesses restraining renewable energy development?

- Lack of domestic private investment and public funding due to budgetary constraints impedes renewable energy development.
- Insufficient technological expertise and project implementation capacity restrains renewable energy development.
- Regulatory framework is insufficient to promote renewable energy expansion.

The main obstacle to renewable energy development in Mozambique is the lack of available domestic funding combined with relatively low international private investments in Mozambique's power sector. ODA alone will not suffice to create a significant dynamic for Mozambique's renewable energy development. While the funding of the Mphanda Nkuwa by the China Ex-Im Bank marks a major success for Mozambique's ability to attract international investments for large infrastructure projects, a significant development of off-grid and eventually on-grid applications of non-large hydro will require considerable external financing if it is to be successful. Especially in the field of off-grid localized renewable energy, from small hydro to solar PV, the lack of existing technological expertise and domestic project implementation capacity represents an additional impediment. Also, opportunities for solar thermal applications able to reduce Mozambique's heavy reliance on fuel wood have not been systematically explored so far. Despite the financial resources and programs of international donors and institutions such as the World Bank and the African Development Bank, a deep financial gap remains.

Mozambique lacks the adequate regulatory framework necessary to create a favourable investment climate and to turn renewable energy financing into an attractive business option for foreign investment. Currently, the undeveloped regulatory framework constitutes one of the clearest weaknesses hampering renewable energy development in Mozambique. However, a Renewable Energy Policy Strategy (REPS) is currently being discussed by the government. The REPS is sought to contain stipulations regarding favourable tariffs for the import of renewable energy technology as well as premium prices for the generation of renewable energy.

Question 5: What is China's current role in Mozambique's energy sector?

- China is one of the most important foreign investors and trading partners for Mozambique.
- In Mozambique's power sector, China is primarily engaged as developer of the Mphanda Nkuwa hydropower plant.
- China has not yet played a visible role in the development of other renewables in Mozambique.

The current close ties between China and Mozambique date back to the 1960s and China's support of Mozambique's struggle for independence. Since then, the two countries have continuously expanded their



economic and political relationship. In 2009, China invested USD 76.8 million in Mozambique making it the second largest foreign investor behind South Africa. The trade volume between China and Mozambique amounted to USD 442.7 in 2008 marking a 48% increase from the previous year. Chinese imports of Mozambican oil-producing seeds, wood and chrome have increased the trade volume. Mozambique's imports from China mainly comprise manufactured products, vehicles and parts as well as electrical equipment. Around 30 Chinese companies are engaged in the construction of larger infrastructure projects in Mozambique, most importantly the construction and refurbishing of water supply systems as well as construction of water infrastructure like the bridge *Ponte da Unidade* connecting Mozambique and Tanzania.

Following China's focus on water technology and infrastructure, its most visible role in Mozambique's power sector has been the China Ex-Im Bank's financing of the 1500 MW Mphanda Nkuwa hydropower plant on the Zambezi River and the connected transmission line to Maputo. China and Mozambique signed a corresponding Memorandum of Understanding in 2006, securing a soft loan of USD 2.3 billion for the funding of the project. Eventually, the construction and operation contract for Mphanda Nkuwa was awarded to a consortium without Chinese involvement consisting of two Mozambican developers, Electricidade de Moçambique (EDM) and Energia Capita, as well as the large Brazilian construction corporation Camargo Correa. The consortium is in charge of securing the funding for the project through a number of investors with the China Ex-Im remaining one of the major backers of the project. The cooperation between the China Ex-Im Bank and a construction consortium without Chinese involvement represents a new situation for Chinese investments in large African infrastructure projects, "indicating that China Ex-Im Bank is certainly developing its project financing methods according to the specific case at hand".⁶⁹

Question 6: What can China's involvement contribute to renewable energy development in Mozambique?

- China can act as financier and contractor of large hydropower projects.
- China can become an investor and developer of local off-grid renewable energy generation and distribution schemes.
- China can act as a player in the construction of electricity lines and infrastructure.
- China can serve as an exporter of corresponding renewable energy equipment.
- China can act as a partner in transmission grid expansion and upgrading.
- China is a potential future investor in domestic manufacturing capacity.
- China is a potential future investor in on-grid renewable energy generation.

With its engagement in the Mphanda Nkuwa hydropower plant, China has already entered Mozambique's large hydropower sector. Chinese investments in this field will probably be expanded in the future. China Ex-Im Bank has already expressed interest in financing the Moamba Major project that would supply both water and electricity to Maputo⁷⁰. Through the expansion of its already considerable large hydropower generation capacity, Mozambique hopes to further increase profitable power exports through the SAPP as well as to attract foreign and domestic investments in Maputo's industrial sector. Recommendations for Mozambique to manage the environmental and social costs of the Mphanda Nkuwa project and potential future large hydro projects with Chinese engagement will be discussed in Chapter 5.

Beyond investments in large hydro projects, China can potentially play a role in closing the investment and technology gap that prevents the emergence of widespread off-grid power generation in Mozambique. A Chinese engagement in localized renewable energy solutions would directly reflect some of the core objectives put forth in Mozambique's PARPA. The combination of China's overarching interests in

⁶⁹ WWF, *Patterns of Chinese investment, aid and trade in Mozambique*, 9 March 2010.

⁷⁰ Hydro World, Mozambique, China in talks on Moamba Major hydro project, 3 March 2007, http://www.hydroworld.com/index/display/article-display/articles/hrhrw/News/Mozambique_China_in_talks_on_Moamba_Major_hydro_project.html.



developing Africa's renewable energy sector and the particularly long-term horizon of Chinese companies' investment behaviour turn Chinese companies into promising partners for the development of this aspect of renewable energy expansion in Mozambique. Equally important is China's longstanding experience, which allows it to reflect on considerable successes in employing renewables in its own electrification efforts in rural and often extremely remote regions of China. Especially with regard to solar water heaters as well as wind powered water pumps, but also in local renewable energy grid projects, China's expertise corresponds directly with some of Mozambique's pressing energy challenges. Given China's propensity for modelling its engagement in Africa after its own successful development experiences, this combination of factors opens a strong perspective for China's involvement in Mozambican renewable energy based electrification efforts.

Similar to South Africa, Chinese exports of renewable energy products can provide inexpensive equipment for an emerging off-grid renewable energy sector. This can play a decisive role for the cost-effective expansion of renewable energy generation capacity. In the absence of any sizeable domestic manufacturing capacity for renewable energy equipment, concerns about the drawbacks of increasing competitive pressure through Chinese exports do not apply to the case of Mozambique at this point. Mozambique is less able to compete with South Africa in attracting Chinese companies' to establish domestic renewable energy production facilities. Whereas the country can offer a lower cost of labour, investors may prefer South Africa's advancement in manufacturing capability, technological abilities and educational assets. In 2009, plans for a Chinese investment in a solar panel production line company in Mozambique were reported, but the project has not yet materialized.

The funding of the transmission line from Mphanda Nkuwa to Maputo indicates another role China may play in the long-term development of Mozambique's power sector. In the past, China financed and constructed a number of transmission lines in African countries, often in connection with large hydropower projects. The development of China's domestic power transmission system has become one of the highest political priorities in China today, in view of China's ambitious plans for its own renewable energy expansion. China is investing a record USD 7.3 billion in smart grid development in 2010, making it the largest power grid investor worldwide. Given the similarity of its own distance related transmission problems to those in Mozambique, China's rapidly increasing experience in transmission technologies can benefit its African partners. This long-term perspective, reflecting the focus on transmission systems displayed in Mozambique's domestic energy strategy, underlines the potential benefits of engaging Chinese players in Mozambican power sector development.

4.3. Uganda

Uganda's power sector finds itself at a crossroads. With an installed capacity of below 600 MW and energy demand increasing by a projected 8.5% per year, Uganda faces the challenge of dramatically expanding its generating capacity in order to prevent undersupply from further choking economic development. Uganda's domestic power generation relies largely on two large hydropower plants (Nalubaale and Kiira on the Victoria Nile) in combination with a number of thermal power plants to manage peak demand. The thermal power plants, originally installed as emergency options for acute undersupply and fuelled with expensive imported oil from Kenya, have now become a standard source of Uganda's power supply, highlighting the situation of energy shortage. In addition, the concentration of generating capacity in the South poses a major obstacle to electrification efforts in other parts of the country due to the insufficiencies of the power transmission grid. In order to keep economic development going and increase the meagre electrification rate of 5%, major advances in generation as well as transmission and distribution will be necessary to turn Uganda's power sector from an obstacle into a guarantor of economic growth. On-grid and off-grid renewable energy, drawing on the country's vast hydro as well as solar power resources, can become valuable components of this transforming effort.

Question 1: What can Uganda gain from renewable energy?



- Expansion of generation capacity, primarily in hydro and solar power, can service the rapidly increasing demand and reduce the constant undersupply of energy, power shortages and load shedding from further choking economic development.
- Provision of an alternative way of adding generation capacity can complement the planned additional fossil fuel power plants (spurred by fossil fuel discovery at Lake Albert) and thereby slow the expected increases in CO₂ emissions.
- Renewable energy development can reduce the dependence on expensive fossil fuel imports until new domestic oil deposits are usable.
- Expansion of off-grid schemes and local grid solutions based on alternative renewable energy like wind, solar, biomass and small hydro can serve as a means to increase electrification in a sustainable manner.
- Localized renewable energy can reduce the use of off-grid diesel generators for electrification and, through solar thermal applications, decrease the dependence on fuel wood and charcoal.
- Use of renewable technology manufacturing can serve as a motor for industrial development and skilled-labour job creation.
- Diversification of the renewable energy portfolio can reduce one-sided dependence on large hydropower in the face of increasing volatility of hydropower availability.

While featuring many similarities regarding renewable energy, the most important distinction from Mozambique is that Uganda is not employing its hydropower potential to an extent that allows for relative supply security in the mid-term future. The situation of undersupply is thus much more acute in Uganda, requiring immediate and decisive action. Currently, the two medium-sized hydroelectric power plants Nalubaale (180 MW installed capacity) and Kiira (200 MW installed capacity) provide the majority of Uganda's generated electricity. The Bujagali hydropower plant (250 MW) planned to become operational in 2012, can provide some temporary relief, but will not supply enough additional capacity to solve the long-term demands of Uganda's energy sector. Further development of hydropower can play a central role in Uganda's capacity expansion. However, the development of additional hydro projects faces serious obstacles in terms of sufficient financing as well as technological difficulties.

The installation of additional capacity in the form of thermal power plant was intended as a temporary fix for the acute power shortages from 2005 to 2007, but has now become an integral part of Uganda's power supply. In the absence of domestic fossil fuel resources, these power plants have been fuelled by oil imported from Kenya at very large costs due to the expense of transport using inadequate transport infrastructure. The resulting high electricity price has increased the pressure for further reform of the Ugandan power sector. This situation, however, is likely to change now that significant deposits of crude oil, oil sands and natural gas have been discovered on the Ugandan side of Lake Albert. The Ugandan government has underlined its intention to exploit these deposits to the fullest even though they are located in the politically unstable region of the contested border with the Democratic Republic of the Congo, which might complicate the recovery of the resources. Domestic fossil fuel resources will certainly play an increasingly important role in Uganda's energy sector and somewhat dampen the immediate need for renewable energy development. Nevertheless, it remains advisable to explore the potential of renewable energy sources, especially hydropower, in order to provide sustainable and less politically sensitive options for the expansion of Uganda's generating capacity.

Solar and small hydropower in off-grid and local grid applications can increase the country's electrification rate in a sustainable manner. Similar to Mozambique, local electrification schemes can serve to raise living standards without additional emissions and fossil fuel depletion and to reduce reliance on diesel generators for local electricity generation. Solar thermal applications can complement local solution to reduce the unsustainable use of fuel wood and charcoal.

Major investments in Uganda's renewable energy sector can result in benefits for the country's industrial development and manufacturing sector providing a way of moving towards the production of higher skill-intensive goods. However, as in the case of Mozambique, while low labour costs represent an advantage



with regard to the lower-skill aspects of renewable energy manufacturing processes, existing industrial structures, infrastructure and human capital may not be able to compete with South Africa

Question 2: What are Uganda's national objectives and policies with regard to renewable energy?

- The 2007 *Renewable Energy Policy for Uganda* outlines ambitious goals and a policy framework for the period of 2007-2017.
- Uganda's strategy focuses on small and large hydropower as well as making the widespread use of biomass more sustainable.
- Concrete policies and financing mechanisms are still in an early stage and without significant practical impact to this point.
- Uganda is highly dependent on ODA for the financing of its renewable energy development.

Even though Uganda has not put forth official GHG reduction goals or NAMAs, it has developed a comparably comprehensive policy framework for renewable energy development. The backbone of this strategy is the 2007 Renewable Energy Policy for Uganda. In this document, the Ugandan government formulates the vision "to make modern renewable energy substantial part of the national energy consumption [and] to increase the use of modern renewable energy, from the current 4% to 61% of the total energy consumption by the year 2017." The policy outlines goals for the ten-year period 2007-2017, including the expansion of large hydropower from 380MW to 1200MW and small hydropower from 17MW to 100MW, the increase of households with access to electricity from 250.000 to 625.000, as well as the wide dissemination of improved wood and charcoal stoves as well as expansion of installed solar water heater area from 2.000 to 30.000m². The clear focus of Uganda's renewable energy strategy lies on the expansion of hydropower capacities, rural electrification through local grid solutions as well as making the use of biomass, accounting for about 90% of primary energy consumption, more sustainable. Building on the comprehensive liberalization of its energy sector in 1999, the Ugandan government has begun to devise policies for turning the outlined vision into reality:

- **REFIT and PPA:** The *Renewable Energy Policy for Uganda* created a standardized feed-in tariff for small hydropower as well as bagasse cogeneration power plants up to a maximum capacity of 20MW. In contrast to the South African regulation, these REFITs are backed up by a Power Purchasing Agreement ensuring their effectiveness. In January 2011, the REFIT programme was extended to include a wide range of renewable energy sources.⁷¹

⁷¹ Gipe, Paul, Uganda Launches Sophisticated Feed-in Tariff Program, <http://www.renewableenergyworld.com/rea/news/article/2011/01/uganda-launches-sophisticated-feed-in-tariff-program>, 20 January 2011.



Table 4: Uganda Renewable Energy Feed-in Tariff (REFIT)

Uganda Renewable Energy Feed-in Tariff (REFIT)					Cumulative Capacity Limits			
for 2011-2012					MW			
	Years	0.7632 €/kWh	1.02 CAD/kWh	1.000 USD/kWh	2011	2012	2013	2014
Wind	20	0.095	0.127	0.124	50	75	100	150
Solar PV	20	0.276	0.370	0.362	2	3	5	7.5
Geothermal	20	0.059	0.079	0.077	10	30	50	75
Landfill gas	20	0.068	0.091	0.089	10	20	30	50
Biogas	20	0.088	0.118	0.115	10	20	30	50
Biomass	20	0.079	0.105	0.103	10	20	30	50
Bagasse	20	0.062	0.083	0.081	20	50	75	100
Hydro >500 kW<1 MW	20	0.083	0.111	0.109	1	1.5	2	5
Hydro >1 MW<8 MW	20			Linear tariff	15	30	60	90
Hydro >9 MW<20MW	20	0.056	0.075	0.073	45	90	135	180
http://www.era.or.ug/Pdf/Approved_Uganda%20REFIT%20Guidelines%20V4%20%282%29.pdf								
Project size cap: <20 MW.								
Inflation adjustment based on O&M costs of tariff.								
Administered by Uganda's Electric Regulatory Authority (ERA).								

