



Green Investments In Mozambique

A Market Needs Analysis on Sustainable Energy and Environmental Performance Projects in Mozambique for Agence Française de Développement and the Bank of Mozambique



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Glossary / List of Abbreviations & Acronyms

ADM	: <i>Aguas de Moçambique ; National Water Utility</i>
AFD	: Agence Française de Développement
AfDB	: African Development Bank
BoM	: Bank of Mozambique
C	: Centigrade
CDM	: Clean Development Mechanism
CE	: Clean Energy Sector
CENELEC	: <i>Conselho Nacional de Electricidade / National Electricity Council</i>
CEPAGRI	: <i>Centro de Promoção da Agricultura / Agriculture Promotion Center</i>
CFL	: Carbon Fluorescent Lamp
CJO	: Crude Jatropha Oil
CNG	: Compressed Natural Gas
CPI	: Investment Promotion Centre
CPS	: Country Partnership Strategy of the World Bank
CRA	: <i>Conselho de Regulacao do Abastecimento de Agua: Water Regulatory Agency</i>
CSR	: Corporate Social Responsibility
CTI PFAN	: Climate Technology Initiative Private Financing Advisory Network
DBSA	: Development Bank of Southern Africa
DNFT	: National Forest & Land Directorate
EDM	: <i>Electricidade de Moçambique / the National Electricity Utility</i>
EE	: Energy Efficiency
EEP	: Environment & Energy Programme
EMP	: Environmental Management Plan
EMS	: Environmental Management & Standards
ES	: Environment Sector
ESIA	: Environment & Social Impact Assessment
EU	: European Union
FIPAG	: Water Supply & Assets Fund
FSC	: Forest Stewardship Council
FUNAE	: <i>Fundo Nacional de Electricificação / Energy Fund of Mozambique</i>
FUNAB	: <i>Fundo do Ambiente / Environmental Fund</i>
GEF	: Global Environment Facility
GHG	: Green House Gas
GJ	: Giga-joule
GoM	: Government of Mozambique
GTZ / GIZ	: German International Cooperation
GW / GWh	: Gigawatt / Gigawatt hour
Ha	: Hectare
HCB	: <i>Hidroelectrica de Cahora Bassa</i>
IDA	: International Development Agency
IPP	: Independent Power Producer
IRR	: Internal Rate of Return

ISO	: International Standards Organisation
LNG	: Liquid Natural Gas
LPG	: Liquid Petroleum Gas
kW / kWh	: Kilowatt / Kilowatt hour
MAE	: Ministry of State Affairs
MDG	: Millennium Development Goals
MICOA	: Ministry for Environmental Coordination
MINAG	: Ministry of Agriculture
MoPH	: Ministry of Public Works & Housing
MOTRACO	: <i>Mozambique Transmission Company SARL</i>
MSW	: <i>Municipal Solid Waste</i>
MTS	: Mozambican Meticals
MW / MWh	: Megawatt / Megawatt hour
NEDAP	: National Energy Development & Access Programme
NGO	: Non-Governmental Organisation
PARP III / PARPA II / PRSP	: Poverty Reduction Strategic Plan
PETROMOC	: Peroleos de Mocambique
PPP	: Public Private Partnership
RE	: Renewable Energy
REDD	: Reduction in Emissions through Deforestation & Destruction
RFP	: Request for Proposals
RTN	: <i>Rede Nacional de Transmissão / the Mozambique National Grid</i>
RSA / SA	: South Africa
SAPP	: Southern Africa Power Pool
SPCR	: Special program on Climate Resilience of the World Bank
UNEP	: United Nations Environment Programme
UNDP	: United Nations Development Programme
UNFCCC	: United Nations Framework Convention on Climate Change
UNIDO	: United Nations Industrial Development Organisation
USD	: United States Dollars
USAID	: United States Agency for International Development

1. Introduction & Objectives

This report has been prepared for the Bank of Mozambique (**BoM**) and Agence Française de Développement (**AFD**) by Verde Azul (VA) and PPL International (**PPL**) to establish the potential for and to help in the design of a possible credit facility, to be funded by AFD, to support and promote *Green Investments* in Mozambique.

For the purpose of this report *Green Investments* are defined and characterized under the following 2 sub-sectors:

- Investments in **Clean Energy** generation and distribution capacity, including clean and renewable energy generation projects, including investments in the following areas (and for simplicity hereinafter referred to as the **Clean Energy (CE) Sector**):
 - Biomass
 - Bio-fuels
 - Solar
 - Hydro
 - Wind
 - Geothermal
 - Tidal
 - Waste to Energy
 - Natural Gas

- **Environmental Performance Projects**, including specifically, investments in the following areas (and for simplicity hereinafter referred to as the **Environment Sector (ES)**):
 - Cleaner Production; deployment of energy efficiency, end of pipe and emission reduction technology, particularly in the tourism, heavy manufacturing and construction sectors;
 - Waste Management & Pollution Control;
 - Water Supply and Waste Water Treatment;
 - Forestry;
 - Environmental Management & Environmental Management Systems / Standards;

Because of the fundamental different underlying characteristics of these sub-sectors the report treats and analyses each sector separately but attempts to draw common conclusions for the design and deployment of a credit facility for the combined Green Investment Sector as defined herein.

The study sets out to achieve the following objectives, namely to:

- Provide an overview of the policy framework and regulatory environment for “Green Investments” in Mozambique;
- Examine the potential for development and investment in the various identified sub-sectors by assessing resource availability, market demand and developments and by reviewing past, current and anticipated future investment activity;
- Identify sub-sector- / technology-specific barriers and opportunities for investment in each case;
- Assess future market trends and the size of the market both in the various sub-sectors and as a whole;
- Outline parameters for design and operation of a credit facility and identify specific sub-sectors at which such a credit facility could most usefully be targeted.

The report’s main authors are Kemal Vaz of Verde Azul and Peter Storey of PPL; sector specific research and analysis work has been performed by Boaventura Cuamba (solar & wind), Amilcar Cipriano (hydro), Paulo Falcao (biomass & forestry), Niklas Lehman (co-generation and bio-fuels); the Paper has been extensively reviewed by AFD in both Paris and Maputo as well as by Patrick D’Addario of LaGuardia Foundation.

The report is based on review of existing documentation and prior reports as well as on primary data, collected through interviews with a wide range of stakeholders involved in the Green Investment sector as defined above. These stakeholders included relevant government departments and agencies, donor countries and organisations, project developers of Green Investment projects, private sector companies, commercial banks and NGOs involved in the identified sectors and / or related environmental areas and activities. Annex 2 provides a full schedule of the organisations and individuals who participated in the interviews. The authors would like to extend their sincere thanks to all those, too numerous to mention individually, who participated in the interviews and contributed to this study, as well as to AFD for sponsoring the study and providing valuable guidance on its composition and contents.

While data collection was as comprehensive as possible, much of the project related data in this report is based on unverified information and estimates. Project data, was collected from a variety of sources (including developers, banks, development agencies, government departments and documentary sources) and was largely taken at face value and subjected only to plausibility verification. In addition it should be recognised that the project data does not by any means capture all projects and accordingly should not be taken as providing a complete picture. In turn these project data, together with documentary data and assumptions based on sector activity, underlying economic growth rates, financing and achievability were used to project

figures for the size of the respective market segments and the market as a whole for the five year period 2011 – 2015. Accordingly it is emphasised that these projections should be treated as indicative investment estimates only and not in any way definitive or absolute.



2. Executive Summary

2.1 The Green Investment Sector in Mozambique

The Market for private sector investments in the Green Investment (as defined) in Mozambique is relatively small and still nascent.

While the total potential size of the market over the 5 year time horizon, set as a framework for this study, is put at between USD 9,7 – 12,4 billion these figures are dominated by 2 sectors – Biofuels (USD 4 – 5 billion) and Forestry (USD 4,5 – 5,5 billion) - which together account for over 85 % of the total and which themselves are dominated by large investments from internationally active companies. The remaining 15 % of the market (USD 1,2 – USD 1,9 billion) is shared between 9 sub-sectors.

Growth and development in the sector is constrained by lack of public and institutional awareness as well as by a general lack of appropriate regulation across most sub sectors which could otherwise mandate and / or incentivize investment. These factors are exacerbated by:

- **Limited data availability** on potential savings from investment in green technologies and their various impacts and benefits; existing data is not easily accessible and incentives to invest are still not in the regulation framework. Accordingly the needs, benefits and impacts are perceived as being **less tangible**;
- **“Public Good” perception:** many opportunities for Green Investment are in areas that are traditionally considered the responsibility of the public sector rather than business opportunities (waste management, water & sanitation, electricity generation and distribution);
- **Technology Cost & Technology Risk:** Green Technologies are often relatively new technologies which haven’t been fully commercialized. As such their risk is perceived to be higher and the incremental cost is sometimes prohibitive without subsidy or support. In addition, technologies developed in the developed world may not have been fully adapted for developing country / African applications.

- **Low capacity and willingness to pay:** upfront costs for products and services which require shifts in spending patterns are often barriers to uptake amongst the urban poor. This is seen in the solar rural electrification sector where the most successful schemes are those that replicate existing spending on fuel wood, kerosene, candles and batteries, such that the investment cost of equipment is spread over time in rental or hire purchase instalments rather than incurred in one up-front amount.

2.2 The Clean Energy Sector

In the Clean Energy Sector Mozambique is well-endowed, enjoying plentiful supplies of key renewable resources, including specifically biomass, solar and hydro, and in some locations also geo-thermal (and to a lesser extent also wind), all of which could make significant contributions to power generation capacity in both on-grid utility scale and off-grid distributed, rural electrification constellations. At present these resources are scarcely, if at all, exploited:

- The current price structure of electricity supply in Mozambique works against the establishment of new generation capacity, based on renewables, which cannot in general compete with the EDM tariffs, based on the supply from Cahorra Bassa
- The strong position of EDM in both power generation and distribution: on the one hand the monopoly position facilitates the expansion of the grid without fear of predatory competition, but this same lack of competition, combined with lacking regulation and the tariff structure, means there is no incentive to innovate or to significantly expand the generation base or diversify the energy mix.
- The current structure and capacity of the RTN national grid similarly constrains the establishment of new generation capacity (regardless of energy source): this is because of the lack of North-South interconnection and the fact that the grid does not reach large areas of the population, and in the more densely populated urban areas, does not have sufficient capacity or stability to ensure high quality power supply.
- Although official policy recognizes the potential for renewables, is generally positive and supportive to the deployment of clean energy, there is no explicit regulation which actively mandates, promotes or supports the use of renewables. Examples of such regulation would include:

- Energy mix requirement;

- Requirement of the unbundling of EDM's generation and distribution capacity;
 - Regulation for Independent Power Producers (IPPs);
 - Regulation of off-take from IPPs to the grid;
 - Tariff regulation to set tariffs for off-take from different renewable sources (which would probably require some sort of subsidy element)
- The off-grid rural electrification market is dominated by FUNAE, a government agency, which controls the complete value chain (design, implementation, funding and often also operation in cooperation with local authorities) and which is 100 % government / donor funded. While the work of FUNAE is to be commended in having brought power to thousands in rural and poor populations this activity doesn't facilitate private sector entry (except as equipment supplier) in those areas which could otherwise be open to enterprise and innovation (eg mini-grids operating on hybrid systems – solar, mini-hydro, wind and diesel gen-set back-up; containerized utility solutions; productive use of power).

Despite these issues being recognized and understood within government there is little sign that they will be addressed soon. This means that for the foreseeable future the government and donors will continue to be the main players in both large scale generation and distribution and in smaller scale rural electrification.

The notable exception to this situation is the bio-fuels sub sector which has experienced high levels of project development activity over the past 5 years or so and currently boasts ca. 38 projects under various stages of development, the majority of these, if not all, as fully commercial undertakings. Until recently this activity was driven predominantly by international demand, particularly from Europe but also from Japan, for liquid biofuels (bio-ethanol and bio-diesel) to meet fuel mix mandates as well as by supportive Mozambican policy which, recognizing the right climatic and soil pre-requisites, identified the production of energy crops as feedstock for bio-fuels as a country priority and accordingly allocated ca 41 million hectares of low grade land for their cultivation. This positive situation has been further enhanced by the recent enactment, in March 2011, of a bio-fuels mandate in Mozambique which stipulates minimum blends for bio-ethanol at 10% in petrol and bio-diesel at 3% in diesel fuel sold in Mozambique from 2012 onwards. This legislation can be expected to stimulate further growth in the bio-fuels industry in the foreseeable future. Many of the existing projects represent multi-million dollar investments in feed-stock plantations and production / refining facilities by international bio-fuels companies and as such are beyond the scope of a credit facility as contemplated. However there will be opportunities for smaller scale producers and local small holders / out-croppers at the periphery of this trend, notably in the production of bio-diesel from jatropha and other crops (palm oil / coconut oil / pure plant oil).

The advent of significant quantities of thermal generation capacity (ca MW 2.500 of installed capacity) as a by-product of the exploitation of the Moatise coal reserves will also have significant impacts on the energy market in Mozambique. The further implications and impacts of these coal fired plants is considered in more detail in section 4.3 (*Future Developments in the Energy Sector*) of this report. In the absence, however, of tariff regulation, the addition of comparatively cheap thermal capacity, assuming it can be delivered to paying markets, can be expected to make renewable sources comparatively less attractive.

The fact that Mozambique's baseline electricity generation is 99% hydro-electric means that CDM does not offer sufficiently interesting benefits to stimulate energy and power development based on other renewables. The exceptions hereto are forestry, where REDD can be expected to play a significant role, and some heavy industrial, fossil fuel intensive processes (eg cement manufacturing) where producers may be encouraged to switch to new fuels (gas) and / or low emission technologies / procedures. These opportunities are discussed more fully in sections 5.5 and 5.1.2 respectively.

Mozambican gas is becoming increasingly available and there is certainly potential to exploit more of the proven reserves. There is also widespread political support for increased gas usage. Options under consideration for its use include power generation for export to South Africa, industrial supply, thermal power supply to heavy industry, domestic retail supply for cooking and heating or for use as CNG in gas powered vehicles. It is also thought that use of LPG in small scale enterprises has considerable potential, though sufficient corroborating data was not able to be gathered for this study.

The prospects for gas are considered in more detail in section 4.2.9, however this segment is still very much in its infancy and the immediate projects to exploit its potential are all large scale undertakings, which require considerable government preparation and major investment, not least in distribution systems and, therefore, would probably be beyond the scope of the contemplated credit facility. It is also unclear whether exploitation and distribution activity in the gas segment will take place in the public or private sectors although it is clear that private sector intervention will require positive regulation and government intervention. Therefore, while gas holds much mid - long term potential, it is thought unlikely that the segment will offer near term potential for a credit facility.

2.3 The Environment Sector

The Environment Sector is also marked by lacking formal regulation and wide range of implementation standards, ranging from basic compliance to the locally required minimum standards through to fulfillment of standards, set by internal governance in accordance with stated CSR objectives and philosophies and / or as required by independent standards organisations such as ISO; a number of companies interviewed have attained ISO 14000 certification.

The Cleaner Production / Energy Efficiency segment was found to have some potential for a credit facility in a number of key industry sub-sectors:

- The Mozambican cement industry is gearing up rapidly to position itself for a construction boom fuelled by the *mega projects* (rehabilitation of the Sena railway Line and its extension to Ncala; exploitation of the Moatize Coal reserves and establishment of new thermal power stations; Ncala deep water port, Mphanda Nkuwa and Cahorra Bassa II hydroelectric plants), by rapid urban (re)development, particularly in Maputo, growth of the hotel and tourism industry and a potential oil and gas boom. With 5 new cement factories planned, and a total investment of just under USD 450 million, there is deemed to be good opportunity for introduction of cleaner production, energy efficiency and other resource saving measures which can and will impact the bottom line. Deployment of a gas-fired kiln has already been successfully demonstrated / implemented in one existing plant though replication in the new plants will depend on the proximity to gas outlets and existing distribution infrastructure which, as commented on elsewhere, is still limited. Four of the new investments are being proposed by Chinese companies, the remaining one by PPC of SA. The potential for cleaner production investments across the 5 planned new plants is estimated at between USD 50 – 75 million.
- The hotel and tourism sector displayed generally good awareness of the benefits of energy efficiency and other resource saving measures, however the level of actual implementation is very varied – from fulfilling basic minimum requirements to ISO 14000 certification. Judging by respondents' reactions availability of credit will not materially impact the situation since only one interviewee cited funding as a constraint. Concern about reliability of spare part supply and maintenance appeared to be a larger barrier; it was also apparent that the lack of mandatory requirements is a further major factor. Awareness and readiness to implement can be expected to rise with the completion of UNIDO's and the Mozambique Cleaner Production Center's resource efficiency programme for hotels over the next 2 years and this coupled with the potential for new hotel and tourist development in the North of the country make the segment potentially attractive

for targeting of a facility. The potential total aggregate of this segment is estimated at USD 5 – 10 million, with most investments in the range of USD 50 – 500.000 depending somewhat on the size of the hotel.

It is already clear that there will be considerable private sector involvement in the waste management segment with waste collection and treatment in Maputo (reclamation and closure of the existing dump and establishment and operation of a new landfill) slated for concessional operation by a private sector contractor. While waste to energy initiatives are thought to be unlikely for reasons of insufficient return on the energy generation and regulatory problems with the off-take, potential for private initiative in the segment is also being demonstrated by pilot projects such as EcoPoints and the Maputo City sponsored composting and recycling schemes which all show scale up and replication potential. There are also a number of established players active in the sector, such as Envioserv. Total aggregate investment in this segment is estimated in a range of between USD 125 – 250 million, whereby much of this will be controlled by the government and / or cities / municipalities for implementation / performance by the private sector. Accordingly the requirements for raising financing against future relatively secure management and contract fees may be quite high and the risks would appear acceptable for established and reputable operators. Accordingly, while still in relatively early stages of development, this area is thought to be a potential target for a credit facility. Industrial waste management (including sewage treatment and end-of-pipe emissions) was considered within the cleaner production segment and is also believed to offer opportunities for a credit facility but, in the absence of more meaningful data, would require further targeted research to assess requirements and identify specific measures and potential investments / projects.

While the investment requirements for the water and sanitation sector are projected to be significant most activity is financed by the government and donors. Water supply in some of the main cities is thought to be reaching a state of cost recovery where it could effectively be put out to private contract but it is already effectively served by a PPP model; sanitation and sewage requirements seem to remain firmly in the domain of the government although existing systems are effectively obsolete and there are many informal private systems (pit latrines and septic tanks etc.) which are better or worse maintained. With the possible exception of some of the infrastructure connected to new hotel and tourist developments in the North under the Arco Norte project it is thought unlikely that this segment will offer any real potential for a credit facility.

The Forestry segment is divided into two separate sub-segments: pure logging and harvesting activities and plantation activities. The plantation segment is attracting large investments from international groups with a wide range of backgrounds: some are pure timber traders, some are forestry industry companies, some are carbon

investors looking to leverage the considerable sequestration potential, others are philanthropic / development investors.

It is thought unlikely that Banks will have an appetite to finance pure harvesting and logging activities while the majority of identified investments in the plantation sub-sector will likely exceed the scope of a credit facility. However some of the investments reviewed in the plantation sub-sector involve multi-faceted projects, consisting of many sub-components, which include plantation and tree husbandry, establishment of infrastructure as well as investment into downstream (or parallel) value-added activities (eg processing of forest waste for biomass pellets for co-generation; establishment of saw milling facilities; charcoal production; out-cropping for small-holders etc.). While the total investment commitments are large these have often been pledged with a view to securing concession area and it is accordingly likely that the various commitments will be implemented / structured as independent off-shoots in smaller phased sub-projects and investments. There can also be expected to be spin-off investments. These independent sub-projects could be of interest for a financing facility. Accordingly while Forestry is not a core target for a credit facility it is a sector which appears to hold considerable potential, albeit that this potential would require further investigation and more precise targeting.

