

Final Report – For public release

MOZAMBIQUE PILOT PROGRAM FOR CLIMATE RESILIENCE (PPCR)

**Private Sector Investment to
Build Climate Resilience in Mozambique**



UNIQUE forestry and land use GmbH

Schnewlinstraße 10
79098 Freiburg, Germany
Tel: +49 - 761 - 20 85 34 - 0
Fax: +49 - 761 - 20 85 34 - 10
unique@unique-landuse.de
www.unique-landuse.de

Freiburg, May 2013

Project: Pilot program for climate resilience (PPCR), Private Sector Investment to Build Climate Resilience in Mozambique: Woodland and Watershed Management.

Client:

International Finance Corporation (IFC)

Author: Paul Borsy, Markus Grulke, Sheila Wertz, Timm Tennigkeit

NB: Names of institutions, companies, projects and products in the report have been replaced with letters e.g. Company A, B, C or Product 1, 2 3 in order to maintain confidentiality of the entities, projects and products involved.

Content

Summary of the project studied	5
1 Introduction	6
1.1 The Pilot Program for Climate Resilience (PPCR)	6
1.2 Climate Change in Mozambique	6
2 Methodology	11
2.1 General approach	11
2.2 Criteria applied	13
3 General results and considerations	15
3.1 Miombo forest management	15
3.1.1 General considerations on forests and climate change.....	15
3.1.2 General considerations for Miombo forest management.....	17
3.1.3 Growth and yield.....	17
3.1.4 Area required for sustainable forest management	17
3.1.5 Current management practices	18
3.1.6 Proposed sustainable forest management practices.....	19
3.2 Adaptation to climate change in Agriculture	21
3.3 Policy issues.....	25
3.3.1 Hunting license and forestry concessions.....	25
3.3.2 REDD + in Mozambique	26
4 Results of the project screening	28
4.1 Company A project package	31
4.1.1 The four Company A projects in a nutshell.....	31
4.1.2 Company brief Company A	34
4.1.3 Improved Miombo management with value chain integration.....	36
4.1.4 Conversion of pure eucalyptus stands into mixed plantations.....	47
4.1.5 Eco lodge and mangrove protection.....	55
4.1.6 Forest concession in existing hunting concession Nyala Safari	57
4.2 Cotton production and diversification with smallholder farmers.....	60
4.2.1 The company.....	60
4.2.2 Cotton best practices and Initiative A.....	60
4.2.3 The climate resilient project investment	61
4.2.4 Climate resilience and cotton	62
4.2.5 Risks.....	63

4.2.6 Investment	64
4.2.7 Project brief.....	64
4.3 Niassa REDD+ Carbon project.....	78
4.4 Other projects/ companies screened (as presented in the interim report)	90
4.4.1 Project Ranking/ Scoring of companies screened.....	90
4.4.2 Companies not cleared by IFC.....	91
4.4.3 Companies contacted but without further interest.....	91
4.4.4 Companies with some constraints	91
4.4.5 Potential investors Potential investors with concrete business ideas and plans 111	
Annex	131
Annex 1: Terms of Reference.....	132
Annex 2: References	140

Summary of the project studied

The following table provides an overview of the full assessment carried out for this study. Selected companies and firms have been assessed in more detail, which can be found in chapter 4. Company A's and Company B's investments are highly recommended while we see major risks in the Niassa REDD+ Carbon project.

Table 1: Overall Assessment Overview

Project	Climate Resilience	Technical Feasibility	Economic Feasibility	Social Impact	Environmental Impact	Risks	Overall assessment
Company A Miombo	++	++	++	++	+++	-	++
Company A Eucalyptus diversification	++	+++	+++	0/+	+	--	++
Company A Eco Lodge	++	++		0/+	++	--	++
Company A Hunting and Forest Licence	++	++	++	+	++	0/-	+
Company B	+++	++	++	+++	0/+	--	+++
Niassa REDD+	++	+	0	0/+	++	++	+

(Note: "--" in risks means that there is low risk in the investment)

1 Introduction

1.1 The Pilot Program for Climate Resilience (PPCR)

Mozambique holds considerable potential for private sector investment in natural resource management. These investments must be structured within an investment climate that fosters resilience against future climate change. The Strategic Climate Fund (SCF) is a multi-donor trust fund within the World Bank's Climate Investment Funds (CIF) implemented through five Multilateral Development Banks (MDBs) including the World Bank Group/IFC. The PPCR is funded by the SCF and focuses on piloting interventions in developing countries in risk management and building climate resilience. PPCR interventions in Mozambique will be country-led with the ultimate aim of integrating climate change risks into national development planning and investment programs. The PPCR is divided into two phases. Phase 1 supported the preparation of a Strategic Program for Climate Resilience (SPCR). The SPCR aims to integrate climate resilience into national priority development plans, budgets and investments. Phase 2 will focus on the implementation of the SPCR, specifically on programmatic support, and invest in priority sectors and provide support to on-the-ground adaptation activities identified during Phase 1.

The IFC-managed component of the Mozambique SPCR, "Private Sector Investment to Build Climate Resilience in Mozambique" focuses on engaging the private sector and catalyzing private sector investments in climate change adaptation activities.

The IFC has identified three investment options in natural resource management. These include:

- a) Woodland management and agriculture in and adjacent to Niassa Reserve;
- b) Sustainable timber harvesting of Miombo woodlands in central Mozambique; and
- c) Watershed management and tourism in Gorongosa National Park.

UNIQUE forestry and land use was contracted by IFC to review these three investment options.

The intention is to select approximately five to ten feasible projects, of which four will be supported by IFC in the year 2013 with a total volume of about 40 million USD. A total of 53 companies have been identified, of which six projects have been selected and studied in detail.

In this report we provide information regarding the projects identified. Chapter 1 and 2 give a general introduction to the PPCR and climate change in Mozambique, while chapter 2 describes the methodology applied. Chapter 3 provides general observations on agriculture and Miombo forest management under future climate change perspectives as well as key policy issues related to the identified projects. In chapter 4.1 to 4.3 we present the in-depth study of the projects selected as well as our assessment. In chapter 4.4 we describe other projects screened and studied as presented in the interim report.

1.2 Climate Change in Mozambique

Climate change impacts and vulnerabilities in Mozambique

Mozambique is amongst the poorest countries in the world. Located on the eastern coast of southern Africa, it is subject to high levels of climate variability and extreme weather events

(i.e. droughts, floods, cyclones). Of these extreme weather events, droughts are the most frequent, occurring every three to four years, and are seen as a major constraint to development. This is due to the fact that the majority of the country's population, especially the most poor, reside in rural areas and rely on rain-fed agriculture (World Bank, 2013). Mozambique is also located at the end of several transnational river basins, making flooding in deltas a perennial threat to both farmers and infrastructure, especially when coupled with cyclonic storm surges (ibid.).

General climate trends and projections

Table 2 synthesizes recent trends and projections of the future climate as assembled from various sources, notably the 4th assessment report by the Intergovernmental Panel on Climate Change (IPCC) and the country-specific assessments conducted by the Mozambican Institute for Disaster Risk Management (INGC). It should be noted, however, that reliable data for Mozambique is limited (station coverage of only 1: 29,000km² compared to 1:1,017km² in South Africa; with major geographical gaps especially in Gaza and Tete provinces). This reduces the applicability for trend analysis and the applicability of the data for downscaling future climate as well as using it to suggest changes in other areas (INGC, 2009).

In essence, Mozambique's climate is expected to become more extreme, with drought spells being hotter, and floods more extreme. Mozambique's Central zone is likely to be the hardest hit in terms of climate change, particularly those regions at lower altitude, which are already hot, such as the Zambezi valley (INGC, 2009).

Vulnerabilities and potential adaptation measures for relevant sectors

Table 2 provides a brief overview of vulnerabilities of relevant key sectors – agriculture and forestry – and potential adaptation measures. Specific adaptation measures are highlighted in the forestry chapter 3.1 and agriculture chapter 3.2. For the agricultural sector, the information was assembled mainly from INGC reports. As the INGC reports lack specific analysis of Mozambique's forest sector, more general information was assembled for consideration in this study.

Key observations include:

- Agriculture in Mozambique's Center region – from Tete to Sofala southwards – is likely to be most affected by climate change. To increase resilience, adaptation efforts could be targeted at these areas.
- Agriculture will be affected not only by changes in temperature and precipitation, but also by ground-level O₃ – an aspect that has been often overlooked. To increase resilience in the agricultural sector, this aspect requires particular attention, in addition to drought-resistance¹.

¹ "Studies for Mozambique to date have assumed crop transpiration (water) and temperature to be the main restricting factors for yield. While water availability and temperature are important factors for yield, it was found that there is an essential additional factor that determines upper yield limit. It appeared that, in many cases, this had a much higher impact on yield than water and temperature– yet was not reflected in any of the models. This factor is ground-level O₃.

- Forests' adaptive capacity remains uncertain, with many scientists concerned that they will not be able to adapt to unprecedented rates of climate change and its associated impacts (drought, fire).
- Maintaining or enhancing genetic diversity could be one adaptation option to increase forests' resilience. Forest ecosystem-based adaptation approaches could be useful to increase societal resilience (e.g. watershed conservation).

Table 2: Synthesis of climate trends and projections

Recent trends (until 2010)	GCM Projections of future climate (up to 2100)
<p>Temperature</p> <ul style="list-style-type: none"> • Mean annual increase of 0.6°C (1960-06), except in SON months • Warming tendency varies across the country: <ul style="list-style-type: none"> - Center: up to 1.6°C increases in the winter months. - North: a ca. 1.1°C increase in maximum temperature during MAM and SON months 	<ul style="list-style-type: none"> • Mean annual increase of 1-2.8°C by the 2060s, and 1.4-4.6°C by the 2090s. • Projected increase in the likelihood of extreme maximum daily temperatures (> 35°C) of ca. 7% by 2046-65 and 25% by 2080-2100 over all regions. • Projected rate of warming is more rapid in the interior regions of Mozambique during the SON months. • Seasonal variability in maximum temperature will decrease in the North over SON months, but will increase over most of the country during MAM and JJA months.
<p>Precipitation</p> <ul style="list-style-type: none"> • Significant past trends in rainfall are not readily apparent, largely due to high inter-annual variability of rains over different seasons although there are indications of a later start of the rainfall season. • Mean annual decrease by 2.5mm per month (3.1% per decade in 1960-2006 – mainly due to decreases in DJF rainfall. • The proportion of rainfall falling in heavy events has increased, at an average rate of 2.6%. • Over 1960-2005, the South was more 	<ul style="list-style-type: none"> • Overall, no indication of substantial changes in annual rainfall, as decreases in dry season rainfall (JJA, SON) are partially offset by increases in wet season rainfall (DJF). • Proportion (volume) of rainfall in heavy events will increase by 15% (18%) by the 2090s (under highest emission scenario) – esp. in MAM, but decreases is expected in JJA and SON months due to increased evaporation. • At regional level, changes predicted as follows:

As O₃ is released during land burning practices at the start of the planting season, adaptation measures should include the adjustment of plantation dates to avoid a high O₃ concentration, the use or development of crop varieties that are tolerant to high O₃ levels (e.g. cassava, sugar cane), the avoidance of wild fires and a switch to cold fires to avoid high NO₂ emissions and the consequent production of O₃.

The provision of 1 000 m³ of extra water per hectare per season, in combination with improved crop management (dealing with the O₃ factor) and soil nutrient management, it suggested to substantially increase the productivity of small-scale rain-fed agriculture and farmers' resilience to dry spells.

Yields could further decrease due to ground-level O₃ and projected increase in frequency and intensity in natural disasters (droughts, floods, cyclones). Besides water and temperature, ground-level O₃ has in many cases a higher impact on yield levels than water and temperature (Van Logchem and Queface, 2012)".

Table 2: Synthesis of climate trends and projections

Recent trends (until 2010)	GCM Projections of future climate (up to 2100)
<p>prone to droughts than the Center or North.</p> <ul style="list-style-type: none"> Over 1950-2008, floods on average every 2-3 years with very large floods every 15-20 years. 	<ul style="list-style-type: none"> South: A 25% increase in mean annual rainfall and river floods (Limpopo + Save) in JFM months, but some rainfall gains lost through increased evaporation. Center: Upstream rainfall reductions in Zimbabwe and Zambia may translate into significant reductions in river flows (Limpopo, Save) → (i) increased risk of droughts (esp. in OND months) + (ii) implications for Cahora Bassa hydro-electric power supply North: 15% rainfall increase (JFMAM), no change in drought risk → no special adaptation measures needed, rather climate change benefits likely.
<p>Cyclone activity</p> <ul style="list-style-type: none"> From 1960-05, the Center region was more prone to floods and tropical cyclones. From 1980-07, the frequency and intensity increased over the past 20 years. 	<ul style="list-style-type: none"> Tropical cyclones have been poorly captured by GCMs, rendering potential changes in their future intensity and tracks very uncertain, as well as their projected impacts (wet-season rainfall). There is also great uncertainty regarding (i) future ENSO events, and (ii) tropical cyclone interaction with ENSO. Although more detailed assessments needed, there are indications for an increase of both frequency and intensity of cyclones → cyclones are very likely to remain a principal threat, notably in the Central coast around Beira.
<p>Sea level rise</p> <ul style="list-style-type: none"> Very little reliable data available for 1960-2001. Acc. to INGC, records for Maputo are not consistent with estimates from regional trends and identified global trends. 	<ul style="list-style-type: none"> Coastal lowlands may be vulnerable, especially in the Center, but further detailed assessment needed. Depending on the model, projected rise varies between 0.13-0.56m by the 2090s, above 1980-1999 levels. By 2030, salt water intrusion into river systems due to sea level rise projected esp. in the Center (Zambezi + Save rivers), but also in the South (Limpopo + Incomati rivers) → loss of agricultural land.