- **Subsidies and tax exemptions:** The *Renewable Energy Policy* mentions several funding mechanisms aimed at raising the economic feasibility and attractiveness of private renewable energy investments including tax exemptions and subsidies. While concrete financial incentive schemes are still under development, the focus of public financing lies on localized generation solutions aiding electrification of rural areas.
- **Investment facilitation:** Another envisioned mechanism to increase the attractiveness of renewable energy investments in Uganda is government accommodation of private sector loans. The Ugandan government plans to support renewable energy investors by hedging long-term borrowing through existing financial institutions like the Bank of Uganda's Refinancing Facility or the Ugandan Credit Support Facility.
- **Solar Power promotion:** Despite its abundance, solar power development does not play a major part in Uganda's renewable energy policy. Localized solar PV pilot projects like the Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE) were initiated and funded through international donors (UNDP-GEF). Solar thermal development is thus far limited to a pilot project to increase the number of SWH in Kampala.

For the realization of Uganda's ambitious renewable energy plans, the government estimates necessary funding for the 2007-2017 period to amount to approximately USD 3.5 billion. Of this amount only a very small portion will be provided through the Ugandan public budget. Instead, Uganda envisions covering more than USD 2 billion through private investments making extensive use of public private partnership arrangements. The largest portion of the remaining costs will need to be provided through international funds. With the exception of the Bujagali hydropower project submitted to the UNFCCC for CDM validation, Uganda's renewable energy sector has thus far not tapped into the financial resources provided by the CDM. The main source of public funds for the transformation of Uganda's renewable energy sector will therefore be ODA from donor countries and IFIs. Uganda is a highly ODA dependent country that received USD 1.65 billion in ODA in 2008 from more than 40 bilateral and multilateral development partners. The African Development Bank and the Worldbank in particular focused a significant portion of their funds on Uganda's power sector during the last decade (17% and 19% respectively). A large portion of these funds was channelled into the Bujagali hydropower project. Nevertheless, Uganda faces an enormous funding gap in public as well as private investments to reach its renewable energy targets.

Question 3: What are Uganda's strengths that can foster renewable energy development?

- Uganda has a liberalized power sector.
- Uganda possesses significant hydropower and solar power potential.
- Pilot projects for small-scale hydro, solar PV and solar thermal utilization have been implemented.



- Uganda features high overall FDI competitiveness in comparison to other African countries.
- Comparably advanced regulatory framework is in place.
- Renewable energy potential is integrated into political planning (Renewable Energy Policy for Uganda).

Despite recent fossil fuel discoveries, Uganda's hydropower potential will play a significant role in Uganda's energy sector development. If the environmental and social impacts of hydropower generation can be managed, it provides an attractive alternative for large-scale capacity expansion. In addition, the potential for small hydropower installations is estimated at around 210 MW⁷² and can serve as a valuable part of a larger strategy of renewable energy off-grid utilization, especially in the mountainous eastern and western parts of Uganda. Several small hydro projects have been implemented in the past, giving the country a head start and basis for a more comprehensive effort in this direction. The second building block of Uganda's renewable energy expansion can be solar power, which clearly represents a significant energy resource given Uganda's geographic location. In combination with small hydro solutions, solar power use in local grids has the potential to play a crucial role in Uganda's electrification efforts. However, while a number of pilot projects for off-grid solar PV and solar thermal applications have been implemented, solar power promotion is thus far not a priority in Uganda's renewable energy strategy.

As the comprehensive *Renewable Energy Policy for Uganda* as well as corresponding pilot projects show, the political strategy and regulatory framework for renewable energy development is comparably advanced in Uganda, constituting a major strength of its renewable energy sector. In combination with a liberalized power market, regulatory measures such as feed-in tariffs and power purchase agreements increase the profitability of renewable energy development and make investments, especially from foreign investors, more predictable. Uganda's prominent inclusion of renewable energy in its long-term energy policy planning provides important market signals for financiers, developers and manufacturers alike. Taking an overview of the broad economic investment climate, Uganda's 1987 economic reforms have fostered a period of economic growth and macroeconomic stability resulting in an increase in foreign direct investment. As a 2007 World Bank report on African FDI competitiveness notes, Uganda's "pro-business operating environment, with a government committed to promoting and empowering the private sector has made Uganda a primary attractor of FDI into Africa."⁷³

Question 4: What are Uganda's weaknesses restraining renewable energy development?

- Lack of domestic private investment and public funding due to budgetary constraints impedes renewable energy development.
- Insufficient technological expertise and project implementation capacity restrains renewable energy development.
- Profitability of power generation decreases through grid losses due to technological deficits, theft and significant problems with collecting payments from electricity consumers.
- Regional political and economic instability constrain investment activities.

Uganda's recent successes in attracting foreign direct investment countries are impressive. This is especially so given its geographic location in Africa's Great Lakes region that has been plagued with civil wars and trans-border conflicts for decades resulting in significant political and economic instability and unpredictability. However, the investment flows have primarily focussed on manufacturing⁷⁴ and have not yet been sufficiently channelled into Uganda's energy sector. The long-term character of energy sector investments and inflexible asset removal possibilities in case of unforeseen developments, make FDI decisions in the energy sector especially sensitive to political and economic instabilities. Continuing concerns about the entire region's future development and possible major disruptions of economic

⁷² GTZ, *Eastern Africa Energy Resource Base - Uganda Hydro*, 2010.

⁷³ World Bank Group, *Snapshot Africa: Uganda - Benchmarking FDI competitiveness*, January 2007.

⁷⁴ Main areas of FDI: beverages, sugar, textiles, cement, footwear, packaging, plastics and food processing.



conditions by violent conflicts make long-term investments in the energy infrastructure a risky endeavour. Few investors have been willing to take this risk.

In addition to regional instability, the internal weaknesses of Uganda's energy sector add to the investment gap. Little technological expertise and project implementation capacity in combination with a deficient energy infrastructure have resulted in major grid losses, serious problems with electricity theft and payment collection and an unfavourable investment climate. Unsurprisingly, Uganda has problems with attracting outside financiers for major energy projects like large hydropower installations. While Uganda exhibits a number of comparative advantages, especially regarding the formal regulatory framework for renewable energy development, the investment gap that impedes the renewable energy expansion in most African countries also applies to Uganda.

Question 5: What is China's current role in Uganda's energy sector?

- China is Uganda's biggest foreign investor with a strong focus on infrastructure projects.
- China is financing the expansion and development of Uganda's nascent oil infrastructure.
- Chinese financial institutions have shown initial interest in exploring potential large hydropower investments.

According to the Ugandan Investment Authority, China has become Uganda's biggest foreign investor during the 2009/2010 fiscal year with investments amounting to USD 245 million, creating 5,568 jobs. The focus of Chinese investments are large infrastructure projects like the Kampala-Entebbe highway project to be financed through approximately USD 350 million in preferential loans from the China Ex-Im Bank. The highway, connecting the capital to the international airport in Entebbe, represents part of China's intensifying support for the development of Uganda's oil infrastructure including plans for creating an oil transport corridors between Uganda, Kenya, and Sudan, easing the transportation of oil to China and elsewhere.

Throughout 2010, China gradually claimed its stake of the Lake Albert oil deposits. The emergence of China National Offshore Oil Corporation (CNOOC) as one of the developers of Uganda's new oil riches was preceded by a long-winded negotiation process with the Ugandan government and UK-based oil exploration companies Tullow Oil and Heritage Oil that owned the exploration rights to three blocks of the Lake Albert basin with an estimated oil deposit of more than one billion barrels. In July 2010, Tullow Oil bought out Heritage Oil and entered into an equal partnership with CNOOC and French oil company Total S.A. to jointly explore the deposit. The three companies are also planning to build an oil refinery in the western part of Uganda.

The discovery of the Lake Albert oil deposits has obviously increased China's interest in Uganda's energy sector significantly. Within a short period of time, China has become heavily involved in the development of Uganda's oil industry including the construction of corresponding transportation infrastructure. Given China's described propensity for all-encompassing energy deals, this growing involvement can also open opportunities for an intensified Chinese role in Uganda's renewable energy, and especially the hydropower sector. China has shown a general interest and willingness to play a part in Uganda's hydropower development. As early as 2005, the China Shang Sheng Industrial Company expanded a 1MW small hydropower plant at Kikagati into a 20MW installation. Unsubstantiated reports claim a Chinese interest in financing of the planned 600MW large hydropower station in Karuma, which thus far has not succeeded in attracting foreign investments due to the economic risk and technological difficulties of the project.

Question 6: What can China's involvement contribute to renewable energy development in Uganda?

- China can serve as financier and contractor of large hydropower projects.
- China can act as investor in local off-grid renewable energy generation and distribution schemes.



- China can expand its role as an exporter of renewable energy equipment.
- China can become a partner in transmission grid expansion and upgrading.
- China can be a potential future investor in domestic manufacturing capacity.

The specific approach of Chinese companies to foreign direct investment in Africa opens opportunities for Uganda's energy sector development. The strategic interests, long-term horizon and political backing that shape Chinese companies' investment decisions give Chinese investors a considerably higher tolerance regarding risk of short term disruptions, or, as an energy analyst from South Africa's Standard Bank states, a higher "risk appetite than Western companies".⁷⁵ In combination with China's expertise and propensity for large hydropower projects, Chinese financiers, builders and operators can potentially play a decisive role in using Uganda's hydropower resources. Hydropower development along the Ugandan Nile, generating run-of-the-river hydroelectricity, is technically demanding and therefore economically risky, making Chinese developers more likely to invest than Western counterparts. There have been unsubstantiated reports claiming that Chinese financial institutions have shown increasing interest in investments in large hydro sites in Uganda. Given China's tendency for resources-for-infrastructure deals with regard to large hydro installations, Uganda's newly discovered fossil fuel deposits and China's role in their exploration may open an opportunity for an intensified Chinese engagement in Uganda's renewable energy sector as well.

Beyond potential investments in large hydro projects, China's role as a catalyst in Uganda's renewable energy development as pertaining to local grid solar and small hydropower applications is similar to the above case of Mozambique. China's own entrepreneurial motives can serve as a starting point for Chinese investment in the expansion of renewable energy generation as well as renewable energy equipment manufacturing in Uganda. As in Mozambique, inexpensive exports of Chinese renewable energy products may play a central role in increasing renewable energy profitability during the initial stages of this development. Uganda's development as a potential economic hub in East Africa and especially the rising investment flows into the country's expanding, albeit low-tech, manufacturing sector provide a basis for Chinese engagement in Uganda's renewable energy product manufacturing. Given advancements in logistic infrastructure, Uganda may develop a long-term potential to become a manufacturing hub for renewable energy equipment in the larger region of East Africa in future decades.

⁷⁵ Paul Eardley-Taylor, Head of Energy, Utilities & Infrastructure Coverage, Standard Bank.



5. Findings and recommendations

The primary addressees of the recommendations in this chapter are African countries aiming at maximizing the benefits of China's involvement for their domestic renewable energy expansion. Secondly, the recommendations are also intended for governmental, business and civil society actors in OECD countries, such as the World Wildlife Fund, who want to support African countries' efforts in renewable energy expansion. Ultimately, most of the concrete measures presented in this chapter will have to be implemented by African governments with OECD actors playing an assisting role.

SWOT analyses from the perspective of China as well as the African countries will serve as a summary of the general findings. Based on this, the specific recommendations for South Africa, Mozambique and Uganda will identify the strategic focus areas where the interests and expectations of China and the respective African country overlap and then outline policy measures to maximize the benefits in the areas of converging interests.

While the presented recommendations are geared towards influencing China's investment behaviour, policies will of course have to be non-discriminatory towards other international trade and business partners. Therefore, recommended rules and regulations, e.g. trade stipulations, will of course have to apply equally to companies from other countries.



Figure 3: SWOT from China's perspective



Figure 4: SWOT from Africa's perspective



Figure 5: SWOT from OECD perspective

5.1. Recommendations: South Africa

The primary area of overlapping interests and capabilities between China and South Africa with regard to renewable energy is **equipment manufacturing**. The engagement of Chinese renewable energy equipment manufacturers can serve as a catalyst for South Africa's own industrial development and skilled-labour job creation. Complementing the area of industrial development, both countries can benefit from Chinese investments in **renewable energy generation** capacity, creating the necessary demand for both China's entrepreneurial aspirations and South Africa's emerging equipment manufacturing industry. The investments in renewable energy generation can be geared towards South Africa's **electrification efforts**, primarily focusing on off-grid and on-grid solar PV as well as solar thermal power in accordance with South Africa's renewable energy strategy.

Increase South Africa's attractiveness for foreign (Chinese) engagement in its renewable energy sector:

1. **Improve regulatory framework as the basis for economically feasible and attractive renewable energy investments:** The main building blocks of a regulatory framework accommodating renewable energy investments are already in place in South Africa and ambitious official renewables targets serve as market signals. In order to turn this framework into an effective policy tool, South Africa should implement a mandatory Power Purchasing Agreement for renewable energy, enabling the market entry of IPPs and breaking the monopolistic position of Eskom. In the midterm, this can serve as a first



important step towards further power sector liberalization, removing barriers to outside renewable energy investments.

Promote the strengths of China as a partner in South Africa's renewable energy development:

2. **Stimulate the emergence of business-to-business (B2B) partnerships in renewable energy equipment manufacturing:** Creating a network of B2B partnerships, especially between Chinese and African renewable energy equipment manufacturers, can serve as the starting point for industrial development in South Africa. The administration can promote the creation of joint ventures by removing bureaucratic obstacles and designing favourable tax structures for FDI. The South African DoE can also provide information services to businesses thus simplifying the matching of suitable business partners (e.g. as a branch of the REFSO). Technology licensing, allowing South African companies to use Chinese technology for solar panels, water heaters or wind turbines, is another promising way of B2B cooperation that increases technology and best practice transfers. A powerful tool for generating B2B networks can be the establishment of “overseas economic zones” (China’s OEZs are already implemented in several countries) that put foreign (Chinese) and local manufacturers in close proximity and encourage the creation of joint manufacturing clusters. In order to be non-discriminatory, rules and regulations geared towards promoting Sino-South African B2B relations will have to equally apply to companies from other countries.
3. **Design a balanced trade policy for renewable energy equipment imports:** Imports of inexpensive renewable energy equipment, especially from China, increases the profitability and price-competitiveness of renewable energy. Therefore, a trade policy that abstains from levying trade barriers such as tariffs, quotas or NTBs on renewable energy equipment is advisable. While benefits from particularly inexpensive Chinese equipment will be especially high, trade rules have to be non-discriminatory towards other importers under WTO regulation. However, during the initial phase of developing domestic manufacturing capabilities, the additional competitive pressure from inexpensive Chinese products can be detrimental to South Africa’s renewable energy industry. South Africa should monitor the development of import, demand and domestic supply closely in order to devise a balanced approach to Chinese imports. The joint creation of local manufacturing capabilities will mitigate the negative effects from imports. In addition, South Africa can consider using instruments like *local content requirements* to protect fledgling domestic industry if necessary.
4. **Promote R&D cooperation in renewable energy technology between universities and technology research institutions:** Sino-South African R&D cooperation in the academic sphere, e.g. through university partnership programmes etc., can provide the groundwork for deepening business relations. It also adds to the education of a specialized workforce. The administration can promote the emergence of R&D partnerships by providing corresponding financial incentives and organizational support to South Africa’s academic institutions.