Annex 7 provides a table summarising the investment potential of each of the sectors identified and analysed in this report. The table shows the total estimated investment projected in each sector over the 5 year horizon of this report and provides a trend analysis while summarizing the chief barriers in each sector and some of the main opportunities. The following indicators have been used to provide an overview of the short term and long term trends in each sector:

- Zero : There will be no investment activity relevant to the contemplated credit facility in the sector in the given period despite availability of resource / potential.
- Unlikely : It is unlikely that there will be significant investment activity relevant to the contemplated credit facility in the given period.
- Uncertain : Investment activity levels relevant to the contemplated credit facility are uncertain and dependent on the dismantling of regulatory and other barriers.
- Positive : The environment for investment activity relevant to the contemplated credit facility is supportive and positive and can be expected to sustain reasonable levels of deal flow relevant to a facility during the given period.

2.4 Project Potential

As commented above private sector involvement in the Green Investment sector is still relatively underdeveloped in Mozambique. As evidence of this is the result of a request for proposals for commercially viable clean energy projects, with an investment range of USD 1 – 50 million, by CTI PFAN at the end of 2009 / beginning 2010. The RFP allowed applications from any sub-Saharan African country but was actively targeted at projects in Mozambique, South Africa and Uganda; the organisers indicated that they did the same amount of promotion work in each of the 3 targeted countries, probably even with a slight bias in favour of Mozambique. Out of 65 eligible projects from 16 countries only 4 were from Mozambique (2 in biofuels, 1 in biomass, 1 in pico-wind); 23 from South Africa; 14 from Uganda and 4 each from Ghana and Kenya where no active promotion was conducted.

Project identification work further reinforced this notion: out of 169 potential projects identified over 80 % (137) were categorized as being either only in a conceptual development phase (57 %) or in an early pre-feasibility development phase meaning that it is uncertain whether such projects will progress further and in any case unlikely that they will mature to bankability within an acceptable time frame to be considered by a credit facility as contemplated. Only 5 % (9) of projects identified were classified as mature (ready for financing and implementation / in implementation) and another 14 % (23) were in later stage development / early implementation and therefore considered realistic targets for a credit facility. However these projects tended to be larger investments in the biofuels (7) and forestry sectors (11), leaving only 12 from other sectors with the Waste Management (5) and Solar (4) sectors showing the most concentrated promise.

2.5 Overview of the Banking Sector in the Green Investment Sector

For the purposes of this study interviews were conducted with the main commercial banks in Mozambique.

The Green Investment sector is still to a large extent financed by government and multi- and bi-lateral donor / development funding which targets a range of activities in support of stated government policy in the sector particularly in the areas of capacity building and demonstration / pilot projects to help promote and kick-start mainstream private sector activity (eg the SPCR - Special Programme on Climate Resilience of the World Bank). There are currently no dedicated commercial facilities which specifically and solely target Green Investment sectors, although a number of existing facilities incorporate and emphasise environmental performance and sustainability measures as eligibility criteria (eg the AFD supported BCI credit enhancement facility); ProCredit offers so called *EcoLoans* which are specifically targeted at financing purchases of (or supply of) equipment for rural electrification

(focusing principally on solar technology), but this is a meso-finance programme primarily aimed at individuals and micro enterprises; the loan value is thought to range between USD 1.000 – 20.000.

None of the interviewed banks have existing or dedicated management or departmental capacity in Green Investment in Mozambique although some banks are able to draw on expertise from headquarters if deal size justifies this. All of the banks interviewed would be interested in cooperating with AFD in designing and operating a credit facility; all of them also however emphasised that they would require capacity building support to establish the appropriate resource.

The chief barriers to investment identified by the banks can be summarized as follows:

- Average borrowing costs (particularly for new customers) are very high (11 – 15 % for USD loans and 23 – 25 % for MTS loans) and often wreck the economics of green investment project proposals which are fragile at the best of times;
- Borrowers / projects are unable to meet collateral requirements which often run to 120 % of the principal amount;
- The usual loan maturities offered by the banks (5 – 7 years maximum) are too short to accommodate the mainly capital intensive and long term utility type business models of the majority of green investments, particularly in the energy sector.

In addition the banks all commented on the lack of supply of good proposals and suitably qualified borrowers who even when technically capable often don't have the requisite commercial and management skills and experience to satisfy credit committees; few of the banks had ever been confronted with a Green Investment project. This further underlines the relative lack of development of the sector as well as the need for ongoing and expanded technical assistance to support its development particularly in the area of project development and financing.

2.6 Recommendations for a Credit Facility

Given the current structure and state of development of the Green Investment market it is not the supply of credit per se, which is the major constraint on the undoubted scale up potential that Mozambique exhibits. The chief bottle necks appear to be lack of appropriate incentivizing regulation on the one hand and lack of early stage development support and technical assistance for structuring commercially viable projects (as opposed to reliance on donor funding) on the other

hand. This appears rooted in a more general lack of commercial, enterprise and innovation skills and a risk-averse culture.

This notwithstanding it is believed that an AFD Credit Facility can still make a valuable impact on the market by addressing and incorporating the following key areas:

- Credit enhancement to reduce the collateral requirements of the banks particularly for new borrowers and smaller projects;
- Reduction in the cost of borrowing through the subsidization of interest rates to bring interest cost more in line with the return profiles of Green Investment projects;
- Extension of lending tenors to match the longer term cash flow profiles of most Green Investment projects: maturity profiles of 7 – 10 years are suggested;
- Provision of capacity building and technical assistance funding to support the establishment of dedicated capacity at the banks and to facilitate and support project development through the project developers.

It is apparent from the analysis of the project data that no one sub-sector or group of sub-sectors warrants individual sector based targeting on account that this would unnecessarily limit the potential take up of a facility. Accordingly it is recommended to structure the contemplated facility in three tiered components or sub-facilities to address divergent project demands / requirements:

	Component 1	Component 2	Component 3
Amount	USD 20 – 25 million	USD 5 – 10 million	USD 5 – 10 million
Type of Financial Instrument	Senior Debt	Senior Debt	Guarantee Fund
Individual Loan Amounts	Min: USD 2 million Max: USD 10 million	Min: USD 100.000 Max: USD 2.000.000	Up to 50 % of the underlying loan
Availability	As a Loan	As a loan	As a guarantee to the loan providing bank to cover 50 % of any first loss on the loan
Tenor / Maturity	7 – 10 years	7 – 10 years	7 – 10 years
		Maximum of 50 - 70	

Security	Normal Bank requirements	% of collateral cover if first loss guarantee chosen	
Potential Target Sectors	<ul style="list-style-type: none"> ➤ Cleaner Production ➤ Waste Management ➤ Biomass ➤ Hydro ➤ Bio-fuels ➤ Forestry ➤ Cleaner Construction / Green Buildings 	Rural Electrification projects using the following technologies: <ul style="list-style-type: none"> ➤ solar, ➤ mini-hydro ➤ pico-wind ➤ hybrid 	To provide security enhancement for loans provided under Component 2.

Ideally, and for maximum impact, these 3 components would be structured and offered as an integral package. However it would be possible to consider individual components as stand-alone facilities and / or to mix and match the components according to funding capacity and target market preferences. This holds especially for components 1 and 3, which would be able to stand fully in their own right without any of the other elements. Indeed one option would simply be to offer a guarantee facility along the lines of component 3, which would help address the most significant gaps and barriers in the credit market: this facility could then be targeted at larger or smaller loans or both. The impact and take up of component 2 is, however, expected to be enhanced by the guarantee facility and it is therefore recommended that component 2 be offered in conjunction with component 3. Part of the logic of organizing the facility in components was to afford AFD the maximum possible flexibility in structuring a final mechanism.

Sectors are identified purely to assist with targeting promotional and marketing activity; it is not suggested that the identified sectors should be in any way exclusive or used to assess eligibility. Instead eligibility would be based upon loan size and project performance criteria such as:

- GHG emission reduction potential;
- Establishment of CE generation capacity;
- Fossil Fuel replacement
- Provision of rural electrification services
- Energy & resource Efficiency
- Achievement of environmental norms / standards / certification

In like fashion credit risk should be measured more in terms of cash flow performance and interest cover and debt service cover ratios in order to push the banks to a more entrepreneurial project finance based analysis / approach rather than a standard corporate lending approach based solely on the static analysis of balance sheet and borrower substance combined with collateral cover.



3. Mozambican Legal Frame Work for the Energy and Environment Sectors

The key policies, legislation and regulatory enactments relating to the energy and environment sectors are summarized in the table provided in Annex 3.

3.1 Clean Energy Sector Policy & Regulation

Access to energy is fundamental for sustainable economic development and social progress in Mozambique. The Poverty Reduction Strategic Plan (**PARP III / PARPA II / PRSP**) and the World Bank's 2008-11 Country Partnership Strategy (**CPS**) recognise the critical role of the energy sector in reducing poverty. CPS prioritises especially the provision of energy services to rural schools, administrative posts, and hospitals.

The energy-related goals set in PARPA II / PARP III are gradually being converted into sector specific strategies / plans such as:

- Off-grid and Renewable Energy Strategy, which was approved by the Council of Ministers in May 2012¹. The strategy envisages promotion of private sector investment, calls for a commercial financing platform and for the simplification of concession application and granting procedures, while noting that local awareness and capacity remains yet low;
- Generation and Transmission Master Plan;
- North-South (backbone) Transmission Least-Cost Study;
- National Bio-fuels Strategy which has recently led to regulation, mandating a minimum biofuels content in liquid fuels by 2012.

Within the context of the new Energy Strategy and Policy, and in order to tackle the challenge of increasing access to modern energy, the government of Mozambique has elaborated the National Energy Development and Access Program (**NEDAP**) which envisages mobilizing donor funding to implement a broad ranging and flexible program of investments on urban, peri-urban and rural electrification and access to modern energy services. In this connection the on-going IDA Energy Development and Access Project (EDAP APL-1) will be extended and continued by the proposed EDAP APL-2 investment program, which is fully consistent with PARPA II (PARP III), the CPS and GoM's new sector strategy, and constitutes a specific subset of the NEDAP.

Specifically EDAP APL-2 will support:

- scaling up of electricity connections in peri-urban and rural areas;
- promoting rural and renewable energy resources and technologies;
- capacity-building and institutional strengthening of the main sector agencies, i.e. Ministry of Energy (ME), *Electricidade de Moçambique* (EDM) and *Fundo Nacional de Electricização* (FUNAE);
- mainstreaming of a sector-wide approach and process by establishing a comprehensive donor partnership framework for coordinated and sustained financing of investment and a capacity strengthening aligned with national priorities and procedures.

In addition the "Mega Projects" initiative aims to facilitate and mobilise large scale private sector investment for large national and regional power generation and transmission projects (development of new large scale hydro plants at Mphanda Nkuwa & Cahora Bassa North / exploitation of the Moatize & Benga coal fields and establishment of minehead thermal power stations / development and exploitation of the existing and prospective gas & potentially also oil fields) to ensure, among others, long term sustainable least-cost power generation and distribution in the region and help finance rural (nationwide) electrification. PARPA II, and in the meantime PARP III, and the 2010 – 2014 Five Year Plan also specifically emphasise that environmental sustainability must be built into all development initiatives and projects.

Notwithstanding this generally benign and supportive policy framework (Renewable Energy Strategy, Biofuels Strategy, PARP III etc), which envisages and targets both the adoption of clean energy and the protection of the environment, sector specific legislation and regulation is either still absent or incomplete and vague / weak. This means, with few exceptions, there are few specific incentives to promote investment and, that such investments as do get made in the two sectors end up operating in a regulatory grey area. Specific gaps identified include:

- No regulation of feed in tariffs for CE power generation sources;
- No specific regulation / provision for operation of Independent Power Producers, nor for their connection to the grid;
- There is no regulation for the operation of mini-grids and as to how they might one day be connected to the main grid;
- No requirement for EDM to source its electricity generation from multiple (clean) energy sources; an energy mix target or requirement would be beneficial;
- No legislation for household / commercial or industrial energy efficiency or energy savings standards;

- Weak regulatory and limited executive powers of enforcement bodies (CENELEC for Energy / MICOA for Environment);

It is widely accepted that growth in renewable energy can only be effectively stimulated by government legislation and regulations. This has generally also been the case in the developed world, where there are usually a number of motivations underpinning renewable energy legislation, including enhancing national energy security and independence, reducing fuel and energy dependency, particularly on oil, improving the environment and reducing carbon emissions (ie as a mitigation strategy in climate change policy), and stimulating the agricultural economy.

Where specific legislation exists it is sometimes counter-productive: To date attempts by FUNAE and district administrative bodies have failed to build sustainable, private sector-led stand-alone mini grids. Because of the legal grey area in which IPPs and mini-grid operators have to operate, and because of the lack of tariff regulation (both for feed-in and grid operation) the Government has had difficulty attracting private concessionaires, and where they have been used, subsidies to project developers / implementers have been unsustainably high.

The two areas which stand out in this respect are the bio-fuels and the small hydro sectors, both of which enjoy sector specific regulation.

There is a significant opportunity to reduce air pollution and greenhouse gas (GHG) emissions by replacing fossil energy with renewable energy. Ethanol was first used as a fuel additive in the late 1970s when the USA Environmental Protection Agency (EPA) began phasing out lead in gasoline and ethanol replaced lead as an octane enhancer. Provisions in the Emissions Legislation in Mozambique may establish a similar to the Oxygenated Fuels Program and the Reformulated Gasoline (RFG) Program to control carbon monoxide and ozone problems created by motor fuels starting in major cities like Maputo, Matola, Beira and Nampula where emissions are increasing every day. Refiners could blend cleaner burning oxygenates into gasoline to meet the new standards. Ethanol and a petroleum-based additive called methyl tertiary butyl ether (MTBE) became the two oxygenates most commonly used to meet the requirements mandated by the CAA. The use of MTBE is currently being phased out and replaced with ethanol after MTBE was found to contaminate drinking water. Adopting new diesel fuel standards that require refiners to remove most of the sulfur from diesel fuel could increase biodiesel demand. Since biodiesel contains no sulfur and is an excellent lubricity agent, refiners could blend biodiesel with petroleum diesel to help meet the new standards.

In March 2011 new bio-fuels regulation was passed by the cabinet of ministers to introduce a mandate that requires liquid fuels in Mozambique to include a minimum bio-fuel content. At the time of writing this report the legislation had still not been published / gazetted but it is understood that the mandate is to be introduced in 2012 and will call for 10% bio-ethanol content in petrol and 3 % bio-diesel content in diesel

fuel. This requirement can be expected to have a significant impact on bio-fuels production in Mozambique (see below).

Although there is no official document dealing with rural electrification as such, a study undertaken by the Norwegian company Norplan in the year 2000 with the title “Rural Electrification Strategy Plan” guides the activities of the energy sector. The study was produced to assist the energy sector to establish an official rural electrification strategy plan. Nevertheless rural electrification activities are happening on the ground.

The government is establishing a simplified process (2009 draft Energy Strategy) by which investors can obtain exclusive rights to develop concessions (less than 15MW). FUNAE is coordinating this effort with limited success. In 2007 the government invited foreign investors to build hydropower projects in 100 locations. Despite the ample resource and large number of potential sites (as well as the positive Government policy towards small and micro hydro), only a handful of small and micro-hydro projects have been completed over the past five years. This is largely due to the lack of capacity to implement small-scale micro-hydro projects, lack of clear process and lack of focus on the sector.

Furthermore the National Electricity Council (**CENELEC**), which was established under the 1997 Electricity Act as a regulatory body, only became operational as of May 2008. While it was initially intended to be the regulator for generation, transmission and sale of electricity, it currently functions only as an independent council with advisory and dispute-mediating roles; it has no executive powers of enforcement and currently only 3 professional staff.

New electricity sector legislation / regulation is currently being promulgated and is expected to be enacted by the end of the year. It is thought likely that the new legislation will seek to strengthen and expand CENELEC, to improve sectorial efficiency and further encourage private sector participation in electricity generation and distribution; however it is extremely unlikely that it will address the key issues of feed-in tariffs and energy mix for the country. This means that there will remain little economic / political incentive and no reliable regulatory framework for developers of CE projects for the foreseeable future.

3.2 Environment Sector Policy & Regulation

Mozambique first introduced the idea of Social and Environmental Impact Assessment in their Water Law (Law 16 / 91) when it was determined that “hydraulic works will not be approved without the previous analysis of its effects and impact on the environment, economy and society”¹. This idea was strengthened when Mozambique became a signatory to the Rio Declaration, the document approved at the United Nation’s Conference on Development and the Environment².

The law determined that “Environmental Impact Assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority”³. The Mozambican legislation again includes Environmental Impact Assessment mechanisms in its laws when it requires under the Investment Law⁴ that “investors and its’ respective companies shall, during the process of design, implementation and execution of each respective project, carry out studies and assess the environmental impact and problems with pollution and apparent degradation resulting from its activities and waste disposal, including potential and eventual implications on fauna, flora, and geological and hydro resources, not only on the areas of the concession but also on the adjacent areas”. Mozambican environmental legislation requires that certain categories of proposed projects should be subjected to environmental and social screening to determine whether an environmental and social assessment of some type needs to be undertaken. The screening process identifies potential environmental and social impacts of sub-project activities, including impacts on land, assets and socio-economic activities.

According to project activity and its location projects can be class A, B or C. A will require a full and detailed Environmental Impact Assessment and C the simpler. Reg. 24/2004 establishes the requirements and criteria for Project Classification. An update of this regulation was approved under Reg 48/2008 establishing new taxation; renewing of environmental licenses for projects; conflict of interests clarification; The result from the environmental and social screening should (i) be communicated to local communities and their leaders; (ii) be used to develop appropriate mitigation measures; and (iii) help identify the need, if any, for any additional environmental and social analysis (i.e. Environmental and Social Impact Assessment). If the screening's output shows a “no” to all questions, the subproject receives the 'green light' for implementation. But if the screening reveals one or more ‘Yes’ answers, one or more of the following is required:- Environmental and Social

¹ Article 7, item 2 and 3, Law no 16/91 dated August 3

² Mozambique signed 12 June 1992 and ratified 25 August 1995

³ <http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>, consulted November 30, 2007.

⁴ Law No. 3/93 dated 24 of July

Impact Assessment (ESIA); Environmental and Social Management Plan (EMP); - A Resettlement Action Plan (RAP).

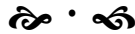
Notwithstanding the requirement for EIAs there are generally low minimum standards for environmental emissions and effluents which are poorly / unevenly enforced. Industry is accordingly essentially self-regulating with some companies adopting high standards (eg ISO 10014) for reasons of CSR and eco-credibility, and others leveraging the situation to avoid environmental cost.

Although the environmental law exists since the nineties, the specific regulation for impact assessment studies was approved in 2004. Before that date environmental assessments were not mandatory unless they were financed by multilateral or bilateral institutions (i.e. World Bank, donors). The degree of environmental compliance is very weak due to low capacity to carry the enforcement of the environmental regulation. At the moment enforcement is mainly vested under the Ministry of Environmental Coordination (MICOA) and its Provincial Directorates. The old industry (before 2004) therefore does not adhere to any specific national guidelines, some have since revamped their older (and at times obsolete) technologies and moved into sound international environmental management standards, but many medium and small businesses have not done so. Most environmental studies are required to summarise their impacts and mitigation activities in an Environmental Management Plan (EMP), which once approved are barely implemented since enforcement is weak and the incentive for project contractors to fulfil their environmental (including social and health related impacts) obligations is not truly enforced. In order to overcome the incapacity to support enforcement monitoring, MICOA needs to license its vested powers into others. During project construction (mostly for public works) some public sectors have created their own environmental and social departments with strong guidelines (e.g. water supply, roads, electricity, mining, tourism) and their own auditors. It is also common practice for contractors to hire their own environmental and social officers to implement the EMP, and a different company to carry out the supervision. But in most cases the contractor is not willing to spend resources in environmental mitigation since EMPs are either not budgeted adequately or in a transparent fashion, in such a way that each main activity and desired mitigation result could be associated to a cost, making the audit much simpler and easier to monitor. Since in most cases the big load of the investment lays in engineering works, it is a norm that supervision is mostly carried by design engineers with weak experience in environmental and social issues. The weak side resides also during operation of any public works projects, the environmental monitoring is disrupted as soon as the project is delivered to the client (GOM).

In the case of industry, mostly a private sector investing environment, the operation phase is crucial and therefore important mechanisms must be in place in order to fulfil any environmental obligations. The client in this case is an easier identifiable target (the project owner is a private entity) and non-compliance can put the

company / operation at risk (heavy social pressure, easily attributable environmental fines, bad press). The incentive to comply is much higher than for public works, and therefore the focus in the operation phase of the project.