Sources: INGC 2009, IPCC 2007a, IPCC 2007b, McSweeney et al. undated

Priority responses and the role of the private sector

Mozambique already places special emphasis on the prevention of natural hazards and im-

proving early warning systems. The National Adaptation Program of Action (NAPA) identifies the following priority actions (Ministry of Environmental Coordination, MICOA 2007):

- Strengthening an early warning system
- Strengthening capacities of agricultural producers to cope with climate change
- Reduction of climate change impacts in coastal zones
- Management of water resources under climate change

As the private sector is expected to play an important role in reaching the above-mentioned adaptation objectives, the INGC commissioned a study from Arthur D. Little to identify commercially viable priority interventions that would have both positive nation-wide impacts on climate resilience and high relevance for the private sector (ADL, 2012). Figure 1 and Table 3 in the methodology chapter show the identified private sector initiatives and projects within this report.

2 Methodology

2.1 General approach

A preliminary meeting was held in Maputo on 15th and 16th of October with representatives from IFC: Anthony Mills and Katia Daude Gonzalvez, and the consultant team from UNIQUE forestry and land use: Sheila Wertz, Markus Grulke and Paul Borsy.

After the inception meeting, UNIQUE contacted potentially interested companies and communicated with key informants from other donor agencies (e.g. GIZ, DED, Technoserve), development partners (e.g. AgriFuturo, Technoserve), service providers (e.g. SwissLab), government agencies (Agriculture Promotion Centre - CEPAGRI), and industrial chamber and members. This communication formed part of the methodology for identifying suitable private sector initiatives.

A recent study commissioned by the INGC identified the commercially viable priority interventions that would have both high nation-wide impact on climate resilience and high relevance for the private sector. The results of this study were reflected in our analysis. Arthur D. Little (ADL, 2012) and the team started the selection process with a strategic analysis of the Mozambican business context to identify and map high-risk, high-(investment)impact areas (Figure 1) and subsequently conducted a cost-benefit analysis, analysis on barriers to investment, and recommendations for implementation simplification (ADL, 2012). Several projects that could significantly improve infrastructure and reduce flooding impacts and water stress resulting from climate change could be identified (Table 3).

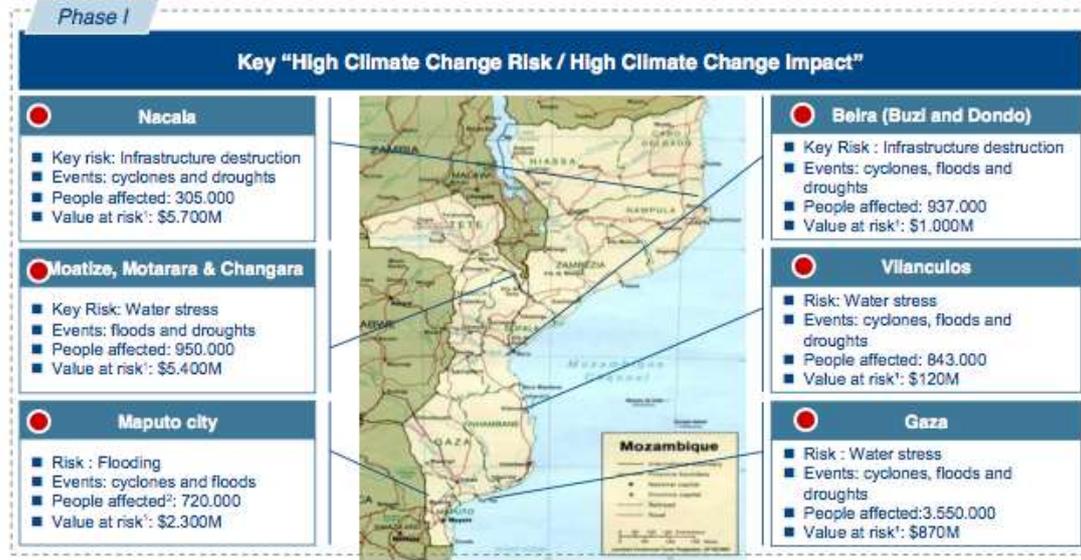
The study highlights, however, that without public co-funding to support the piloting of these first programs and continuous proactive government support, the private sector would not be interested in making the required investments as the costs and barriers would be too great (ibid.).

In addition to - or in the absence of - public co-funding to leverage substantial private sector investments for adaptation, INGC proposes a methodology for identifying sustainable, land-based private sector investments which simultaneously have the potential to build resilience in surrounding communities (Cammaer et al., 2012). This methodology essentially corresponds to a strategic environmental assessment focusing explicitly on climate change adaptation involving a series of risk and opportunity statements formulated for the sectors of agriculture, forestry and tourism. This assessment is combined with a three-sphere model of activity and influence as suggested by the World Business Council of Sustainable Development, i.e.

1. Within-company operations and supply chains (“within the fence line”);
2. Partnerships with surrounding communities (“beyond the fence line”); and
3. Collaboration with the wider community (“beyond the horizon”).

Figure 1: Identification of high-risk, high-impact areas from the private-sector perspective

These six areas have an estimated value at risk of some \$14B and a population at risk of some 7 million people



Source: Arthur D. Little, 2012

Table 3: Short-list of 12 private-sector adaptation opportunities through strategic country analysis, benchmarking, identification of high-risk, high-impact areas, screening and evaluation

Project	Region	Investor	Focus
1. Water security through mini-dam construction	Búzi (Beira)	Búzi Açúcar	Water security, irrigation
2. Access during floods through bridge construction	Búzi (Beira)	Búzi Açúcar	Access during floods
3. Reforestation with agricultural activities	Búzi (Beira)	Búzi Açúcar	Income diversification, food security, carbon emissions reduction
4. Income diversification through waste composting	Pemba	Aga Khan	Food security, income diversification, soil recovery
5. Alternative food and energy production	Ocuca (Chiure)	Ecoenergia	Adaptation to climate variability, food security, income diversification, clean energy
6. Irrigation with solar panels	Ocuca (Chiure)	Ecoenergia	Water security, irrigation, food security, clean energy
7. Alternative energy supply through small-scale solar plan	Maputo district	Self-energy	Energy supply, carbon emissions reduction
8. Agroforestry in Cabo Delgado	Cabo Delgado	Pemba Sun / Technoserve	Income diversification, food security, carbon reduction
9. Income diversification through micro-credit for adaptation	Nation-wide	Aga Khan	Finance adaptation at micro-level
10. Resilient crops	Nacala	Aviam	Drought resistant crops
11. Increased crop yields	Ouca	Ouro Verde	Food security, yield increase through ozone reduction
12. Agroforestry in Nampula	Nampula	Green Resources / Technoserve	Income diversification, food security, carbon reduction

Source: Arthur D. Little, 2012

With these ongoing efforts and studies in mind, a total of 53 companies with potential interest in investment in climate resilience projects were identified. We applied a number of criteria to screen the project ideas from those companies as shown in the next chapter.

2.2 Criteria applied

In order to screen the viability of investment options, we reviewed the project proposals from the companies according to the following criteria:

- Climate resilience
- Total investment volume (> 4 million USD)
- Track record of the company
- Social impact

- Other environmental impacts
- Technical viability
- Economic viability
- Compliance with international standards
- Risks
- Potential for scaling up and best practice examples

The potential investment projects were assessed against the above criteria with information that was provided directly from the firm, interviews with stakeholders and key informants, and existing documentation, including business plans. This information was reviewed and further cross-checked with reliable third persons and institutions, web pages, market studies and any other relevant information available.

3 General results and considerations

3.1 Miombo forest management

3.1.1 General considerations on forests and climate change

Despite the average annual economic growth rates of 8 percent between 1993 and 2009 in Mozambique, the country remains extremely poor with Human Development Index (HDI) levels still well below the average Sub-Saharan African level. Poverty levels are higher in rural areas, making rural householder exceptionally vulnerable to natural disasters. Mozambique has suffered acutely from natural disasters in the past, notably tropical cyclones, floods, and droughts.² The country ranks third in Africa in terms of risk exposure to multiple weather-related hazards.³ During the past 50 years, the country has suffered from 68 natural disasters, which have killed more than 100,000 people and affected up to 28 million. As much as 25 percent of the population is at risk from natural hazards.⁴ This extreme vulnerability is expected to increase being further aggravated by climate change effects. The frequency and severity of droughts, severe flooding, and coastal storms are predicted to increase over the next decades. Deforestation and unsustainable use of forests to meet energy needs and expand agricultural land will aggravate these trends and increase the vulnerability of the population.

Sustainable management and conservation of the vast forest resources in Mozambique play a crucial role in enhancing landscape resilience to climate change – e.g. at the watershed scale – and increase resilience to extreme weather events. Sustainable management and conservation of forests provide environmental services ranging from improved water quality and quantity in certain areas, reducing soil erosion, creating micro-climatic conditions that maintain (or in some cases improve) productivity.⁵ Moreover, sustainable management of forests has great potential to strengthen social resilience by offering a diversification of revenue sources and product supplies, and building the capacity of local and national institutions. Forest management can provide a low-cost approach to enhancing resilience of rural landscapes and create synergies between socio-economic development and climate change mitigation. Biodiversity conservation offers an opportunity to improve ecosystem functioning and diversify livelihoods at multiple scales; it may also reduce degradation pressure on the fragile ecosystems by improving protected area management and maintaining ecosystem connectivity.

A study conducted by Convention on Biological Diversity (CBD) concluded that: “maintaining and restoring biodiversity in forests promotes their resilience to human-induced pressures and is therefore an essential ‘insurance policy’ and safeguard against expected climate change impacts. Biodiversity should be considered at all scales (stand, landscape, ecosystem, bioregional) and in terms of all elements (genes, species, communities). Increasing the biodiversity in planted and semi-natural forests will have a positive effect on their resilience capacity and

² The World Bank. 2010. Economics of Adaptation to climate change – Mozambique. Washington. The World Bank Group.

³ UNISDR (United Nations International Strategy for Disaster Reduction). 2009. Global Assessment Report on Disaster Risk Reduction. Geneva: UNISDR.

⁴ *ibid.*

⁵ PROFOR <http://www.profor.info/knowledge/using-forests-enhance-resilience-climate-change>

often on their productivity (including carbon storage).”⁶ Therefore, we consider the management of native Miombo forests with the aim to maintain biodiversity and environmental and social services as highly relevant under climate resilient aspects.

The following table 4 gives an overview on forest vulnerabilities to climate change and potential adaptation measures. These measures have been considered in our project assessment of Miombo forest management which will be outlined in the next chapter.

Table 4: Vulnerability and potential adaptation measures for the forest sector

Vulnerability	Potential adaptation measures
<p>Although the adaptive capacity of forests remains uncertain, many scientists are concerned that the adaptive capacity of forests will not be sufficient to adapt to unprecedented rates of climate change.</p> <p>Tropical dry forests are likely to be affected most by drought and fire in response to decreases in annual precipitation and prolonged dry seasons. Latin American tropical dry forests will be more affected than those in Africa or Asia (Miles et al., 2006 cited by Locatelli et al., 2008).</p> <p>Mangroves have been identified as among the forest types most threatened by climatic changes due to sea level rise and the associated changes in sediment dynamics, erosion and salinity.</p>	<p>a. Adaptation for forests</p> <p>Various adaptation measures for forests have been proposed⁷ - most for temperate or boreal forests, but which can be extrapolated to tropical forests even though some measures may not be directly applicable.</p> <p>Two broad categories of adaptation measures for forests can be distinguished:</p> <ul style="list-style-type: none"> • Measures for buffering a system from perturbations (e.g. fire), by increasing its resistance and resilience to change. • Measures for facilitating shifts and evolution towards a new state that meets altered conditions. <p>As genetic diversity is a key element for understanding ecosystem adaptive capacity, proposed adaptation measures include maintenance or enhancement of genetic diversity in managed forests.</p> <p>b. Forests for societal adaptation</p> <p>Based on the concept of ecosystem services (MEA, 2005) and their impact on human well-being: forest ecosystem-based adaptation. Examples include forest conservation in watershed areas and mangrove protection to reduce coastal erosion.</p>

Source: adapted from Locatelli et al. 2008

⁶ CBD 2009 Technical Series No. 43 Forest Resilience, Biodiversity, and Climate Change A Synthesis of the Biodiversity/Resilience/Stability Relationship in Forest Ecosystems

⁷ For a list of references, please see Locatelli et al. (2008).