Mitigate the weaknesses of China as a partner in South Africa's renewable energy development:

5. **Regulate the set-up of Sino-South African business-to-business partnerships in order to maximize the benefits of China’s involvement on South African domestic industrial development:** In order to ensure benefits for its domestic industrial development, South Africa should guarantee that Chinese manufacturers are integrated into local economic structures. Instruments to achieve economic integration include rules/incentives that favour the set-up of Chinese production capacity as joint ventures with African partners; specific requirements for knowledge sharing, technology transfer and training of local employees; incentives for local employment in Chinese production sites with a specific focus on local workers in responsible positions; and industry clusters with a balanced presence of Chinese and local companies. South Africa could also consider implementing a local content requirement mandating the partial local manufacturing of equipment entering the domestic market. All



of these instruments will have to be carefully balanced against their negative effects on South Africa's attractiveness as a manufacturing location.

Adapt South Africa's capabilities and conditions to reap the full benefits from China's engagement:

6. **Invest in local capabilities and conditions necessary to utilize the positive effects for domestic industrial development:** In order to maximize benefits from Chinese technology and knowledge transfer, South Africa should consider investments in its domestic manufacturing infrastructure. Furthermore, South Africa can expand its specialized education, such as engineer training, in order to provide a well-educated work force that can fill responsible positions in Chinese production sites and act as recipients of knowledge and technology transfers.
7. **Reconsider the cost-benefit calculation of domestic renewable energy investments in light of industrial development potential:** The stimulation of Chinese investment will require some degree of investments from the South African side financing incentive structures for the initial phase of renewable energy development. South Africa should therefore reconsider its domestic cost-benefit calculation and budgetary priorities with regard to renewable energy in light of the opportunities for industrial development and economic growth that arise from increasing Chinese investments. South African policy makers should acknowledge renewable energy subsidies and tax exemptions as strategic investments in South Africa's long-term economic growth. In order to factor the benefits of renewable energy expansion into the policy decision making process, more detailed assessments of the corresponding economic potential are necessary.



Recommendations South Africa: International NGOs could provide:**Advocacy:**

1. Advocate and illustrate the benefits of renewable energy development and the necessity of a functioning regulatory framework to South African policy makers.
2. Provide advocacy and analysis demonstrating alternatives to a purely coal-based power sector.

Capacity Building:

3. Initiate knowledge transfer and capacity building regarding design and implementation of regulatory measures and renewable energy policies.
4. Provide assistance with formulating South Africa's NAMA strategy as well as corresponding MRV instruments.
5. Share best practices with regard to the design and implementation of voluntary tradable certificate schemes to improve South Africa's Tradable Renewable Energy Certification (TREC).

Information:

6. Provide assessments of renewable energy equipment manufacturing as a motor of South Africa's industrial development and economic growth, illustrating the potential economic returns of corresponding public investments.
7. Provide assessments of future renewable energy equipment export potential in Africa.
8. Advise on the expansion of Clean Development Mechanism (CDM) financing for renewable energy projects.

In addition to these measures, developed country governments could offer:**Financial Assistance:**

2. Make available financial products that support alternatives to a purely coal-based power sector, either bilaterally or through International Financial Institutions.
3. Support the expansion of Clean Development Mechanism (CDM) financing for renewable energy projects.
4. Provide NAMA financing, for example through direct funding as well as technological support and capacity building for the South African Renewables Initiative (SARi).
5. Set up favourable (soft) lending schemes to support the necessary infusion of funds to support South African planned renewable energy investments.
6. Offer financial support for targeted capacity building in the renewable energy industrial sector: education, technological advancement, manufacturing infrastructure.
7. Grant budget support to existing renewable energy incentive structures (subsidies, tax exemptions).
8. Provide targeted finance of pilot projects in the area of localized renewable energy solutions for rural electrification.

5.2. Recommendations: Mozambique

China's and Mozambique's interests with regard to renewable energy most clearly meet in the area of **large hydropower development** in combination with resource-backed loan and investment arrangements. In addition, especially in light of an emerging Sino-South African partnership on equipment manufacturing



and export, it is in both countries interest to expand **off-grid renewable energy applications** in Mozambique, creating additional demand for Chinese products as well as increasing Mozambique's electrification rate of a sufficient transmission system. In the long-term, cooperation in **transmission system expansion** might be an additional area of complementary interests.

Increase Mozambique's attractiveness for foreign (Chinese) engagement in its renewable energy sector:

1. **Design a regulatory framework that increases predictability and economic attractiveness of investments in localized renewable energy solutions:** Mozambique's regulatory framework for renewable energy development is still in its infancy. As a first step, the Mozambican government should pass and implement the currently negotiated Renewable Energy Policy Strategy (REPS). On the basis of this strategy, Mozambique can then begin to design building blocks of a comprehensive regulatory framework for renewable energy promotion.

Promote the strengths of China as a partner in Mozambique's renewable energy development:

2. **Explore possibilities for China's continuous involvement in large hydropower development:** Building on a strong Chinese involvement in Mozambique's infrastructure construction and given China's engagement in the Mphanda Nkuwa project, opportunities for further Chinese engagement in large hydropower development certainly exist. Negotiations regarding the Moamba Major project underline this dynamic. Mozambique should explore these opportunities in light of its domestic needs and export ambitions as well as with regard to social and environmental costs. A careful case-by-case assessment of the opportunities and downsides of larger infrastructure deals and resource-backed financing will be necessary.
3. **Adopt liberal trade rules to boost imports of renewable energy equipment, not only but especially from China:** The benefits from inexpensive Chinese equipment imports, increasing profitability and price-competitiveness of renewable energy generation, are the same as in South Africa. However, in the absence of sizeable domestic manufacturing capacity, the negative effects of competitive pressure do not apply to Mozambique. While benefits from particularly inexpensive Chinese equipment will be especially high, trade rules have to be non-discriminatory towards other importers under WTO regulation.
4. **Establish bilateral (non-discriminatory) agreements with China's government and Chinese companies to locate manufacturing capacity in Mozambique:** The comparative advantage of low labour costs might serve as an incentive to locate certain low-tech elements of Chinese equipment manufacturing in Mozambique.
5. **Involve China investments in the implementation of the renewable projects executed by the Mozambique Energy Fund (FUNAE):** The ongoing pilot projects implemented by FUNAE provide a promising starting point for drawing Chinese investments to localized renewable energy schemes and rural electrification efforts.
6. **Explore specific lending schemes for renewable energy projects with China's government and financial institutions.**
7. **Consider long-term opportunities for Chinese investments in Mozambique's power transmission system:** Building on China's construction of the transmission line from Mphanda Nkuwa to Maputo as well as China's involvement in several other African transmission line construction projects (e.g. in Angola, Sudan and Senegal) Mozambique should consider possibilities to include transmission system expansion into future infrastructure deals with China.



Mitigate the weaknesses of China as a partner in Mozambique's renewable energy development:

8. **Strengthen domestic regulation on environmental and social standards for project implementation:** The guidelines on social and environmental standards put forward by the China Ex-Im Bank provide Mozambique with a starting point for managing undesired impacts of large hydropower projects. The guidelines stress the primacy of the host country's domestic legislation with regard to project implementation. Mozambique should therefore revise its domestic stipulations on infrastructure guidelines to include adequate assessment of indirect costs as well as proper procedures of monitoring, reporting and public consultation. Existing international stipulations like the World Commission on Dams (WCD) guidelines can serve as a blueprint for these efforts. At the same time, Mozambique should increase domestic capacity to conduct comprehensive impact assessments for large hydro projects and expand domestic monitoring and verification capacities to enforce legal requirements.
9. **Actively cooperate with China's financial institution (especially China Ex-Im Bank) on the enforcement of standards vis-à-vis Chinese construction companies:** The Mozambican government should cooperate closely with China's loan-providing institutions in order to enforce adherence by Chinese companies. Given the growing attention China's political actors pay towards negative reputation effects, China's financial institutions can become powerful partners in standards enforcement.
10. **Pursue a strategy of high transparency with regard to project implementation, using the reputation lever to ensure standards adherence by Chinese companies:** Mozambique has a spectrum of naming and shaming instruments at its disposal to enforce regulation vis-à-vis Chinese counterparts. Positive reinforcement of standard adherence through public acknowledgement can complement Mozambique's approach to Chinese construction firms.

Adapt Mozambique's capabilities and conditions to reap the full benefits from China's engagement:

11. **Demonstrate feasibility of localized renewable energy solution through pilot projects:** Building on first experiments with off-grid solar PV, small hydro and wind power, Mozambique could implement further pilot projects of localized renewable energy solutions. Successful pilot projects would demonstrate the feasibility of renewable energy solutions and thereby increase the political incentives for creating a comprehensive regulatory framework. At the same time, pilot projects can serve to create the experience and technological expertise necessary for the roll-out of a more comprehensive localized renewables strategy.



Recommendations Mozambique: International NGOs could provide:

Advocacy:

1. Act as a mouthpiece for the Mozambican government in case of standards violations by Chinese companies to increase national and international public pressure and reputation costs.
2. Advocate and illustrate the benefits of renewable energy development and the necessity of a functioning regulatory framework to Mozambican policy makers.
3. Advocate for the adoption of Mozambique's Renewable Energy Policy Strategy as well as NAMA policies and provide assessments of envisioned measures.

Capacity Building:

4. Share best practices with regard to the design of specific social and environmental standards for large hydropower projects on the basis of existing international principles.
5. Provide capacity building for monitoring and enforcement of social and environmental standards.
6. Initiate knowledge transfer and capacity building regarding design and implementation of regulatory measures and renewable energy policies.
7. Support Mozambique in defining a NAMAs strategy, identifying sectors and pilot projects and funding actions required to implement the NAMA.

Information:

8. Monitor large hydropower project implementation, providing independent assessments and recommendations for social and environmental costs reduction.
9. Advise on the expansion of CDM financing for renewable energy projects.
10. Support Mozambique in the identification of most promising NAMAs sectors and measures and on how to access international climate finance.

In addition to these measures, developed country governments could offer:

Financial Assistance:

1. Provide co-financing to existing multilateral programs to accelerate access to energy and the expansion of renewable energy in Mozambique (e.g. the World Bank's "Energy Development and Access Project for Mozambique").
 2. Support the expansion of Clean Development Mechanism (CDM) financing for renewable energy projects.
 3. Set up favourable (soft) lending schemes to support the necessary infusion of funds to support planned renewable energy investments.
 4. Join forces with other developed countries already supporting Mozambique in the development of renewable energy, increasing impact through common projects and strategies.
 5. Seek comparable partnerships with Chinese governmental actors and financial institutions.
 6. Integrate specific credit lines and lending mechanisms for renewable energy development in Mozambique into the portfolio of national development financing institutions (KfW etc) and environmental funds (Fond Français pour l'Environnement etc)
 7. Provide targeted finance of pilot projects in the area of localized renewable energy solutions for rural electrification, either bilaterally or through multilateral mechanisms.
 8. Grant budget support to future renewable energy incentive structures (subsidies, tax exemptions).
-



5.3. Recommendations: Uganda

Areas of complementary interests between China and Uganda with regard to renewable energy development are similar to the case of Mozambique. Opportunities for sizeable renewable capacity expansion can be found in the **large hydropower development**. Uganda's existing regulatory framework for renewable energy development provides it with a head start with regard to **off-grid renewable energy applications** to reach its ambitious electrification goals in the absence of a sufficient transmission system. In the long term, given Uganda's current economic trajectory, cooperation in **equipment manufacturing** might be an additional area of complementary interests.

Increase Uganda's attractiveness for foreign (Chinese) engagement in its renewable energy sector:

1. **Expand and capitalize on the existing regulatory framework for renewable energy development:** Uganda has the significant advantage of a comprehensive regulatory framework for renewable energy promotion. Uganda should capitalize on this advantage by meticulously implementing existing stipulations and communicating the investment incentives to potential renewable energy investors. In addition, Uganda should build on the existing framework and consider additional incentives, for example targeted capital subsidies or tax exemptions.
2. **Reconsider political priorities in light of potential Chinese involvement in solar power expansion:** Creating demand for solar power equipment (PV as well as thermal) is one of the drivers behind China's engagement in Africa's renewable energy sector. Given the potential for solar power in Uganda and the opportunities for increased Chinese investment in this sector, the government could consider adjusting the current priorities of its Renewable Energy Policy and putting greater emphasis on solar power development.

Promote the strengths of China as a partner in Uganda's renewable energy development:

3. **Explore possibilities for China's continuous involvement in large hydropower development:** In contrast to Mozambique, Uganda cannot build on longstanding Chinese involvement in the country's infrastructure sector. However, the evolving Chinese engagement in Uganda's oil sector opens opportunities for larger package deals that include hydropower development. China's rumoured interest in financing planned hydro projects in Uganda also points to this possibility. As Mozambique, Uganda should explore these opportunities in light of its domestic needs as well as with regard to social and environmental costs. A careful case-by-case assessment of the opportunities and downsides of larger infrastructure deals and resource-backed financing will be necessary.
4. **Adopt liberal trade rules to boost imports of renewable energy equipment, not only but especially from China:** As long as no domestic manufacturing capability for renewable energy equipment exists, Uganda can follow the non-discriminatory trade policy as outlined for the case of Mozambique – see paragraph 5.2.

Mitigate the weaknesses of China as a partner in Uganda's renewable energy development:

5. **Strengthen domestic regulation on environmental and social standards for project implementation:** Regarding the management of detrimental social and environmental effects of large hydropower projects, Uganda can follow the same approach as Mozambique – see paragraph 5.2.
6. **Actively cooperate with China's financial institution (especially China Ex-Im Bank) on the enforcement of standards vis-à-vis Chinese construction companies:** Regarding the management of detrimental social and environmental effects of large hydropower projects, Uganda can follow the same approach as Mozambique – see paragraph 5.2.



7. **Pursue a strategy of high transparency with regard to project implementation, using the reputation lever to ensure standards adherence by Chinese companies:** Regarding the management of detrimental social and environmental effects of large hydropower projects, Uganda can follow the same approach as Mozambique – see paragraph 5.2.

Adapt Uganda's capabilities and conditions to reap the full benefits from China's engagement:

8. **Demonstrate feasibility of localized renewable energy solution through pilot projects:** The same opportunities for and benefits of pilot projects apply as in the case of Mozambique - see paragraph 5.2.
9. **Consider long-term investments in advanced manufacturing capabilities and human capital to prepare for the potential emergence of a renewable energy equipment industry:** In light of Uganda's economic trajectory and ability to draw significant outside investments to its manufacturing sector, its political leadership might consider creating domestic renewable energy equipment manufacturing in the long-term. Preparations for such a long-term strategy would entail investments in advanced manufacturing capabilities and specialized human capital. However, the potential and feasibility of this strategy will have to be assessed in great detail before taking corresponding steps.



Recommendations Uganda: International NGOs could provide (see also recommendations for Mozambique):

Advocacy:

1.-2. Publicize standards violations by Chinese companies and advocate a functioning regulatory framework for renewable energy development.

Capacity Building:

3.-4. Support Uganda with the design, monitoring and support of social and environmental standards for large hydropower projects.

5.-6. Provide assistance with the design and implementation of regulatory measures and the formulation of the Ugandan NAMA strategy.

Information:

7.-8. Monitor large hydropower project implementation, support social and environmental costs reduction, and advise on the expansion of CDM financing for renewable energy projects.