The existing environmental regulations do not address specifically green energy projects, which may imply that they should be classed as “B” projects in terms of screening (pls refer to Reg.24 / 2004). In more complex projects (e.g. biofuels) the environmental analysis must be done separating each component of the project, which may fall in different classes. In most cases if the project requires resettlement than it automatically becomes a Class A project. The classing of a project is confirmed by the environmental authority. The class of study will therefore impact not only in the effort required to carry the study but also the licensing fees (pls refer to update Reg.48/2008).



4. Energy Sector

In order to fully appreciate the dynamics of the CE sector in Mozambique it is first necessary to understand the backdrop of the overall energy supply and demand situation in the country. The following sections provide an overview of the prevailing market situation in Mozambique for energy supply, including the overall energy mix and the electricity generation and distribution sector.

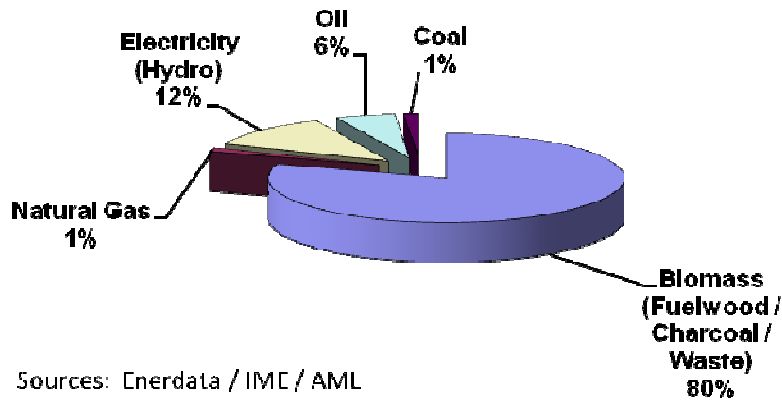
Since the nineties a programme of energy sector reform has eliminated the state's monopoly rights in the energy sector (with the exception of electricity transmission) The reform programme has also entailed wide-ranging organizational initiatives to help public companies operate on a more commercial basis. In 1997 various pieces of legislation altered the status and competencies of the two main state companies in the energy sector, "Petróleos de Moçambique –PETROMOC" and Electricidade de Moçambique – EDM". The first became a limited liability company and the second became a public company with the obligation of signing multi-year programme contracts with the Government, outlining their performance objectives. A council of Ministers decree established new conditions for the import and distribution of petroleum products and a market-based pricing system, while another introduced management contracts for district electricity facilities. The 1997 Electricity Act (Law 21/97, from 1st October 1997) opened up all aspects of electricity production, distribution and sale to private operators through concession contracts. The decree 8/2000, from 20th April 2000, determined the legal and financial autonomy of public companies and stipulated that they should function on a commercial basis and be financially viable. But responsibility for the management of the high voltage transmission system is reserved for a public entity. While the role of private actors in the petrol distribution sector has increased substantially, EDM still dominates the electricity sector. Concerning EDM important issues of the reform include unbundling of the company and separation of accounts. Although the reform programme envisaged considerable private sector participation, particularly at district level (Montepuez, Vilanculos, Inhassoro, Nova Mambone, etc), this has not shown sustainability. Mozambique's nascent private sector is still small and fragile and other activities offer more secure promises of return.

4.1. Current Market Situation

4.1.1. Energy Mix

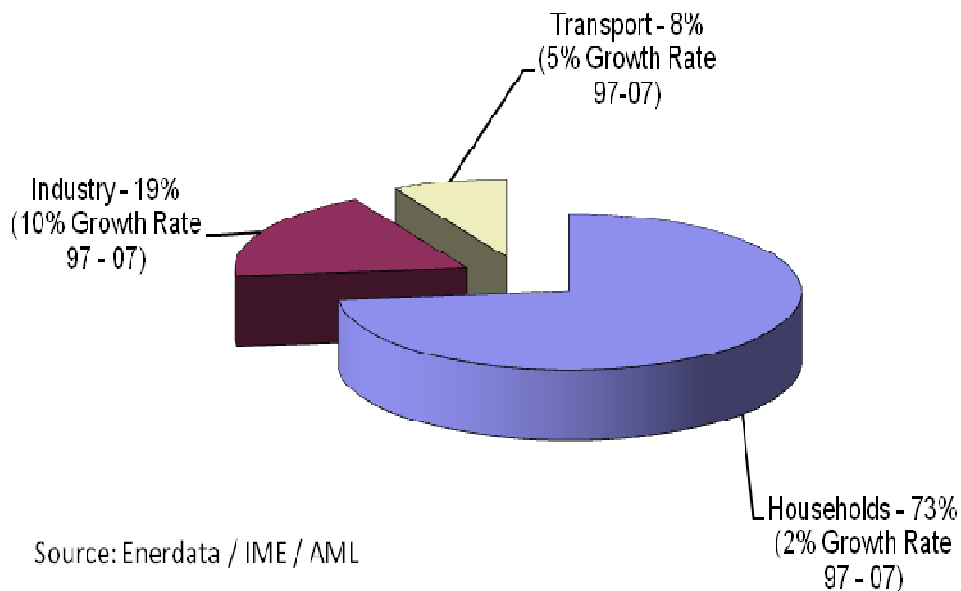
Non-commercial energy, primarily coming from forest / biomass resources, provides over 80% of the overall energy needs of the Mozambique.

Mozambique Energy Supply



The largest consumer group is the domestic household sector, representing some 73% of the total and reflecting the dominance of informal biomass in the mix. Overall growth in energy demand ran at about 6% pa between 1997 – 2007 and is currently estimated at about 7 % pa, with the industrial sector growing much faster (10 % pa) than either the household or transport sectors.

Energy Consumption in Mozambique



4.1.2. Liquid Fuels

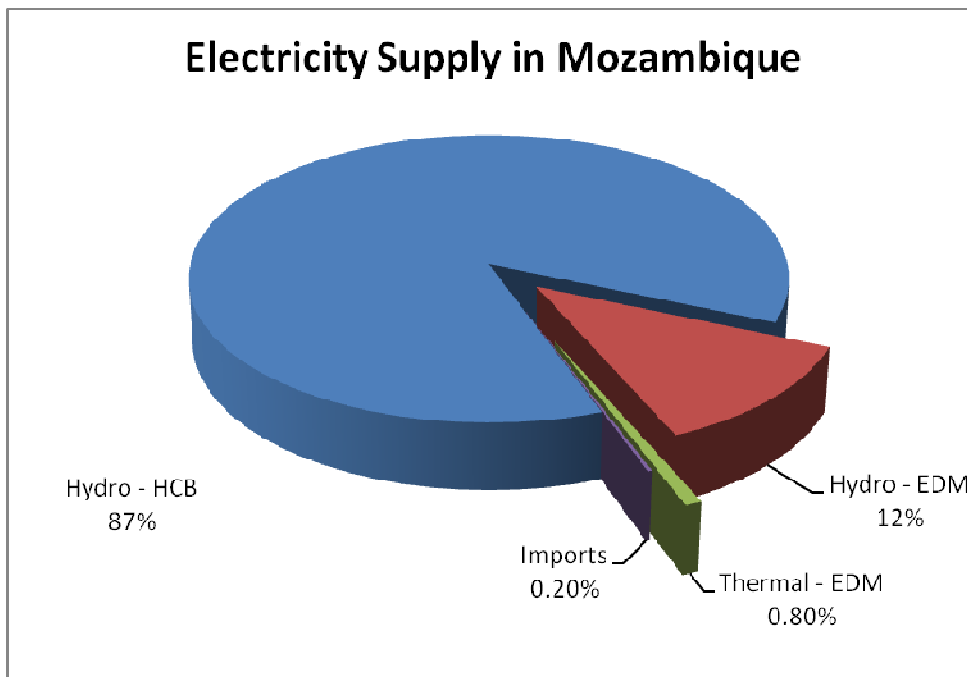
In 2005 Mozambique imported about half a million tonnes of petroleum products (an 18 % decrease against 612.000 tonnes in 2004); consumption however remained more or less stable at 416915 tonnes. Mozambique does not produce oil or fuel products itself, and thus depends 100 % on imports. The transport sector is responsible for the vast majority of fuel consumption, followed by industry. Households consume LPG as well as kerosene for cooking and lighting. Diesel accounts for about 65% of total consumption, followed by gasoline and kerosene for lighting with about 9% and 7%, respectively. In 2005 the consumption of LPG and fuel was about 14.000 and 7.000 tonnes, respectively. In 2005 there were 12 fuels distribution companies in the country. PETROMOC, the public company, was then the market leader with an overall market share of 31%, followed by BP, with a market share of 25%. TOTAL and MOBIL each has a market share of 9%. The remaining 26% of the market is shared by 8 smaller companies. Today new companies like GALP and a few others are also entering the Mozambican market.

4.1.3. Electricity Sector

The Mozambican Electricity Sector is dominated by four entities namely:

- *Electricidade de Moçambique (EDM)*, a state owned utility responsible for generation, purchase, transmission, distribution and sale of electricity. EDM's existing installed capacity is approximately 240MW (109 MW hydro and 130 MW diesel and gas). Most of the available supply capacity - about 136MW (61MW Hydro and 75MW thermal) is generated by obsolete equipment in need of refurbishment. EDM owns and operates the national grid, *Rede Nacional de Transmissão (RNT)*, comprising all transmission infrastructure except those lines belonging to HCB and MOTRACO.
- *Hidroelectrica de Cahora Bassa (HCB)*, an IPP owned by Mozambique (85%) and Portugal (15%) via designated holding companies. HCB owns and operates a hydroelectric power plant on the Zambezi River with an installed capacity of 2.075 MW of which about 400 MW is currently available to supply national loads.
- *Mozambique Transmission Company SARL (MOTRACO)*, a joint venture company, owned by EDM (Mozambique), SEC (Swaziland) and ESKOM (South Africa), set up with the sole purpose of supplying power to the aluminum smelter, Mozal.
- *Fundo Nacional de Electricização (FUNAE)*, owned by the state under the tutelage of the Ministry of Energy and the Ministry of Finance to promote and implement off-grid energy access and fuel distribution to remote locations.

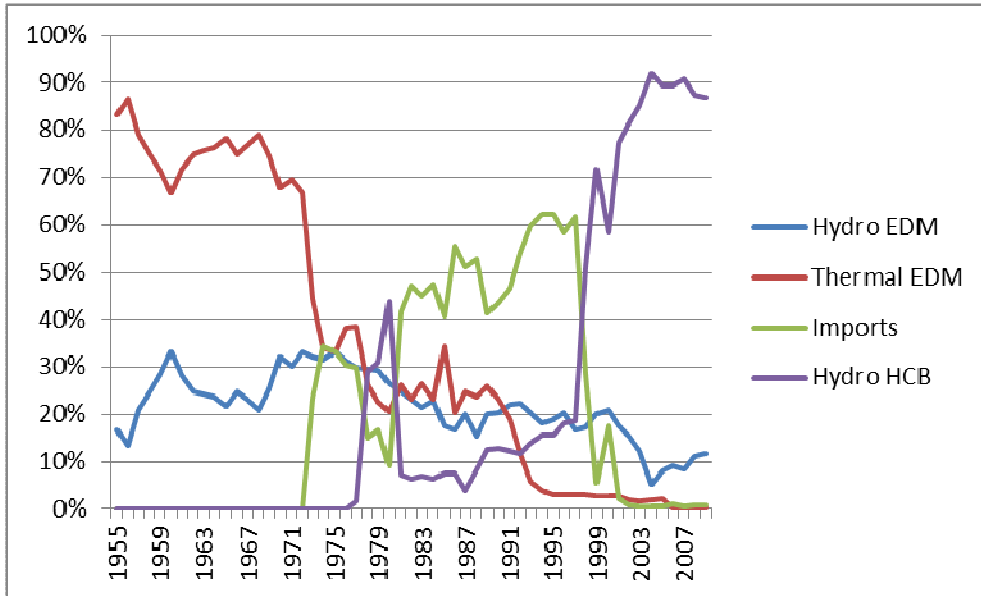
As illustrated by the chart Mozambique is 90% reliant for its electricity on hydro power from one river system – the Zambezi. The main source (2.075 MW) is the Cahora Bassa hydroelectric power station, operated by HCB. The bulk of power produced (more than 80%) is exported to South Africa; this is because there is no established high voltage transmission link between the North and the South of Mozambique meaning that the power has to be wheeled into South Africa from the HCB site in the North for reimport back to the South of Mozambique. In addition EDM operates several small hydro plants but only two, Chicamba and Mavuzi, have significant capacity; a third plant at Corumana (16 MW) supplies the Maputo province, but suffers seasonal water flows.



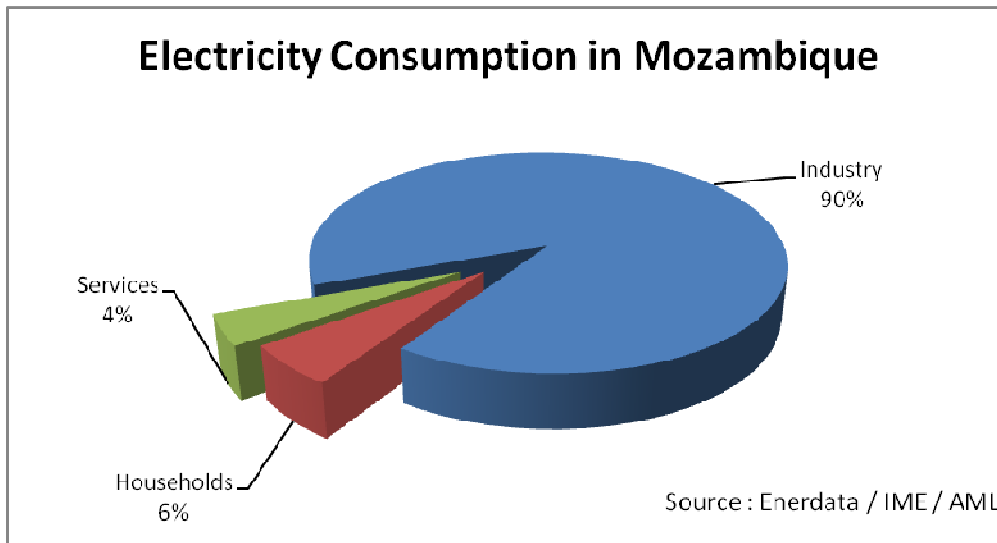
The remaining urban centres have diesel or gas generators that supply electricity which is distributed through mini-grids that are independent of the main national grid system. All except a few of these independent systems are owned by the State and operated by district administrations, municipalities or other government institutions.

As the national demand has grown so the reliance on the main source – HCB – has increased due to:

- Phasing out of inefficient and expensive thermal capacity;
- Lack of investments in new hydro and other renewable capacity;
- Reduced imports due to improvement and availability of transmission system as well as suitable regional (wheeling) agreements;

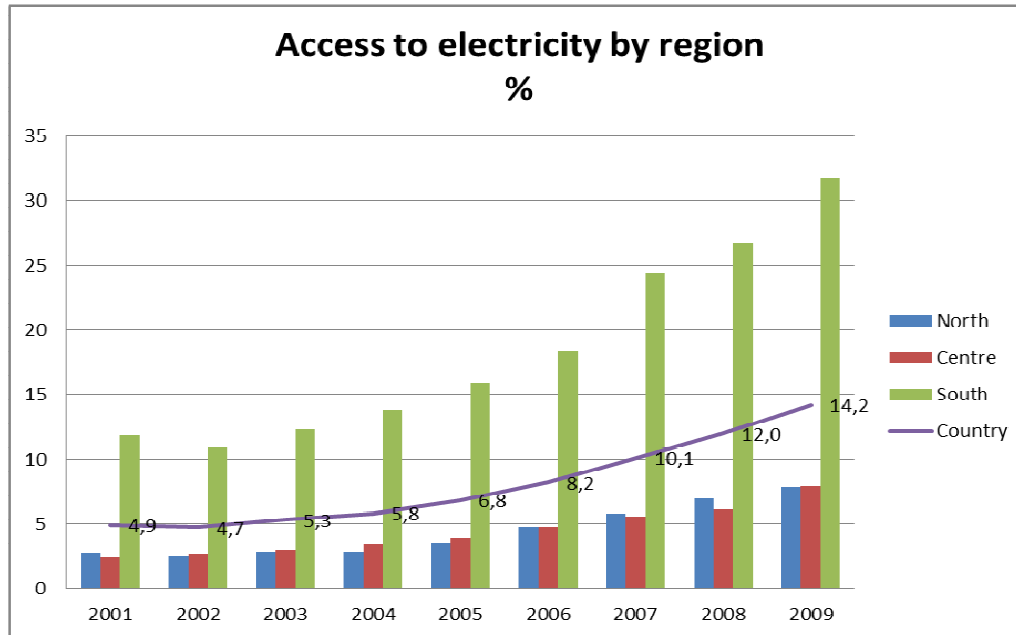


Industry is by far the largest consumer of electricity accounting for ca. 90% of total electricity consumption; at 41% pa it is also the fastest growing segment, although much of this growth is accounted for by Mozal; household consumption is growing at ca 7% pa, reflecting mostly new connections as the grid is extended rather than increasing energy intensity.



According to the 2007 population census, Mozambique has 20.226.296 inhabitants, 28 % of which live in urban areas and the remaining 72 % in rural areas. Thanks to concerted government effort and a comprehensive implementation plan at EDM, access to electricity has increased from 5 % to 14,2 % over the last 10 years and EDM appears to be ahead of its target of 15 % by 2020. By the end of 2007 all of the

11 provincial capitals had been connected to the grid and work has since started on connecting the 128 district capitals. But this often involves only one connection in each centre rather than complete coverage of a population and as the graphic shows the country average masks a major North – South divide in favour of the urbanized South at over 30 %) against only 7 – 8 % in the more rural Central and Northern provinces.



While the growth in access rates is encouraging continuing expansion efforts are constrained by unfavourable macro-economic factors such as:

- Ability to pay in a 54% extreme poverty incidence environment;
- Remote / rural locations of low density populations;
- Lack of a 'productive energy use' to motivate the market and economically justify investments.

In low-demand rural centres, electricity development, connection and operation costs per customer are higher than those in larger towns and cities. Revenues from consumers rarely cover costs. Most consumers fall within the domestic consumer category and very little electricity is used for economic purposes. There are very few large consumers. Under the current regime of uniform tariffs throughout the country, there is an implicit cross-subsidy of consumers in these low-demand centres by consumers in the larger cities and towns. Most of the rural areas are located far away from the national grid. For these areas, rural electrification programs based on off grid renewable energy systems is probably the most suitable option. EDM is, with DBSA funding, rolling out connections in low income areas of Maputo. The program

expects to connect 12,000 households (10 MW at 200W per household) and is conducting “backbone strengthening”. EDM has standardized low-income connections and is using low-income appropriate ready-boards and MCBs for many of the connections.

If one includes the industrial demands for power in the per capita figures, Mozambique is a leading country in Sub-Saharan African per capita electricity consumption. If one considers the residential consumption, Mozambique is at the bottom end of electricity access in Africa.

The RTN national grid is divided into a Centre-Northern section and a Southern section, which are not directly interconnected, except via the SAPP transmission network. The Centre-Northern section, where Cahora Bassa is situated, has excess power supply, while the Southern part, with the greater load, has a generation deficit. As a whole Mozambique is a net exporter of electricity to Southern Africa ; but the Maputo province, with 2 major load centres, Maputo City (peak load 200 MW) and the Mozal aluminium smelter (constant load of 900 MW), is a net importer from South Africa.

The grid structure exacerbates the power supply imbalance in the country and can be a barrier to investment.

EDM's Annual Report for 2005 puts its “operating costs” at 1 US cent (2,4 MT) per kWh, whereas the average selling price was US cents 8,5 per kWh. It appears also that scope for a feed-in tariff for power from other sources above 9 US cents / kWh seems unlikely. In turn this makes the introduction and promotion of renewables, which often have higher generation costs than this, difficult, at least for grid supply, unless there would be a significant subsidy element which in turn would require funding.