3.1.2 General considerations for Miombo forest management

Miombo forests are dry forests, resulting in relatively low timber productivity. In dry forests water is usually the limiting factor for growth as opposed to most other forest ecosystems, where light is the main limiting factor. As a consequence, in dry forests, enhancing the annual increment of individual trees through liberation thinning will not have the positive impact observed in other forests.

Silvicultural management can and should be applied to maintain and enhance productivity and the economic value of natural forests. The most important silvicultural objective is to ensure against shifts in species composition from commercial to non-commercial species and limit the degradation of tree quality. Ideally, silviculture should result in improvements in the commercial value and quality of trees. This shift can only be initiated by selective thinning, i.e. by gradually diminishing the stock of non-commercial, low quality trees. Unfortunately, the traditional management of the Miombo forests often results in the opposite effect. Only commercial trees of good quality are harvested (high grading); with the low quality trees left standing. Without a shift in the management approach, a gradual degradation of the forests is inevitable.

3.1.3 Growth and yield

The MAI (mean annual increment) of Miombo forests over all species is estimated to be between 0.5 and 1.5 m³/ha/yr (Silva et al., 1965; Saket, 1994; Saket, 1999). This seems to be a realistic figure. It might be enhanced up to 2 m³/ha/yr by applying silvicultural interventions. In other words, when managing 10,000 ha an average annual cut of 10,000 m³ of timber would be below increment and therefore sustainable. The problem is that the share of commercial species (see above) is small; meaning that most of the MAI occurs in non-commercial, low quality tree stands. The national forest inventory in Mozambique shows that only 7% of the standing volume is made up of commercial species (Marzoli, 2007). Saket (1994) states that commercial timber species account for only 4% of biological growth. This low share of timber species is the reason for circulating figures of MAI below 0.1 m³/ha/yr for commercial trees. These observations give evidence that three aspects have to be considered consequently when managing Miombo forests:

- Enhance the share of commercial species
- Gradually increase growth of commercial species by selective thinning
- Developing uses and markets for secondary species

The annual allowable cut derived from the approved management plans ranges from 0.1 to 0.5 m³/ha/yr made up of primary and secondary species. This seems to be below the actual growth increment and therefore sustainable.

3.1.4 Area required for sustainable forest management

Most experienced forest managers consider the minimum economically feasible Miombo forest management area to be 100,000 ha. However, it is the annual harvest volume not the area

that dictates economic feasibility. A profit-oriented forest company should harvest a minimum of 8,000 to 10,000 m³ per year in case of valuable natural timber and 30,000 m³ per year in case of plantation forestry. The required forest area is the result of forest productivity:

- With annual growth and yield around 1 m³/ha/yr, one can successfully manage a forest area of 10,000 ha.
- With annual growth and yield of only 0.1 m³/ha/yr, one requires 100,000 ha.

As mentioned before, by applying silvicultural management (selective thinning) and developing markets for secondary species, it should be possible to obtain MAI around or above 1 m³/ha/yr. However, this requires time and must be a long-term endeavor.

3.1.5 Current management practices

The conditions of the Miombo forests are often poor, mainly due to annual fires and the highly concentrated harvesting of only a few species. Even though dry Miombo woodlands are ecologically well-adapted to regular fires, overly frequent fires suppress young tree species from regenerating while older trees with higher diameters are relatively well-adapted to these annually occurring fires.

In the management plans analyzed⁸ there was unfortunately no data on the number of trees per diameter class and natural regeneration (young trees > 10 cm of DBH) has not been inventoried either. However, considering the stated standing volume per diameter class, it can be assumed that there is a lack of younger trees due to frequent fire events. Fire is part of the Miombo forest ecosystem. If fire happens once or twice per decade, it will most likely not negatively affect natural regeneration of the forests.⁹ However, when fires occur more frequently, the regeneration of the forests is altered. In order to ensure a sustainable resource base, it will be of utmost importance to control the annual fires and promote natural regeneration of desired commercial timber species.

Aside from forest fires, common silvicultural management endangers sustainability and long-term forest productivity. The operations only consist of selective harvesting of the best mature trees of the premium and first class commercial species. This leads to a gradual degradation of the forest resources. With each intervention the tree composition shifts towards a higher share of non-commercial species as the best individuals are removed, impoverishing the genetic base for commercial species. Furthermore, no silvicultural treatments are applied to enhance the productivity of the forests. Therefore, the naturally given growth potential is currently not adequately utilized and growth and yield could be enhanced significantly.

⁸ Four management plans of different concessions have been available and were analyzed.

⁹ See also: C.J. Geldenhuys: Disturbance and recovery in natural forests and woodlands in Africa: Some concepts for the design of sustainable forest management and rehabilitation practices. In: Sustainable Forest Management in Africa: Some Solutions to Natural Forest Management Problems in Africa. Proceedings of the Sustainable Forest Management in Africa Symposium. Stellenbosch, 3 – 7 November 2008.

3.1.6 Proposed sustainable forest management practices

The forest area to be managed should be divided into the same number of compartments as the harvesting cycle length (i.e. 20 year harvesting cycle = 20 compartments). Each compartment will be subject to forest management on a specific year. After 20 years the harvesting will be repeated in the first compartment and so on.

The following integrated management approach is highly recommended. Without the proposed measures for integrated forest management, sustainability and long-term economic success is threatened and the project will not be eligible for forest certification:

Fire Management

Dry Miombo woodlands are adapted to fire, but fire events should not occur too frequently (e.g., should not occur annually). To assure natural regeneration of the Miombo forests, fire management is crucial. Since fires occur mainly due to human activities (hunting, shifting cultivation, carelessness), fire protection cannot be done without the support of the local communities (see next point). Fire management requires advanced technical management (e.g. establishment of a network of firebreaks in order to avoid extensive large-scale fires). However the success of fire control measures depends mainly on the integration of the local stakeholders.

Community involvement

It will be of utmost importance to engage the local population in forest management. Illegal logging, shifting cultivation, poaching, and fire are symptoms of poverty driven ecosystem destruction. Promoting alternatives to current destructive livelihood strategies, such as improvement in agricultural productivity, generation of alternative incomes sources, support in market access, etc. are some of the keys success factors.

Figure 2: Clearing of forests / shifting cultivation



Source: UNIQUE 2013, Sofola Province

Strategic and operational planning

For mid- and long-term strategic planning and for the development of an annual operational plan, conducting a forest inventory is necessary in order to produce a dynamic geo-data referenced database of stocks per management unit. The availability of this precise information forms the basis of accurate forest resource estimates including thematic maps of the conces-

sion area, sound planning of the forest road network and a management plan which assures sustainability and guides the operations.

Enhancing productivity

Silvicultural management always targets the enhancement of productivity in order to optimize the economic outputs of operations without compromising sustainability. In the context of the Miombo woodland management, the following aspects are crucial:

- Assurance of natural regeneration of commercial tree species
 - Exclusion of frequent fire events
 - Assurance of a sufficient amount of good quality trees as seed trees (here semi-mature trees of the diameter classes between 20 and 40 cm are perfectly suited)

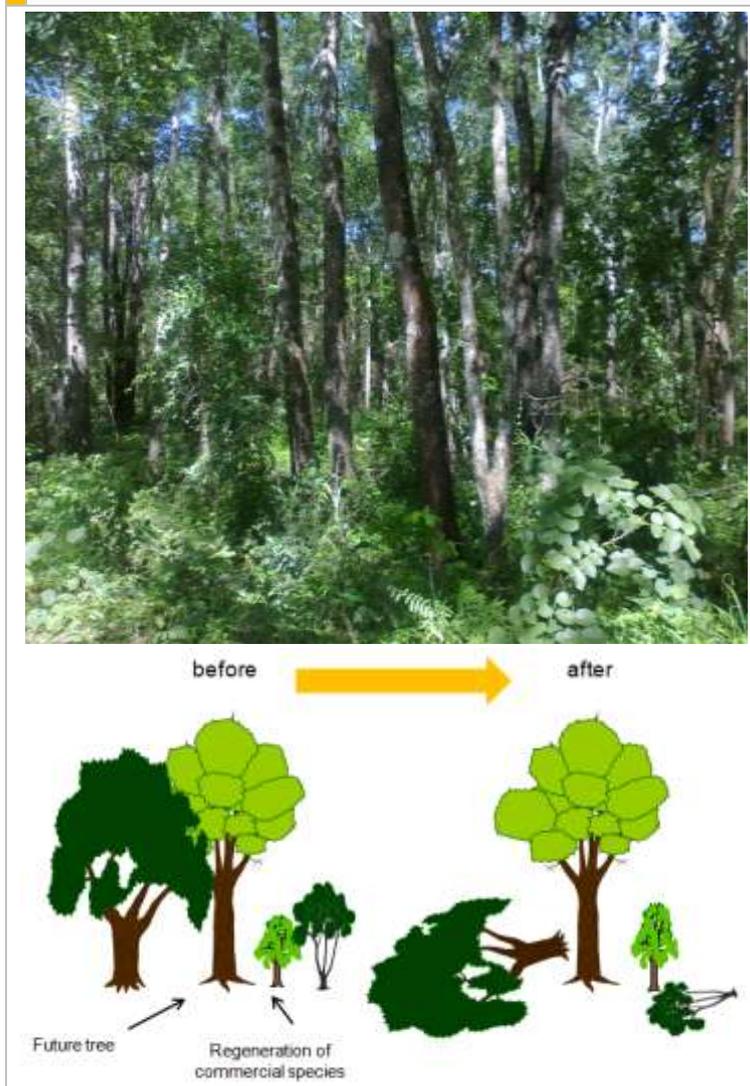
- Regulation of competition, as even in dry and relatively open forests it may happen that groups of trees are too dense (figure and picture in figure 3). In order to pro-

motivate increment and concentrate the naturally site-given growth potential on the best individuals, competition should be regulated.

- Elimination of (over) mature¹⁰ non-commercial trees

During harvesting operations, additional non-commercial mature trees should be removed in order to avoid indirect promotion of non-commercial tree species. If only commercial species with guaranteed markets were harvested, over time, increasingly non-commercial

Figure 3: The need for competition regulation in Miombo woodlands



Source: UNIQUE 2013, Sofola Province; Unique (2007)

¹⁰ A mature tree is an old tree having reached target diameter or being in process of decaying.

tree species would receive a competitive advantage and occupy space which could be used by the commercial tree regeneration. Therefore, each harvesting operation must also remove non-commercial tree species (either through cutting and leaving as felled deadwood or through standing elimination). This will create new space for natural regeneration of preferred commercial tree species, and at the same time, provide sufficient space and less competition for future commercial tree species.

Applying reduced impact logging (RIL) techniques

Generally, no reduced impact logging (RIL) techniques are applied in Mozambique. As a consequence, the remaining forest (and the remaining production potential) is damaged and harvested products are often devalued.

Applying RIL assures:

- Increased worker safety
- Lowered erosion
- Lower damage to neighboring trees, forest and harvested products
- In the long run: more cost-efficiency in harvesting operations

Figure 4: Lack of proper felling technique resulting in lowered log value



Source: UNIQUE 2013, Sofola Province

One key aspect of RIL is directional felling. This includes the secure and directed felling of the tree, optimized recovery rates, facilitation of log skidding, and last but not least, increased worker safety.

3.2 Adaptation to climate change in Agriculture

There are nearly half a billion smallholder farmers in Africa¹¹. These farmers are at the frontlines of climate change which is predicted with high certainty to impact negatively on agricultural production¹², food security, and poverty reduction. For these farmers, adaptation to climate change is a top priority. Their traditional adaptation responses can no longer suffice as they are faced with unprecedented future climate variability. A great deal of effort is therefore

¹¹ <http://www.farmafrica.org.uk/Final%20ASFG%20-%20Africas%20smallholder%20farmers.pdf>

¹² About 5 to 25% loss in agricultural productivity is predicted for East, West and Southern Africa (Economic Report on Africa, 2009) http://www.uneca.org/era2009/ERA2009_ENG_Full.pdf

needed to widely promote suitable agricultural adaptation practices in order to enhance the capacity of these farmers to respond to climate change impacts.