In addition to these measures, developed country governments could offer: (also see recommendations for Mozambique)

Financial Assistance:

1.-3. Provide co-financing to existing multilateral programs, and set up alliances for renewable energy development and financing with other developed countries as well as emerging economies like China.

4.-5. Support CDM expansion for renewable energy projects and provide favourable (soft) lending schemes for renewable energy investments.

6.-7. Design lending mechanisms for renewable energy development and integrate credit lines into the portfolios of national development banks and environmental funds.

8.-9. Provide targeted finance of pilot projects for rural electrification and budget support to future renewable energy incentive structures (subsidies, tax exemptions).

5.4. Recommendations for China and actions vis-à-vis China

Chapter 2 outlines the motives that lie behind China's intensifying interest in Africa's renewable energy market and provide the potential benefits that might lead China to increase its investments in this field. China can actively seize the corresponding opportunities while being conscious of possible threats. International NGOs and OECD countries have the chance to facilitate this process not only by supporting African countries as described in sections 5.1. to 5.3., but also by engaging China directly.

China:

1. Acknowledge and act on the opportunities of an engagement in Africa's renewable energy sector for China with regards to expanding its renewable energy manufacturing industry, securing resource supply flows, gaining international reputation and mitigating climate change.
2. Realize these benefits by a significant increase in investments and business activities in Africa's renewable energy sector.



3. Balance the preminent entrepreneurial and resource motives with a stronger focus on reputational gains and climate protection.
4. Be aware of the potential economic and political backlash connected to the disregard of social and environmental standards when engaging in Africa.
5. Understand and use adherence to internationally accepted standards as well as ensuring real benefits to African countries as a way to support Chinese companies going global strategy and establish Chinese companies as international brands.
6. Encourage African countries to work towards improving the investment environment and regulatory framework in the renewable energy sector by expressing general interest in renewable energy investments.

International NGOs vis-à-vis China:

7. Make the case towards China of how beneficial increased Chinese investments can be in the four discussed dimensions.
8. Substantiate this claim by further and more specific studies on the beneficial effects of Chinese renewable energy investments in Africa for China.
9. Increase reputation benefits that China can derive from sustainable renewable energy engagement in Africa through public acknowledgment of successful examples.
10. Offer support to China in expanding and improving environmental and social guidelines for international investments as a unique opportunity to further environmental objectives in China as well as Africa.

OECD governments/businesses vis-à-vis China:

11. Increase reputation benefits that China can derive from sustainable renewable energy engagement in Africa through public acknowledgment of successful examples.
12. Try to engage China in Sino-African-OECD triangular business partnerships in the renewable energy sector in order to facilitate investments, improve standard adherence and mitigate the costs for OECD companies deriving from increasing competition.
13. Consult with China on possibilities for cooperation on the project as well as the broader strategic level based on a shared interest in expanding and developing Africa's renewable energy sector.



Annex I Background South Africa

Background

South Africa is the wealthiest country in Africa located at the southernmost part of the continent, having a population of 50 million with a slightly declining growth rate of -0.05%.⁷⁶

South Africa has the continent's biggest economy, although the country went into recession in 2009 following a sharp slowdown in the mining and manufacturing sectors. However, the construction industry has benefited from a huge programme of government investment for the 2010 World Cup.⁷⁷ The GDP per capita is USD 10,300, though declining with -1.8% in 2010.⁷⁶ Despite its wealth, many South Africans remain poor and unemployed. Land redistribution is an ongoing issue. Most farmland is still white-owned. The government aims to transfer 30% of farmland to black South Africans by 2014.⁷⁷

South Africa is highly dependent on fossil fuel and the industry is energy and emission intensive. In 2005, South Africa was responsible for about 1.1% of global emissions and about 18% of emissions in sub-Saharan Africa.⁷⁸ Per capita, in 2005, South Africa produced 9.2 tonnes of CO₂ which is high compared to the sub-Saharan and the global average of 3.2 and 6.8, almost equal to the European average of 10.9.⁷⁹ Water supply is a particularly vulnerable element with respect to climate change and desertification may also be worsening as it is already a widespread issue in the country.

The Power Sector

The South African power sector is a crucial part of the country's economy and contributes most to the GHG emissions. The power sector is dominated by two state-owned enterprises, Eskom and Sasol. Both companies focus on fossil fuel technologies. Eskom produces almost all electricity in South Africa (95%) and owns/operates the national transmission system.⁸⁰ The share of the private sector in the South African energy sector is only 2%.⁸¹ Sasol is a large petrochemical industry and mainly supplies fuels for transport and industry.

The primary energy source used in electricity production is coal (86%), followed by nuclear energy (5%) and various other sources, including renewable energies such as hydropower (Figure 5). South Africa has abundant coal resources of poor quality, resulting in very low efficiency and a high emission factor. South Africa has the world's sixth largest recoverable coal reserves estimated at almost 50 billion tonnes.⁸¹ The total installed power capacity in South Africa is nearly 40GW and Eskom is operating at nearly full capacity: peak demand is currently about 36 GW, giving a narrow reserve margin of about 10%.⁸² Power shortage in early 2008 resulted in load shedding which caused economic damage of between USD 253 and 282 million.⁸¹

⁷⁶ CIA, The World Factbook, South Africa (2010)

⁷⁷ BBC South Africa Country Profile (2010)

⁷⁸ World Resource Institute (WRI), Annual Report (2010)

⁷⁹ Decarbonizing South Africa? Globalics 8th international conference (2010)

⁸⁰ Prospects for renewable energy in South Africa: mobilizing the private sector / Anna Pegels. – Bonn : DIE, 2009

⁸¹ The US Energy Information Administration 2008 (US EIA 2008)

⁸² Department of Minerals and Energy, Renewable Energy Directorate, 2008 (DME 2008), Implementation progress for the first five years of the renewable energy white paper

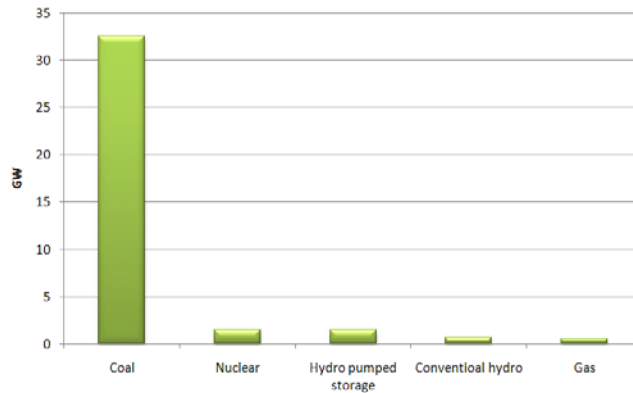


Figure 5. Power mix in South Africa⁸¹

The country has plans to enhance energy efficiency and develop the application of renewable energy. The two major barriers towards the development of renewable energy technologies in South Africa are the high investment costs of renewable energy technologies and the monopoly operational structure within the power sector.⁸¹ As most of the renewable energy technologies are in early stages of development, they have not yet realized their full financial feasibility and continue to entail a higher risk than established technologies.⁸²

To overcome these barriers, the South African government has introduced several renewable energy support measures, such as a Renewable Energy Feed-In Tariff (REFIT). This scheme in theory is very promising but entails a crucial flaw: Eskom functions as the sole buyer of electricity generated from power producers and is responsible for the distribution while is not obliged by law to buy the generated renewable electricity from the producers. This is in raw contrast to the mission of REFIT that intends to facilitate renewable energy production. Capacity in renewable energy is lacking at every stage of the technology cycle, from research and development to installation and maintenance.

Power Demand. Before the apartheid regime collapsed in 1990's the grid operated by Eskom had excess power capacity due to a low selective electrification rate. In 1994 only 36% of the South African households had access to electricity. This trend changed due to the democratic government's massive electrification programmes which caused the electrification to rise up to 72% in 2004. The goal was to achieve 100% coverage by 2012. However, during this period the power capacity of the national grid has not grown proportionally. Following industrialisation and increasing demands of the households the country will need 80 GW capacity by 2025 which is more than double compared to 2010 level (40 GW).⁸³ In terms of electricity consumption, industry and residential sectors have the largest shares (Figure 7). In terms of overall energy consumption including heat and power, industry has the largest share of energy consumption followed by transport (Figure 6).

⁸³ Prospects for renewable energy in South Africa: mobilizing the private sector / Anna Pegels. – Bonn : DIE, 2009

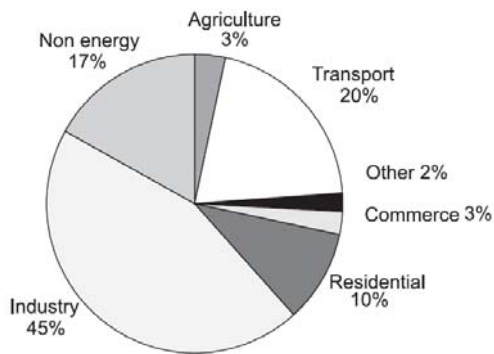


Figure 6. Share of energy consumption by different sectors in South Africa (2000).⁸⁴

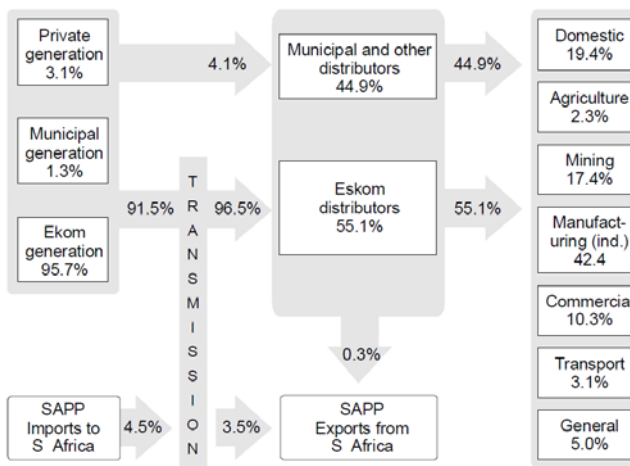


Figure 7. Electricity supply and demand flow in South Africa (2001).⁸⁴

Electricity Demand Projection: The demand in electricity consumption is assumed to increase by between 2% and 3% per year (Figure 8). Based on this assumption the electricity demand in South Africa in 2025 will range between 300,000 to 375,000 GWh per year which is more than double compared to 2000 figures.

⁸⁴ Energy policies for sustainable development in South Africa, Options for the future, Energy Research Centre, University of Cape Town, April 2006

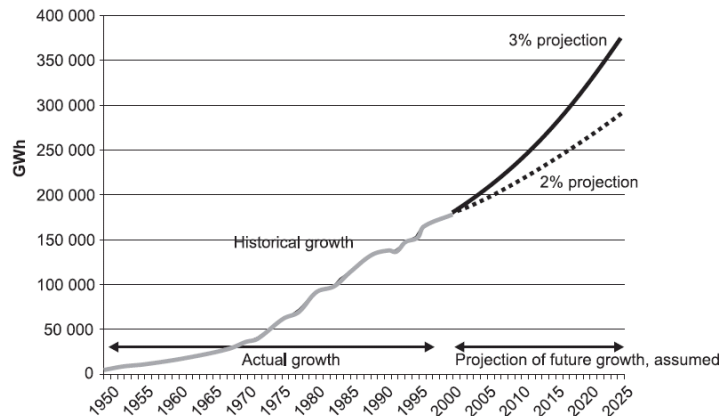


Figure 8. Electricity demand projection for South Africa (2001).⁸⁴

Power Development Difficulties: In 2008 the Department of Minerals and Energy together with Eskom published an energy policy paper called “national response to South Africa’s electricity shortage”. The paper focused on the supply side to add 2.4 GW new capacity to the grid by introducing two new coal powered stations and exploration of co-generation and renewable energy options. Through behavioural programs, penalties and positive incentives on the other hand, Eskom aimed at reducing the demand by nearly 3 GW by 2012 followed by 5 GW by 2025.⁸⁵

The South African electricity sector faces four major problems:

- Electricity undersupply, and outdated operational structure, resulting in a narrow reserve margin and power shortages;
- Demand being doubled within the next 15 years;
- High emission intensity of the South African economy, especially the electricity sector, which results in enormous local and global environmental damage;
- the power sector in South Africa is underfunded;

Renewable Energy Sector

Theoretically South Africa has an enormous potential for renewable energy. The major renewable resources in South Africa are solar, renewable biomass and wind power followed by hydro and organic/renewable waste. Total renewable power capacity in the country is estimated up to 280 TW which is 6,500 times more than the currently installed power capacity of 43 GW.⁸⁶ Solar power in the country alone can generate up to 2,300 million GWh while the final consumption in South Africa in 2000 was 0.16 million GWh.⁸⁶

Solar photovoltaic: Up to 200,000 households in South Africa are already using solar photovoltaic systems. In spite of the huge potential, due to high investment costs, the installed capacity in this sector remains low at around 12 MW. South Africa is expecting to supply 14% of its electricity through these systems by 2050.⁸⁷

Solar thermal: Solar water heaters have been used in South Africa on the roofs of thousands of households. However, the potential has not been exploited sufficiently. It is expected that 43 TWh of heat will be replaced by solar heaters by 2030. Solar thermal power for electricity generation has not yet been practiced

⁸⁵ Prospects for renewable energy in South Africa: mobilizing the private sector / Anna Pegels Bonn : DIE, 2009

⁸⁶ Renewable energy policy in South Africa: policy options for renewable electricity, H. Winkler (2005)

in South Africa while the potential is estimated to be high at around 65 GW.⁸⁷ In 2008 Eskom launched a programme to support large scale solar water heater producers.⁹¹

Solar heaters: South Africa has ample potential for solar water heaters (SWH) and already many households are using this technology. The South African solar water heating industry had not yet tapped into this potentially huge market. Since 1999, with USAID support, Winrock's South Africa REPSO has taken a gradual approach to bridging these gaps. The department of energy has committed to the roll out of 1 million SWH systems by 2014, in an attempt to reduce the use of coal-fired power to increase energy security, as well as for environmental reasons, and also as a way of alleviating poverty and improving service delivery. There are over 100 SWH manufacturers in South Africa active in distributing, installing and maintaining these systems. Around 60% of SWHs in South Africa are from local producers. The rest are imported into the SA market from China, Germany, Greece and Israel. Most imports in terms of collector area are of European origin. Chinese importers are said to be enthusiastic about increasing their export to the SA market.