A privately operated concession to generate, distribute and sell electricity through an isolated mini grid in a rural area of Inhambane Province operated successfully for a while with an average tariff to consumers of 18 US cents per kWh; this was apparently the lowest of a number of bids for the concession and compares favourably with the cost of stand-alone / household diesel powered generation. In addition the private consortium offered much higher standards of service and reliability. Even in this case subsidies were provided but contingent on minimum levels of connection. The concession has however in the meantime been revoked.

4.1.4. The Regional Dimension

There is a growing shortfall of power in the Southern African region, and the demand in the Southern African Power Pool (SAPP) is increasing at 1500 MW per year. In the period 2004 to 2007, only 2836 MW of capacity was added and only minimal efforts have been made to reduce demand through efficiency measures or demand-

management. The main export clients for Mozambique power are South Africa, Zimbabwe and potentially, Malawi. Currently, Zimbabwe's power demand is depressed as a result of the political and economic problems the country is experiencing but power demand is expected to grow rapidly when the current problems are resolved. Additional demand from Malawi is expected to come on line in the next two years following the completion of the World Bank-supported connection between the countries. SAPP demand for power is taken very seriously by Mozambique, and it sees itself as a major contributor to the market.

Several features of the SAPP power system are critical in relation to possible alternatives to large dams and coal-fired generation:

- The market group predominately focuses on installation of new capacity to address the gap between power supply and demand. All of the projects in the SAPP pipeline are large hydro, coal or gas turbines.
- Low cost power is a stated priority for the region; it is critical for the profitability of the extensive mining and smelting activities that take place. It also serves the political agenda of maximizing access. The RSA Energy Security Master Plan 2007-2025 makes it clear that RSA's electricity status quo will be difficult to change in the near future: "South Africa is... the lowest cost producer of electricity in the world, a position we would like to retain for strategic reasons. A number of challenges have arisen in the past few months, related to the security of electricity supply, and it is in that context that it has become imperative to conclude the Master Plan that will address those challenges".
- Little attention is given to new and renewable sources such as cogeneration, wind and solar in the SAPP reports.
- Demand-side management is only now beginning to be discussed by SAPP

4.2. Potential for Clean Energy & Renewables

The following sections will analyse the underlying potential of each of the sub-sectors of Clean Energy and summarise some of the main barriers and opportunities for investment in each.

4.2.1. Biomass - Fuel Wood & Charcoal

There is a kind of ladder of energy resources in the peri-urban and urban areas: from fuel wood at the bottom, through charcoal, kerosene and gas, to electricity at the top. People generally climb this ladder as their income increases.

It is estimated that around 70-80% of the urban population consume charcoal in their houses (Sitoé, 2007) – for cooking, heating bathing and drinking water, and heating during the cold season - mainly because it is considered more accessible and cheaper than other sources of energy in the absence of affordable alternatives (gas / electricity). In addition charcoal is a marketable, commercialized commodity and one of the most important commodities produced by the rural poor as an important and simple means of income generation; in terms of cash flow its production is often more important than mainstream agricultural and subsistence activities. Additionally, charcoal trade offers income generation opportunities for many people in the urban areas, through small scale retail businesses mostly run by women who sell it in the urban roads.

Most of the charcoal in Mozambique is produced by the traditional earth kiln method, which has a production efficiency of 10 % - 25 %. More efficient kilns and methods (eg Cusab Kiln, and Gayland Batch Charcoal Retort) which give higher efficiency rates of up to and over 30 % are mostly out of reach for most of the producers for reasons of prohibitive initial investment cost.

At an average production level of 20 - 30 bags of charcoal per month and a retail price of 120 MTS / bag, producers' income can be between 2.400 and 3.600 MTS / month (USD 100 – 150 / month) per person which is significantly higher than average minimum wages⁵ in the country. Even where producers consider agriculture as the major activity, it is clear that charcoal makes an appreciable contribution to rural livelihoods and incomes and is of crucial importance with regard to financing cash expenses for buying food and clothes, getting medical aid and paying school fees.

As a result sustainable forestry management and charcoal production is required to ensure these producers have a long lasting source of income. Producers have benefited from training on the use of improved kilns and production techniques (eg using forest waste, cost effective technologies, sustainable forestry exploitation). For instance the promotion of the use of drum kilns could be a good option; this would promote reduction of waste as well as promote resource sustainability by reducing the amount of trees that are currently being cut.

4.2.2. Biomass - Co-generation / Gasification

⁵ Minimum wage in 2008 for Mozambique is 1.315Mt for the Agrarian Sector and goes up to 2.345Mt for the Defense & Security Sectors

The potential for biomass co-generation in Mozambique is thought to be considerable with the sugar industry seen as both a supplier of resource and beneficiary. The sugar industry, which suffered drastic decline during the civil war, is now recovering strongly and, based on 2006 figures, is currently thought to be producing in excess of 419.000 tonnes of sugar and ca 433.000 tonnes (dry weight) per annum of bagasse from 5 major plantations / sugar mills (Xinavane, Mafambisse, Marroumeu, Marragra and Buzi). The co-generation potential is estimated to run into the 100's MW.

All 5 major sugar mills have their own thermal and electricity co-generation production facilities which power the sugar production process and most are connected to the grid but, at present, there is no possibility of off-take of any of the surplus power generated. EDM and Tongat Hullet have been in protracted negotiations regarding the deployment of surplus capacity from Xinavane Sugar Factory but to date without result because of the regulatory environment and lack of regulated tariff.

The sugar mills at Mafambisse and Marroumeu in Sofala province could be immediate candidates for replication should the co-generation initiative prove to be commercially viable and profitable for the mills. The investment would depend on the amount of capacity established in each case but would probably run to an estimated total for all five mills approaching ca. USD 100 million.

In addition biomass and animal wastes can be used to produce renewable energy. Biomass is used to generate electric power by direct burning, using gasification systems, or mixing biomass with coal in coal-fired electrical generation facilities. The primary feed stocks include wood waste used by the pulp and paper industry for industrial heat and steam production. In addition, forest residues and municipal solid waste are used to generate electricity. Another potentially large source of renewable energy is animal waste which can be turned into methane gas through anaerobic digestion. Anaerobic digesters although not yet a common practice in Mozambique are being adopted by commercial livestock operations not only to produce energy, but also to meet best practices (e.g. regulations for controlling animal waste disposal). Nearly most anaerobic digesters will be associated with dairy, swine or poultry operations.

Another emerging approach to reducing fossil energy use is to replace petroleum based products with products made from biomass. There are many industrial and consumer products that have been traditionally made from biomass, including yarns and fabrics, soaps and detergents, pulp and paper, lubricants and greases, and adhesives and paints. However, agricultural feed stocks can be used to produce non-traditional products such as chemicals, plastics, hydraulic fluids, and pharmaceuticals. There are many agricultural feed stocks that can be used to make bio-products, including a variety of crops, wood and plant oils, and agricultural and

forestry residues. Bio-products often require less energy to produce than the fossil and inorganic products they replace. With the increasing costs of fossil fuels, industries in Mozambique have an increased incentive to consider and produce alternative bio-products. As examples of new bio-based technology in the US, corn starch is being used to produce bio-plastic products, and soybeans are being used to produce a polymer used to manufacture carpet backings. The chemical industry could potentially offer a large market for numerous high-value bio-based chemicals and other materials made from agriculture.

More efficient gasification technology presents opportunities for energy production from other waste / resource streams including for instance coconut husk, palm kernels and forestry waste. It is anticipated that these would be smaller, stand-alone installations providing distributed / off-grid generation capacity in remote / rural areas without grid connections. A number of such projects have been identified including for instance an initiative to establish a cold logistics chain for processing of fish for fishing villages along the northern coastline using small scale biomass gasification technology from India and containerized processing units, shared between neighboring villages. This would facilitate the processing and freezing of fish, for sale to domestic and export high value cash markets rather than to local markets as dried or salted products where the value is low. A pilot for 6 villages is being developed using World Bank funding which, if successful, may be replicated on a commercial basis in up to 200 further villages which have already been identified and for which funding would in due course be required.

The total investment potential for the biomass segment is put at between USD 100 – 200 million.

4.2.3. Bio-fuels

Since the energy crisis of the 1970s, developing new energy sources from the agricultural sector has been viewed by the developed countries as a way to expand the domestic energy supply and help mitigate growing dependence on imported oil. In the US, government incentives encouraged investment in the ethanol industry and production grew rapidly throughout the 1980s and 1990s. In 2005, the ethanol industry produced 4 billion gallons of ethanol which is blended in 30 percent of the Nation's gasoline. Mozambique has extensive tracts of land available to replicate such development but has only recently begun to understand that it is a bio-fuel superpower. Its agro-ecological resources allow for the production of a wide range of efficient energy crops, including eucalyptus, grasses, starch crops like cassava, or sugarcane and jatropha. Analysts affiliated with the International Energy Agency estimate that the country can produce around 7 exajoules of biofuels sustainably (ie

without encroaching on food crops or endangering biodiversity) that equates to 3.1 million barrels of oil equivalent per day.

In this context it is noted that only 6,6% (4,3 million ha) out of a total potential of 63,5 million ha of arable land is currently utilized for agriculture and 41 million ha of poor quality land has been demarcated for energy crops.

Some 38 biofuels projects are believed to be currently under development / registered with CEPAGRI covering an estimated total of about 5 million ha; 7 of these are for bio-ethanol and 31 are for Pure Plant Oil (PPO) or bio-diesel (mostly from jatropha but also from coconut oil and palm oil). There continues to be some debate about the comparative viability of jatropha, and in the meantime it is accepted that it is not necessarily the “wonder crop” once and often proclaimed; like any other crop its performance depends on soil and climate conditions as well as farming techniques. Ultimately its success in a particular location depends on comparative yields and costs in an international market. Given Mozambique’s climate and soil there is no reason to suppose that jatropha cannot be a viable biofuels crop and the country’s biofuels strategy identifies jatropha as such. A number of projects interviewed for this study confirmed this.

While sugar / bio-ethanol is generally seen as a more viable crop / product, bio-ethanol production is on average far more capital intensive than biodiesel with average investment costs for sugar at USD 15.197 / ha / pa leading to a yield of ca 87 t / ha / pa while jatropha yields average 2,7 t / ha / pa from investments of USD 5.300 / ha / pa. As a result bio-ethanol production is generally conducted on a large scale, while bio-diesel from jatropha lends itself more readily to smaller scale operations and out-cropping from individual small holders, often gathered around a larger central plantation operation which provides seeds, fertiliser, training and development and an off-take for the harvest for centralised processing. These smaller operations could be targets for a credit facility.

Annex 4 provides a schedule of selected biofuels investments and displays a fairly even mix between bio-ethanol and biodiesel.

To date development in the bio-fuels industry has been driven very much by export markets and particularly by demand from the EU (but also Japan) to meet mandated fuel blending requirements. Accordingly about half of these investments are in large scale integrated plantation and production units with cultivation areas of over 50.000 ha and some rising to over 200.000 ha; these investments rise into hundreds of millions of dollars and are being driven for the most part by international investors and off-takers. However there are also a number of smaller scale operations (1000 – 40.000 ha / investments < USD 5.000.000 - 50.000.000). The total value of current and projected investment in bio-fuels in the country in the near future is estimated at USD 4 – 5 billion.

Most of these projects are at a relatively early stage of development with initial plantation and cultivation work having been completed in test areas and the first test crops now being harvested for sample production and testing before plantation and production capacity is scaled up. In most instances the jatropha projects are producing crude jatropha oil (CJO) for export and it is refined into biodiesel in its destination market rather than in Mozambique.

Now that Mozambique has enacted its own blending mandate, to come into force during 2012 (see above), further interest and activity in the bio-fuel sector can be expected. This should lead to the existing projects moving more rapidly through development to implementation and new projects coming on stream, targeting the domestic market. It will also probably lead to the creation of more domestic bio-diesel refining capacity to serve the Mozambican market.

4.2.4. Solar

Mozambique enjoys a high insolation rate. The average global solar radiation in the country is 5.7 kWh / m² / day, with a minimum average of 5.2 kWh/m²/day, registered in Lichinga, and a maximum of 6.0 kWh/m²/day, registered in Pemba and Maniquenique. By comparison, global solar radiation in the UK varies from 2.25 to 3.0 kWh/m²/day, in Italy from 4.0 to 5.0 kWh/m²/day and in Tanzania from 5.0 to 6.7 kWh/m²/day. Assuming a minimum average insolation of 5,2 KWh/m²/day the total irradiation of Mozambique's land surface amounts to ca 1,49 GWh per annum. .

This notwithstanding the solar resource is relatively underused: 1 MW of solar capacity is estimated to have already been installed, mostly for off-grid rural electrification. The use of solar for household water heating and power in urban areas is relatively rare. The wholesale and retail infrastructure for the distribution and maintenance of pv / solar products is extremely underdeveloped and all parties involved in the solar value chain complain that this is a major constraining factor in developing the sector and promoting the use of solar equipment.

Much of the development in the solar sector has been driven by FUNAE which implements projects in the rural areas using a social development model funded by donors and providing solar lighting and electrification on a heavily subsidised or purely grant basis. In most cases FUNAE implements and operates the projects itself, together with local communities / municipalities, and simply sources equipment from suppliers. This in turn raises the entry barrier for private sector investors and entrepreneurs, making it difficult for them to compete and providing an added disincentive to engagement from the private sector in the solar sector.

Some private sector solar companies are however showing interest in Mozambique are making plans to enter the market. These companies supply solar lighting kits, including the pv panel, LED chargeable lights and cell phone / laptop chargers (starting from ca USD 25 / kit) to the rural poor. Sales of the kits (which are generally modular and scalable) are made on a commercial basis through a variety of channels including direct retail sales to the end user for cash, through and supported by microfinance institutions, and also via donor / NGO development programmes and activities. These companies, and others like them, ship significant volumes of product in Africa, but generally face supply gaps caused by a lack of working capital in their distribution networks; this means that the companies have to pre-finance distribution. As these operations establish themselves in Mozambique it is anticipated that funding opportunities will arise accordingly. Depending on the supplier and the product mix, a 20 foot container of kits has a value of between USD 120.000 – 200.000 and requires 3 – 6 months financing support which however is more usually structured though a revolving facility to enable on-going / repeat business.

A number of larger solar initiatives have been announced: most significantly, South Korea announced it will provide USD 35 million to build three solar power plants in Mozambique as part of plans to support ecofriendly projects in Africa. The finance ministry said the loan, from the Economic Development Cooperation Fund, will be offered interest-free for 40 years including a grace period of 15 years. In addition a PV manufacturing plant is planned by Indian investors with support from the Indian and Mozambican governments; the technology and equipment will be provided by the Indian side with the GoM providing land and the Indian Government providing funding for studies and implementation. The plant is planned to have a production capacity of 5 MW pa and is estimated to have an investment cost of USD 15 million and it is hoped will be operational during 2012.

The market for investment in the solar sector over the next 5 years is cautiously estimated at between USD 50 – 100.000.000; this does not however include activities initiated through donors and / or FUNAE.

4.2.5. Small-Scale Hydro

Mozambique's total hydroelectric potential is estimated at 12 – 14.000 MW of which only MW 2.310 (most of it at Cahorra Bassa) are exploited.

For the purposes of this report we have classified small-scale hydro-electric plant capacity based on the Kyoto Protocol's classification system which has also been adopted by the Mozambican government. This system defines the threshold of between 'small-scale' and 'large-scale' as 15 MW. In addition we have identified a medium classification to signify plants with a capacity of between 15 MW – 50 MW

which might be available for consideration by a credit facility and in order to distinguish them from the very large scale category (over 50 MW) which are most likely beyond the scope of a facility as contemplated. For clarity the terms used in this report are summarised as follows:

Classification	Plant Output
Pico-hydro	< 10 KW
Micro-hydro	11 KW – 100 KW
Mini-hydro	101 KW – 15 MW
Medium-hydro	15 – 50 MW
Large- Very Large Hydro	> 50 MW

As discussed in more detail in section 4.3 (Future Developments in the Energy Sector) a number of very large hydro projects (Mphanda Nkuwa / Cahora Bassa North) are on the drawing board within the context of the Mega Projects initiative, although it is presently unclear when these might move towards detailed planning and implementation. The majority of the sites are in the 'large-scale' range (ie > 50 MW), while those few in the 'small-scale' range are all of mini-hydro size (101 kW – 15 MW). Little information exists for micro-hydro (11 kW – 100 kW) and pico-hydro (1kW – 10 kW) size potentials, but studies are now underway to identify potential micro-hydro sites.

The Government energy policy emphasizes that there is a "need to encourage and promote the construction of small hydropower plants in suitable sites, as well as the rehabilitation of existing ones". Several sites have been earmarked for hydropower development. They are located in the following localities or administrative posts:- Chizolomondo, Kazula (Macanga district) and Ulóngue (Angónia district) in Tete province together with Chôa Mountains, Nhazónia (Bárue District) and Mafuia (Mussorize District), in Manica province. The IDA EDAP (APL-2) Project does not include financing for hydropower schemes.

Over 60 locations for mini-hydro on and off-grid projects (101 kW - 15 MW) have been identified as potentially suitable for distributed off-grid generation and rural electricity supply; detailed hydrology and feasibility studies have yet to be performed although pre-feasibility studies for projects in Tete (0,25 MW), Manica (1,75 MW) & Zambezi (0,6 MW) are underway. There is also potential for a number of medium projects (15 - 50 MW) such as at the Massingir site (25 MW) in Maputo province.

UNIDO and UNDP have been developing 10 micro hydro projects in Chimoio in co-operation with the Chinese government; the intention was that UNIDO / UNDP would fund the civil works and the Chinese would fund the equipment but the Chinese

funding fell through. UNIDO / UNDP are now approaching the GEF / World Bank for the remaining funding.

While small scale hydropower clearly has the potential to be part of the solution for distributed on and off-grid electricity generation in remote locations only a small number of small and micro-hydro projects have been completed over the past five years. Again this is partly due to FUNAE's intervention in the sector (though most of its activity has been in the solar sector – see above) but also due to the lack of capacity to implement small-scale micro hydro projects, lack of clear process to select concessionaires, lack of tariff and regulatory regimes and lack of focus on the sector. Apparently also a number of small hydro projects were allocated to a single company, which has thus far not delivered on its development commitments, but because of lax contractual arrangements (no penalty clauses or cancellation rights) GoM has not been able to enforce the contractual commitments or rescind the contracts and resume control over the project developments.

Hydro schemes in tea plantation areas are attractive not only where there is no electricity from the grid but also where the electricity from the local hydro schemes can be cheaper than that provided by the utility. A publication on “Best practices for sustainable development of micro hydro power in developing countries” gives an overview about micro hydro potential in Mozambique, especially in the Manica Province. A scoping study for micro hydro investments in Mozambique has been undertaken by the World Bank. The study considers the provinces of Manica, Niassa and Tete.

Although it is difficult to assess the full potential for mini to medium hydro without the results of more detailed studies it is estimated at between 210 – 500 MW which would entail investments in the range of USD 400 – 600 million; the NEDAP program concept note indicates that the electrification through small hydropower generation is expected to reach approximately 97 000 beneficiaries, i.e. an average of 16,000 per project. These figures do not include the large scale investments under the so called Mega Projects. For the time being however these projects should be considered as being speculative / conceptual in nature and while the potential is certainly available it remains to be seen how viable the resource is and, as a result, the timing of development and implementation of such projects remains unclear and probably longer term rather than short or medium term.

4.2.6. Wind

The wind resource in Mozambique has not yet been investigated in any systematic or comprehensive way. Most available wind data has been collected through meteorological measuring stations which are not at all suited for producing reliable data for wind applications. This notwithstanding available data indicates that there

may be good regimes for electricity production, at least in stand-alone small scale systems and potentially also in wind farms. Prime candidate areas include the highlands of the interior (above 1000 m eg in Lichinga / Niassa) and along the coast line. In areas like Chimoio, at an altitude of around above 500 m and below 1000 m, sufficient resource may exist for stand-alone small scale systems while in the southern part of the country, where the altitudes in general are below 500 m, the wind resources may only be enough for mechanical applications, like water pumping and crop milling, but not for electricity production. However wind resources are very site specific and detailed measurements need to be carried out in any potential location.