Practices that can be implemented to enhance adaptation at the farm level include, among others: agroforestry; conservation agriculture; techniques for increased water use efficiency; use of crop varieties that are heat, drought, flood or salt tolerant; integrated nutrient management; and integrated pest/disease management. At the household and community level, weather-proof storage for seed, food and forage can help improve food security; while at both the local and regional/national level, improving access to reliable weather-related information and climate-proofing of rural infrastructure can enhance adaptive capacity.

Adaptation is defined as activities that aim “to reduce the vulnerability¹³ of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience” (OECD-DAC, 2011).

Vulnerability could be reduced by altering exposure, reducing sensitivity, and improving the adaptive capacity of the system (Adger et al., 2004; OECD, 2009.) IPCC (2007)¹⁴ defines adaptive capacity as the ability or potential of a human or natural system to respond successfully to climate variability and change so as to moderate potential risks or cope with consequences of extreme events (floods, heavy hail/snow events, heavy wind and dust storms, droughts and dry spells, heat waves and warm spells, cold spells). Among the main determinants of adaptive capacity are financial resources, technology, access to information and skills, infrastructure, social institutions and policies and equity (Swanson et al 2007).

Adaptation strategies and measures increase the range of climate conditions farmers can cope with. These could include a specific action (e.g. switching from one crop variety to another) or a systemic change (e.g. diversifying livelihoods against risks or an institutional reform to create incentives for better resource management) (FAO, 2009a)¹⁵. Although there is no general consensus on indicators for adaptation activities, the contribution of such strategies to increasing systems’ adaptive capacity could be estimated by means of increased physical, economic, social and human resilience which summarize the determinants of adaptive capacity.

A World Bank study conducted in 2010 assessed farmers’ risk perception in Mozambique as shown in the following figure.

¹³ Vulnerability is defined as the degree to which a system is susceptible to the adverse effects of such change (IPCC, 2007a).

¹⁴ Adger, W. N., Brooks, N., Bentham, G., Agnew, M., & Eriksen, S. (2004). *New Indicators of Vulnerability and Adaptive Capacity. Technical Report 7*. Norwich: University of East Anglia. Tyndall Centre for Climate Change Research. OECD. (2009). *Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance*: OECD. IPCC (2007). Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change In M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden & C. E. Hanson (Eds.), *Climate Change 2007, Fourth Assessment Report*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

¹⁵ FAO (2009). *Coping with a Changing Climate: Considerations for Adaptation and Mitigation in Agriculture*. Rome: FAO.

Figure 5: Farmers perception of risk

Table 4. Farmers' Perception of Risks

Risk	Maize	Sorghum	Millet	Peanuts
Floods	7.9%	6.3%	5.3%	6.4%
Pests	11.8%	13.0%	16.3%	17.4%
Wild animals	9.6%	14.1%	16.7%	11.5%
Domestic animals	1.9%	1.4%	1.3%	1.1%
Diseases/decay	2.4%	3.6%	4.3%	3.1%
Excess rainfall	15.5%	14.8%	6.9%	17.5%
Deficit rainfall	44.8%	48.7%	48.5%	38.0%

Source: Trabalho de Inquerito Agrícola 2008.

Source: World Bank 2010 study on cotton supply chain

According to this figure the greatest risk identified by farmers is that of a lack of rainfall.

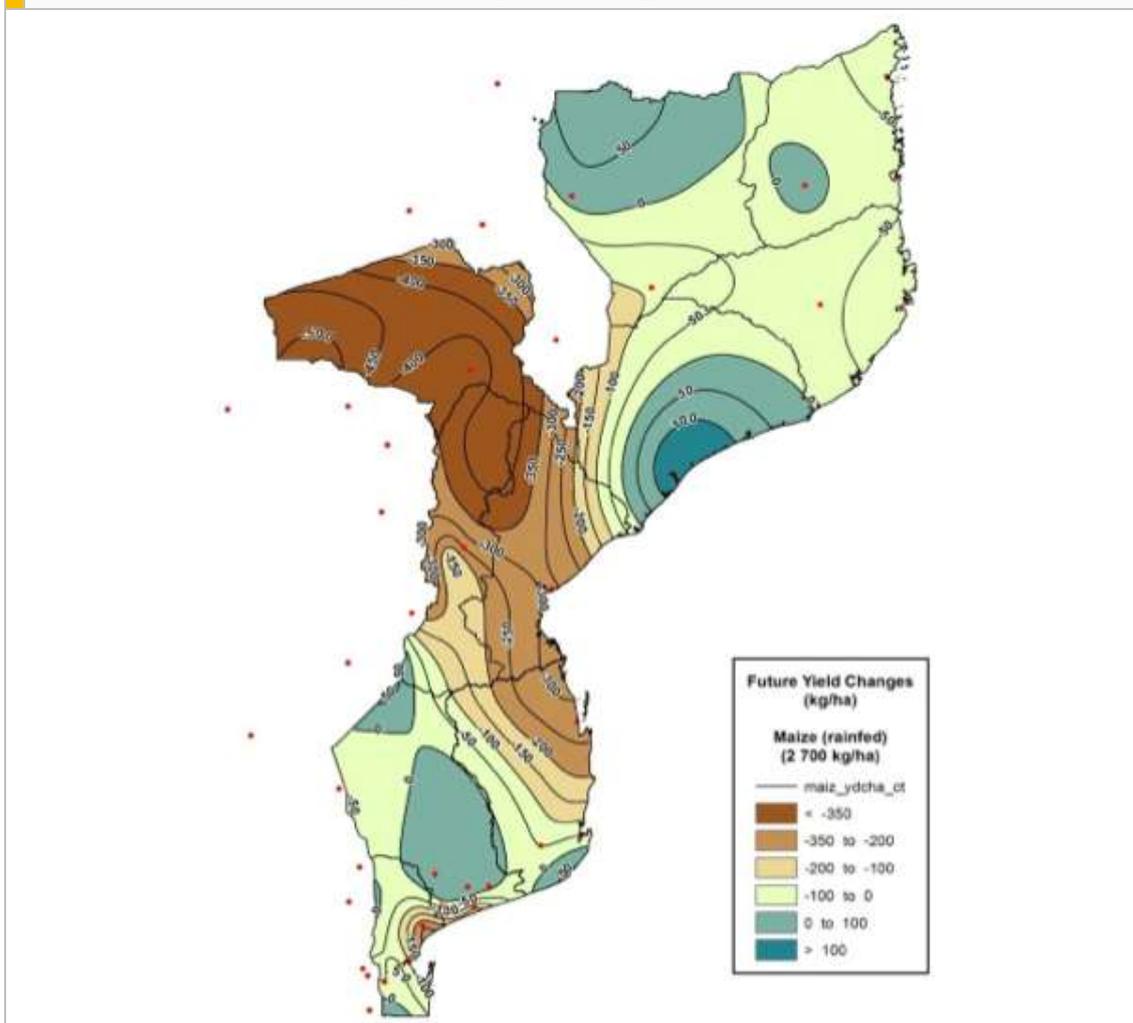
According to a 2012 INGC synthesis report, "the agricultural sector is crucial to the development of Mozambique. Analysis shows that climate change poses a threat to the Government's current strategic plan to double yields by 2020, as the impacts of climate change will demand significantly more effort to attain the targeted levels of yield. As a consequence of these impacts, climate change is likely to aggravate food insecurity in Mozambique, putting the country's efforts to reduce poverty at risk." This study shows that, on average, annual crops experience an annual yield reduction of 5.4% with each degree Celsius increase in average temperature (see also Siwi report 31, 2012 and Dell 2012).¹⁶ The overall projected reduction for maize by 2040 to 2065 is approximately 11% of present yield, although this aggregate figure masks higher reductions in specific areas, such as in the area around Tete, where up to between 30% and 45% decreases could be expected. The strongest decreases could spread from the Tete area towards the Sofala coast and on towards the south. Yields could further decrease due to the projected increase in the frequency and intensity of disasters. The report further states that water management remains key, as climate change combined with development and population growth will increase the demand for water, which is already becoming less available. There is a large potential for poverty reduction through small interventions in rain-water harvesting and storage in smallholder settings in semi-arid and sub-humid areas. The provision of 1,000 m³ of extra water per hectare per season, in combination with improved crop management and soil nutrient management, could substantially increase the productivity of small-scale rain fed agriculture and farmers' resilience to dry spells.

Figure 6 highlights the expected future changes in yield for maize.

¹⁶ Dell, Melissa, Benjamin F. Jones, and Benjamin A. Olken. 2012. "Temperature Shocks and Economic Growth: Evidence from the Last Half Century." *American Economic Journal: Macroeconomics*, 4(3): 66-95.

http://www.siwi.org/documents/Resources/Reports/Feeding_a_thirsty_world_2012worldwaterweek_report_31.pdf

Figure 6: Expected future changes (2046 to 2065) for maize [kg/ha] under rain-fed agriculture based on the median of all seven climate change models and considering changes in temperatures and rainfall



Source: Van Logchem B. and Queface, 2012 INGC report

Private Sector

In the same INGC report the private sector is also mentioned as crucial: “The private sector investing in Mozambique has both an opportunity and a responsibility to contribute to the building of resilience to climate change” (see also chapter 1.2)

The report concludes by saying that “massive development and the adoption of adaptation mechanisms in the agricultural sector are crucial to increasing the resilience of Mozambican communities and society to climate change. This will require strong coordination mechanisms in the sector, the development of local adaptation measures, and fast dissemination mechanisms involving both the private sector and large producers, as well as small-scale farmers. It will require strong leadership from the government and a coordinated channeling of efforts and resources by all relevant sectors (universities, research institutions, policy-makers, extension services, and producers) towards the same goal of increasing agricultural productivity and resilience to climate change.”

The proposed climate resilience projects which we will present in this report take into account predicted climate changes for Mozambique, climate adaptation options in agriculture and the involvement of the private sector.

The following table summarizes the main findings of the INGC report for the agriculture sector.

Table 5: Vulnerability and potential adaptation measures for the agriculture sector

Vulnerability	Potential adaptation measures
<p>In Mozambique, average annual crops lose approximately 5.4% in yield with each degree Celsius increase in average temperature.</p> <p>Overall projected reduction for maize by 2040 to 2065 is ca. 11% of present yield, although this figure masks higher reductions in specific areas, such as around Tete (up to 30-45% decreases could be expected). The strongest decreases are predicted to spread from the Tete area towards the Sofala coast and on towards the south (Figure 6).</p> <p>Yields could further decrease due to ground-level O₃¹⁷ and projected increases in frequency and intensity in natural disasters (droughts, floods, cyclones). (see also footnote 1)</p>	<p>As O₃ is released during land burning practices at the start of the planting season, adaptation measures should include the adjustment of plantation dates to avoid a high O₃ concentration, the use or development of crop varieties that are tolerant to high O₃ levels (e.g. cassava, sugar cane), the avoidance of wild fires and a switch to cold fires to avoid high NO₂ emissions and the consequent production of O₃.</p> <p>The provision of 1,000 m³ of extra water per hectare per season, in combination with improved crop management (dealing with the O₃ factor) and soil nutrient management, is suggested to substantially increase the productivity of small-scale rain-fed agriculture and farmers' resilience to dry spells.</p>

Source: Van Logchem and Queface 2012

3.3 Policy issues

During the field visits, numerous discussions arose regarding the possibility of policies hampering the development of climate resilience projects. We would like to highlight two policies which need to be addressed: the first one is related to the possibility of combining sustainable forest management with hunting concessions in order to have greater impact and presence in a defined area which needs to be conserved; the second is related to the possibility of planning and implementing large conservation areas under a REDD+ legal framework.

3.3.1 Hunting license and forestry concessions

Hunting and forest management in Mozambique are regulated by the Law of Forestry and Wildlife (Law N° 10/99 of July 7, 1999), and its correspondent regulations (Decree N° 12/2002 of June 6, 2002).

¹⁷ Besides water and temperature, ground-level O₃ has in many cases a higher impact on yield levels than water and temperature (Van Logchem and Queface, 2012).

There are two types of hunting regimes in Mozambique: *coutadas* (game reserves within conservation areas) and *fazendas bravia* (game farms outside conservation areas). Only *coutadas* are relevant to this project.

Although the legal framework allows for other activities (of both subsistence and commercial nature), out of concern that forestry activities might disturb wildlife, commercial logging has thus far not been permitted.

As some *coutadas* contain high value tree species that are threatened by illegal logging, there is openness to exploring the possibility of allowing forest management in *coutadas* to increase the economic rents derived from *coutadas* and control illegal logging.

The details of an institutional arrangement that would allow forest management in *coutadas* are yet to be determined. One possibility could be to embed a logging license (simple license, forest concession) within the contract of a *coutada*. Based on this arrangement, logging permits would be limited to *coutadas* and their duration defined by the duration of a *coutada* contract (ca. 5-10 years), based on an aligned management plan that considers both hunting and forestry activities. To this end, close collaboration between the Ministry of Tourism (responsible for hunting in *coutadas*), Ministry of Agriculture (responsible for forest management) and the operator would be required. To reduce the risk of forest degradation, one precondition for allowing logging in *coutadas* could be certification of sustainable forest management (SFM) practices.