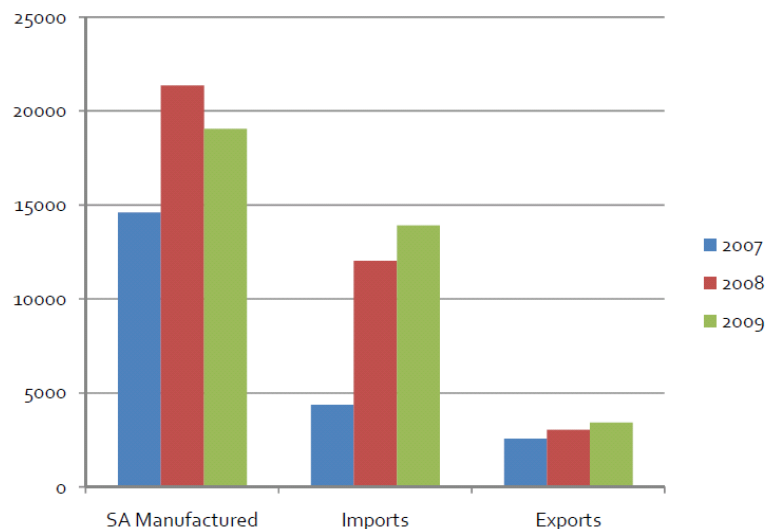


Figure 9. SWH manufactured, imported and exported 2007-2009 in square meters (m²)⁸⁸

Solar cookers: The Department of Minerals and Energy (DME) and GTZ have been collaborating on a field trial testing of 7 different models of solar cookers since 1996. However, commercial production could not be justified and the project was closed in 2005. Although solar cookers remain available as commercial in the market to consumers, sales have remained low. Affordability and end user credit remain crucial issues and the question still remains that if consumer credit can be offered if sales will increase.⁸⁹

Biomass and biofuel: biomass and biofuel are the most successful source of renewable energy and contribute 9% to the South African energy mix.⁸⁵ It is expected that the share of renewable biomass in the energy requirement will increase up to 16%. Sasol has been putting efforts to convert biomass into renewable biofuel through the Fischer-Tropsch process.⁸⁷ In 2007 the country has mandated a 2% blending of biofuel (or 400 million litres/yr) in the country's liquid fuel consumption.⁹¹

⁸⁷ The potential contribution of renewable energy in South Africa, Douglas Banks and Jason Schäffler, 2006

⁸⁸ <http://solarthermalworld.org/files/South%20Africa%20survey%20ESKOM%202009.pdf?download>

⁸⁹ <http://www.un.org/esa/agenda21/natlinfo/countr/safrica/energy.pdf>



Wind energy: The currently installed capacity is around 30 MW.⁸⁷ Total wind power potential in South Africa is estimated at 30 GW capable to generate around 78,000 GWh of electricity at a load factor of 30%.⁹⁰

Hydropower: South Africa is not endowed by large hydropower resources. The currently installed capacity is around 640 MW.⁸⁷ However, the country can exploit up to 4,700 MW of hydropower in different scales. Adding the prospective hydropower import capacity, the total hydropower capacity can amount to 7,000 MW.

The development of renewable energy technologies is very slow. In 2009 South Africa spent only USD 125 million on renewable energy technologies. Compared to China with USD 34 billion, this amount of investment is dramatically low.⁹¹ The regulation of the power tariff to reflect the actual cost of power generation can help to change the situation. It will also create incentives to reduce energy consumption.

Renewable Energy Policy

The major objectives of South Africa's energy policy were settled in Energy White Paper 1998 as:⁹²

- increasing access to affordable energy services;
- improving energy governance;
- stimulating economic development;
- managing energy-related environmental impacts; and
- securing supply through diversity;

To supplement the Energy Policy White Paper, in 2002 a White Paper on the promotion of renewable energy and clean energy development was published. In this paper, renewable energy is defined as energy from sun, wind, biomass, hydro and landfill gas. The White Paper on Renewable Energy set a target of 10,000 GWh renewable electricity generation in 2013, equal to 4% of total electricity generation.⁸⁰ The draft policy paper sets no long term target for renewable energy.

To achieve the renewable energy target, the government is committed to strengthening competition in the electricity market by creating an appealing environment for Independent Power Producers (IPPs) that utilise renewable energy sources. The Long-Term Mitigation Scenario (LTMS) by the government entails an energy model that anticipates a renewable electricity share of 15% in 2020 and 27% by 2030.⁸⁰ It is unclear if and how this share will be met as South Africa has not made enough progress towards achieving its current target of 10,000 GWh by 2013 for to date only about 3% renewable energy systems have been realised. Although little has been achieved a number of policy actions to supplement renewable energy are planned or have been implemented. These policy actions are as follows:

Renewable Energy Feed-In Tariff (REFIT): The instrument was first introduced with rather low tariff rates subject to annual degression and guaranteed rates for fifteen years. After receiving comments and feedbacks from stakeholders, private and public sectors, the National Energy Regulator of South Africa (NERSA) released a new tariff code for renewable energy technologies. The tariff includes four technologies and is guaranteed for 20 years without degression.⁸⁰

Table 5. REFIT rates for renewable energy technologies⁸⁰

Renewable Energy Type	ZAR c/kWh (USD c/kWh)
Wind	125 (18.25)
Hydro	94 (13.72)

⁹⁰ Employment Potential of Renewable Energy In South Africa, The Sustainable Energy and Climate Change Partnership Johannesburg, 2003

⁹¹ Corporate Clean Energy Investment Trends in Brazil, China, India and South Africa, Renewable Energy & Energy Efficiency Partnership, 2010

⁹² South Africa Energy White Paper 1998



Landfill gas	90 (13.14)
Concentrating Solar	210 (30.66)

The REFIT has one crucial flaw: only the monopolistic electricity supplier, Eskom, is allowed to buy the electricity from renewable energy producers, however, it is not obliged to do so. This creates considerable uncertainty for renewable energy project developers that cannot rely on grid access and vacation of the produced electricity. Therefore, the REFIT in its current form is not likely to have the aimed motivating effect on private investment activity.

Tax exemption for Clean Development Mechanism revenues: To promote clean investments, the South African government has introduced a tax exemption for CDM revenues. This measure is also aimed at improving South Africa's attractiveness for CDM projects.⁸⁰

Carbon Tax vs. Cap and Trade: While the aim of a feed-in tariff is to encourage investments in renewable energy, a carbon tax or cap and trade system seeks to discourage investments in fossil fuel technologies. Carbon taxes lead to a direct increase in the cost of producing electricity. If this increase is passed on to consumers, the price of electricity to households and to industry is affected.⁸⁰

Financing strategy

Because of ample internal resources and ease of access to international capital markets with competitive prices, South Africa has made limited use of development assistance and donor resources. The government has been directing the development assistance towards the State Owned Enterprises (SOEs) and the private sector.

Financing mechanisms are varied and include guarantees, grants, incentive schemes, loan and equity financing. The government supports micro-enterprise development, skills development, acquisition and development of new technologies through grants and incentives. In addition, micro, small and medium size enterprises can use governmental lending facilities. South Africa is introducing sustainable financing mechanisms for delivering renewable energy systems and fiscal incentives. Examples are: Eskom Incentive Scheme for solar water heaters, Renewable Energy Finance Subsidy Office (REFSO) and tax incentives for energy efficiency.

On the other hand there are other market based instruments that can help financing renewable energy projects. These instruments are designed to subsidise renewable energy generation and energy efficiency projects. Examples of market instruments are: REFSO, Renewable Energy Market Transformation Programme (REMP) and Tradable Renewable Energy Certification (TREC).

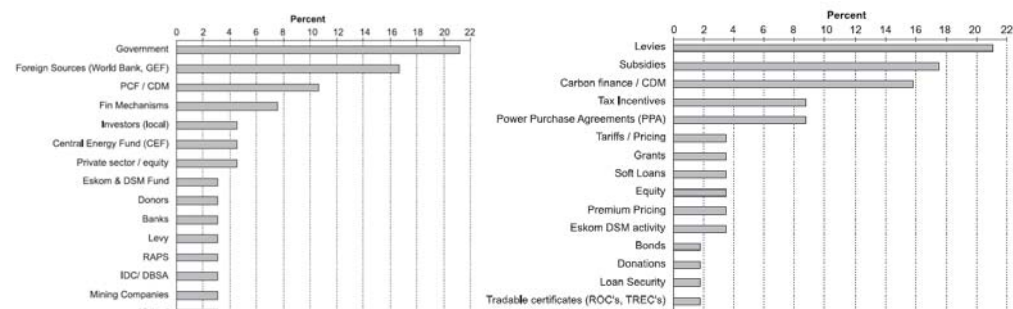


Figure 10. Source of finance (left) and financial mechanisms/instruments (right)⁹³

⁹³ Financing strategies for growth of the renewable energy industry in South Africa, Journal of Energy in Southern Africa, Vol 17 No 4, November 2006



Energy development strategy and instruments

The Integrated Energy Plan (IEP) draws the direction and steps to be taken by South Africa to meet national energy needs. The plan indicated continued reliance on coal, but uses modelling to anticipate which energy sources can be applied most effectively to fulfil the demand. The plan suggests diversification of energy sources, including renewables, as well as fuel switching to improve energy efficiency.

The World Bank has funded Renewable Energy Market Transformation (REMT) project of the Department of Environment (DoE) hosted by Development Bank of South Africa. This aims is to reduce the implementation costs of renewable energy projects in the country. The focus will be on power generation and solar water heaters. The project aims at assisting assist South Africa to satisfy its 2013 renewable energy targets by supporting DoE to develop regulatory/policy framework for renewable energy, and develop institutional/finance support within the economy to promote renewable energy.

Tradable Renewable Energy Certification (TREC): TREC System has been developed consistent with the EU RECs. TREC is an electronic record that verifies the origin of energy by the registered renewable energy entity; it refers to green certificate or green tags. Under the scheme, commercial consumers buying electricity from the national grid can choose to pay a green premium and are issued TRECs to certify the use of renewable energy. The TRECs therefore represent a way for companies to work towards their sustainability targets and triple bottom line reporting. TRECs are priced at the differential between the cost of new renewable energy generation and the Eskom supplied cost for existing coal-fired plant. They offer an additional revenue stream for renewable energy. Independent Power Producers (IPPs). Major advantage of TREC is that, apart from extra income stream, certificates can be traded worldwide and separately from the electricity grid infrastructure. The DoE completed a feasibility study on TRECs in March 2007. Consultation meetings with stakeholders in all provinces were conducted in April and May 2007. The aim of these meetings was to determine the extent to which other market participants would like to contribute towards the formation of the South African National Tradable Renewable Energy Certificate Team (SANTRECT). In March 2008 the SANTRECT was formed by the DoE with an aim to facilitate and coordinate the establishment of Issuing Body (IB) as Non- Profit Organisation (NPO) that will be responsible for registering, issuing, transfer and redeem certificate in South Africa.

Renewable Energy Finance Subsidy Office (REFSO): The DoE has established the Renewable Energy Finance and Subsidy Office (REFSO), whose mandate includes: management of renewable energy subsidies; and offering advice to developers and other stakeholders on renewable energy finance and subsidies. This includes information on the size of awards, eligibility, procedural requirements, and opportunities for accessing finance from other sources. Since the establishment of REFSO, six projects with a total installed capacity of 23.9 MW have been subsidised. Three of these projects are small scale hydro, biogas to electricity project, wind energy and landfill gas to electricity. REFSO options are: Grants for feasibility studies; Short-term finance; Long-term finance; Export credits and soft loans; Equity or loans; and Purchase of carbon emission reduction credits.

Biofuel industrial strategy: This strategy addresses policy, regulations and incentives for biofuels. Biofuels strategy aims to achieve a biofuels average market penetration of 4.5 per cent, of liquid road transport fuels (petrol and diesel) in South Africa by 2013, which is achievable without excessive support by utilising surplus agricultural capacity. The fuel levy exemption on biofuel and support mechanism should continue and be adjusted, if necessary to assist the target being achieved. Until this target is achieved, licensed biofuels producers will have a linked licence condition for petroleum wholesalers to accommodate qualifying production volumes at Basic Fuel Price (BFP) or import parity price.

Demand side subsidy, Solar Water Heater Programme: Eskom together with the Government has developed a programme to have a mass roll out of solar water heaters over the next three years. The current cost of a solar water heater unit is perceived to be unaffordable and prohibitive. To eliminate these barriers, Eskom will be providing a subsidy of 50 per cent. Potential savings of the programme is 650 MW.



Traffic and public lighting: All traffic lights and public lights will be converted to solar power with a battery backup. The project will be another opportunity for the nationwide application of renewable energy technology, employment creation and skills development.

Energy sector lending

South Africa is not an aid dependent country; however, the country has been receiving ODA as an incentive to the government's growing development goals and measures. The ODA to South Africa currently amounts to around 1.5% of the total annual budget. The total ODA budget for South Africa was around USD 800 million in 2007-08.⁹⁴ The European Union is the largest multilateral donor followed by bilateral donors including the United States, France, the United Kingdom, Germany, the Netherlands and Denmark.

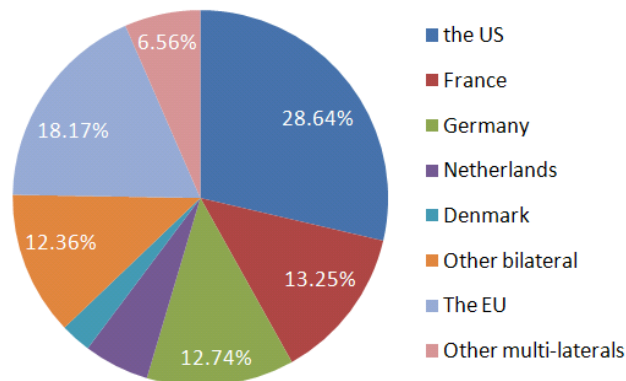


Figure 11. ODA partners for South Africa 2007⁹⁴

ODA makes up a relatively low percentage of GNP at 0.3% for 2005-06.⁹⁵ South Africa is not aid dependent, but as a beneficiary, receives foreign aid for several projects and initiatives within the environmental sector.

South Africa does not seem to have planned any specific long term ODA budget to be invested within the power sector. Most of the ODA money has been spent for environmental protection and waste management programmes.

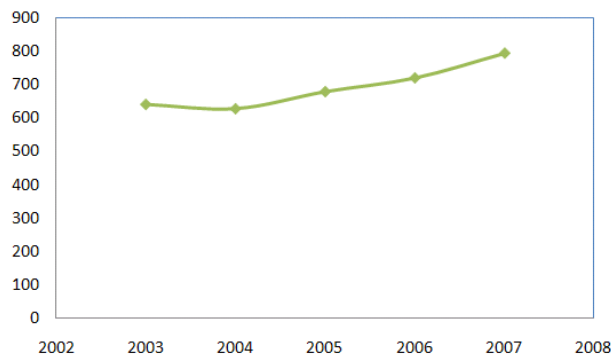


Figure 12. ODA budget for South Africa 2003-2007 (USD million)⁹⁴

⁹⁴ Japan's ODA disbursements to South Africa 2008: http://www.mofa.go.jp/policy/oda/data/pdfs/south_africa.pdf

⁹⁵ State of the Environment, <http://soer.deat.gov.za/487.html>



China and the Renewable Energy sector

China has recently started showing interest in the renewable energy market in South Africa by investing in two promising technologies, wind and solar. In December 2010, Mulilo Renewable Energy (MRE) has entered into an agreement with China Long Yuan Corporation for the development of six wind parks in South Africa that in total comprise 1,500 MW of capacity. It is foreseen that the first phase of the project will start commissioning in 2011 and will become operational in June 2012.⁹⁶ The Chinese firm is also committed to transfer the wind turbine technology to South Africa by building a modern blade and turbine manufacturing facility in Western Cape.

South Africa's NAMAs

In January 2010 South Africa has submitted its long term national GHG emissions mitigation policy which only mentions the overall GHG emissions reduction targets of 34% and 42% by 2020 and 2025. There is no detail on how the South African government will take action to meet above targets.⁹⁷ Hence, it was not possible to assess how South African NAMAs could assist the engagement of long term foreign investment within the renewable energy sector.