Wind measurements over a period of 12 months by Riso National Laboratory of Denmark in collaboration with the Ministry of Energy, at Ponta de Ouro and Inhambane, indicate speeds of 6.0 m/s and 6.8 m/s, respectively, at 30m height and potential wind farm sites (10 – 20 MW) have been studied / considered at Inhambane, Limpopo River and Ponto d'Ouro. In all these plans would see ca 40 – 50 MW of wind capacity being established at a total investment of between USD 67 – 90 million. A 300 KW test turbine has been erected and is operational in Inhambane and there are plans to expand the site to 20 MW but these are held up by the difficulty of agreeing an off-take tariff with EDM.

A detailed desk-top feasibility analysis of the Ponto D'Ourro site has concluded that a 10 MW wind farm would only be commercially viable at unrealistically high tariff levels (16 – 18 c / KWh) and / or high levels of grant and concessional funding, whereas the maximum available tariff for off-take by EDM would be in the range 7 – 9 c / KWh at which rate the IRR is 4,3 % (5,3 % with CDM income). A further barrier is the need to establish logistics and grid interconnection infrastructure which pushes up the capital cost of installed capacity to ca USD 2 million / MW (based on 1 MW turbines) which is relatively high by international comparison (1 – 1,5 million / MW).

It is accordingly difficult to see significant wind generation capacity coming on to the grid unless tariff issues are resolved and / or government introduces a mandatory requirement to source from renewables and specifically wind.

However there does appear to be considerable potential for micro and pico-wind turbine applications (< 10 KW) in off-grid rural situations and / or in hybrid solutions in combination with other renewables (hydro / solar) and / or diesel generation for specific applications such as water pumping, agricultural applications, remote housing, eco-tourism (eco-lodges).

The Clean Energy Company, registered and based in Cabo Delgado, has been set up expressly to address these markets and has already installed a number of wind turbines and hybrid systems. The wind turbines are manufactured locally from local components and are designed specifically to provide high performance in the light

trade wind scenarios prevailing in the tropics. They are generally quite small 500 W - 1KW and run in conjunction with solar water heating and solar lighting and used to charge deep cycle batteries when power is not immediately required. The market for these turbines coupled with hybrid systems is seen in remote housing (holiday / beach homes), eco-lodges as well as in remote communities either on a commercial basis or supported via the development community. Opportunity for funding arises both through funding for the manufacturer (working capital and growth capital) and for the customer base, although individual funding amounts are relatively small. The market for these installations is relatively small and estimated at between USD 500.000 to 5 million over a 5 year period. The total market size for wind projects over this time horizon is put at USD 50 – 75 million but as commented above the majority of this is considered speculative at this time and without regulation change.

4.2.7. Geothermal

Thirty eight thermal springs have been identified (within the East Africa Rift just North of Metangula where boiling water is reported on the edge of Lake Nyasa and springs with lower temperatures (below 60°C) issue along and to the West of major faults in the Espungabera-Manicaareas, near the border with Zimbabwe) and conservative estimates put the geothermal potential at 25 MW. However there are currently no detailed resource assessments or realistic plans for their exploitation. Accordingly we have not projected a market size figure for this segment.

4.2.8. Tidal

Given the long coastline of the country ample tidal resource should by logic be available but no detailed resource assessments have been conducted nor are there currently any realistic plans for their exploitation. Towards the end of the study period a pilot project from Finland was identified but this was at an early conceptual stage and looking to raise funding for feasibility studies and accordingly not further considered. No market size figure has been projected for this market segment.

4.2.9. Natural Gas

Mozambique has proven reserves of 127,4 billion m³ of natural gas. Presently three accumulations of gas exist on-shore in Pande and Temane, Province of Inhambane, and Buzi, Province of Sofala. Pande gas is now being exported to South Africa through a pipeline linking Temane, to Sekonda, in the province of Gauteng in South Africa, a distance of 865 km, of which 340 km in the territory of South Africa. The project was launched in 2002. One part of the Pande Gas is planned for domestic

use both in rural as well as in industrial activities. Right now some industries in the cities of Maputo and Matola are using natural gas. The initial driver for the Mozambican gas industry was to provide an energy source to the Republic of South Africa (RSA) and the gas is harvested and transported by the South African oil company SASOL against a royalty fee which is paid in gas (Royalty Gas) and / or in cash. The RSA market still accounts for over 95% of natural gas produced in Mozambique. Since 2004 however, domestic gas consumption has increased markedly, mainly in the Distribution Concession area granted to the Matola Gas Company (MGC).

At present, piped natural gas can only be accessed in Matola, Maputo and in Vilanculos and since 2005 via an additional pipeline to the Bebeluane Industrial Park near Maputo which has resulted in domestic consumption rising dramatically (from 346.000 m³ in 2004 to more than 17 million m³ in 2005. 99% of this went to industry (with the Mozal smelter alone accounting for 95%) with commerce and services accounting for under 1 % and the residential sector at 0,3 %. LPG, on the other hand, is more widely available but because of the transport costs associated with its distribution, it is not widely consumed outside urban Maputo. Indeed it is estimated that around 80% of LPG was consumed in the urban areas of Maputo and largely in the residential sector. All LPG supplies are transported by road tankers from South Africa

At the moment the royalty gas that the Government takes in kind is sold onto the Matola Gas Company (MGC), a company with concession rights to distribute gas in Matola. The price that the Government charges the MGC for the gas is equal to the sum of the wellhead price, the CPF fee and the transportation fee. The final retail price of gas that the MGC sells the gas on for is determined by negotiation with each customer but will have to include the cost of getting the gas from the main transmission pipeline to the customer. At present around 9% of the Matola Gas Company's gas demand (from non-power sources) comes from non-energy intensive industries and a significant amount of projected demand from new customers is expected to come from these industries. While the cement industry (as an energy intensive user) has been identified as a potential customer, and in one case conversion to gas fired kilns has already taken place, the problem of transport of the gas to the factory location remains a problem for some of the new / planned plants. Hence non-energy intensive industries are likely to continue to play an important role in Mozambique's emerging gas market.

Despite the relatively large increase in the consumption of gas, Mozambique still only consumes a very small proportion (around 1%) of the gas it produces and only around 20% of the gas it could potentially receive as "Royalty Gas from Sasol. The present Royalty Gas entitlement is approximately 6 million GJ a year of which only about 20% is taken as gas, and the rest is taken as a cash (despite this being at a lower than if it was sold in the local market). So there is a great opportunity for

Mozambique to explore avenues to increase the use of at least an extra 4.8 million GJ of gas per year.

In this connection there are plans for establishing a gas distribution system in Maputo for commercial, industrial and household supply, widespread introduction of gas powered vehicles for public transport and for using the gas in iron and steel production. There are very few vehicles in Mozambique that currently use Compressed Natural Gas (CNG) to fuel vehicles. Major reasons for the non-adoption of gas vehicles in Maputo city were related to high costs of the engine gas conversion kit and lack of gas distribution points in the city. There is also no legislation which incentivizes the conversion to gas or its use. If the price differential between CNG and conventional fuels was great enough to incentivize conversion and if financing was available, then the potential demand for gas from the transport sector could be quite significant.

A recent study on Domestic Natural Gas and Condensate market study for Mozambique ME/ERAP (2009) estimates Royalty gas to cost \$3/MMBtu, while non-royalty gas to be purchased on a commercial basis from Sasol at \$4.50/MMBtu (this based on oil at USD80/barrel) for a modelling exercise on energy viability for Mozambique and concluded that the majority of the increase in capacity will arise from increased hydro and coal generating capacity. In the high growth scenarios, it will be largely coal that is brought on to meet the increased demand because all other generating technologies will have reached their capacity constraints or would be considered more expensive than coal generation. Mozambique's endowment of hydro and coal reserves will fortunately enable Mozambique to generate most of its base load electricity at a relatively low cost. Natural gas is not expected to play a very significant role in base load generation for two main reasons. Firstly the amount of royalty gas that is expected to be available is quite limited and secondly because using relatively expensive non-royalty gas is not expected to be a cost-effective way to generate base-load electricity compared to hydro and coal generation.

The largest share of the peak electricity generated in gas fired OCGT located in Mozambique is exported to South Africa. In the long term this option is expected to be very profitable for Mozambique as the exported electricity is cheaper compared to peak electricity generation in South Africa, which will predominantly consist of much more expensive diesel or (potentially) LNG fired OCGT. As these plants will set the electricity price in South Africa during high demand periods based on their cost of generation, electricity prices will be well above the cost of gas fired OCGT in Mozambique. It is not clear however whether (and if, then when) the establishment of gas fired generation capacity and the respective export infrastructure would move from current conceptual stage to planning and development.

ME-ERAP (2009) concludes that consumption patterns and the prices of alternative fuels in different supply areas produce prices ranging from \$20.20 to \$23.40 a

Gigajoule. This is the price at which gas will have to be available for the final consumer to switch to natural gas. This is low due to relatively low commercial liquid fuel usage, virtual absence of LPG penetration in the residential market and inappropriateness of other fuel sources (electricity, kerosene) as substitutes for natural gas. It is apparent however that the study may miss a few points regarding environmental issues, job creation and business development opportunities.

Currently all of Mozambique's LPG consumption is imported and there is a potential for demand to grow. The cost benefit analysis shows that LPG can be produced at the Central Processing Facility for \$0.4/kg and lower, this is half of the current import price which is around 0.8 \$/Kg. This suggests that a significant proportion of LPG volumes currently imported from South Africa can be replaced with indigenous production.

In summary, while the potential for expanded exploitation of Mozambican gas is apparent, whether for retail supply to retail customers for heating and cooking purposes, power generation for export and / or industrial supply, distribution as bottled LPG, use in CNG powered vehicles or thermal power supply to heavy industry, the sector remains severely constrained by the lack of adequate and widespread supply infrastructure. While mains distribution infrastructure is planned for Maputo, it is as yet unclear when and how this distribution network might be established to further unlock investment and development in this sector.

There is currently huge political pressure to use more gas and as outlined above there is capacity and scope to achieve this, albeit subject to the establishment of a reliable distribution system. It is thought unlikely that this system will transpire within the 5 year time horizon set by this report. In the meantime there would appear to be considerable potential for the use of gas in the small scale enterprise sector (LPG) and in transport (CNG) as well as potentially in some heavy manufacturing processes (eg cement / metals / aluminium smelting as already the case in Mozal), though these too will depend on proximity to existing distribution points. It was not possible to collect data for the small enterprise sector and accordingly no estimate was made for this segment's market potential.

4.3. Future Developments in the Energy Sector

Mozambique has 3 large known deposits of coal at Moatize-Minjova, Benga and Mucanha-Vuzi, all in Tete province; the total reserve is estimated at over 4 billion tonnes of high grade Coking Coal and a roughly equal amount of relatively low grade thermal coal. The Moatize mine is currently being developed by the Brazilian Company CVRD with the aim of extracting and exporting up to 14 million tonnes of coal pa and the Benga mine is under development by an Indian group. Thermal power stations are planned at both mine heads to utilize the thermal coal by-product

of the coke mining operations: at Moatize an initial 500 MW is planned to expand up to 1500 MW while at Benga 1000 MW of installed capacity are planned.

These thermal power plants are expected to be built, operated and largely funded by the private sector and / or through public private partnerships with the mine owners / operators and there can be expected to be public sector and donor support either in the form of technical assistance and or concessionary financing of various forms. Their commercial viability is primarily predicated either on the export of power and / or on the sale of power to large captive industrial users (which have yet to be established and are mostly only in a conceptual planning phase – see below).

There is an opportunity for the employment of clean coal technology but this would probably increase the investment cost by 40 – 60%; given the hypothesis that the investment cost for establishing this generation capacity will need to be underwritten by local industrial off-take capacity (still to be established) or export markets, it is unlikely that there will be much appetite for the developers to opt for clean coal generation technology unless required by local regulation.

One option would be to use a credit facility to encourage and fund the adoption of clean coal technology in the new thermal power plants but this would effectively entail a buy-down / subsidy of the incremental cost of the technology. This sort of funding (in theory) is available via the UNFCCC funding mechanism.

Additionally four more large hydropower stations are under mature studies for a total of ca 3000 MW of installed capacity: these include Cahora Bassa North (800-1250 MW), Mphanda Nkuwa (1300-1500 MW), Boroma (160 MW) and Lupata (100 MW).

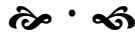
If all these generation projects were to materialize then between 3.860 – 5510 MW of new capacity would come on stream in Mozambique, bringing the total installed capacity in Mozambique to ca 6.385 – 8.035.

This capacity would in all probability exceed current and projected demand: current load factors (2009) are around 418 MW (not including Mozal which is supplied separately at a base load of 900 MW) and projected maximum load factors (even allowing for 100 % electrification and current growth) are estimated at between 3000 – 4000 MW). Therefore to make these large projects commercially viable electricity would either need to be exported or sold to captive industrial users that don't yet exist.

In this connection it is noted that various plans have been aired for new large scale industrial facilities in Beira and Nacala including a titanium smelter, steel production, 5 new cement factories (2 in the North, 3 in the South) and a new deep water port at Ncala, but these plans have yet to take tangible shape and it is difficult to estimate when they might mature.

A further bottleneck, which all the above mentioned projects are facing, is the lack of transmission infrastructure and capacity to evacuate the electricity from the generation centres (at the minehead in Tete or at the dams on the Zambezi) to the potential markets. This barrier is being addressed by the CESUL project which envisages the establishment of a new backbone linking the Northern and Southern grids and providing high voltage interconnection with the SAPP. But again the actual timing of implementation is at present uncertain.

Finally there is oil with recent confirmed finds in the Rovuma Delta Basin and probable offshore deposits. As yet however the potential is unknown. If the finds prove to be commercially viable then they will have a transformative effect on not only the energy landscape but also on the entire Mozambican economy.



5. Environment Sector

The following sections will analyse the underlying potential of each of the sub-sectors of the Environment Sector and summarise some of the main barriers and opportunities to investment in each.

5.1. Cleaner Production

Mozambique and specifically the cities of Maputo and Matola were one of the selected pilot countries / cities selected under the Development of the African 10 Year Programme on Sustainable Consumption & Production (10-YFP) within the framework of the Marrakech Process.

The Sustainable Consumption & Production Programme for Maputo and Matola was launched under the aegis of UNEP, the Mozambique National Cleaner Production Center and MICOA in 2006 / 2007 and targets the following areas:

- Water & Sanitation, including demand side management of water harvesting and use;
- Energy Efficiency & Sustainable Energy, including demand side management of energy use;
- Urban Development & Infrastructure;
- Resource Based Industries
- Sustainable Tourism
- Education & capacity building for sustainable consumption & production
- Sustainable building & construction

Against this background two industry segments were researched and analysed for the purposes of this report: hotels & tourism, heavy / energy intensive industry represented chiefly by cement manufacturing and aluminium smelting at Mozal). This choice was made because of the relative importance of these sectors to the Mozambican economy and because of the anticipated expansion in these sectors in the next 5 – 10 years. Originally we had also been anticipating to look at the food and drink processing industry and a number of interviews were conducted with brewers for example but no meaningful data / information transpired. The construction sector was also looked at briefly but again without meaningful results. With one exception, ProCredit Bank's new Maputo headquarters, which was constructed to high green building standards incorporating energy and water saving measures, outside the hotel / tourism industry no further examples of green building / construction could be found and there are no regulations to promote the use of energy / resource efficient designs and materials.

The Mozambique UNIDO Cleaner Production Center is currently focusing its activities on similar sectors as indicated by the following recent and ongoing activities:

- A Resource Efficiency Programme for the hotel industry which targets improvements in hotels' management of water and energy resources as well as waste management practices and supply chain management, including a focus on sourcing of local goods and services, as well as overall CSR. The programme is targeted at hotels in the 3 – 5 star category with over 50 beds and a swimming pool; ten hotels are currently participating in the programme (Polana, Terminus, VIP, Monte Carlo, City Village, Andalucia) which runs until October 2012 with possible extension to 2014;
- An Energy Efficiency programme with Parmalat and Coca Cola to support a fuel switch to Natural Gas and better insulation of the respective factories' steam piping transmission network;
- A UN joint programme with UNEP in Chilaquala focusing on energy for productive use in agriculture which includes a solar water pumping system, an anaerobic digester and gas turbine system generator system (10 KVa) for producing electricity from biogas from cow dung to provide power to the local school, health centre and a new abattoir together with a mini-grid.

5.1.1. Hotels & Tourism

Judging from the interviews the level of environmental awareness is relatively high amongst all hotel management, however the levels of implementation of good environmental management practices in Mozambique's / Maputo's hotels varies tremendously. At least 2 hotel groups (Polana and Girasol) are currently going through ISO 14000 certification;

Generally speaking the higher category hotels were seen to be making more of an effort to implement, or already have implemented, energy efficiency, water and waste management measures: these ranged from use of CFLs where possible, automatic dimming systems, re-use of grey waste water for irrigation, waste separation and recycling, composting of organic waste etc, use of natural gas for cooking. In other cases only minimal measures – eg introduction of CFLs – have been introduced despite apparent awareness of the main issues. None of the hotels interviewed used solar water heating, though one hotel was actively considering its introduction, coupled with an electricity back-up / boosting system to ensure hot water supply during darkness or during periods of low irradiation.

In many cases general upgrades and refurbishment programmes had been one of the drivers for implementing new environmental measures / practices.

In all cases management cited availability of equipment and reliability of spare part supply and maintenance issues as real and major bottlenecks for the consideration and introduction of new environmentally friendly technology: CFLs, dimming switches, energy efficient air conditioning, solar equipment, automatic cut-off switches linked to the key card to turn electricity off if the room is vacant etc. - all such items need to be predominantly sourced from South Africa, presenting logistics, cost and reliability of supply as well as maintenance issues, and as a result making the commercial case for the introduction of such technology questionable.

With one exception interviewees indicated that availability of funding, especially if subsidised or on longer maturities, would help support investment decisions. Hard data on the size of individual investments was hard to come by. As indicated above in a number of cases cleaner production and energy efficient measures had been implemented as part of major refurbishment programmes and were subsumed under larger investments. Individual measures however appeared to range from figures in the tens of thousands of dollars (lighting equipment etc) to the low hundreds of thousands for automatic sensor systems, water supply and treatment and gas cooking systems etc.

The Ministry of Tourism is in the process of introducing and positioning a new hotel brand / chain to solve the hotel accommodation problem in Mozambique's rural areas. Known under the name *Kapulana* these hotels are designed as 2 star bed & breakfast type accommodation, each with a 5 – 16 bedroom capacity depending on the location. It is envisaged that the ministry will fund the development and construction of the hotel and infrastructure but that the hotel operation will be franchised to private sector operators and run on a commercial basis. Since the intended locations are often off-grid, power supply and water and sanitation are inevitably an issue, and the Ministry is considering various options for dedicated off-grid power supply using renewables. Two hotels have already been built and a further 5 are planned for 2011 / 12; in all 40 districts have been identified as possible locations.

The hotel and tourism sector is ascribed considerable development potential, particularly in the less well developed Central and Northern provinces. The USAID funded project, *Arco Norte*, has developed a master plan for the development of tourism infrastructure in the Northern Provinces of Cabo Delgado, Nampula and Niassa, including Ibo and Mozambique Islands. This master plan envisages creation of a minimum of 5.000 new hotel rooms across a range of accommodation categories and types and the construction of related infrastructure to support the developments, including major investments in water supply and treatment as well as power and transport infrastructure. While these developments will offer significant

potential for deployment of cleaner production technologies and techniques in the future their current status is unsure and should not be relied on as an immediate stream of potential transactions.. The investment into related water and sanitation infrastructure in connection with the *Arco Norte* project is considered in the Water and Sanitation section.

5.1.2. Heavy Industry – Cement Manufacturing / Aluminium Smelting

As with the hotel and tourism sector there is a wide variance within the industrial manufacturing sector as to the adoption of environmentally sound working practices and cleaner production methods.

It is widely believed that some manufacturing companies locate in Mozambique because of lower environmental standards than in neighbouring South Africa; other companies have voluntarily gone through ISO 14000 certification.