Although Mozambique has no experience with SFM in *coutadas* thus far, the concept appears feasible from both a legal and policy perspective. The Ministry of Tourism is open to exploring this option further, for example, within the scope of a pilot project. However, given the poor track record of forestry activities in Mozambique,¹⁸ it will be important to ensure responsible forestry. Certification could be one instrument to this end.

3.3.2 REDD + in Mozambique

As part of Mozambique's national REDD+ process, the government is currently in the process of adopting a first decree on REDD+. In the face of an absent comprehensive legal framework for REDD+, the objective is to provide at least some guidance for the readiness phase.

Lead by the Ministry of Environmental Coordination (MICOA) and the Ministry of Agriculture (MINAG), the decree intends to guide (i) the approval of REDD+ demonstration activities (i.e. to get a license to operate), and (ii) the structure supporting the national REDD+ process (incl. the Technical Unit for REDD+).

Specifically, the following parameters are relevant to the scope of this project: (i) the decree's defined size limitation for a REDD+ demonstration activity, which is set to 10,000 hectares maximum, and (ii) the requirement that the demonstration activity be located in an area threatened by deforestation and forest degradation. Although the draft decree is still in the

¹⁸ EIA 2013, First Class Connections – Log Smuggling, Illegal Logging and Corruption in Mozambique, Environmental Investigation Agency, London.; German, L.A., Wertz-Kanounnikoff, S., 2012. Sino-Mozambican relations and their implications for forests – A preliminary assessment for the case of Mozambique. Working Paper 93. CIFOR, Bogor. ; Mackenzie, C., 2006. Chinese Takeaway! Forest Governance in Zambézia, Mozambique. Forum das Organizações Não Governamentais da Zambézia, Quelimane.

process of internal revision and awaiting public consultation prior to endorsement, informal statements suggest that the 10,000 ha limitation is unlikely to change in this process. The extent to which the REDD+ decree will remain in force once Mozambique has developed a more comprehensive legal framework (incl. safeguards) is unclear. Additional clarity can be expected after the consultations, which were initially scheduled for March 2013 but have since been postponed. The consultation is now scheduled for 3rd of June 2013.

4 Results of the project screening

As described in chapter 1, a total of 53 companies were identified to assess their potential interest in investing in climate projects.

- Of these 53 companies 9 **were not cleared** by IFC due to ongoing negotiations with IFC.
- **22 companies did not show strong interest** and commitment to investing in PPCR projects at that time, but could be interested at a future date. **10 companies** were identified and expressed an interest in investing, with **some constraints** identified.
- **8 companies** showed high interest but were still at the stage of generating **project ideas**.
- And finally, **4 companies had concrete business ideas** and proposals.

This selection process has been documented in the interim report. We have included these screened projects in chapter 4.

Out of these 44 companies (53 minus the 9 companies not cleared) presented in the interim report, IFC selected seven possible projects for an in depth study after consultations, discussions and telephone conferences with one additional project added later. The projects included were:

1. Company G: Investment in Macadamia with outgrowers in the Gorongosa area
2. Company H: Investment in cassava production with small scale farmers (for ethanol production) with conservation agriculture and agroforestry systems in Gorongosa area.
3. Company A: Improved Miombo forest management with integration of a value chain in a forest concession to reduce fire, illegal logging and include neighboring communities.
4. Company A: Eco Lodge and Mangrove Forests protection.
5. Company A: Adding a forest concession in an existing hunting concession in order to reduce illegal logging and fire, as well as maintain the watershed.
6. Company B: Investment in small scale cotton farmers in irrigation schemes and crop diversification (Niassa).
7. Niassa REDD+ Carbon Project: Financing community-based fire management and improved management of the Niassa Reserve through carbon credits.
8. During the in depth study one additional project was identified with Company A: Conversion of pure eucalyptus stands into mixed stands plantation with other climate resilient species.

Out of these 8 projects, the project ideas with companies G and H could not advance for the following reasons:

Company H:

Company H is currently in the process of establishing the ethanol production plan, is assisting communities in cassava production with conservation agriculture techniques, is importing and selling ethanol cook stoves, and currently importing ethanol to promote the ethanol cook stoves. These processes still need to be settled and stabilized before a new project can be proposed and realized. Staff from Company H were not in the position to find adequate time to

work out a detailed proposal. However, Company H remains interested and is still seen as a potential candidate for the PPCR program.

Company G

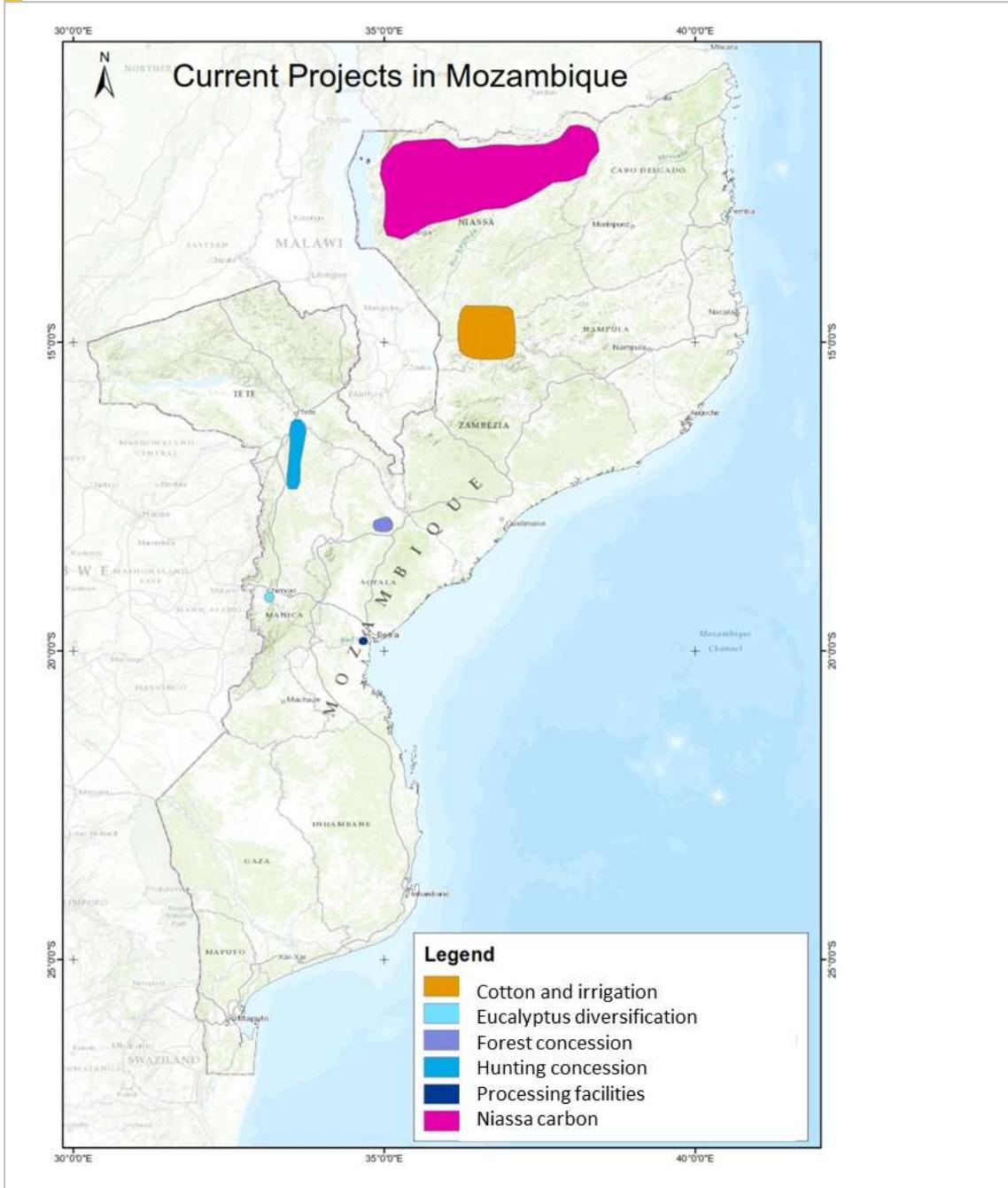
[Sensitive information has been removed.]

This project did not match with the criteria and was therefore not studied in detail.

In the following section we describe the 6 remaining possible project proposals accompanied by our recommendations to IFC.

Figure 7 shows the location of the studied projects.

Figure 7: Location of projects studied



Source: Our elaboration

4.1 Company A project package

4.1.1 The four Company A projects in a nutshell

In the framework of the present study, four Company A projects have been scrutinized:

1. Miombo management with value chain integration
2. Conversion of pure eucalyptus stands into mixed-stand plantations
3. Eco lodge and mangrove forest protection
4. Adding a forest concession to an existing hunting concession

Table 6: Company A's climate resilience projects in a nutshell

Parameter	Miombo management & value chain	Conversion of Eucalyptus stands	Eco lodge and mangrove protection	Forest and hunting concession
Project description	Sustainable Miombo forest management and value adding by integrated timber processing	Conversion of pure eucalyptus stands for pole production into a more diversified forest plantation (50 % eucalyptus, 50 % other tree species, mainly teak)	Constructing an environmentally-friendly eco lodge on seaside near Beira. Protection of surrounding mangrove forests is part of the plan.	Adding a forest concession to an existing hunting concession
Climate resilience	Miombo forest management will decrease fire in the concession, increase the natural regeneration, soil organic matter and thus maintain the biodiversity of the forest to better adapt to climate changes. Through an improved value chain, Miombo forest management will be more economically viable. Neighboring communities will be assisted in their agriculture activities to adapt to climate change, increase productivity and yield and diversify crop production.	The introduction of other tree species will increase biodiversity and enhance climate resilience. Projects within the communities to increase productivity will improve livelihoods and food security.	Due to the permanent presence of personnel and tourists, the deforestation of the important mangrove forests will be slowed or stopped. Mangrove forests will be maintained for coastal protection of one of the most vulnerable areas in Mozambique.	(As in the first column.) Additionally due to the size of the area (300,000 ha) it serves as an important watershed area
Technical feasibility	Company A has worked for decades	The introduction of other tree species	Eco Lodge is a fairly new subject to Com-	(As in the first column.) The policy

Table 6: Company A's climate resilience projects in a nutshell

Parameter	Miombo management & value chain	Conversion of Eucalyptus stands	Eco lodge and mangrove protection	Forest and hunting concession
	<p>in the forestry and timber sector with good performance. Management capacity is very good. Operations work well but can be improved by applying adequate technology and best practices.</p> <p>Product definition and marketing concept of secondary species needs to be elaborated in detail.</p>	<p>will be based on local / regional experiences. Species adapted to the current and future climate, suitable to the area will be selected.</p> <p>Technical assistance to Company A will be required.</p>	<p>pany A. However, the Company J (100% shareholder of Company A) is experienced in real estate and construction (see also chapter 4.1.2). A preliminary feasibility study has been conducted.</p> <p>By being present in the area and giving job opportunities to communities, the reduction of mangrove forests should be feasible since it does not require a high level of expertise.</p>	<p>issue needs to be resolved; a zoning process needs to be conducted to identify appropriate forest management areas without interfering with the hunting concession.</p>
Financial feasibility	<p>The total investment volume of approx. 2.0 million USD relatively small. A first rough assessment on project economies has been promising. A detailed business plan using excel spreadsheets remains a work in progress.</p>	<p>The conversion of the current Eucalyptus stands into mixed plantations will require around 3.0 million USD (approx. 1,000 USD per ha) within the next 10 years. A first rough assessment on project economies has been promising. The IRR should be beyond > 10 %.</p> <p>A detailed business plan with excel spreadsheets remains a work in progress.</p>	<p>The estimated total volume is 6.2 million USD according to the feasibility study. The investment for the first phase would be approximately 3.5 million USD.</p> <p>The lodge is expected to be profitable.</p>	<p>An onsite revision looked promising for sustainable Miombo forest management, since the forests are of good quality due to the absence of commercial harvesting.</p> <p>As a function of the area under forest management, the investment is between 2.0 and 5.0 million USD.</p> <p>After having clarified the policy issue, an inventory needs to be conducted as a basis for the business plan.</p>
Main risks	<ul style="list-style-type: none"> • Social risk (medium): Loss of forest area due to shifting cultivation, illegal logging • Production risk (medium): Fire 	<ul style="list-style-type: none"> • Social and production risks are the same as in the first column. • Market risks (low): Secured market for Eucalyptus poles; selection of other 	<ul style="list-style-type: none"> • Social risk (medium): Potential conflicts with the population because of mangrove protection. • Market risk (medium): No experi- 	<ul style="list-style-type: none"> • Social risk (medium): Conflicts may arise if the "free access" to forest resources is limited by the project. • Production risk:

Table 6: Company A's climate resilience projects in a nutshell

Parameter	Miombo management & value chain	Conversion of Eucalyptus stands	Eco lodge and mangrove protection	Forest and hunting concession
	<ul style="list-style-type: none"> • Market risk (low): Price decrease. • No success with the commercialization of the secondary species • Political risk (medium): Forest authorities are not willing to increase annual allowable cut (AAC) when applying silvicultural best practices • No red flags 	<p>species will include market aspects. Performance of Eucalyptus behind expectations.</p> <ul style="list-style-type: none"> • No political risk. • No red flags 	<p>ence with eco lodges in this region; however, high potential.</p> <ul style="list-style-type: none"> • Political risk (low): Protection of the coastal area has priority. • No red flags 	<p>See first column.</p> <ul style="list-style-type: none"> • Market risk: See first column. • Political risk medium to high): Approval of a forest concession is uncertain. • No red flags
Overall recommendation	Highly recommended to select for due diligence. For small investment volume only in combination with other Company A projects. The combination of sustainable Miombo forest management and value-adding by processing and intelligent marketing is the proper approach to conserve natural forests (conservation by sustainable utilization). The project is exemplary and has huge potential to be scaled up.	Highly recommended since this project will make the forest production system more diverse and climate resilient combined with promising returns on investment. The approach of diversified forest plantations is exemplary and has potential to be scaled up.	Highly recommended since high probability of profitability and mangrove protection goes hand in hand. However, there are marketing and social risks which need to be considered. The first feasibility study is focused on the technical and economic feasibility of the lodge. The eco aspects of the project and the mangrove forest protection need to be further developed.	Recommended, however political framework needs to be clarified first. It is worthwhile to explore forest management options in order to conserve biodiversity and the huge wildlife and forest area as well as the watershed area. Potential conflicts with neighboring communities have to be considered.

Considering the whole package, the overall investment volume is > 10 million USD.

Company A is presented briefly below and the aforementioned projects are described as stand-alone projects. However, there are many interactions within the projects (particularly considering Miombo forest management, forest plantations and timber processing) and they are all conducted with one and the same management team. Therefore it is recommended to consider the whole project package when deciding to conduct due diligence for climate resilience investment in Company A.

4.1.2 Company brief Company A

Company A is owned by Company J. The company was founded in 1964 and develops activities in the forestry and wood processing sector. The annual turnover is around 3 million USD, there are 130 permanent staff and around 170 seasonal workers (approx. 9 months per year).

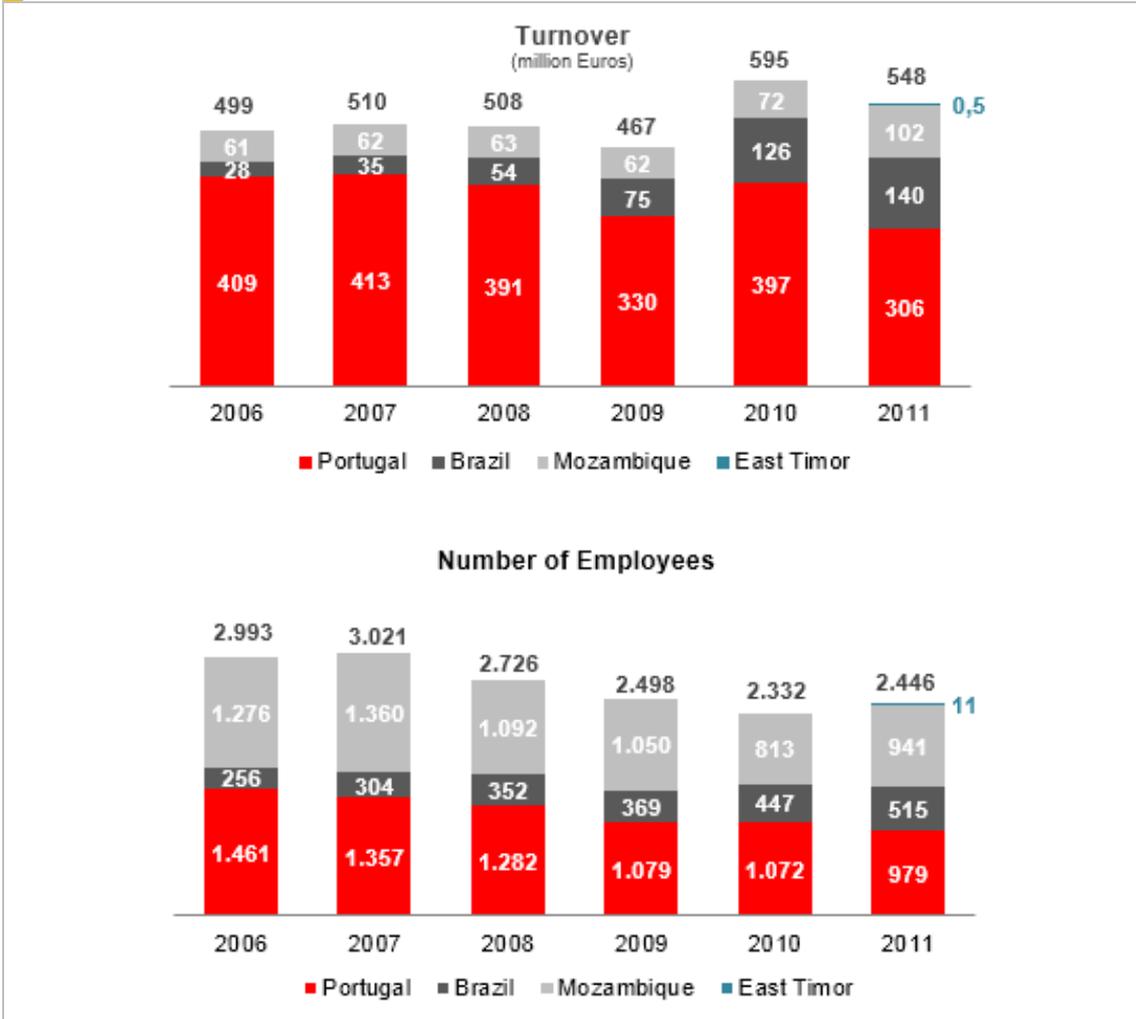
The main activities are:

- Natural forest management in Sofala province, currently with two running concessions (Derunde I and Derunde II) with altogether 19,000 ha and a new concession area with approx. 10,000 ha to be integrated in the course of the year 2013.
- Management of approx. 2,800 ha forest plantations in Manica province.
- Timber processing in two plants in Derunde and Dondo.
- Eco lodge in Rio Savane, some 40 km north of Beira.
- 300,000 ha hunting concession in Sofala province.

The main products of Company A are railway sleepers and poles for power and communication lines. In the second half of 2012 Company A started to establish timber processing facilities towards higher added value (tables, parquet flooring).

Company A belongs to the Company J, a holding with headquarters in Portugal. The Company J is engaged in a wide range of activities: Automobile distribution and retail, real estate, tourism, logistics, machinery, and last but not least, forestry and timber processing. The Company J engages exclusively with Portugal and former Portuguese colonies. The figure below shows the development of turnover and employers between 2006 and 2011. While turnover and employment in Portugal decreased over recent years, in Mozambique there has been a significant increase in both.

Figure 8: Key figures for the Company J



Source: company J's website (2013)

4.1.3 Improved Miombo management with value chain integration

**Figure 9: Project brief:
Improved Miombo management with value chain integration**

Project Description	
Main actors	Company A
Region	Sofola province
Company description	See chapter 4.1.2
Main products and markets	Currently railway sleepers from Messassa for domestic market. In future also semi-finished and finished carpentry products (e.g. flooring and paneling, wood work components) from other native species for domestic and export market.
Investment (total)	1.5 to 2 million USD Of which: 0.5 million USD for improved forest management 1.0 to 1.5 million USD for timber processing (carpentry)
Products and markets	
Products	<p>Railway sleepers Current production: approx. 1,800 m³ (requires approx. 5,500 to 6,000 m³ of logs) for domestic market. Specifications: 2.1 / 2.4 / 2.7 m x 25 cm x 12.5 / 16 cm 3.0 / 3.4 / 3.7 / 4.0 / 4,2 m x 25 cm x 12.5 / 16 cm Recovery rate log – sleepers: 30 to 32 % (log measured over bark)</p> <p>Carpentry products The carpentry requires log input of approx. 5,800 m³. The planned product lines are:</p> <ol style="list-style-type: none"> 1. Flooring and paneling 2. Wood work components 3. Housing and structures 4. Agro-industrial products (pallets and containers) 5. Biomass & green business
Markets	<p>Railway sleepers The sleepers are sold on the domestic market. Company A is the main provider for wooden railway sleepers in Mozambique. Prices: 2.10 to 2.70 m: 700 USD / m³ 3.00 m: + 770 USD / m³ <i>Photo: Sleepers produced at forest concession site.</i></p>

	 <p>Carpentry products The carpentry products will be sold on the domestic and export markets. Assumed prices for the five different product families: Flooring and paneling: 800 – 1,150 USD/m³ Wood-working components: 650 to 850 USD/m³ Housing and structures: 3,600 USD/m³ Agro-industrial products (pallets and containers): 550 USD/m³ Biomass & green business: 6 USD/m³</p>
<p>Product innovation</p>	<p>Miombo forest management The application of reduced impact logging (RIL) techniques, the enhancement of natural forest productivity and the management under FSC certification are new ways towards conservation of Miombo woodlands by making sustainable use out of them (see also chapter 3.1).</p>  <p><i>Photo: Log devaluation avoidable by applying appropriate felling techniques.</i></p> <p>Carpentry The forest management plan plans to integrate secondary native species into the value added timber processing. This is a highly innovative approach. If this works, a substantial obstacle for Miombo forest management will be addressed (see also chapter 3.1).</p>
<p>Marketing strategy</p>	<p>The sleeper market is well-known by Company A. No extra marketing strategy is required. For the export of (semi-)finished products, a sound marketing strategy is still required. FSC certification would help to market the products in Europe and North America.</p>

Technical Feasibility	
Technical implementation description	<p>Miombo forest management</p> <p>In order to achieve a more cost efficient and more sustainable forest management approach in Miombo, the following improvements should be applied:</p> <ul style="list-style-type: none"> • Forest inventory, silvicultural management and implementation of a forest information system (FIS). A forest inventory should be conducted to feed into the mid- and long-term strategic planning and in order to develop an annual operational plan. The inventory generates required information for a dynamic database on stocks per management unit. This “natural” information will be blended with geographical and production information. The availability of this precise and integrated information in a FIS is the basis of accurate forest resource base estimates including thematic maps of the concession area, sound planning of the forest road network and a management plan which assures sustainability and guides the operations. It is assumed that production can be increased by 10- 20 % when applying these practices and instruments. • Machinery and training: Adequate machinery (skidder with cable winches and front loader, special trucks for internal log transport) will reduce operational costs significantly (-20%) and contribute to the sustainability of the forest management. • Initiating the FSC certification process In order to optimize social and environmental impact, for external communication and for product marketing, the FSC certification is a useful instrument. <p>Carpentry</p> <p>Implementation of a timber processing line at Donde industrial plant (so far only impregnation of sleepers and poles).</p> <ul style="list-style-type: none"> • Saw milling logs with band saws; Saw milling dimensional cut with circular saws • Kiln drying • Planning, moldering and finishing <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>Construction has just started. First production output is planned for mid - 2013.</p> <p><i>Photo: Donde industrial plant. Construction for timber processing has started.</i></p> </div> </div>
New technology (if any)	Reduced impact logging; adequate machinery for cost-efficient harvesting operations in natural forests.
Uncertainties in the produc-	Miombo forest management

tion system	<p>Today's allowed annual cut is very low (in Derunde I and II around 0.3 m³/ha/year) and could be increased a minimum 10 to 20 % in the future by applying silvicultural best practices (see chapter 3.1). However, the likelihood of forest authorities being convinced to allow higher harvesting when applying these best practices remains unknown.</p> <p>Carpentry</p> <p>The underlying recovery rates for the carpentry project seem to be too optimistic. Based on a log volume under bark the following recovery rates have been assumed:</p> <ul style="list-style-type: none"> • Log – sandwich cut: 70 % • Log – sawn timber, dimensioned and kd: 58 % • Log – finished (main) product (planed, milled): 55 % <p>Recovery rate depends on many factors (log quality, type and dimension of finished products, variability in dimensions, technology applied, and capacity of personnel) and there is no uniform benchmark. However, in the case of tropical hardwood the recovery rate log - finished (main) product (kd, planned, milled) rarely exceeds 35-40 %. Hence recovery rate is a very sensitive parameter; the business plan should foresee different scenarios.</p>
Possible risks	<p>Miombo forest management</p> <p>Natural forest management is inherently low in production risks. Aside from fire which is harming the long-term productivity of the forest resources there is no biotic or non-biotic factor which can affect the production significantly.</p> <p>The risks are (see also section "Risks and measures to mitigate risks"):</p> <ul style="list-style-type: none"> • Market risks: Decrease of prices, complete loss of markets • Social risks: Shifting cultivation, log thefts • Political risks: No approbation of higher harvesting volumes when applying best practices; corruption. <p>Carpentry</p> <ul style="list-style-type: none"> • Continuous supply of logs • No success with the commercialization of the secondary species • Market risks (decrease in prices, complete loss of markets)
Financial Feasibility	
Financial capacity of the firm (turnover, capital, assets,)	<p>Turnover: 3 million USD per year</p> <p>Assets:</p> <ul style="list-style-type: none"> • 19,000 ha Miombo concession (Derunde I and II) • 2,800 ha eucalyptus plantations • 300,000 ha hunting concession • Rio Savane site near Beira • Forest harvesting equipment and saw mill at concession site (both outdated)