⁹⁶SA, Chinese firm invests in green energy: <http://www.southafrica.info/business/investing/mulilo-061210.htm>

⁹⁷ South Africa NAMAs submission to the UNFCCC secretariat: http://unfccc.int/files/meetings/application/pdf/southafricacphaccord_app2.pdf



Annex II Background Mozambique

Sino-Mozambique Commercial Relations

Mozambique's relations with China started to intensify in the early 1960s during the period of the liberation struggle. During the 1980s and 1990s Sino-Mozambican cooperation was carried out mainly through the provision of a line of credit to purchase equipment, raw materials and consumer goods. Following the launch of FOCAC (Forum on China-Africa Cooperation) in 2000, China increased its presence in Mozambique through loans, foreign direct investment, technical cooperation, contract projects and direct grants for public works. In 2001, China and Mozambique signed a general Trade Agreement as well as an Agreement on the Promotion and Reciprocal Protection of Investment. A Joint Commission for Technical, Economic and Trade Activities was also established during the same year. Today the Chinese and Mozambican relations are based on a strong foundation for mutual trust.

Today Sino-Mozambique political and commercial relations take place under the following three forums:

- Bilateral relations;
- Forum on China-Africa Cooperation (FOCAC);
- Macau Forum. This organism was created to foster economic and political relations between China and Portuguese-speaking countries. China has been using the Macau Forum as a multilateral platform for conveying political and economic exchanges that complement the more traditional bilateral channels .

China has also cancelled a total of USD 52 million of Mozambican debt; USD 22 million in 2001 and USD 30 million in February 2007.

Both countries continue to enhance their friendship and mutual cooperation, which is demonstrated in principle by their frequency of high-level visits and cooperation in bilateral relations. The only areas that have become controversial in Sino-Mozambican relations are illegal logging and illegal fishing.

Chinese Investments in Mozambique

According to Mozambique's Investment Promotion Centre (*Centro de Promoção de Investimentos* - CPI), from 1990 (the year China started to invest in Mozambique) to 2007, Chinese investment in Mozambique amounted to USD 148 million. Also, over 40 Chinese companies registered with CPI during this period and provided an estimated 11 214 jobs. In 2008, China became Mozambique's second largest foreign investor, up from sixth place the previous year. A center for the promotion of Chinese investment (*Centro de Promoção de Investimento Desenvolvimento e Comercio China* (CPIDCC) was settled in 1999.

The cost of Mozambique's imports from China exceeds export earnings by 114 percent. Mozambique's main exports are unprocessed natural resources and minerals. Rough wood (mostly timber) accounted for 69 percent of Mozambique's exports in 2008. Mineral resources are also one of the main products exported to China - i.e. chromium, titanium, other ores and precious stones. In contrast, Mozambique's main imports from China consist of construction material and related machinery, motorcycles, motor vehicles and manufactured goods. Mozambique's commercial relationships with China are similar to other trade models China has in the African continent and it has strongly been criticised by lacking sustainability.

Areas of China's investments in Mozambique

Below is a summary of the main type of projects/activities carried out by China in Mozambique.

1. Agriculture sector

- Increase presence of Chinese companies. More Chinese enterprises are already taking in interest in Mozambique's agricultural sector. China Grains & Oil Group (CGOG) has constructed a USD 10 million



- soya processing plant in Beira. In November 2008, the Chinese government provided a USD 18 million loan to fund a range of agricultural projects in the Zambezi Valley.
- Agricultural technology demonstration. China opened in Mozambique the Instituto de Investigação Agrária de Moçambique to which pledged RMB 55 million towards its establishment.

2. Infrastructure

There are two main ways of cooperation between China and Mozambique in infrastructure development: (i) the financing of the projects; (ii) and the provision of civil engineering and construction services to carry out the projects. Around 30 Chinese companies are currently operating in Mozambique. Whereas in the past Chinese enterprises almost exclusively carried out infrastructure development projects funded by the Chinese government recently it is frequent to see Chinese companies involved in projects funded by the World Bank or the Mozambican government. China Henan International Corporation Group (CHICO) is one of the most active Chinese companies in Mozambique. Its most recent project is the building of an integrated water supply system in Chicamba - situated in Mozambique's central province of Manica. China Metallurgical Construction Group (MCC) is also a Chinese company conducting refurbishment of Maputo water system. China Geo-Engineering Corporation has also built the bridge Ponte da Unidade (connecting Mozambique and Tanzania). Water technology and water infrastructure are thus one of the main China technologies and knowledge exports to Mozambique.

3. Energy

In the energy sector, most of China's actions concentrate on hydropower technology. Here Chinese financial institutions are providing direct financial support to projects in Mozambique. In 2006, it was reported that China EXIM Bank extended a USD 2.3 billion loan for the construction of the Mphanda Nkuwa dam 1,350 MW capacity. There is also participation of China in the electricity infrastructure development. In this sense, the China Exim Bank's USD2.3 billion loan package also includes funding a transmission line from the dam site to Maputo, the capital.

The main contractor of the Mphanda Nkuwa dam project is not though a Chinese company but a Brazilian entity (Camargo Corrêa) and its Mozambican partner group Insitec. Nevertheless, the fact that the China EXIM Bank admitted its interest in financing a project which is not executed by a Chinese company represents a new model of China business participation in Africa. At the moment of writing this report it is not clear though the financial closure for the project and the exact China's involvement. The Mphanda Nkuwa dam is a controversial project highly criticized by international NGOs such as International River Networks. The financial crisis has also affected the financial closure of the project.

China EXIM Bank has also expressed interest in financing the Moamba Major dam project that would supply both water and electricity to Maputo. At the moment of writing this report it could not be clarified if there has been a final financial agreement between China EXIM Bank and Mozambican authorities.

4. Forestry and fishing

- Illegal logging by Chinese operators is the most controversial issue in China Mozambique relations.
- Most of Chinese timber economic actors are not companies registered in Mozambique but merchants that buy directly from local or foreign operators and that export directly to China.
- Illegal fishing is also becoming an area of tension between China and Mozambique

Mozambique Energy Context

Mozambique has vast large energy resources including hydropower, gas, coal, and perhaps petroleum. The energy sector in Mozambique is characterized by a very low level of exploitation and internal use. Instead most of the Mozambique energy production is exported to South Africa. As a way of example the main hydropower source is Cahora Bassa Power Station where 90% of the 2,075 MW capacity is exported to South Africa. Natural gas reserves exports to South Africa have also started. However, the main sources of energy for satisfying the energy needs of Mozambique population have been fuel-wood and fossil fuels.



In recognizing the importance of energy in the population survival and well-being, Mozambican policy makers have traditionally assigned a high priority to the energy sector. Hence significant resources have been allocated to this sector. This allocation of resources has been mostly attributed to conventional sources of energy, namely, fossil fuels and electricity.

Main traits of Mozambique energy sector

Mozambique's potential for power generation has been estimated at 14,000MW (85% of which is hydropower). More than 80% of the hydropower potential is located in the Zambezi Valley, including the existing Cahora Bassa Dam. Mozambique already has 12 medium-sized and large dams. Cahora Bassa Dam, which has an installed capacity of 2,075 MW, is the primary electricity source for the country --- as well as a key source for Southern Africa.

At present, the energy sector in Mozambique is characterized by the following traits:

- Low electrification rate. It is estimated that only about 12% of the 20 million population has access to electricity. The electrification rate is estimated at 20% of urban areas and 1-2% of rural areas.
- Hydropower dominates supply generation. Mozambique has not diversified its power supply away from large dams. The 2,075 MW Cahora Bassa dam on the Zambezi River developed primarily to supply power to South Africa and Maputo industry dominates the electricity sector. .
- Energy demand increasing. Energy demand is considerably growing, at an average annual rate around 7%.
- Focus on energy exports. Mozambique is more focused on supplying power to South Africa than its own populations. Mozambique financial resources devoted to energy projects are intended to feed the Southern Africa Power Pool (SAPP) and mainly South Africa. Main Mozambique clients are South Africa, Zimbabwe and in the future Malawi. SAPP was established in 1995 to share electricity in the region, but the reality is that 80% of the grid's power is used by South Africa SAPP's power requirements are dominated by Eskom, which accounts for over 80% of electricity demand. There is a growing shortfall of power in the region --- and SAPP demand is increasing at 1500 MW per year. However, there are no efforts to reduce demand through efficiency measures or demand-management. Practically no attention has been given to new and renewable sources such as cogeneration, wind and solar in the SAPP reports and demand-side management has only been object of discussion recently.
- Limited infrastructure network. Mozambique's transmission and distribution infrastructure is relatively limited due to the large size of the country and the high cost of transmission and distribution infrastructure in far flung regions. The Mozambique government is devoting large financial resources to electricity transmission, distribution rehabilitation and expansion.
- Power transmission is expensive. The large size of the country and its dispersed settlement patterns make dispatching power to the entire population extremely expensive.
- Very limited use of renewable energy. The country is making practically no use of its renewable energy potential.

Mozambique Renewable Energy Sector

Renewable Energy Sector

Mozambique has a large potential for RE. It has large solar and biomass resources. The country has also considerable mini-hydro potential mainly in areas where there is no access to electricity. Equally the country has wind resources concentrated in its coast which is the second largest coastline in Africa.

Despite its potential, RE projects in Mozambique have been mainly limited to traditional uses (i.e. wood and charcoal for cooking) and some examples of off-grid power supply sources (PV, wind pumping). Although Mozambique has a considerable potential of renewable energy technologies it on electricity from large dams which is primarily driven by a need to sell low-cost power to South Africa and industry prevents the development of RE. However, over the last years there is an increase government and private interest in RE.



A summary of the main RE in the country is offered the table below .

Type of RE	Potential	Comments	Obstacles
Mini Hydro	Over 60 potential micro- and mini-hydropower projects with a potential of up to 1,000 MW exist in the country	<ul style="list-style-type: none"> -The 2009 draft Energy Strategy establishes a simplified process by which investors can obtain exclusive rights to develop concessions less than 15MW. -Despite its potential, very few micro-hydro projects have been developed. 	<ul style="list-style-type: none"> -Lack of capacity to implement small hydro projects. -Lack of clear institutional processes
Biomass and biofuels	Large potential due to its agro-ecological resources (eucalyptus, grasses, starch crops like cassava, or sugarcane and jatropa)	<ul style="list-style-type: none"> -Biomass and biofuels are the only RE resource that has an approved governmental strategy (Bio-combustible Policy Strategy⁹⁸). -The government intends to push for making use of agricultural wastes through cogeneration power plants. - Biomass cogeneration has been estimated at 100's of MW from various fuel sources especially bagasse. 	<ul style="list-style-type: none"> -No main obstacles have been observed for the development of biomass energy. -The recent Bio-combustible Policy Strategy seems to support the development of biomass projects.
Wind	Ongoing feasibility studies	<ul style="list-style-type: none"> -Need of wind resources mapping⁹⁹ 	
Solar	High availability	<ul style="list-style-type: none"> - Estimated 1MW of off-grid PV systems installed - FUNAE is a major player in the off-grid solar PV sector, having installed hundreds of PV systems in remote sites around the country. -Solar water heaters is not much extended. 	<ul style="list-style-type: none"> - Photovoltaic prices are still very high in Mozambique. -There is no tax exemption or reduced duty for solar equipment.

Mozambique Renewable Energy agenda

So far no incentives for the development of renewable energy projects have been approved by the Mozambique government. However the Mozambican Ministry of Energy has recently concluded a draft policy on the development of renewable energies that is currently being discussed by the Council of Ministers. It seems there is a political willingness to approve the draft policy in support of renewable energies development. Lack of access to the draft policy on the development of renewable energies does not allow the clarification of the concrete incentives for RE previewed by the Mozambican government.

Currently specific plans for the different renewable energy sectors as well as targets do not exist. The only approved strategy is the Bio-combustible Policy Strategy.

Despite the inexistence of ad hoc governmental programs to foster renewable energy Mozambique is integrating RE in its development policies :

⁹⁸. Resolução n°. 22/2009, de 21 de Maio

⁹⁹. A recent Memorandum of Understanding between FUNAE and Gesto Energia S.A. (Portuguese company) has included the development of a renewable energy Atlas for Mozambique. http://www.portugal.gov.pt/pt/GC18/Governo/Ministerios/MNE/Documentos/Pages/20100304_MNE_Doc_Mocambique.aspx.



- Through FUNAE (National Fund for Energy) Mozambique has initiated a series of developments that are indirectly promoting RE. FUNAE has initiated a number of off-grid electrification efforts to promote rural energy and to promote RE projects. FUNAE is supported by foreign institutions such as the EU, NORAD, DANIDA, World Bank/GEF. Implemented projects are and installation of PV systems, development of microhydro projects, installation of wind pumps and promotion of fuel-efficient stoves in the country. FUNAE has also signed cooperation agreements with Portuguese companies to launch renewable energy projects .
- The Mozambique's Poverty Reduction Strategy (PARPA) also has integrated energy as one of the six main pillars . Energy related goals included in PARPA II are being turned into strategies such as the Off-grid and Renewable Energy Strategy, Generation and Transmission Master Plan, North-South (Backbone) Transmission Least-Cost Study and National Biofuels Strategy.

Mozambique renewable energy needs

Mozambique national renewable energy resources should be sufficient to address the increase of energy demand. However, some factors hinder the access to renewable energy in the country, mainly:

- Lack of sufficient technical national skills: The overall task of building human capacity for a renewable energy infrastructure has yet to begin.
- Lack of financial resources. Absence of finance impairs the capability to efficiently develop energy projects.
- Lack of RE policy frameworks. The lack of policy frameworks supporting RE and incentives represents also a constraint for the renewable development as it decreases the investment appetite for RE. However this obstacle might be overcome soon once the Mozambican government approves the draft policy on support to renewable energies.

From this perspective the role of external funding and technical assistance remain basic for the development of the RE sector in the country. It is in both aspects where China could play a role in RE development in Mozambique.

Alignment Of Interests In Renewable Energies Between China And Mozambique

Are Mozambique's interests aligned to Chinese interest investment?

The fact that China has become Mozambique's second main development partner makes that China's investment in Mozambique can potentially impact Mozambique's course of industrialisation.

However, it is not clear to which extent Chinese investments in Mozambique that focus primarily in the mineral, agricultural and retail sectors match the priorities of development identified by the GoM . Additionally Chinese investment in Mozambique has also received the criticisms of environment activists, who have opposed Chinese timber buyers who get tropical hardwoods from Mozambique's semi -arid forests and also for financing large hydro projects such as Mphanda Nkuwa.

It seems though that China has tailored its activities in Mozambique to the needs of the Mozambique government and has partially contributed to Poverty Reduction Strategy Paper (PAPRA) mainly through its contribution to the improvement of the health system and its support in agriculture research. China also actively participate in infrastructure development, which is one the needs identified by the Mozambican government. In the energy context, China heavily supports one of the main Mozambique's objective which is dam expansion.

Chinese opportunities for RE by China in Mozambique

China's role in Mozambique energy projects mostly focused on large hydro. However, Chinese clean technology has a vast potential to become one of the main focus of China's foreign sustainable policy in Africa. If something characterizes China's climate policy has been the investment, trade and development in clean energy. Domestically China has invested substantially in clean energy through its manufacturing, its extension in the country and even R&D. However, and with the exception of hydropower technology,



China has overlooked the possibilities that clean technology represent in its commercial relationships with Africa. This is valid also in the Mozambique context.

Focusing on extending RE in Africa can offer China the possibility to explore markets for technologies that in China might be at the edge of over capacity. Whereas this over capacity can be problematic for the domestic market, it can offer great opportunities for in foreign trade with Africa, where China can expand its clean technology diplomacy . From this perspective renewable energy clean technologies such as wind and biomass can follow the dynamics of expansion in Mozambique similarly to what China has performed already in the hydropower sector . Additionally, Chinese RE technology products have a competitive advantage in Mozambique in respect of technology material from other countries as Chinese technology tends to be cheaper.