The Aluminium smelter, Mozal, which has recently received ISO 14000 certification, is a good example of one of the companies at the top end of the spectrum: it has sub-contracted large areas of the implementation of its environmental management programme to Enviroserve Mozambique. Measures already implemented include: 90 % of lighting provided through CFLs; solar energy used to heat hot water for the production facility's washing and changing rooms and for 30 staff houses / dormitories; industrial waste water sent to a recycling plant the operation of which will shortly be sub-contracted to a 3rd party. However there are a number of areas / initiatives still outstanding:

- The production facility's hazardous waste (ca 2.000 tonnes pa) is currently shipped to South Africa for recycling in the cement industry there under contracts with PPC and AFRICEM. From a cost efficiency and logistics point of view it would make more sense to dispose of this waste in Mozambique; the planned new cement manufacturing facilities might offer opportunities in this respect and could be explored
- Water supply is a critical problem and solutions are being investigated with the support of FIPAG (the Water Supply and Assets Fund of the GoM, supported by the World Bank);
- The company is considering replacing its complete installed stock of air conditioning units with more efficient absorption chill technology units but as yet it has yet to find a Mozambican environmental contractor that is able to deal with the harmful Ozone (O3) residues in the old units.

Three Chinese firms have announced plans to build cement factories in Maputo province, which will become operative by 2012: Africa Great Wall Cement Manufacturer with a capacity of 500.000 tonnes pa at a total investment of USD 78 million; China International Fund with a capacity of 800.000 tpa at USD 72 million of investment and GS Cimento 550.000 tpa at ca USD 100 million. Two further plants are planned for Sofala (Bill Wood, also Chinese) and for Southern Mozambique (600.000 tpa at USD 200 million by the South African PPC). Construction on the plant in Southern Mozambique is believed to have already commenced. These projects, if completed, will see production capacity in Mozambique triple to 4 million tonnes pa by 2013. Current production is estimated at 1,3 million tonnes pa from 5 different facilities; the market leader, Cimentos de Moçambique (owned by Cimpor of Portugal), accounts for some 700,000 tonnes. The sharp rise in cement manufacturing capacity is intended to meet booming demand from the construction market in Mozambique, with mega-projects in mining, energy and construction being the principal sources of demand.

The CIMPOR plant in Maputo province has recently moved from coal to gas to power the rotary kiln at its clinker production plant. The smoke-stacks have also been extensively modernized, reducing down-time and particle emissions. This is Mozambique's, to-date single CDM Project which, however, is still at the validation stage.

Considering these 2 industry segments only, but including an estimate for general waste management and treatment in these sectors, it is estimated that the market potential for cleaner production in Mozambique is in the range of USD 100 – 200 million. This However this figure needs to be treated with some caution and is based more on estimates than hard data. It was also difficult to gauge how quickly such investments might mature.

5.2. Environmental Management & Standards (EMS)

SIQAS (Systemas Integrados de Qualidade Ambiente e Segurianca), a Mozambican consultancy, specialising in advising manufacturing companies on environmental management and health and safety issues, reports that companies are aware of the need to conserve energy and adopt environmentally sound, sustainable production methods but more often than not have no idea what measures can be taken and what their implications, impacts and benefits are. The biggest areas of interest and concern are reported as:

- Waste management;
- Water treatment – sewage & sanitation;
- Waste oil disposal (which for instance can be refined as an additive to biodiesel or recycled in cement production).

SIQAS' experience confirms that the 2 biggest constraining factors on the environment sectors are the lack of awareness of the real and commercial benefits of cleaner production methods and the lack of capital (human and financial) to implement new technologies and procedures; there is a further in-built constraint in the comparative limited supply of new technologies that are available and adequately supported in Mozambique. In a little over 2 years SIQAS, which provides training, awareness and capacity building, consulting on technologies, standards and procedures as well as implementation services, has grown from a one man operation to employing ca. 25 professionals which illustrates both the market interest and demand but also the lack of knowledge and capacity in the sector. It is not entirely clear what has driven this demand: some of it is apparently being fuelled by resource constraint (especially in respect of energy and water / water treatment) and there also appears to be an element of peer pressure and CSR awareness in play.

Again hard data in this segment was extremely difficult to obtain and at the time of writing this report we were still waiting for feedback from a number of respondents. The market potential is cautiously estimated at between USD 25 – 50 million USD which includes investments in environmental training and preparation and achievement of certification regimes such as ISO and FSC (Forestry Stewardship Council).

5.3. Waste Management & Pollution Control

Under Law 11 / 96 waste management is the responsibility of the municipalities. However, most large cities in Mozambique, and especially Maputo, suffer from severe inadequacies in the collection, transport, treatment and final deposit of municipal solid waste (MSW). In general the final destination for most urban waste is in open dumps on the edge of cities and environmental requirements (soil permeability and erosion characteristics, minimum depth of the aquifer etc) are not met. The one exception to this is the town of Songo in Tete which has a dump conforming to environmental requirements.

The problems are even more acute in suburban and peri-urban areas where most waste collection is informal and disposal is achieved through traditional methods of burying and burning. As urban populations grow there is less available space to accommodate these methods and the risks to the environment and health increase.

From 2002 / 03 there has been a steady improvement in the approach and attitude of the municipalities to waste management and pollution control; this started with diagnosis work performed by MICOA and was continued through the GTZ (now GIZ) funded AGRESU (Apoio a Gestao dos Residuos Solidos Urbanos) programme which conducted further analysis work, capacity and awareness building and instigated

waste collection and disposal pilot projects in Maputo and Matola. These resulted in re-introduction of city cleaning / waste collection fees collected with electricity bills and the involvement of private sector contractors for the waste collection and transport. Today about 80 – 90 % of Maputo's MSW is collected by private companies.

Maputo City is now in the process of launching a request for proposals from the private sector for the operation of the Maputo - Hulene dumpsite. It is planned that this contract will include the eventual closure of the site by 2014, the subsequent final disposal of the dump contents, capture of methane gas and reclamation of the site itself. A landfill is planned as a substitute and it is intended that this will also be operated by a private sector contractor on a PPP basis with the GoM assuring the investment costs and the operator responsible for operating and management costs against a management fee. The total investment cost of the establishment of the landfill is put at USD 40 million. The bidder will have to consider in their proposals to the Municipality, that willingness to pay cannot exceed 974 Meticaís / tonne (31.92 USD / tonne) of MSW. The municipality will pay around 60% of that cost.

Maputo has also been considering the deployment of incineration and gasification technologies as possibilities for disposal of the Maputo / Matola dumpsite contents and proposals have been made from Germany (gasification) and South Korea (incineration). The South Korean proposal, which has been extensively researched and investigated by FUNAB, was for an integrated waste management facility with a final capacity of up to 1.200 tonnes / day (after 3 phases of development) and included establishment and operation of a landfill site (up to 1.000 tonnes / day capacity) including methane capture and flaring, and an incineration plant for the treatment of ca 200 tonnes / day with a 3 MW generation capacity. The total investment was put at ca. USD 50 million and was supported with an offer of concessional financing from the Korean Exim Bank. However because of the low electricity unit price offered by EDM the incineration component has proved to be not feasible. It is anticipated however that some of the offers for the dump closure and land fill operation may include W2E components based on the production of liquid fuels from the waste stream as a result of the high organic component (over 60 %).

Maputo city has also recently established pilot recycling and composting projects which are proving extremely successful. Small scale recycling of plastics was started in 2006 / 07 and is now handling 14 tonnes / month. This was another project that came out of the AGRÉSÚ programme with funding being provided by GTZ (GIZ) for the establishment of the infrastructure which is rented to private sector operators (waste pickers who were specially trained) and who then sell the recycled product as raw material to plastics companies. Similarly a small scale composting pilot project was promoted by Italy, using organic waste from the Maputo markets; the current model is taking only 1,5 tonnes of waste per day out of a total waste supply from all Maputo markets of ca. 100 tonnes / day. The compost retails for 8 MTS / kg and has

in the meantime displaced more expensive South African imports from the market. Both pilots have the potential for scale up and replication.

The Ecopoints Programme is a private initiative of the non-profit organisation AMOR and the paper recycling company PagaLata Lda to collect and recycle waste paper and carton from Maputo streets and households. The system works through containerised collection points (*Ecopoints / Eco Pontos*) positioned strategically around the city, which are managed by a small specially trained collection team; citizens and neighbouring businesses can bring their waste to the collection point and the team also actively collects waste paper and carton from the streets and households. The waste paper is then transferred to Pagalata Lda for recycling into pulp and raw paper sheets which are either used internally or on-sold for further processing. This process produces about 2 tonnes of recycled paper sheets for every 3 tonnes of waste. Amor is currently running a small scale pilot based on 3 Ecopoint containers, financed by BIM Millennium and grants from the Swiss and Belgian Cooperation Organisations (CTB / SDC). The pilot is currently collecting 120 tonnes / per month and it is planned to scale up by a factor of 4 by adding at least 12 more containers. One of the effects has been to increase the price / tonne of the waste paper input thereby increasing the income of the waste collectors and informal pickers involved in the collection network. Total investment for the scale up is budgeted at USD 1.150.000 which will include capability for further replication and scale up work and replication in other cities. Maputo City estimates that it produces about 200 tonnes of paper waste / month.

The estimate for the total market potential of the Waste Management & Pollution Control segment is put in the range of USD 125 – 250 million over the 5 year time horizon set by this report. This does not include the figures for industrial waste management which are considered in the analysis of cleaner production.

5.4. Water Supply & Sanitation

Although there is some dispute over exact data, water supply and sanitation in Mozambique is characterized by low levels of access to clean / treated water (ca 43% of the total population) and sanitation infrastructure (ca 32% of the total population); service delivery in both areas is generally poor. As is the case for the energy / electricity sectors these averages mask regional differences with urban areas generally enjoying far higher access than peri-urban and rural areas.

		Urban (37% of the population)	Rural (63% of the population)	Total
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Water	Broad definition	72%	28%	43%
	House connections	18%	2%	8%
Sanitation	Broad definition	53%	19%	32%
	Sewerage	4%	0%	1%

Source: Joint Monitoring Program WHO/UNICEF(JMP/2006).

Water supply in urban areas is handled by an innovative public-private partnership that has been in successful operation since 1999. Under this partnership assets in 13 cities are owned by the GoM through an asset-holding company (**FIPAG** – the Water Supply and Assets Fund). Operations in the 5 largest cities (In Maputo / Matola, Beira, Quelimane, Nampula and Pemba) are subcontracted to a private company, Aguas de Mozambique (**ADM**), which is jointly owned by a public Portuguese firm and local investors. Recently the GOM has cut the contract with the Portuguese Water Company due to not investing as agreed in the improvement of the water supply and sanitation system; in the remaining cities (Xai-Xai, Chokwe, Inhambane, Maxixe, Tete, Moatize, Chimoio, Manica) public municipal companies operate and maintain the systems. According to data from Maputo municipality ca 47 % of total water supply in the city is lost or unaccounted for owing to leakage from poor and obsolete infrastructure, illegal connections and vandalism; for the country as a whole the figure is put at over 50 %.

While the strategy for urban water supply in Mozambique is well defined and organised, there are no clear strategies for rural water supply or for sanitation.

While over 50% of the population is said to have access to sanitation this is provided for the most part, especially in rural and peri-urban areas, but also in the cities, through informal and / or improvised pit latrines, built for the most part on private initiative. Over recent years the GoM has made concerted efforts to improve the quality of latrines and to introduce septic tanks.

Maputo is almost the only city in Mozambique with a functioning central sewage system which is estimated to serve just 10 % of the city's population. Other important cities have systems constructed during colonial times which today are only partially operational or completely obsolete. The sewer system in Maputo city centre discharges directly into rivers that flow into the Maputo Bay; the treatment pools for the rest of the city at Infulene are in poor condition. Studies have found high levels of faecal coliforms, faecal streptococci and Escherichia coli in marine water and shellfish tissue and constantly increasing levels of pathogens owing to the discharge of untreated sewage.

The Strategic Sanitation Plan for Maputo, designed in 2004, envisages a sanitation service rate of 84 % of the population by 2017 (taking a population increase of 8 %

into consideration) through the construction of improved latrines and septic tanks as well as the rehabilitation and expansion of the sewage treatment ponds to assure the city's compliance with Mozambican effluent regulation and to reduce discharge into the Maputo bay. In 2007 the European Commission initiated an important sanitation rehabilitation programme which started with Beira.

Other identified actions for improvement of the sanitation situation include:

- Investment in low-cost sewage collection and treatment facilities for local communities.
- Avoidance of pit latrines and septic tanks in water table coastal areas
- Enforcement of regulations and standards of tourism development in terms of wastewater discharge and setbacks from the shoreline.

The National Directorate of Water within the Ministry of Public Works and Housing (**MOPH**) is in charge of policy setting and legislation (the Law on Water Affairs, National Water Policy, Regulation on Public Water Supply, Drainage and Wastewater Systems), and a regulatory agency (Conselho de Regulacao do Abastecimento de Agua - **CRA**), is in charge of regulating the contracts for service provision, setting tariffs and service quality targets, monitoring compliance with the targets, reviewing investment programs and dealing with complaints by users and municipalities. CRA covers only the water supply side and does not have mandate to cover sanitation service.

Other institutions and organisations involved in the sector include:

- Ministry of State Administration (**MAE**) in respect of the Land Act;
- Ministry for the Coordination of Environmental Affairs (**MICOA**) in respect of the Environmental Act and the Regulation for the Environmental Quality and Emissions.

Based on the framework of the National Water Policy of 1995 the main guiding principles and long term objectives of policy in this sector have been:

- Reduced involvement of the Central Government (which shall concentrate on “setting priorities, direction, definition of minimum levels of service, the collection and provision of information and both stimulation and regulation of the activities of the providers”);
- Private sector participation in infrastructure development and service provision;

The Mozambique MDG status report for water and sanitation notes that the sector as a whole still strongly depends on donor financing and that between 1995 and 2005 donors financed about 80% of all investments. The main donors in the water sector

are the World Bank, the African Development Bank, Canada, the Netherlands, Sweden and Switzerland. According to the World Bank, the urban asset holding company is approaching the stage of achieving full cost recovery and can graduate from government subsidies. In rural areas, however, revenues are by far insufficient to recover operation and maintenance costs. The government aims to "gradually" achieve full cost recovery for water supply.

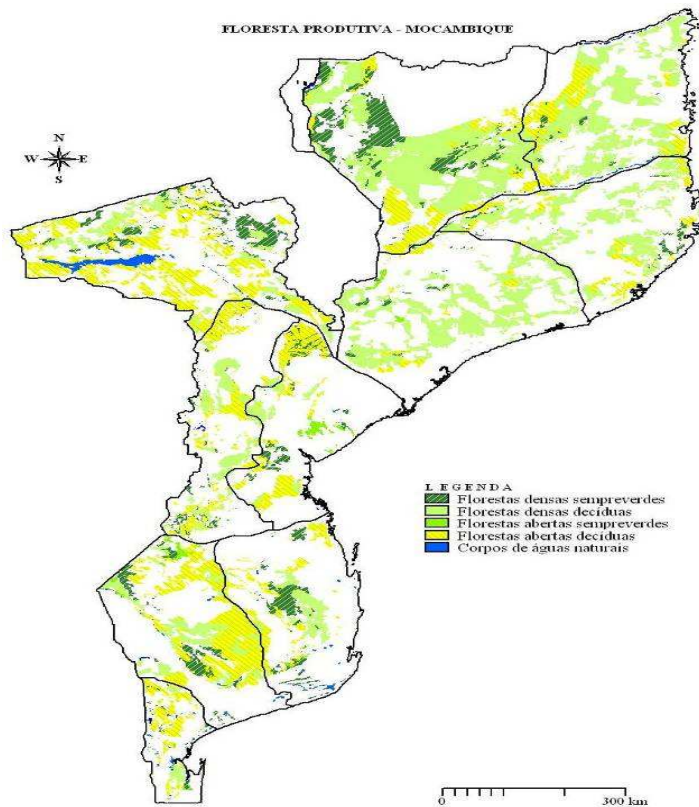
Data on investment in the sector is disparate but it is estimated that the water sector requires annual public investments of US\$82M to reach the MDGs. According to the World Bank, Mozambique's delegated private sector management approach attracted about US\$ 350 million to urban water infrastructure over the six years 2001 – 2007.

The African Development Bank (AfDB) and the World Bank are funding improvements in rural water supply and sanitation in Niassa and Nampula provinces. The Millennium Challenge Corporation is just about to begin a \$203.6 million project of major rehabilitation of urban water supply and sewage systems in Nampula City, Pemba, and three mid-sized towns (Gurué Mocuba, and Nacala), two small towns (Monapo and Montepuez) and 600 rural villages in the provinces of Nampula and Cabo Delgado. Total required investments in water supply and sanitation infrastructure to support the Arco Norte project are estimated at USD 315 million and some of this is expected to be borne by the private sector tourism investors and operators coming into the region.

Total investments in the Water & Sanitation Sector on a country wide basis over the next 5 years are cautiously estimated at between USD 350 - 515 million.

5.5. Forestry Sector

Mozambique is rich in forest resources with a total forest area of approximately 40.6 million hectares (Marzoli, 2007). These resources are extremely important for the country's development and as described in section 4.2 are an important source of energy and also income for rural populations. Apart from timber / logging activities, including for construction materials, fuel wood and charcoal production, forests also provide food and medicinal products. The majority of Mozambique's forests are located in the northern provinces of Niassa, Tete, Cabo Delgado and Zambezia and the southern province of Gaza.



Spatial distribution of “productive forests” in Mozambique (Source: CIFOR, 2011).

The Action Plan for the Reduction of Absolute Poverty (PRSP / PARPA II / PARP III), the National Agricultural Programme (PROAGRI, phases I and II), and the policy, law and regulations for the forestry and wildlife sector, formulated between 1999 and 2002, all set out the requirement for sustainable forest management and the development of forest industries for combating rural poverty. In 2003, the GoM signed the Yaounde Ministerial Declaration on African Forest Law Enforcement and Governance (AFLEG), committing itself, internationally, to the fight against illegal logging and hunting, trade and corruption, and to promote sound forest governance. Responsibility for the forestry sector comes under the National Forestry and Land Directorate (DNFT), within the Ministry of Agriculture (MINAG) together with MICOA but enforcement of the law and regulation is limited. Cases of illegal logging activity and corrupt practices in the award of licences and concessions as well as the oversight and control of cutting quotas were reported.

The expansion of agricultural areas, illegal forest exploration, logging, charcoal production for energy, and uncontrolled burning have contributed greatly to the transformation of closed forests and wooded grasslands into agricultural areas, open spaces and shrub land. The annual rate of deforestation is put at just over 1% or 219.000 ha although the rate varies from province to province.

Under Mozambican law, there are 3 “regimes” for forest harvesting: simple licenses, concessions and community based regime. At this point in time, the majority of harvesting is carried out through simple licenses (Ministry of Finance, 2010). The key features of the two main regimes are summarized in the table.

Key features of the two forest harvesting regimes

Parameters	Simple License	Concession
Purpose	Commercial, industrial and energetic uses	Harvesting to supply industry
Eligibility	Restricted to Mozambican nationals	National and foreign individuals and companies
Validity	1 year	Up to 50 years renewable
Maximum volume	500 m ³	Unspecified
Mechanisms to ensure sustainability	Topographical sketch; harvesting plan; simplified management plan (including preliminary inventory of species present, estimate of the quantity and quality of products to be harvested, estimated annual harvest, industrial and mechanical methods to be used); verification of production potential; simplified environmental license	Topographical map; forest inventories; specification of species and quantity to be harvested; management plan with delineation of annual harvesting blocks; environmental license
Mechanisms to enhance local benefits capture	Restriction to Mozambican citizens; community consultation; declaration of the number of jobs to be created and other benefits for local communities; 20% of the timber revenues generated in a simple license area are to be returned to the communities living nearby that area	Negotiation of terms and conditions for harvesting with local communities (community consultations); survey of third party rights and plans to harmonize these concession activities; submission of plans for processing; declaration of the participation and benefits to communities; harvesting quotas; installation of timber processing facilities prior to issuance of license; requirement to allow local subsistence uses in concession area; preferential hiring from local communities; 20% of the timber revenues generated in a concession area are to be returned to the communities living nearby that area
Revenue generated	Harvesting fees; a [caucao] equivalent to the value of the harvesting fee; and a 15% surcharge on the harvesting fees for reforestation purposes	Annual concession fees; harvesting fees based on volume and species (reduced for operators supplying national industry), and a 15% surcharge on harvesting fees for reforestation purposes

(Sources: Decreto 11/2003, altering Article 29 of the Lei de Florestas e Fauna Bravia; Ministry of Finance, 2010; *República de Moçambique*, 2002a)

In addition to these “regulated” regimes, local residents can harvest forest resources at any time for subsistence purposes without paying fees, provided the resources do not leave the administrative post in which they were harvested.