	<ul style="list-style-type: none"> Industrial plant for sleeper and pole impregnation in Dondo (outdated) <p>The assets are mainly the natural resources. The old industrial facilities are outdated with limited remaining value. The new processing facilities have not yet been installed.</p>
Total investment volume, investment period	<p>The total investment volume for the Miombo forest management project with integration of value chains is approx.2.0 million USD, of which:</p> <ul style="list-style-type: none"> 0.5 million USD will be used for improved forest management: <ul style="list-style-type: none"> a) Forest inventory, best practices and forest information system (0.15m USD) b) Machinery and training (0.3 million USD) c) Initiating FSC certification (0.05 million USD) 1.0 to 1.5 million USD for timber processing (carpentry). The business plan for timber processing is still a work in progress. <p>The investment period is 1 to 2 years.</p>
Expected co-investment (volume, equity, loan)	Tbd
Repayment period	<p>Miombo forest management</p> <p>Calculations conducted by consultants based on rough estimations resulted in a positive cash flow after 6 years.</p> <p>Carpentry</p> <p>Not yet available.</p>
Expected IRR	<p>Miombo forest management</p> <p>Calculations conducted by the consultants based on rough estimates resulted in an IRR of 14 %;taking into account:</p> <ul style="list-style-type: none"> the initial investment of 0.5 m USD; an annual cost of 30 USD / ha for the application of silvicultural practices; a reduction of 20 % of the operational harvesting costs (from 31,10 USD / m³ to 24,90 USD / m³); an increase of 15 % of production; a period of 10 years (depreciation period of forest machines). <p>Carpentry</p> <p>Not yet available.</p>
Excel-spreadsheets available	Partly.
Analyzed parameters	<p>Miombo forest management</p> <p>IRR, DCF and break even.</p> <p>Carpentry</p> <p>Not yet available.</p>
Methodological approach	Miombo forest management

	<p>Simple IRR and DCF calculation using investment volume, current production prices, cost efficiency potential (20 %) and increase in production; considering a discount rate of 6 %.</p> <p>Carpentry Not yet available.</p>
Assessment of main input data	<p>Miombo forest management</p> <p>Underlying production costs are real costs of Company A originating from audits. They are plausible compared to other natural forest management companies.</p> <p>A 20 % cost efficiency potential through the application of appropriate technologies is a conservative estimate. If best silvicultural practices are to be applied, a 15 % increase in forest productivity is also a conservative estimate.</p> <p>Carpentry</p> <p>The processing costs include equipment amortization, variable costs and personnel costs calculated at 165 USD / m³ of product. This is plausible but rather optimistic.</p> <p>The assumed product prices are as follows:</p> <ul style="list-style-type: none"> • Product family 1: Flooring and paneling: 800 – 1,150 USD/m³ • Product family 2: Wood-working components: 650 to 850 USD/m³ • Product family 3: Housing and structures: 3,600 USD/m³ • Product family 4: Agro-industrial products (pallets and containers): 550 USD/m³ • Product family 5: Biomass & green business: 6 USD/m³ <p>For product family 1, 2 and 5 the prices are realistic to conservative. For product family 4 the price assumption seems to be too optimistic. Regarding product family 3, the author team has no experience and cross-checking was not possible.</p> <p>As already mentioned, the recovery rates log – products seems to be optimistic, particularly regarding product family 1 and 2.</p>
Management capacity, skills, operation performance	
Technical capacity	<p>Regarding the traditional business (Miombo forest exploitation, production of sleepers) Company A has decades of experience and all required technical capacities.</p> <p>For improved forest management, technical capacity has to be increased.</p> <p>For timber processing Company A has engaged an experienced international project developer. It could be the case that he may require more support from an experienced industry manager in the field of tropical hardwood processing.</p>
Company experience	More than 50 years in the forestry and timber business.
Number of permanent staff	Around 130 permanent employees and around 170 seasonal employees (approx. 9 months per year)
Financial and cost accounting,	Monitoring of production and cost accounting works. Unit costs have

Monitoring system	been available. Derivation and amount of unit costs are plausible. Cost efficiency potential is evident.
Reputation	Company A has a good reputation in Mozambique. However, the reputation of the company was not assessed systematically.
Capacity upper management	<p>CEO is highly committed and possesses an excellent business instinct and management capacities. He is highly suited to bringing Company A onto an expansion track.</p> <p>The unit responsible for Miombo management and sleeper production is experienced and committed. He fulfills a very important role at the different interfaces with service providers, in-house staff, clients and local authorities. Due to his non-forestry professional background, he cannot always identify and implement the entire range of best practices in forestry.</p> <p>The unit responsible for processing / carpentry is new in Company A. He managed a timber processing company in Maputo and sold this to Company A. He has an international profile and is an experienced project developer. His ideas and plans regarding Miombo timber processing are convincing. The undertaken economic assumptions regarding recovery rates and processing costs seems to be too optimistic.</p> <p>An experienced forest economist is lacking in order to analyze systematically and implement consequently improvements in: i) cost efficiency; ii) increased productivity; iii) quality improvement; iv) reducing negative environmental and social impacts.</p>
Middle management capacity	Was not assessed
Documentation and transparency	<p>Miombo forest management Transparent and reliable documentation of workflows, production costs and product revenues.</p> <p>Carpentry Operations have not started yet.</p>
Operational staff skills	<p>Miombo forest management Improvement potential in terms of quality, job safety and cost efficiency are evident.</p> <p>Carpentry Operations have not started yet.</p>
Operation performance	<p>Miombo forest management See section "Technical feasibility".</p> <p>Carpentry Operations have not started yet.</p>
Climate Resilience	
Resilient Production	<p>Sustainable Miombo forest management will enhance the climate resilience of the ecosystem and guarantee long-term production of high value timber and ecosystem services.</p> <p>In a business as usual scenario the forest area will be reduced by farmers, and forests will be converted into charcoal, degraded for-</p>

	ests, savannah, and finally, agriculture production land. Biodiversity will be maintained, which has a higher resilience to climate change than low biodiversity or degraded forests.
Resilient markets	The project aims to diversify the value chain by introducing nontraditional wood species to the market. This will not only diversify products and marketing opportunities but also maintain biodiversity of the forests by adding value to tree species and reduce pressure on the existing marketable tree species.
Resilient people	The main benefit to people will be the maintenance of ecosystem services to the communities (water, less soil erosion, non-timber products, biodiversity). Additionally, the project will assist neighboring communities in their agriculture production system to reduce the pressure on forests, increase yield and improve food security. Small social projects (water, schools, and health centers) might be supported if requested as additional benefits to local people.
Supporting resilient institutions	There is no close link to local institutions planned.
Environmental Impacts	
Water	<p>Miombo forest management Natural forest management protects watersheds and improves water quality in a way no other economically- driven land use can. Reduced burning and forest encroachment will enhance soil organic matter and reduce soil erosion.</p> <p>Carpentry / processing Wastewater management should be analyzed.</p>
Biodiversity	Natural forest management conserves biodiversity in a way no other economically- driven land use can. By reduced forest burning, natural regeneration for non-fire-tolerant species will be enhanced.
Land, land access, land use	There is no lack of land in the region. Communities are semi mobile and will be supported in their agriculture activities.
Use of pesticides, chemicals, fertilizer	<p>Miombo forest management Does not apply, as there is no use of agrochemicals.</p> <p>Carpentry / processing Waste management should be analyzed.</p>
Soil and soil erosion	Little erosion risk as a result of flat landscapes and use of selective logging. By increased dry organic matter, soil erosion can be reduced.
Invasive species	Limited risk due to selective logging (remaining forest cover after logging operations). No specific monitoring of invasive species is planned.
Protected forests	The Miombo management should plan to set aside 10 - 15 % of the potential production area to have no human interference. This also facilitates FSC certification.
Flora and fauna	Natural forest management fosters biodiversity protection more than other economically-driven land uses.

Endangered species	Natural forest management fosters biodiversity protection more than other economically-driven land uses.
Monitoring system	There is no specific monitoring system in place to observe biodiversity, invasive species, water, biodiversity or flora and fauna. During regular inventories, however, species composition and changes in species composition will be observed with a focus on forest species.
Social Impacts	
Economic benefits	<p>Generation of qualified long-term employment for the local population. In natural forest management we calculate 4-6 qualified jobs per 1,000 m³ of harvested round wood. For the Company A concessions this adds up to: 25 to 40 permanent jobs.</p> <p>With regard to the economic benefits for the local population permanent and non-permanent employment opportunities are an important asset. Apart from this, communities are to be supported in their agriculture activities to enhance productivity, yield and food security. Technical assistance and marketing facilities would be provided. Experiences in other areas show that doubling production of the main crops is feasible without major inputs apart from technical assistance and proper crop management. This would result in food security and additional cash income of about 1,000 USD per ha, or a total of 1,500 to 2,000 USD per family. We estimate that there would be at least 10,000 families benefiting from this assistance totaling an estimated 15,000,000 USD additional income for the families.</p> <p>Professional management of the concession areas and of the carpentry will require educated and trained staff. This will benefit not only the directly employed staff in the forest concession / industrial plant but also other community members due to positive spill-over effects (mobilization of regional economy).</p>
Social projects	Some small social projects might be supported (school, water, health center) and will be defined in the course of project implementation.
Community health and safety	There is no negative impact expected on community health and safety. Reduced burning might have a positive impact on health.
Grievance mechanism	There is no grievance mechanism planned so far.
Cultural soundness	Not assessed
Risks and measures to mitigate risks	
Red flags	No red flags have been identified.
Social risks	<p>The population in the surroundings of the forest concession area is generally comprised of smallholder farmers that mostly depend on subsistence agriculture and hunting. Shifting cultivation is still the most common practice. This endangers sustainability of the forest concession area.</p>  <p><i>Photo: Shifting cultivation in the surroundings of Derunde concession area.</i></p>

	To mitigate the social risk of deforestation, a livelihood program to improve agricultural production of smallholders is essential. For this social engagement, alliances with local NGOs and international donors can be established.
Production / environmental risks	Fire is the main environmental risk (see also chapter 3.1 on Miombo forest management). As fire is a general practice by the local people to clear land for agricultural and to hunt, it can only be controlled with the support of local communities. Fire control and social engagement goes hand in hand. Environmental risks will be reduced through the project and ecosystem services of the forest areas maintained.
Financial risks	The overall financial risk is relatively low. Company A has worked successfully over recent decades in Mozambique's forest and timber sector. The risk is rather a performance risk (less return than expected) than the risk of complete loss of investment.
Political / institutional risks	No incentives when applying modern and sustainable forest management. Corruption is prevalent and must also be considered a risk.
Reputation risks	Harvesting operations in natural forests can provoke campaigns of environmental-driven NGOs. The best defensive strategy against this is: i) FSC certification (supported by WWF and Greenpeace); ii) keeping communication channels open: invite relevant NGOs to come and see sustainability of forest operations.
Multiplication/ Scaling up	
Potential for up scaling	The potential for scaling up is huge. In Mozambique millions of hectares of Miombo woodlands still exist that could be sustainably managed.
Interest in scaling up	Ambivalent. Both, government and (segments of) the private sector express interest in establishing sustainable production schemes in the Miombo woodlands. Nevertheless, corruption among forest authority officers is as frequent as private sector companies looking for quick money. Both form a symbiosis hindering sustainable forest management.
Innovation and research: improvement potential	
General company attitude	The improvement potential is high and Company A is open for innovation. Due to the company's size, Company A does not have its own research & development unit.
Products and markets	See also section "product innovation." Currently Company A delivers to niche markets (sleepers). However, by expanding in carpentry they are entering a new phase. Company A has the innovative and ambitious plan to add value to secondary Miombo timber species. If this works, Company A would become a pioneer in this key aspect of sustainable Miombo management.
Operations	See section "Management capacity, skills, operation performance" There are no innovations planned in terms of forest operations.