It is well known that China has placed special emphasis on soft-power aspects of its engagement in Africa. Introducing clean energy into its Mozambique agenda might contribute to deep China's influence and power into a key area of economic development for the country where other international donors have not yet been successful.

Where and how China can contribute to support Mozambique RE development?

- Focus on mini hydro and biomass. In both areas China has vast expertise. Both areas are further main interests for immediate actions by Mozambique. Also power generation is one of the most urgent priorities of Mozambique. FUNAE has identified a good pipeline of small hydro projects to which Chinese investment could contribute
- Link investments in RE with the support to the implementation to the PARPA framework. The PARPA framework is the strategic document for economic development in Mozambique. This is the document that most occidental donors and investors check to align its priorities in the country. Since the PARPA document is elaborated with the support of AfDB, contributing to its achievement.
- Join occidental donor and investment programs in the country. Countries like Brazil that share similar interests and traits with China (both BRIC countries) are linking their investment and action plans in renewable energies to the actions of other occidental countries. That would reinforce the interest of China in collaborating with occidental government sustainable strategies. For instance, an examples of projects in which BRICs countries collaborate with EU countries is the UK-Brazil-Southern Africa Biofuels Taskforce.
- Set up Chinese RE clean technology production in Mozambique. Establishing local clean energy production lines in the country might be of interest for Chinese investments. As a way of example, the Indian company Central Electronics Ltd (CEL) is collaborating with FUNAE to build a factory that will produce solar panels. The factory will be built in one of the districts of Maputo province, and will be funded by the Indian government .
- Bring Chinese clean technology companies to establish agreements with Mozambican institutions such as FUNAE. This practice has been recently used by Portuguese companies that have plans of development in the RE area in the country.



Annex III Background Uganda

Background

Uganda is one of the poorest countries in the world with an estimated population of 30 million growing at nearly 3.2% yearly.¹⁰⁰ The country has been politically unstable in different periods in 1970's and 1980's but since the 1990's has experienced a relatively stable political, social and economical growth.

Uganda's natural resources include fertile soils, water resources, and deposits of copper, gold and other minerals. Agriculture is the most important sector of the economy, comprising over 80% of the work force. Coffee is one of the most important exports of the country. Since 1986, the government has acted to rehabilitate and stabilize the economy implementing some reforms. The policy changes are especially aimed at reducing inflation and boosting production and export earnings. Growth continues to be solid, despite the fluctuations of the price of coffee, Uganda's principal export. Uganda's GDP in 2009 was USD 1,200 growing by 5.4% which is relatively strong due to past reforms and sound management of the downturn.¹⁰¹

The Power Sector

The power grid in Uganda consists of hydroelectric power plants and thermal plants fuelled by diesel or heavy fuel oil. Diesel and Heavy Fuel Oil (HFO) are transported overland through Kenya. The Ugandan grid is managed by the state owned transmission company UETCL. Total annual power production in Uganda averages 2,045 GWh in the period 2007-2009.¹⁰² More than 70% of around 510 MW installed capacity in Uganda is from renewable sources, mainly hydropower.¹⁰² The rest of the country is scattered with small off-grid diesel and mini hydro plants, mainly to provide power to towns and regions not connected to the grid or small business and industrial regions suffering from power deficit and load-shedding.

The main sources of power generation in Uganda are two hydropower plants that were built in the mid 1950s (Nalubaale) and 2000-2002 (Kiira) respectively. Furthermore there is a number of small hydropower plants and a biomass plant. To address the severe power shortage in the county, substantial thermal generation capacity was installed from 2005/6 to supplement the existing hydropower plants. Originally put in place to mitigate power shortages arising from seasonal low hydrology, the thermal power expanded in the following years to sustain the need for power in Uganda and to limit the effects of unpopular load shedding. These plants, typically 50 MW per plant, are operated by Aggreko and Jacobsen on short term agreements. They have produced up to 27% of grid connected power between 2005 and 2007 and are expected to produce more in the ensuing years.

Electricity in Uganda is very expensive compared to international benchmarks. The reason is Uganda's significant dependence on imported petroleum products. The current generation mix of hydropower and thermal energy has an average cost of USD 0.27 per kWh in 2007¹⁰³. The Government of Uganda (GOU) continues subsidising electricity to make it affordable to the end users. Through the subsidies, GOU has succeeded to reduce the average power tariff to the consumer to USD 0.17 per kWh, which is still high for many Ugandans, of which only 5% have access to the power grid.

In addition to high prices, the shortage of electricity has led to daily load shedding. During load shedding parts of the grid are disconnected to secure stability of supply in the remaining parts. Load shedding has increased substantially over the past three years as the effects of a drought and lower hydropower production has been felt, coupled with continuing load growth. Power shortage and subsequent load shedding is a significant barrier to further economic development of Uganda.

¹⁰⁰ Data source: [World Bank, World Development Indicators](#) - Last updated December 13, 2010

¹⁰¹ CIA, The World Factbook, Uganda (2010)

¹⁰² UETCL power plants datasheet 2005-2009

¹⁰³ Bujagali II - Economic and Financial Evaluation Study, February 2007.



Power Demand. Uganda has been suffering from a lack of electricity and as the demand is growing the problem has become ever more severe in recent years. While the emergency thermal generation program of the government helps to address short term needs, new power projects are needed to address the medium and long term need for economical, large scale, power generation in Uganda. New power supply options for Uganda have been the subject of extensive planning and analysis.

The government is studying ways to meet the increasing energy demand. As part of this effort, the government with the support of the African Development Bank is undertaking a study with the aim of formulating a long term integrated least cost alternative energy resource development programme for the country. The energy sources considered include geothermal, biomass, wind, solar and mini- and micro hydro.

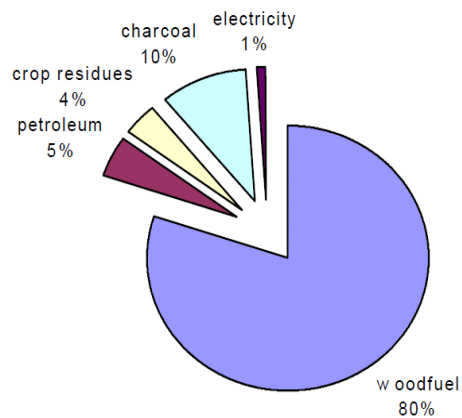


Figure 13. Uganda's national energy mix (1995-99)¹⁰⁴

Electricity Demand Projection: Electricity demand growth in Uganda is projected at 8.50% per year. This means that the country will need more than 1,900 MW power by 2025.¹⁰⁵ Moreover, assuming Uganda would grow to be an industrialised country by 2025, the country would require around 22,500 MW of installed capacity to satisfy the demand of the 42 million people.¹⁰⁶

¹⁰⁴ Investing in Uganda's Energy Sector, Ministry of Energy and Mineral Development (2002)

¹⁰⁵ Presentation: investment opportunities in the power Sector in Uganda, Uganda Electrification Organisation 2003

¹⁰⁶ Uganda electricity demand: <http://allafrica.com/stories/200707070032.html>

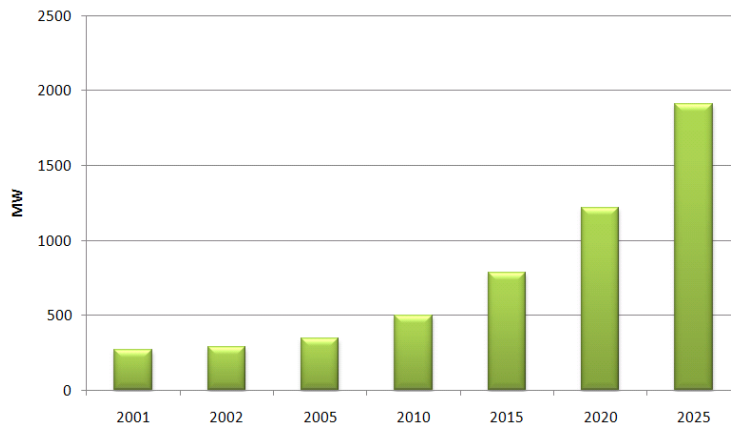


Figure 14. Electricity demand growth 2001-2025 in Uganda (2003)¹⁰⁵

Only 3% of commercial energy needs is being provided by grid electricity.¹⁰⁷ Around 80% of the generated electricity in Uganda is consumed in residential and commercial buildings while only 20% is consumed by industrial activities. The electrification rate is very low with grid access of 5% for the country and less than 2% in rural areas.¹⁰⁴

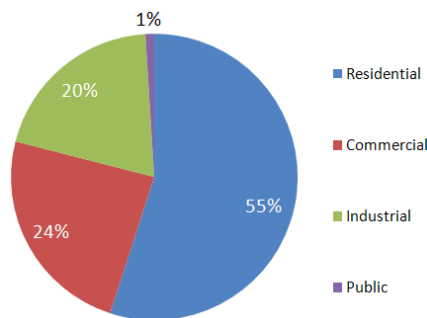


Figure 15. Share of different sectors in electricity consumption in Uganda (2002)¹⁰⁴

Power Development Difficulties: The transmission and distribution system in Uganda are old and need substantive renovation. In addition the capacity of the transmission network should be expanded in parallel to new power plant additions to the grid. Uganda has a large rate of grid loss of up to 35% (Figure 16) while the grid loss in developed countries is up to 8%. About 50% of the grid loss in Uganda is due to non-technical issues such as illegal consumption of electricity and theft. Another barrier is the lack of efficient infrastructure to facilitate the development of the power sector. Electricity generation and distribution in Uganda entails a very inefficient. It is very hard to collect service charges from 50-60% of the consumers¹⁰⁸ which is another barrier against private sector involvement in the sector. Participation by the private sector in energy projects, especially the large ones, has been impacted by the situation in the global energy markets.¹⁰⁹

¹⁰⁷ The US library of congress, country studies, Uganda: <http://countrystudies.us/uganda/48.htm>

¹⁰⁸ The electricity sector of Uganda—results of development assistance, Bergen 2003

¹⁰⁹ Uganda's experience in the implementation of power sector reforms, Ministry of Energy and Mineral Development

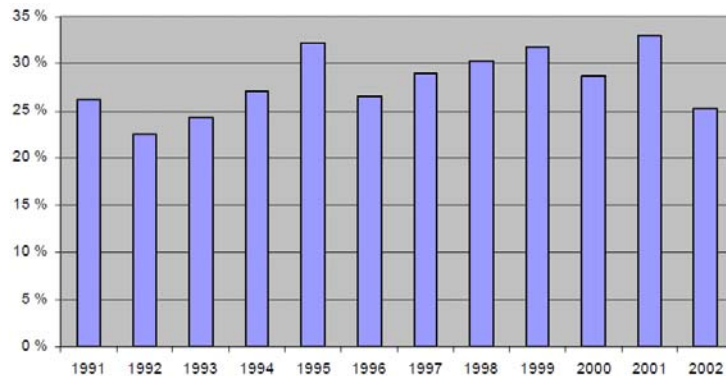


Figure 16. Losses of transmission and distribution in Uganda's grid system (World Bank 2002)¹⁰⁸

Renewable Energy Sector

Apart from the exploitation of large scale hydropower resources in Uganda in the 1950's, the interest in new and renewable energy sources including wind energy, photovoltaic, solar water heaters and geothermal is relatively new. The combined contribution of new and renewable sources of energy to the total energy consumption in Uganda is estimated at 1%. Except for biogas, these sources of energy have not been sufficiently and appropriately explored to determine the best methods of exploitation in a sustainable approach. Renewable energy sources in Uganda comprise wind, biomass, solar and geothermal. The overall exploitable renewable energy potential in Uganda is estimated at around 5,300 MW.¹¹⁰

Wind energy: The wind speeds in most areas of Uganda are moderate with average speed not exceeding 2 m/s.¹¹¹ In some areas with complex terrain, the wind may speed up due to slopes of hills, escarpments and tunnelling effects. In the mountain areas in the south-western part towards the border with Rwanda the average wind speed goes up to about 4 m/s. The wind energy resource in Uganda is insufficient for large scale electricity generation.¹¹¹ However, they may be suitable for special applications, such as water pumping in remote areas and for small scale electricity generation in mountainous areas.

Biomass and biofuel: Biomass including firewood, charcoal and crop residues play an important role in Uganda's energy supply. They comprise over 90% of total energy consumption in the country (Figure 13). It provides almost all the energy used to meet basic needs of cooking and water heating in rural and most urban households, institutions and commercial buildings. Since most of the biomass supply is not from sustainable resources, fuel wood use has contributed to the degradation of forests as wood reserves are depleted at a rapid rate in many regions. Several initiatives to conserve biomass resources have been undertaken by the government, private sector and NGOs. They include the promotion of improved stoves, as well as afforestation.¹¹²

Solar energy: Uganda is endowed with plenty of radiation of about 4-5 kWh/m²/day.¹¹² This level of solar radiation is very favourable for all solar technology applications, especially photovoltaic (PV), solar concentrators as well as solar cookers and dryers. PV systems are generally suitable applications where modest power needs exist, mainly in remote areas that are not connected to the grid due to power or transmission lines constraints. The government is currently implementing a solar PV pilot project through a financing mechanism that makes it possible for both PV consumers and vendors to obtain credit from banks for solar rural electrification. The application of solar water heating is still very limited. Solar power potential in Uganda is high and can generate several folds more than the total energy demand of the

¹¹⁰ Developments and investment opportunities in renewable Energy Resources in Uganda, 2009

¹¹¹ Overview of Wind energy resource in Uganda, Wind Energy Sources, GTZ online, last checked December 2010

¹¹² Investing in Uganda's Energy Sector, Ministry of Energy and Mineral Development (2002)



country. The main barrier against the development of these systems is their very high initial investment costs and lack of installation, operation and maintenance knowledge.¹¹²

Solar heaters: Uganda has not been progressed significantly in the field of SWH. Since more than 95% of the population have no access to electricity, at the moment the government's priority is electrification. However, there has been some activities to introduce the system in electrified areas in order to cut the use of electricity for heating purposes. Ministry of Energy and Mineral Development in cooperation with GTZ has targets to install 30,000 m² SWHs by the year 2017. In 2008, the government started pilot projects in Kampala to install 500 SWH systems in two years and increase them to 60,000 in six years thereafter. There are no significant SWH manufacturers in Uganda.¹¹³

Solar cookers: In 2006, Solar Connect Association (SCA) and Solar Cooking Netherlands (SCN) have developed a collaboration agreement to introduce different solar cooking systems in four different villages in Uganda. They could distribute up to 2,000 solar cookers by 2008 as pilot projects. When justified, the consortium intends to develop the plan as a commercial project. Total solar cooker distribution for 2011 is anticipated to be 6,000-9,000. At the moment there are some local solar cooker assembling units in collaboration with American and Dutch companies.