An important distinction needs to be made between operations in the plantation sector and in the harvesting and trade of timber from indigenous forests. The vast majority of firms operating in the forestry sector are in the business of harvesting from natural forests rather than investing in plantation forestry; however recent investments in plantation forestry are sizeable both in terms of investment levels and land area with investors mostly coming from Europe and looking for carbon offset projects. These projects include:

- a Carbon Livelihoods Project, operated by UK based Envirotrade in Quirimbas National Park and in 2 further locations in Zambezia and Gorongosa, which in 2007 established a Mozambique Carbon Livelihoods Trust (MCLT) to safeguard the interests of communities and individual farmers through payments for sequestered carbon. Approximately one third of the proceeds of any carbon sale go directly to this fund, which is used to pay individual farmers and to make annual contributions to a community trust fund and other payments for forest management and conservation;
- the Lurio forestry plantation and carbon sequestration, project operated and financed by Green Resources AS, Norway. The project is primarily situated in Nampula province along the Nacala corridor, close to the railroad and the largest harbour in Northern Mozambique. The project is based on a 50 years renewable land lease signed with the GoM and which allows Green Resources to develop 126,000 hectares forest plantation for carbon sequestration, as well as producing wood for building materials, energy and pulp; in addition, Green Resources will assist in the establishment of 54,000 ha. of forest by local smallholders and companies. All operations will be FSC certified. The forest plantations are envisaged to supply a wide range of forest processing industries and products, including sawn timber, panel board, charcoal, electricity transmission poles, as well as a future world scale pulp mill. The plantations are projected to absorb more than 30 million tons of CO₂. Total investment is in excess of USD 2 billion and the project is expected to generate annual revenues of USD 1 billion at full capacity.

Annex 5 provides an overview of selected forestry plantation investments.

To date Mozambique has only received minor benefits from the Clean Development Mechanism (CDM) created for developing countries through the Kyoto protocol and established to combat climate change. Forestry is the one sector within the CDM mechanism where Mozambique can become a major beneficiary of carbon finance. Forestation is also a pre-requisite for successful reduction in emission from

deforestation and destruction (REDD). REDD is still a relatively new concept for Mozambique and is neither well known nor understood but it has the potential to promote the creation of new plantations and promote sustainable forestry harvesting and related industries.

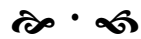
In March of 2009, Mozambique's Ministry of Coordination of Environmental Affairs (MICOA) and Fundação Amazonas Sustentável (FAS) in Brazil signed a memorandum of Understanding (MU), on South-South Cooperation on REDD. This joint initiative is intended to promote zero deforestation, and will provide technical assistance and participation in the development of the national REDD strategy and subsequently a national program on REDD. In this connection Mozambique has prepared the document entitled "proposta de estratégia de redução de emissões por desmatamento e degradação florestal" which is currently undergoing public discussion.

Because of worries over abuse of concession and license rights coupled with concerns about sustainability, biodiversity protection of old growth forest and management, forestry projects also offer opportunities for environmental training and certification, eg through the Forest Stewardship Council (FSC) Certification which verifies that the complete value chain of forest management and exploitation is conducted within internationally and independently agreed economic, social, environmental and sustainability standards. FSC certification is one of the most demanding, both operationally and financially, certification regimes. Investors and banks often require FSC certification as a pre-condition for financing forestry and downstream forestry related projects. In this connection financing support to help companies prepare for and achieve certification would be particularly valuable and could be expected to have a multiplier effect. As noted above some of the identified forestry projects have already been through or are undergoing FSC Certification but this area is believed to hold considerable potential for a credit facility, given the interest and projected development of the sector and, together with the sector as a whole (see section on project data), would warrant further investigation. The estimated market potential for FSC supported projects is included within the section on EMS.

It is thought unlikely that Banks will have an appetite to finance pure harvesting and logging activities while the majority of identified investments in the plantation sub-sector will likely exceed the scope of a credit facility. However some of the investments reviewed in the plantation sub-sector, involve multi-faceted projects consisting of many sub-components, including the establishment of downstream or parallel value adding activities (eg processing of forest waste for biomass pellets for co-generation; establishment of saw milling facilities; charcoal production; outcropping for small-holders etc). While it is not clear whether these investments would be structured within the main forestry investment or as independent off-shoots they would appear to offer some potential for a credit facility. This potential would

however require considerable more research, to target opportunities and refine the parameters.

The total market potential for forestry projects, excluding purely certification projects which are accounted for under the EMS section, is estimated at between USD 4,5 – 5,5 billion.



6. Overview of Project Identification

During the course of the work some 169 Green Investment projects were identified, representing a total estimated investment of ca USD 10,7 billion; 115 of these projects with a total investment value of USD 4,8 billion are categorized as Clean Energy projects, and the other 54 (USD 5,9 billion) as Environmental Sector projects. The Clean Energy sector projects were further categorized under 6 sub-segments: biomass, biofuels, solar, wind, hydro and other; the Environment Sector projects were categorized under 5 sub-segments: cleaner production (energy efficiency), waste management, water & sanitation, forestry and environmental management systems and standards (EMS). A table summarizing the main project data is provided in Annex 6.

The amount of data available for each project varies greatly, depending on the maturity of the project itself, the source of data and on the level of openness of the respective project developers. As a minimum we tried to establish project objective and size as measured by total estimated investment, location and project maturity. In order to assess project maturity 4 broad development categories were established:

1. **Conceptual:** the project is little more than a good idea; potential has been identified and in some cases quantified but no significant development or feasibility work has been engaged; the project is at least 2 years, probably 5 years away from implementation and financing. Some projects in this category may never come to fruition. The majority of the small hydro projects identified fall into this category;

In total 96 Conceptual projects were identified with a total estimated investment value of USD 900 million, 66 of which are CE projects, and 30 ES projects.

2. **In Development:** projects in this category are undergoing tangible development work; pre-feasibility has been established and full feasibility is in process; projects in this category may be expected to reach implementation stage and require financing within a 1 – 3 year period. This category of projects is potentially interesting for a credit facility but it is still difficult to identify which projects will make it through to bankability and which will prove to be unfeasible;

In total 41 Stage 2 development projects were identified with a total estimated investment value of USD 3,7 billion, 35 of which are CE projects and 6 ES projects.

3. **Feasibility:** projects in this category have established full feasibility and are moving to implementation within an 18 month to 2 year time horizon; financing

is still an issue for many of the projects in this category which is accordingly of prime interest for a credit facility;

In total 23 Stage 3 development projects were identified with a total investment volume of USD 3,4 billion, 9 of which are CE projects, and 14 ES projects

4. **Mature Projects:** these projects are in the process of implementation and for the most part are invested / financed; however it is apparent that some of the larger projects in this category, especially those implemented in phases, still require investment / financing to secure the implementation of later stage developments and / or sub-projects. Some of the large forestry and biofuels projects fall into this category and display this characteristic.

In total 9 Mature projects were identified with a total estimated investment value of USD 2,6 billion, 5 of which are CE projects and 4 ES projects

6.1. CE Projects (110 Projects / USD 4,8 billion).

Some 60 % (69 out of 115) of the CE sector projects fall into the hydro sub-segment; for the most part these are small hydro projects with a projected installed capacity of under 15 MW; many are mini projects at under 1 MW and the investment range is USD 1 – 20 million per project depending on size and location but it is emphasized that for the most part estimation of investment volume is based more on assumption (using cost per capacity criteria) than hard data. On the face of it these projects would be ideal for targeting by a credit facility but the majority (60) are still at a conceptual phase and probably too far away from implementation to be of real interest at this time. A number of projects (9) are at a more mature stage of development (stage 2 - 3) and could be of interest.

The next largest category within the CE sector is the Bio-fuels Group with 30 (27%) projects. Another 8 or 9 projects are believed to be under development in this segment but it was not possible to identify developers and capture the data in the time available. For the most part these are quite large investments (average investment is ca USD 145 million) and by investment volume the biofuels category accounts for 88 % (USD 4,2 billion) of the total CE Sector. Most of the projects are in late stage development and early stage implementation (ie development categories 3 & 4). Many of these projects are, however, being implemented in phases which concentrate on crop and plantation establishment in the early phases, together with the establishment of production capacity (eg for pure plant oil or crude jatropha oil) and then move on to expansion of plantation and production capacity and refining of crude oil to biodiesel in later phases. While early stages are already invested / financed, on-going and later development stages are still open. Since these phased investments will be smaller than the total slated investment amount, there can be expected to be opportunities for a credit facility eg in the financing of establishment of production and refining capacity as the projects mature and expand. Since such

projects will already be producing cash flow they will also represent a better credit risk than the initial green field projects. As noted above the newly legislated bio-fuels mandate which comes into effect in 2012 can be expected to provide a further boost to commercial viability and resulting activity in this sector.

The remaining CE projects are spread relatively evenly between Biomass (4 projects), Solar (8) and Wind (4). While it was difficult to get good data on these projects it would appear that they fall mostly into development category 1 and 2, with some later stage 3 projects, and are all small to medium size. With one exception (gasification of coconut husk for rural electrification) the bio-mass projects were based on the use of bagasse for co-generation either for captive use at the respective sugar factory and / or feed into the grid. In the case of the grid feed-in option all 3 projects are struggling with the lack of regulation (see above) and with the negotiation of a viable and acceptable tariff. The gasification project is currently looking for development capital to complete feasibility work.

Of the 8 captured solar projects, 7 are outside the remit of FUNAE while one is a FUNAE demonstration project in Niassa. This project seeks to establish a sustainable / commercially viable rural electrification model using solar as the main source: if successful this model may be available for replication on a wide basis; the pure project costs, without the sunk development costs, are estimated at around USD 130 – 150.000 for a 10 kV system. The other projects comprise the establishment of a solar panel manufacturing plant, 3 solar farms and the distribution of solar powered lamp and charger kits for rural electrification on a commercial basis (see also above). The 2 distribution projects are getting ready to launch this year and it is known that at least 1 of them will require financing for working capital purposes, estimated initially at about USD 250 - 500.000 on a 4 - 6 month revolving basis. The solar panel manufacturing facility is expected to be primarily financed by the Indian government and the Indian technology providers while the solar farms appear to be only at an early planning stage (stage 1); these projects are being promoted and supported by South Korean technology providers and it is to be expected that a portion of the financing, should the projects materialize, be supported by the South Korean Exim bank and / or the South Korean government.

Of the 4 identified wind projects, 3 are for wind farms; one of these, in Inhambane where a 300 kW turbine has been erected, is put at development stage 2, the others at the conceptual phase (stage 1), and further development of all 3 is essentially blocked by the dual problems of grid off-take and tariff. Without resolution of these issues it is difficult to see that the wind sector could be a significant target for the credit facility. The remaining wind related project consists of a manufacturer of pico-wind turbines for stand-alone off-grid rural electrification applications, targeting specifically hybrid RE solutions (wind combined with solar / hydro and diesel generators as back-up) for eco-lodges, hotels and high end housing and tourist developments in remote locations. This is a mature project (stage 4) which is looking for scale-up and expansion capital and working capital. However the volumes are

extremely small (the larger turbines / systems sell at between USD 10 – 20.000) and the total capital requirement is put at USD 100 – 150.000.

6.2. ES Projects (46 Projects / USD 5,9 billion)

In terms of project numbers each of the ES sub-category segments are more or less equally represented with 10 – 12 projects each: in terms of project investment volume, however, the Forestry sector (USD 5 billion / 80 % of the ES total) clearly dominates. These are mostly large investments (average investment volume is USD 461 million) spread over a long time frame and including investment in plantation, husbandry and management, downstream value added processing and in some instances related development investment into local communities and infrastructure. Because of their remote location (in the Northern provinces of the country) it was difficult to get detailed data on these projects. The majority of the projects however, appear to be in late stage development (stage 3) and early implementation (stage 4) and like the bio-fuels sub-segment of the CE Sector, these projects are often phased in components and sub-projects (including for instance plantation scale-up, establishment of downstream processing capacity such as saw-mills, pulp and paper mills, logistics and infrastructure) and while a total investment commitment amount has been identified and agreed as an integral element of the concession, financing for the sub-components has in many cases yet to be finalized. Accordingly the Forestry segment could be expected to be a good source of deal flow for a credit facility. However the sector would require more detailed investigation to identify and quantify this deal flow more precisely. In addition for the most part the developers of these projects are large international organisations and companies, which can be assumed to have a good understanding of credit markets and are able to develop and structure bankable investment plans; this would facilitate credit analysis, documentation and approval processes and would presumably also lead to acceptable risk levels and security availability.

The next biggest group with 12 projects and an estimated USD 515 million of investment is the Water and Sanitation sub-segment. Six of these projects are components of the master plan for the Arco Norte tourism development project in the 3 Northern Provinces of Cabo Delgado, Niassa and Nampula and are at a conceptual stage of development (stage 1); while some of this investment can be expected to be borne by private sector companies (hotel developers and other tourism related operations) it is unlikely that it will transpire soon enough to be a realistic target for the contemplated credit facility. One project is already being implemented and is understood to be fully financed by the Millennium Challenge Corp and the remaining 5 projects (also at a very early stage of identification / development) appear to be the clear domain of government / local authorities. Accordingly the Water & Sanitation segment appears to be an unlikely immediate target for a credit facility.

The 10 identified projects in the Cleaner Production category are also predominantly at an early development stage (stage 1 or 2); these include the plans for the 5

planned cement factories (whereby the cleaner production investment potential (ie in energy and resource efficient equipment and emission reduction technology has been estimated at 20 % of the total given investment volume in each case). One of the reasons for categorizing these developments as early stage is that it is not known how open the mainly Chinese plant developers / owners will be to implementing high-end, high cost energy efficiency and resource saving technology solutions. While the potential for using the contemplated credit facility in this sector is apparent, more detailed discussions with the cement plant developers / owners would be necessary to obtain further precision on the exact nature and scale of the opportunities.

The other significant area of opportunity in the cleaner production sub-segment is the hotel and tourism segment either through cooperation with hotel developers of new properties and / or through cooperation with owners / management companies on refurbishment and upgrade investments on existing hotels. Close cooperation with the UNIDO / Mozambique CPC resource efficiency programme would be one way of achieving this. In the new hotel segment the development process is still early stage and can be expected to be quite slow (stage 1 equivalent) but investments would have the advantage of being larger and relatively self-contained, whereas in the refurbishment segment investments are more likely to be relatively small in size (individual investments mostly under USD 500.000) but will likely have a shorter planning / development horizon (1 – 2 years ie equivalent of stage 3).

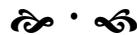
Of the 8 projects identified in the Waste Management segment 5 are in late stage development / early implementation; these include the projects for the closure of the present Maputo dumpsite and the establishment of a new landfill as well as recycling and composting projects in Maputo which are ready for significant scaling-up and / or replication. The average investment in these projects is estimated at USD 14,6 million whereby actual credit requirement would be nearer USD 10,5 million assuming a 30 % - 70 % debt – equity financing ratio. Private sector involvement in this segment is already well established and it would accordingly appear to present a good target for a credit facility.

The Environment Management & Standards segment includes 10 projects, targeting training programmes and certification regimes (ISO / FSC) and all categorized nominally as early stage (stage 1) development projects. Data collection on this segment was however extremely difficult and relied mostly on third parties and assumptions and cannot therefore be considered fully representative. Indicative project volumes (average project size at USD 3,5 million) would lend themselves well to the scope of the contemplated facility and it is believed that the EMS segment could provide good deal flow. One possible way of achieving this would be to partner with certification organisations and or implementing consultancy companies such that access to the credit facility is effectively offered to their clients.

6.3. Project Data Summary

With over 80% of the projects identified still in early stage development (stages 1 and 2), the collected project data reinforce the conclusion that the overall market for Green Investments in Mozambique is still at an early development stage. Of the 169 projects identified only 5 % (9 projects) can be considered mature projects and only 14 % (some 23 projects) are expected to require financing for implementation with a 2 year time horizon. While the authors of this report would not claim that this project survey is in any way comprehensive (ie there are probably further potential projects out there) it is believed that it is representative of the sort and status of projects that might be available for consideration as financing targets.

From the perspective of the contemplated credit facility, potential project supply is further constrained by the fact that the more mature projects tend to be in segments where demand for the project outputs is driven by an already existing global market (eg Bio-fuels and Forestry) and where the project investment volumes will exceed the capacity of the credit facility, although as noted above sub-projects and phased components of the framework investments may fall within the parameters of the facility.



7. The Banking Sector & Financial Mechanisms

7.1. Feedback from Banks

Among the commercial banks interviewed, none has a dedicated Clean Energy / Environmental Sector project division / department in Mozambique. Some banks have access to sectorial departments in headquarters but normally only larger projects and financing volumes justify the involvement of the international sectorial teams. Some banks have CSR philosophies which strongly emphasise environmental values.

None of the commercial banks have seen many CE or ES projects of the sort contemplated in this study and those that they have come across have rarely resulted in loans being made. The main reasons cited for this include:

- Project developers have generally been smaller entities with no established track record and resulting low credit worthiness;
- Project developers have not been able to fulfill the equity commitment and security / collateral requirements:
 - In general at least 20 % equity is required though this can vary depending on the perceived risk of the projects / technology involved;
 - More than 100 % collateral cover is often required in the form of fixed and moveable assets; trade and other receivables can be used as security if they are of undoubted quality and / or backed up with an appropriate payment guarantee.
- The project proposals are rarely commercial. And the project developers often lack a track record, commercial skills and business acumen;
- The banks' credit departments are not familiar with the risks and specifics of CE and ES projects; the respective technologies are often by nature new and untested in Mozambique and therefore perceived as high risk. Credit committees, therefore, are cautious in granting credit.
- The generally available financing tenors of 5 – 7 years do not match the requirements of CE & ES projects which, typically, have investment horizons of 7 – 15 years (and sometimes longer);

7.2. Existing Financial Mechanisms

This section provides an overview of the financing mechanisms provided by commercial banks, development banks, development finance institutions and related organisations.

With the exception of the ProCredit Eco-Loan programme (see below) none of the commercial banks in Mozambique offer a credit facility specifically targeted at the clean energy or environment sectors. Standard Bank Mozambique and BCI operate facilities which are targeted at the agricultural sector and BCI offers a credit line which emphasizes environmental compliance in its eligibility criteria but is open to use to a range of sectors and is not targeted or tied in any way.

We present concessional and development aid funding in our analysis because it continues to play a dominant role in the financing of the sector.

7.2.1. Concessional & Grant Funding aimed at Project Development and Implementation

There are 2 development programmes available in Mozambique which provide technical assistance and early stage funding support to promising projects in the clean energy and environment sectors:

- The Energy and Environment Partnership (EEP), funded by the Finnish and Austrian governments, provides early stage grant funding to further develop and support good project ideas. The funds, up to EUR 200.000 per project, can be used to fund feasibility and technical studies and the internal costs of project development but need to be matched by equity funding from the developer and / or co-funding from other sources. Access to EEP grants is on a competitive basis through cyclical calls for proposals.
- The Climate Technology Initiative Private Financing Advisory Network (CTI PFAN) is a project development and investment matchmaking service which provides support and advice to selected projects on the preparation of feasible and bankable business plans and then matches the projects to private sector investment and financing, providing deal facilitation as necessary. The service is provided free of charge and funded by the CTI Countries, USAID and REEEP. To qualify projects must be commercially viable, deploy clean or renewable energy technology and contribute to a reduction of CO2 emissions. Access to CTI PFAN is by free form application at any time; in addition calls for proposals are run periodically for projects to participate in Clean Energy Financing Fora.

In addition the following facilities / programmes provide concessionary funding for project implementation:

- In March / April 2011 India Exim Bank granted a new Line of Credit of USD 20 million to Mozambique (7 previous lines of credit have provided up to USD 140 million), backed with a guarantee from the Government of India. The credit line is targeted at providing long term project finance (10 – 20 years) at concessional rates and is tied to the delivery of Indian goods and services in the technology sector, with a particular emphasis on clean energy technology.