Geothermal power: Geothermal is a potential alternative to hydro, fossil fuel, and biomass energy resources. In addition to power generation, geothermal energy could be used in Uganda to substitute for increasingly scarce wood to dry crops in the industrial processing units.¹¹² It is estimated that up to 450 MW of geothermal resources can be exploited in the country.¹¹² However, the exploration and exploitation process of geothermal wells are expensive. Moreover, some geothermal resources in Uganda are located in environmentally sensitive areas like the National Parks, making their development contested. Another barrier is the lack of information on environmentally friendly and modern geothermal technologies that recycle the water. If more investment enters the geothermal energy sector, costs of the development will drop as the operational costs of geothermal sources are already comparable to hydropower plants.¹¹⁴

Mini and micro hydropower: In addition to large scale hydropower potential, Uganda is endowed with large mini and micro hydropower potential ranging between as small as 100 kW up to 15 MW. The total potential for these types of systems is estimated at around 210 MW.¹¹⁵ The small and mini hydro sites are located in the east and the western parts of Uganda which are mountainous. Some of the sites can be developed for isolated grids and others as energy supply to the grid.⁷²

Since 2003 East African has been dealing with a severe drought that has reduced the availability of water resources. As a result, the electricity generation of the hydropower stations has dropped which has caused doubts on the reliability of hydropower as the main source of electricity supply. The development of mini and micro hydropower stations by the private sector in Uganda has not been very successful till today due to barriers such as:⁷²

- Complicated negotiations to hedge investment risks;
- High investment costs leading to high consumer tariffs;
- Demands from the government force to bear most of the risks;
- International lobby groups that are against hydropower sites.

Renewable Energy Policy

In order to ensure sufficient, safe and reliable power supply in Uganda, the government has taken a number of steps to facilitate sustainable power development in the country.

¹¹³ <http://www.ugandainvest.com/admin/docs/Assembly%20and%20Marketing%20of%20Solar%20Units%20in%20Uganda.pdf>

¹¹⁴ A Guide to Geothermal Development in Uganda, National Association of Professional Environmentalists (NAPE)-Uganda (2005)

¹¹⁵ GTZ Eastern Africa Energy Resource Base, Uganda Hydro (2010)



The Electricity Act 1999: This act was endorsed to facilitate investments by the private sector in power generation and transmission projects. Following this act, the Electricity Regulatory Authority (ERA) was established to regulate industrial electrification independently from the ministry. Through this act Uganda Electricity Board (UEB) lost their monopoly in the power sector.

As part of the privatisation process, UEB was split in three companies for generation, transmission and distribution. The generation and distribution companies were privatised and sold whereas the transmission company, Uganda Electricity Transmission Company Limited (UETCL), remained in state hands. The existing assets remained public while experienced private power companies were allowed to decide on the investment and expansion of the assets. Future generation capacities are developed as Independent Power Producer (IPP) projects.

Energy Policy for Uganda 2002: The Energy Policy aims at meeting the energy demand of Uganda for social and industrial development in a sustainable manner. The overall policy is to increase the share of modern renewable energy sources to 61% of the total energy consumption by 2017.¹¹⁶

Renewable Energy Policy for Uganda: As one of the strategies to fill the energy supply gap as well as to plan for long term diversification of energy sources, the government has decided to facilitate the development of grid connected renewable energy generation projects. This effort is being supported by the establishment of a Power Purchase Agreement (PPA) template and a favourable feed-in tariff to help accelerating the transactions for renewable energy projects up to 20 MW capacity.

Table 6. Feed-in Tariff for renewable energy projects below 20 MW¹¹⁶

Renewable Energy Technology	Years 1-6	Years 7-20
Hydropower	7.20	5.33
Cogeneration and Bagasse	7.03	5.25

The feed-in tariff is different for Peak and off-Peak hours. The figures above are mean values in US cents per kWh.

Investment incentives: The electricity tariffs in Uganda that had once been adjusted in 1983 were regulated in 2001 to reflect the current generation cost of each kWh of generated electricity. The electricity tariff amendment is considered as a compliment to the Electricity Act 1999 to motivate the private sector to invest in Uganda's power sector. The tariff structure shall follow the following principles:¹¹⁶

- Tariffs should provide a weighted average price equivalent to the cost of new base load hydropower capacity in Uganda, adjusted for transmission losses;
- In the short to medium term, prices should be based on the estimated marginal costs of production;

In addition the government has plans to pay subsidies to energy projects with the following specification:

- When a grid connected project sells electricity to the local area as well;
- Mini grids, where generation and distribution are combined in remote areas with the main grid;

Another instrument to motivate renewable energy developers is to comfort private investors by using either of the following existing financial instruments to hedge their long term borrowing from local financial institution:

- The Refinance Facility at the Bank of Uganda;
- The Credit Support Facility (CSF), a Public Trust entity;

Financing strategy

Uganda's National Development Plan (NDP) for 2011-15 relies on domestic budgetary financing as well as on Official Development Assistance (ODA). To attract direct foreign investment in the private sector, the government will try to pursue market-led policies while keeping its strategic lead in providing public

¹¹⁶ The Renewable Energy Policy For Uganda, Ministry of Energy and Mineral Development, 2007

goods/services and addressing/recovering market failures. In addition, it will seek financing through capital markets, in particular through sovereign bonds to generate capital for investment in vital sectors namely the construction of physical infrastructure and energy facilities.¹¹⁷

Energy development strategy

Uganda is underdeveloped in terms of power generation infrastructure and needs to take serious steps for increasing the electrification rate (currently less than 5%) as well as eradicating load shedding. In order to increase the electricity consumption per capita from the current level of 75 kWh to the level of middle income countries at above 3,500 kWh, Uganda has to increase the overall power capacity from 420 MW in 2010 to more than 41,000 MW in 2040.

Table 7. Electricity generation projections to meet NDP targets.¹¹⁷

Year	2010	2015	2020	2025	2030	2035	2040
Consumption (kWh/capita)	75	674	1,273	1,872	2,470	3,069	3,668
Capacity (MW)	425	3,885	8,601	14,670	22,222	31,252	41,738

Uganda has defined several objectives, strategies and interventions to be met to achieve its energy sector targets among which the most important ones are:

- Increasing the power generation capacity: constructing large scale hydro and thermal power plants through public and private funding, developing mini hydropower plants to generate 150 MW;
- Building new transmission lines to connect the new plants to the grid and extend the network to other areas in the country;
- Accelerate rural electrification;
- Promote energy efficiency;
- Strengthen the policy, legal and institutional framework;
- Promote renewable energy:
 - o Promote and facilitate the use of renewable energy technologies including biomass, solar, gasification and efficient stoves through subsidies;
 - o Promote and facilitate the use of biofuels through developing strategy for growing biofuel crops and legislation for fuel blending;
 - o Promoting co-generation power plants through incentives and subsidies;
- Promote the peaceful use of atomic energy;
- Capacity building within the sector;

Energy sector lending

Uganda is highly dependent on international aid and has several development partners. In the course of 2001-2010, net ODA for Uganda has almost doubled and reached USD 1.53 billion^{118,119} resulting in an average ODA to Gross National Income (GNI) ratio of about 15% per year.¹¹⁸ In total there are 42 development partners including 26 bilateral and 16 multilateral donors providing assistance to different sectors. Among the multilateral aid providers, the International Development Association (IDA), from the World Bank group contributes with 25% the largest share of total ODA, followed by the African Development Bank (AfDB) with 4.4%. Around 60% of the aid is provided through bilateral development partners amongst whom the US, the UK, the Netherlands, Denmark, Ireland, Germany, Sweden and Norway cover the most shares.

¹¹⁷ National Development Plan 2011-2015

¹¹⁸ Uganda country assistance evaluation 2001-2007, the World Bank 2009

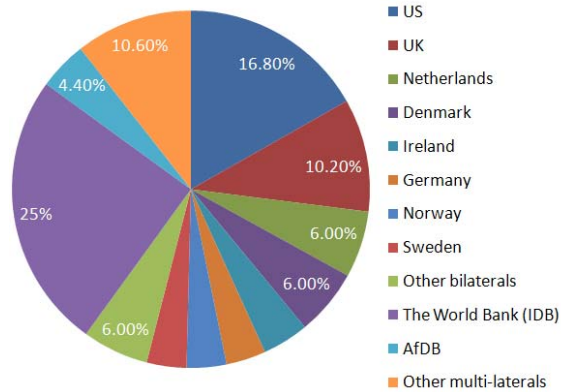


Figure 17. ODA partners for Uganda 2001-2007 ¹¹⁸

ODA per capita is anticipated to increase by 60% between 2008 and 2015 and reach USD 35 per capita. This is 3.7% of the GDP which is far below 12% share of ODA to GDP that Uganda would need in the course of 2005-15 in order to finance programmes to meet the Millennium Development Goals (MDGs).¹¹⁹

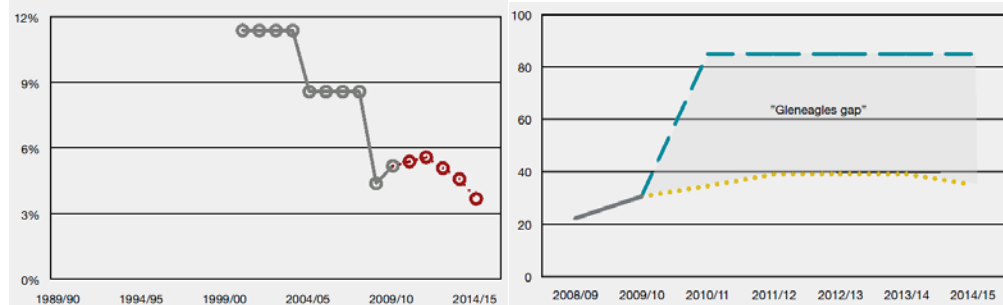


Figure 18. ODA to Uganda 2000-2015 in % of GDP and USD per capita.¹¹⁹

The World Bank and AfDB were the main donors in respect to Uganda's power development programs. In the course of 2001-2007 AfDB dedicated more than 17% of its aid stream in Uganda to the power sector. In the same period the World Bank spent 19% on average.¹¹⁸ In addition, there is an IDA guarantee of USD 115 million for private power generation, the Bujagali hydropower plant.

The World Bank and Uganda's national development plans. Financial resources for Uganda's development supported by the World Bank group during 2011-15 are estimated at about USD 2 billion. Development partners in Uganda continue to seek ways to further improve aid effectiveness by focusing on basket funds, sector-wide approaches, and new coordination mechanisms, such as the Joint Budget Support Framework. The World Bank chairs the Local Development Partners' Group, the apex DP forum in Uganda.

The World Bank's Country Assistance Strategy for Uganda provides a framework for the World Bank Group to support five financial years between 2011 and 2015. The focus would be on several strategic objectives of which the most relevant outcome for the energy sector is:

- Improved conditions for private sector growth;
- Increased efficiency and sustainability of natural resource management.
- Increased access to electricity;
- Improved management and delivery of urban services.

¹¹⁹ Millennium Development Goals for Uganda, Ministry of Finance, Planning and Economic Development, September 2010



The sector distribution of IDA financial resources shows the government's focus on infrastructure development. About 68% of commitments are allocated to energy, mining, environment, urban development, and transport. For 2012, IDA has proposed to support the power sector up to USD 100 million.

Investment commitments through IFC reserves over 2006-09 amounted to USD 200 million mainly in the electricity sector and the financial sector, especially for small and medium enterprises (SMEs). Since 2006, the IFC has focused on intermediaries for SME finance, resulting in improved portfolio performance with negligible loss reserves. Currently, the portfolio amounts to USD 193 million, the fourth largest country portfolio for IFC in Africa. IFC will continue assisting viable investments in the Kampala Industrial and Business Park for 2011-15.

Development Partners. There have been efforts to improve donor harmonization. The government and development partners (DPs) agreed to shift increasingly from project support to sector support. In 2005, several DPs joined together to elaborate a Uganda Joint Assistance Strategy (UJAS) to support the government's development plans. DPs coordinate their activities through a private development working group co-chaired by the World Bank. DPs supporting the private sector development include: the Danish International Development Agency (DANIDA), Department for International Development UK (DFID), the European Commission (EC), the German Agency for Technical Cooperation (GTZ), Ireland, Norway, and the United States Agency for International Development (USAID). The key partners for the development in the energy sector are: the Norwegian Agency for Development Cooperation (NORAD), the German Reconstruction Credit Institute (KfW), Japan International Cooperation Agency (JICA), and AfDB who have provided financing towards generation, transmission network development, rural electrification, technical assistance and capacity building activities. The World Bank has initiated the Power Sector Development Operation led by the Ministry of Energy and Minerals Development.

Trust funds. Since the start of UJAS, Uganda benefited from 48 trust funds providing nearly USD 65 million in grants mostly linked to lending operations. The focus areas were: environment (GEF); renewable energy (GEF); demobilization and reintegration of ex-combatants (MDTF); avian influenza; sanitation and hygiene (WSP); monitoring and evaluation (IDF); and piloting output-based aid in health and water supply (GPOBA). For the period 2011-15, the Energy Sector Multi-donor Assistance Program (ESMAP) will support to identify geothermal resources. A Dutch Trust Fund for the Africa Renewable Energy Access Program will finance two pilot projects in Uganda. A Russian Trust Fund is financing studies for the development of renewable energy.

Guarantee Agencies. During the UJAS period, Multilateral Investment Guarantee Agency (MIGA) became increasingly involved in the energy projects. MIGA is supporting an electricity distribution grid project in Uganda with a USD 41 million guarantee for 20 years as well as an equity share in Bujagali Energy Ltd with a USD 115 million guarantee. In all, MIGA's portfolio includes three guarantees with combined gross exposure of USD 158 million. MIGA will likely be able to support foreign direct investment in the energy sectors for the 2011-15 period based on an as-needed basis. At MIGA, under Small Investor Program (SIP), projects have gross exposures of less than USD 10 million and are normally approved in less than two months.

China and the Renewable Energy sector

China's investment in Uganda at the moment is concentrated on transport infrastructure such as building highways and oil industry exploration and extraction activities.¹²⁰ No constructive investment strategy regarding Chinese presence in the renewable energy sector in Uganda could be found. There have been very limited investments in biogas and a small scale hydropower plant in Uganda:

¹²⁰ China aims at deepening cooperation with Uganda in infrastructure, 24 December 2010, http://news.xinhuanet.com/english2010/china/2010-12/24/c_13663586.htm



Biogas: Biogas technology was introduced in Uganda in the early 1980's by installing a few bio-digesters in eastern Uganda with technical assistance from China. The project was no success as some of the bio-digesters quickly ran out of order due to improper maintenance and lack of knowledge for operation. There has not been any substantial investment in Ugandan biogas sector by China.¹²¹

Hydro: By investing USD 17 million China will build and operate a 10 MW hydro project in collaboration with Uganda and Tanzania along their common border.¹²²

Oil discovery and renewable energy

At least 800 million barrels of oil reserves has been discovered in Uganda which is above the threshold for commercial development.¹²³ It is foreseen that annual revenue of such reserves will be more than USD 3 billion and that the country can feed its fossil fuel power plants with domestic oil. Although this is not expected to happen before 2016, readily available and cheap fossil fuel, compared to today's exported and expensive oil can have negative impact on renewable energy development in Uganda which might disappoint foreign investors in the sector.

Uganda and NAMAs

The Bali Action Plan envisages enhanced national/international action on climate change mitigation. This includes consideration of Nationally Appropriate Mitigation Actions (NAMAs) by developing country parties in the context of sustainable development with technological and financial support from the developed countries. The planned mitigations shall be measurable, reportable and verifiable. Uganda has not communicated with the UNFCCC secretariat regarding its NAMAs plans.

¹²¹ Renewable Energy Technologies in Uganda, Heinrich Boell Foundation, 2004

¹²² Africa Energy Case Study, Teach Africa 2009

¹²³ Country Assistance Strategy for Uganda, The World Bank, 2010



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