In this connection also India & Mozambique recently agreed a Double Taxation Avoidance Agreement (DTAA). The DTAA provides that business profits will be taxable in the source State if the activities of an enterprise constitute a permanent establishment in the Source State. Examples of permanent establishment include a branch, factory, office, place of management etc. Profits of a construction, assembly or installation projects will be taxed in the State of source if the project continues in that State for more than 12 months. The DTAA also provides for effective exchange of information including banking information. It also includes anti-abuse provisions to ensure that the benefits of the agreement are availed of by the genuine residents of both the countries. It is anticipated that this agreement will provide tax stability to the residents of both the countries and facilitate mutual economic cooperation, stimulate the flow of investment, technology and services.

- The Project to Support Private Sector Competitiveness & Development (PACDE - a World Bank sponsored programme) operates the Business Subsidy Mechanism (MESE) which provides grant funding to SMEs and micro-enterprises for a variety of competitiveness strengthening activities, including ISO and other quality standards certification programmes. MESE funds up to 50 % (70 % for micro-enterprises) of an eligible activity up to a maximum of USD 70.000. MESE has confirmed funding of USD 4,5 million available to it for Mozambique, which can be expanded to USD 25 million.

7.2.2. Development Programmes

There are many past and ongoing development programmes, funded multilaterally or bilaterally, that address clean energy and the environmental sector from a number of different angles including (but not limited to) energy, poverty reduction, urban and rural development as well as climate change. These are too numerous to list individually; EU, France, Germany, Norway, Sweden, UK and the World Bank are some of the more active donors in the sector; some of the more relevant and ongoing programmes are summarized below:

- The World Bank led and funded, Strategic Programme on Climate Resilience (SPCR) seeks to pilot the *mainstreaming* of climate resilience into development through piloting and demonstrating investments and approaches for integration of resilience in different sectors. The programme is structured into a capacity building and planning first phase (USD 1,5 million) and an investment 2nd phase (USD 110 million indicative). According to the draft proposal for Phase 1 Funding the main areas targeted by the programme will include:
 - mainstreaming climate change into budget and planning at central level in two pilot sectors: transport and agriculture;
 - tourism, ports, urban water and forests for the private sector because these sectors appear vulnerable to climate change,
 - agriculture, water management and transport in the Limpopo watershed and the Zambezi valley for the pilot investment in rural areas where the risks are floods and drought;
 - coastal protection and storm water drainage in one coastal town, possibly Beira for the pilot investment in an coastal city where the main risk is sea inundation.

- INGC and MICOA are about to start the implementation of a USD 3 million *Africa Adaptation Programme (AAP)*, aiming at the institutional strengthening of the Government to manage the climate change agenda, financed by the Japanese Government and managed by UNDP.

There is functioning donor coordination in both the Energy Sector and the Environment Sector, through the respective Sector Donors Working Group.

Annex 8 provides a table of the development and grant funding programmes identified in sections 7.2.2 and 7.2.3.

7.2.3. Other

The US micro insurance broker Guy Carpenter LLC is currently working on developing an indexed insurance scheme to provide climate risk insurance to agricultural small holders in Mozambique. The development work is being funded by IFC but the aim is to develop a commercially viable product.

7.3. Financing Barriers & Gaps

From the discussions with the banks and the feedback from project developers a number of barriers to raising finance and gaps in the range of available financing instruments became apparent as follows:

- **Need for High Levels of Collateral / Security:** the banks have a high requirement for tangible security to cover the loans they make. New borrowers and especially those with unproven track records are required to charge security of up to 120 % of the loan principal amount. This is driven partly by regulation but also by the natural risk aversion of the banks confronted by new customers and unfamiliar technology and sector risks. CE and ES projects are rarely in the position of being able to provide this level of security. Because of the lack of regulation (eg of off-take in the CE sector and of contractual responsibility in ES) contractual arrangements and the cash flows arising out of them (eg PPAs and management contracts for the operation of facilities) are rarely accepted by the banks as acceptable security unless they are backed up with payment guarantees, which increases complexity and cost, sometimes significantly.
- **High Borrowing Costs:** at normal rates of 23 – 25 % on MTS loans and 11 – 15 % on USD loans, even without extra risk premiums, the interest burden is often simply not bearable for CE and ES projects.
- **Need for Capacity Building:** there is extensive need for capacity building and training both on the part of project developers and the banks:
 - To improve the capacity of the project developers to be able to develop and present high quality bankable project proposals which meet the requirements of the financing community (banks and other investors). This is a gap which CTI PFAN is starting to address in Mozambique.
 - To improve the capacity of the banks to analyse, understand, mitigate, manage and price the risks inherent in lending to CE and ES projects.
- **Lack of Early Stage Development Finance:** developers, investors and banks all comment that there is an acute lack of early stage development finance / seed capital that is often needed to take projects from pre-feasibility and initial development through to full feasibility and bankability. This funding is often needed to commission technical studies and cover salaries / development and operating costs at a time when the underlying feasibility (technical and commercial) of a project has been established, but when there is still no appreciable income or cash flow and the project's asset base is limited and the risk accordingly elevated. This is a universal problem and is not limited to Mozambique or even Africa; but it is particularly acute in Mozambique (and indeed Africa as a whole) because of the almost complete absence of *angel investment* and *friends and family* funding of the sort that is relatively abundant in

developed markets and is increasingly available in some Asian markets (India, China, Thailand, Philippines).

- **Relative Attractiveness of other Sectors:** it was remarked by a number of interviewees that other sectors, especially Property Development & Construction, are currently much higher on the Mozambican banks' priority list than either Clean Energy or the Environment sector. This is because of the rapid growth of the market in this area and the relative high returns that can be made with "better" (more familiar) risk profiles and better collateral. It may accordingly be difficult to get the banks to focus on Green Investment opportunities. One strategy in this respect would be to consider prioritising the construction and property development sector for opportunities in green and energy / resource efficient buildings and in efficient building materials and processes. However as reported on in the section on cleaner production, with the exception of the hotel and tourism industry, this segment appears to be more or less completely unknown and unpopulated at this juncture in Mozambique.

These factors need to be taken into account when designing and implementing the any credit facility targeting the Green Investment Sector



8. Conclusions

8.1. Indicators & Outlines for the Credit Mechanism

Based on the above analysis of the constraints, opportunities and trends in the various market segments and of the collected project data this section will consider options for the structuring of a possible credit facility and analyse various parameters critical to its design. These include:

- Nominal amount of the facility
- Target Project Size
- Individual loan amount
- Target Project sector
- Tenor / Maturity
- Security / Risk Allocation / Credit Enhancement
- Interest Rate & Costs
- Eligibility Criteria
- Technical Assistance

Given the nascent state of development of the market and in particular the relatively limited supply of mature bankable projects any credit facility targeting this sector needs to be structured to cater to a wide ranging target group from various sub-sectors and of various project sizes, ranging from larger bio-fuels and forestry projects to smaller rural electrification projects. No project supply stream from any of the groups or segments appears pre-dominant and mature enough to justify targeting a facility at only one or a limited number of the segments. This presents potential administrative and logistical challenges:

- The wide range of project sizes will mean that the application, assessment and approval processes will need to be highly flexible;
- The cost of processing the smaller volume loans is the same (if not more) than the higher value loans but the returns are smaller; unless compensated by a differentiated pricing structure, which may be unwieldy, this will act as a disincentive to the banks to write business for smaller projects;
- The potentially wide array of new technologies may appear daunting to banks' risk assessment teams and credit committees acting as a brake on deployment of the facility.

On the face of it, one possible conclusion is that the market is not sufficiently mature for a facility, as contemplated, to gain traction in a reasonable period of time. This view however is not shared by the authors who believe that a credit facility can make a valuable contribution to the mainstreaming of Green Investments in Mozambique. It is however important to recognize that this is a pioneering initiative and accordingly

will require capacity building to support the various stakeholders in providing and accessing the facility. Accordingly any facility will need careful structuring and targeting if it is to achieve the desired effects of incentivizing and invigorating activity in the Green Investments sector while keeping developers focused on environmental performance criteria.

While availability of credit is not currently the main bottleneck in the deal flow pipeline there are a number of important areas which AFD could usefully address to incentivize project developers and enhance their chances of securing financing for their projects. These areas include:

- Credit enhancement to reduce collateral burden
- Reduction of the cost of borrowing
- Extension of borrowing tenors
- Technical Assistance

8.1.1. Proposed Outline Facility Structure

In order to target different sectors and developers more precisely it is suggested to structure the facility in three tiers or as 3 separate sub-facilities or components to cater to both larger projects on the one hand and smaller projects on the other hand and to be able to provide credit enhancement. The respective components / sub-facilities could look something like the following:

	Component 1	Component 2	Component 3
Amount	USD 20 – 25 million	USD 5 – 10 million	USD 5 – 10 million
Type of Financial Instrument	Senior Debt	Senior Debt	Guarantee Fund
Individual Loan Amounts	Min: USD 2 million Max: USD 10 million	Min: USD 100.000 Max: USD 2.000.000	Up to 50 % of the underlying loan
Availability	As a Loan	As a loan	As a guarantee to the loan providing bank to cover 50 % of any first loss on the loan
Tenor / Maturity	7 – 10 years	7 – 10 years	7 – 10 years
Security	Normal Bank requirements	Maximum of 50 - 70 % of collateral cover if first loss guarantee chosen	
Potential Target Sectors	<ul style="list-style-type: none"> ➤ Cleaner Production ➤ Waste Management ➤ Biomass 	Rural Electrification projects using the following technologies:	To provide security enhancement for loans provided under

	<ul style="list-style-type: none"> ➤ Hydro ➤ Bio-fuels ➤ Forestry ➤ Cleaner Construction / Green Buildings 	<ul style="list-style-type: none"> ➤ solar, ➤ mini-hydro ➤ pico-wind ➤ hybrid 	Component 2.
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Component 1 is targeted primarily at larger projects across a range of primarily ES and some CE sectors with individual borrowing amounts being in the range USD 2 – 10 million and average amounts being USD 5 – 7,5 million.

Component 2 is targeted primarily at smaller rural electrification projects with individual borrowing amounts being in the range USD100.000 – USD 2 million and average amounts being in the range USD 250 – 750.000. Loans under Component 2 will be available for credit enhancement support via the guarantee fund.

The only difference in the structure of Components 1 & 2 is in the envisaged credit amounts which have been devised simply as a mechanism to facilitate more efficient administration and directing of the components at their respective target groups. This is predicated on the assumption that origination and administration of credit amounts of USD 2 – 10 m will be different than for amounts of less than 2 million (and probably in many cases in the low USD 100.000's) and on the basis that different banks will have different appetites for different business.

Component 3 / Guarantee Fund is aimed at providing credit enhancement to selected loans predominantly under Component 2. This is because these smaller projects will have more difficulty in meeting banks' collateral requirements and will generally be viewed as less attractive risk / return propositions than the larger projects, whose borrowers will generally have more substance and better risk profiles. However if funding availability would permit the guarantee fund could also be extended to include loans under Component 1.

It is proposed that the guarantee (Component 3) could cover 50 % of any first loss arising on the underlying loan. This should effectively enable the banks to reduce required collateral cover from other forms of security to at least 70% of the loan principal amount, while still providing the required 120% cover. Ideally the conditions of the guarantee would however see the banks' other collateral cover capped at 50 % of the loan principal in recognition of the quality of the guarantee. This would participate the banks more equitably in the risk of the project and thereby serve to focus attention on project quality and reduce moral hazard. The readiness of the banks to reduce their collateral requirements remains uncertain and probably varies from institution to institution, with BCI and BIM being most cautious. Tolerance levels and thresholds would need to be discussed and agreed in detail with the banks should discussions proceed. The primary objective of the guarantee facility is

however to reduce the collateral burden on the borrower who in many instances simply cannot generate the necessary asset cover to meet the banks' expectations.

The guarantee fund would be available only to selected projects subject to independent approval by AFD.

It would be possible to combine component 1 and 2 into a single component, either as a stand-alone component or in conjunction with component 3. Component 3 could also be a stand-alone component

8.1.2. Borrowing Costs / Interest Rate Subsidy

Given that a reduction in borrowing costs is thought to be one of the key areas likely to motivate and accelerate take up of the facilities, as remarked upon by both project developers and banks, it is suggested that AFD consider incorporating an interest rate subsidy into both Component 1 and 2.

Use of the Guarantee Fund would be charged through a guarantee fee commensurate with the margin of the underlying loan and would also incur a one-off processing fee payable on application. Processing / application fees could also be considered in respect of applications for Components 1 and 2 but are thought likely to act as a major disincentive to take up of the facilities, especially if it is attempted to calculate and charge such fees on a full recovery basis.

8.1.3. Eligibility Criteria – Sector & Project Targeting

We would suggest that the facilities are generally not expressly targeted by sub-sector since it is believed that this will seriously limit the number of potential borrowers and act as a brake on the take-up of the facilities. However the sectors identified in the table above are those sectors in which the facilities should be actively marketed and promoted to accelerate and focus the take-up and ensure maximum impact.

Instead of specific sector criteria the following eligibility criteria outlined below could be used to assess eligibility of projects wishing to access the credit facility. These should serve to appropriately focus and target the components. Candidate projects would be expected to fulfill at least 1 and preferably several of the criteria:

For CE projects:

- Project will lead to a quantifiable reduction in GHG emissions measured against a simple fossil fuel baseline; ie the project will need to demonstrate that through use of a clean energy technology less GHG is emitted than if the

same amount of capacity were to be established using traditional fossil fuel technology (oil or coal);

- Project will lead to the establishment of CE generation capacity either for grid off-take, rural electrification (via mini-grid) or captive / productive use in agricultural, industrial or commercial applications;
- Project will lead to and / or is based on the replacement of fossil fuels for generation of power or powering of industrial processes (eg conversion to gas) or for transport purposes (production of bio-fuels);
- Provision of rural electrification and energy solutions (including for provision of lighting and power appliances, heating, water heating and cooking facilities) based on CE technologies but not necessarily involving the establishment of CE generation capacity or distribution of power through traditional grid systems.

For ES Projects:

- The project is based on the reconfiguration and / or up-grading of an existing production and / or service delivery process and / or deployment of appropriate technology in a process (new or existing) that leads to quantifiable efficiencies in the production / service delivery process and to quantifiable conservation in the use of natural resources, raw materials and input commodities and / or quantifiable reductions in the amount of emissions and effluents produced by the process as measured against the use of standard or existing technologies already in operation;
- The project will lead to a quantifiable saving in use of energy (measured in kWh pa) measured against the existing process (in the case of upgrade and reconfiguration projects) or against pre-dominant local averages (for new processes and where available). In the absence of appropriate local data, potential projects will need to demonstrate that energy efficiency is on a par with international best practice for the relevant industry sector (under appropriate consideration of local criteria);
- The project leads to the introduction and achievement of environmental norms and standards in the production / service delivery process under internationally recognized registration / certification schemes (eg ISO / FSC);
- The project is based on and / or leads to sustainable exploitation of forestry resources preferably under internationally accepted certification regimes (eg FSC). One option would be for all forestry related projects to require FSC certification but this may prove to be impractical and too constraining on smaller projects and / or sub-projects. Explicit and appropriately rigorous criteria (eg for the relation of timber cut to re-forestation and conservation

areas etc.) would need to be established through closer analysis of the potential projects.

- The project involves the provision of waste collection and disposal services using environmentally acceptable techniques for disposal based on eg landfill, methane flaring and / or capture, waste to energy, waste to fuel, recycling and composting techniques and technologies;
- The project involves and / or leads to the establishment of infrastructure for the management and provision of clean water, protection and conservation of water resources and / or the provision of sanitation facilities especially in connection with new property developments (and upgrades to existing buildings) and tourism infrastructure projects;
- The project involves new property development and / or refurbishment of existing properties based on principles of “green buildings” leading to reduced usage requirements for energy (better thermic design and insulation to reduce cooling and heating requirements / less lighting / energy efficient lighting and appliances, automatic and sensor controlled switching) and for water (recycling of grey water for toilet flushing etc.) as well as for reduced use of construction materials and a higher content of environmentally friendly and locally sourced materials. More work on appropriate and quantifiable aspects for this criteria would be required.

It is emphasised that, particularly for the ES but also for the CE sectors, “projects” can also include individual investment measures, deployment of technology and or sub-projects / -components which form part of a greater whole, which itself is not necessarily solely based on or targeted at environmental considerations.

Ideally the facility will nudge the banks towards a more project finance oriented (rather than corporate lending) risk analysis and lending approach. While it is unreasonable to expect a full transition to limited recourse type lending structures, the facility should be structured to emphasise both the substance of the borrower (evidenced by the balance sheet) and the repayment potential / security provided by the projected cash flows generated by the project / investment. This means in turn that minimum conditions / criteria for the size of the borrower (or relation of the balance sheet to the proposed borrowing) are not proposed (though they could feasibly be used for Component 1) because they would probably lead to disqualification of many potential smaller and indigenous borrowers.

Accordingly the main size / volume related criteria would remain the size of the project or rather the volume of the requested borrowing and principally only to determine which component the project could access. More appropriate credit risk criteria would accordingly be minimum thresholds for interest cover, debt service cover ratios and loan life cover ratios. The exact nature of these thresholds / criteria would need to be worked out in discussion with the banks and probably based on the

closer examination of a number of potential test cases. There may also be the need to adjust the thresholds or maintain flexibility in their application such that they cover the range of eligible projects, accordingly it is suggested that such thresholds would be expressed as ranges rather than absolute targets.

All projects would be expected to conduct Environmental Impact Assessments, appropriate to the project size and nature, and especially larger biofuels and forestry projects (or components thereof) would be expected to submit to recognized certification regimes.

8.1.4. Technical Assistance & Capacity Building

It is thought advisable that both components be supported with a Technical Assistance element to support both project developers on the one hand and the banks on the other hand:

- It is apparent that project developers do not often have the requisite experience or the necessary skills to prepare convincing business plans and the necessary project documents for credit risk analysis purposes. Poor documentation often results in otherwise good projects being refused support. It is accordingly proposed that the credit facilities be supported by a technical assistance component made available on a deal by deal basis to selected projects which meet eligibility criteria and which appear feasible on initial analysis but which require further development and preparation work to refine the business plan and put together presentable bankable proposal documentation.

This would greatly enhance the quality of such proposals and increase the success rates of proposal approval. AFD could consider cooperating with CTI PFAN which is already offering project development support to selected CE projects to achieve this. Co-operation could take the form of simply tapping into to PFAN's specialist consultant network or the agreement of some sort of outsourcing arrangement for provision of such support and advice by CTI PFAN. This could be on a more or less formal basis whereby banks (AFD) simply introduced such projects deemed to be not yet ready to CTI PFAN for further development work on the understanding that on completion of the work the projects would be referred back to the banks (AFD). In addition the banks may be able to tap into CTI PFAN's existing development pipeline to generate deal flow for the facilities.

- Likewise it is clear that the banks lack experience in the assessment of the unfamiliar risks connected with the economic performance of CE and ES technologies and would accordingly benefit from capacity building support to familiarise them with the risks and benefits offered by such technologies. Such capacity building could be offered on a deal by deal basis or could equally take the form of comprehensive / formal training. This is also an area where

cooperation with other programmes may be worth considering: CTI PFAN offers capacity building to banks and government agencies and institutions but not yet in Mozambique and the GEF, UNEP / UNDP / UNIDO and the World Bank under the PPCR could be other potential candidates for such cooperation. It would also be possible to consider outsourcing some of the more technical commercial elements of the due diligence process but this might lead to conflicts of interest and could also slow down transaction processing.

8.1.5. Currency of Facility

For the purposes of our discussions with the banks it was assumed that any facility would be denominated in USD. Most of the products and services that would be subject of the credit facility are import based and therefore also naturally denominated in USD. Obviously currency exchange risk would arise where income is predominantly in MZN. However, many businesses also have an export bias (biofuels / forestry) with USD income. The majority of the interviews for this study were conducted ahead of introduction of the exchange restrictions now in force in Mozambique. Accordingly currency concerns did not feature in our discussions with the banks nor with project developers (though this might be different if we were to revisit discussions now). It may be assumed that the difficulty, now involved in obtaining currency, coupled with on-going uncertainty in this area, would serve as a disincentive to potential borrowers under a USD facility.