Management	See section “Management capacity, skills, operation performance” There are no innovations planned in management.
Monitoring	The monitoring will consist of regular forest inventories to observe forest species, age classes and natural regeneration.
Customer relationship	It is foreseen that by searching for new markets for nontraditional forest species, some new customer relationships can arise.
Final assessment	
Financial viability	The total invest volume is 1.5 to 2.0 million USD. A first rough assessment on project economies has been promising. A detailed business plan with excel spread sheets is still a work in progress.
Management capacity, skills and operational performance	Company A has worked for decades in the forestry and timber sector with good performance. Management capacity is very good. Operations work well but can be improved by applying adequate technology and best practices.
Main improvement potential	<ul style="list-style-type: none"> • Updated information-based silviculture planning • Harvesting technology and best practices • FSC-certification • Product definition and marketing of secondary species
Red flags	No red flags have been identified.
Main risks	<ul style="list-style-type: none"> • Social risk (medium): Lost of forest area through shifting cultivation, illegal logging • Production risk (medium): Fire • Market risk (low): Decrease of prices, complete loss of markets • Political risk (medium): Forest authorities do not increase annual allowable cut when applying silvicultural best practices to enhance forest productivity.
Readiness for due diligence	Additional documentation required; in particular, a complete business plan with underlying transparent economic calculations.
Final recommendation	<p>A very interesting project. Highly recommended to select for due diligence. For small investment volume only in combination with other Company A projects.</p> <p>The combination of sustainable Miombo forest management and value adding through processing and intelligent marketing is the proper approach to conserve natural forests (conservation by sustainable utilization). The project is exemplary and has huge potential to be scaled up.</p>

4.1.4 Conversion of pure eucalyptus stands into mixed plantations

Figure 10: Project brief
Conversion of pure eucalyptus stands into mixed plantations

Project Description	
Main actors	Company A
Region	Manica province
Company description	See chapter 4.1.2
Main products and markets	Poles for telephone and power lines from Eucalyptus In the future, other high value timber species and a wider range of Eucalyptus products will be included in the portfolio (processing of Eucalyptus timber at carpentry installed in Dondo).
Investment (total)	Up to 3 million USD in the next 10 years. (1,000 USD per ha re-planted).
Products and markets	
Products	<p>Impregnated poles</p> <p>Current production: approx. 1,700 m³ poles and approx. 1,200 m³ of logs and woods for domestic market.</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Long poles: > 6 m • Short poles: 1 – 6 m
	 <p><i>Photo: Poles produced in Dondo.</i></p>
Markets	<p>Railway sleepers</p> <p>The poles are sold on the domestic market.</p> <p>Prices:</p> <ul style="list-style-type: none"> • Long poles: 430 USD / m³ • Short poles: 300 USD / m³
Product innovation	<p>Forest plantation</p> <p>Company A's eucalyptus plantations have low performance given the natural growth potential as a result of not applying modern silviculture in terms of regeneration with highest seedling quality, balancing age structure, spacing, and tending and thinning regimes according to production objectives (here poles).</p>

	 <p><i>Photo: Eucalyptus stand producing very below site given growth potential.</i></p> <p>In implementing an up-to-date plantation forestry production scheme, Company A would require less than 50 % of the area for the same volume of current pole production. The production cycle for poles is estimated to be 10 to 12 years.</p> <p>Therefore the project foresees replanting the entire 2,800 ha with high quality plantations, of which:</p> <ul style="list-style-type: none"> • 50 % of the area will be re-planted with Eucalyptus using the best seedling qualities, • 50 % of the area will be planted with other high value timber species. Here Teak (<i>Tectona grandis</i>) and Khaya (<i>Khaya ssp.</i>; African mahogany) will probably be used after having analyzed their suitability. <p>Under given site conditions (soil and climate), the production cycle for Teak is expected to be around 30 to 35 years and for Khaya around 20 to 25 years.</p> <p>The diversification of pure eucalyptus plantations is highly innovative for Mozambique and for the entire African plantation forestry sector.</p> <p>The timber produced in the new plantations also contributes to assuring raw material provision of the carpentry facilities in Dondo.</p>
Marketing strategy	<p>The pole market is well-known by Company A. No extra marketing strategy is required.</p> <p>For the extension of the product portfolios, a sound marketing strategy is still required. FSC certification would help to market the products in Europe and North America. However, this aspect will not have to be considered within the next ten years, since the new plantations still have to be established.</p>
Technical Feasibility	
Technical implementation description	<p>To renew the eucalyptus plantations in order to implement a more cost efficient and more sustainable forest management approach, the following measures should be applied:</p> <ul style="list-style-type: none"> • Forest inventory: Division of present plantations into +/- homogeneous strata and determine standing volume per strata. Mapping of stands. • Forest planning: Subdivision of whole area. Re-planting within the next 10 years. To be planted per year: <ul style="list-style-type: none"> - 140 ha of eucalyptus - 140 ha of high value timber species • Analyzing species suitability for high value timber production. Teak and Khaya seem to be a promising option. Both

	<p>are drought resilient.</p> <ul style="list-style-type: none"> • Applying state-of-the-art silvicultural management - Using best seedling material. In the case of eucalyptus improved seeds or clones coming from South Africa. - Defining correct spacing according to production objectives (for poles in South Africa 3x2 and 4x1.5 are frequently applied). - Defining tending and thinning regime. • Implementation of a forest information system (FIS): For the mid- and long-term strategic planning and for the development of an annual operational plan a dynamic database on stocks per management unit, combined with geographical information should be established. • Machinery and training: Adequate machinery (e.g. skidder with cable winches and joker system in combination with forwarder) will reduce operational costs significantly. • Initiating the FSC certification process: For internal optimization in terms of social and environmental impact, for external communication, and for product marketing the FSC certification is a useful instrument.
New technology (if any)	Conversion of monoculture plantation forestry into diversified multi-species plantation forestry.
Uncertainties in the production system	Lack of regional experience regarding other plantation forestry species aside from eucalyptus.
Possible risks	<p>The risks are (see also section “Risks and measures to mitigate risks”):</p> <ul style="list-style-type: none"> • Production risk: Performance of non-eucalyptus species behind expectations • Market risks: Decrease in prices • Social risks: Shifting cultivation, log thefts (much lower than in natural forests)
Financial Feasibility	
Financial capacity of the firm (turnover, capital, assets,)	<p>Turnover: 3 million USD per year</p> <p>Assets:</p> <ul style="list-style-type: none"> • 19,000 ha Miombo concession (Derunde I and II) • 2,800 ha eucalyptus plantations • 300,000 ha hunting concession • Rio Savane site near Beira • Forest harvesting equipment and saw mill at concession site (both outdated) • Industrial plant for sleeper and pole impregnation in Dondo (outdated) <p>The assets are mainly the natural resources. The old industrial facilities are outdated with limited remaining value. The new processing facilities are not installed yet.</p>
Total investment volume, investment period	The total investment volume of the forest plantation project is approx. 3.0 million USD (1,000 USD per ha replanted).

	The investment period is 10 years.
Expected co-investment (volume, equity, loan)	tbd
Repayment period	Not yet analyzed
Expected IRR	Considering the site conditions, the short rotation for eucalyptus poles combined with Company A's market experience and the price level for Teak and Khaya the IRR should be between 10 % and 15 %.
Excel-spreadsheets available	Partly (on current production costs and prices for poles).
Analyzed parameters	Not available.
Methodological approach	Not available.
Assessment of main input data	Company A has an up-to-date registration of eucalyptus pole production costs and product prices. Both are plausible compared to other plantation forestry companies with some potential for more cost efficiency.
Management capacity, skills, operation performance	
Technical capacity	Company A has decades of experience in eucalyptus plantations for pole production and all required technical capacities. However, improvement potential is evident. For improved forest management, technical capacity development is required.
Experience of the company	More than 50 years in the forestry and timber business.
Number of permanent staff	Around 130 permanent employees and around 170 seasonal employees (approx. 9 months per year).
Financial and cost accounting, Monitoring system	Monitoring of production and cost accounting works. Unit costs have been available. Derivation and amount of unit costs as plausible. Cost efficiency potential is evident.
Reputation	Company A has a good reputation in Mozambique. However, the reputation of the company was not assessed systematically.
Upper management capacity	<p>CEO is highly committed and possesses an excellent business instinct and management capacities. He is highly suited for bringing Company A on an expansion track.</p> <p>The unit responsible for eucalyptus plantation management and pole production is experienced and committed. He fulfills a very important role at various interfaces to service providers, in-house staff, clients and local authorities. Due to his non-forestry professional background, he cannot always identify and implement the whole range of best practices in forestry.</p> <p>An experienced forest economist is lacking in order to analyze systematically and implement improvements in: i) cost efficiency; ii) productivity; iii) quality; iv) reducing negative environmental and social impacts.</p>
Middle management capacity	Was not assessed.

Documentation and transparency	Transparent and reliable documentation of workflows, production costs and product revenues.
Operational staff skills	Was not assessed.
Operation performance	See section "Technical feasibility".
Climate Resilience	
Resilient production	By diversifying the products, increased production is anticipated. Improved productivity will enhance resilient production. Increase biodiversity by introducing more species will enhance climate resilience compared to low production monoculture.
Resilient markets	Diversification of products and FSC-certified products will increase marketing options.
Resilient people	Apart from labor opportunities some social projects will help resilient people to adapt better to climate changes. Neighboring communities will be assisted in agriculture activities to enhance productivity, yield and food security.
Supporting resilient institutions	No specific impact to be expected.
Environmental Impacts	
Water	No negative impact on the water regime is anticipated. Diversified species composition can improve the water regime.
Biodiversity	Due to the conversion from pure eucalyptus plantations to multi-species plantations, biodiversity will be enhanced.
Land, land access, land use	There is no lack of land in the region of the project. No land conflicts are expected as a result of the project.
Use of pesticides, chemicals, fertilizer	The use of agrochemicals in the forest plantations will be of minor relevance compared to agricultural production. However, only FSC compatible agrochemicals should be applied.
Soil and soil erosion	Little erosion risk, because of +/- flat landscape.
Invasive species	Limited risk on clear cut areas. Should be monitored.
Protected forests	No protected forests inside the production area. When going for FSC certification some percent of the production area should be assigned for protection / ecological restoration.
Flora and fauna	Due to the conversion from pure eucalyptus plantations to multi-species plantations, positive impacts on flora and fauna could be expected.
Endangered species	Due to the conversion from pure eucalyptus plantations to multi-species plantations, positive impacts or at least no negative impact on endangered species could be expected.
Monitoring system	There is no specific monitoring system in place to observe biodiversity, invasive species, water, biodiversity or flora and fauna.
Social Impacts	

Economic benefits	<p>Generation of qualified long-term employment for the local population. Professional management of the forest plantations will require educated and trained staff. This will benefit not only the directly-employed staff in the forest concession / industrial plant but also other community members due to positive spill-over effects (mobilization of regional economy).</p> <p>Neighboring communities will be assisted in agriculture activities to enhance productivity, yield and food security. The economic benefits are expected to be in the range of the benefits highlighted in the previous project (4.1.3).</p>
Social projects	Some small social projects might be supported (school, water, health center) but will be defined in the course of project implementation.
Community health and safety	There is no negative impact expected on community health and safety.
Grievance mechanism	There is no grievance mechanism planned so far.
Cultural aspects	Not assessed.
Risks and measures to mitigate them	
Red flags	No red flags have been identified.
Social risks	<p>The population in the surroundings of the forest concession area is generally comprised of smallholder farmers that mostly depend on subsistence agriculture and hunting. Fire and illegal logging are the main social risks. Some farmers may have settled in the forest concession benefiting from the availability of wood. This might imply some negotiation process to intensify forest production and limit smallholder agriculture activities in the concession area.</p> <p>To mitigate the social risks, a livelihood program to improve agricultural production of the smallholders is essential. For this social engagement, alliances with local NGOs and international donors can be established.</p>
Production / environmental risks	Fire; see above "Social risks".
Financial risks	The overall financial risk is relatively low. Company A has operated successfully for decades in Mozambique's forest and timber sector. The risk is rather a performance risk (less return than expected) than the risk of complete loss of investment.
Political / institutional risks	No risk identified.
Reputation risks	<p>An engagement in eucalyptus plantations can provoke campaigns of environmentally-focused NGOs.</p> <p>The best defensive strategy against this is: i) FSC certification (supported by WWF and Greenpeace); ii) active communication of the innovative project approach (making pure eucalyptus plantations more diverse); iii) invite relevant NGOs to come and witness the sustainability of forest operations.</p>
Multiplication/ Scaling up	
Potential for scaling up	The potential for scaling up is immense. Mozambique hosts many

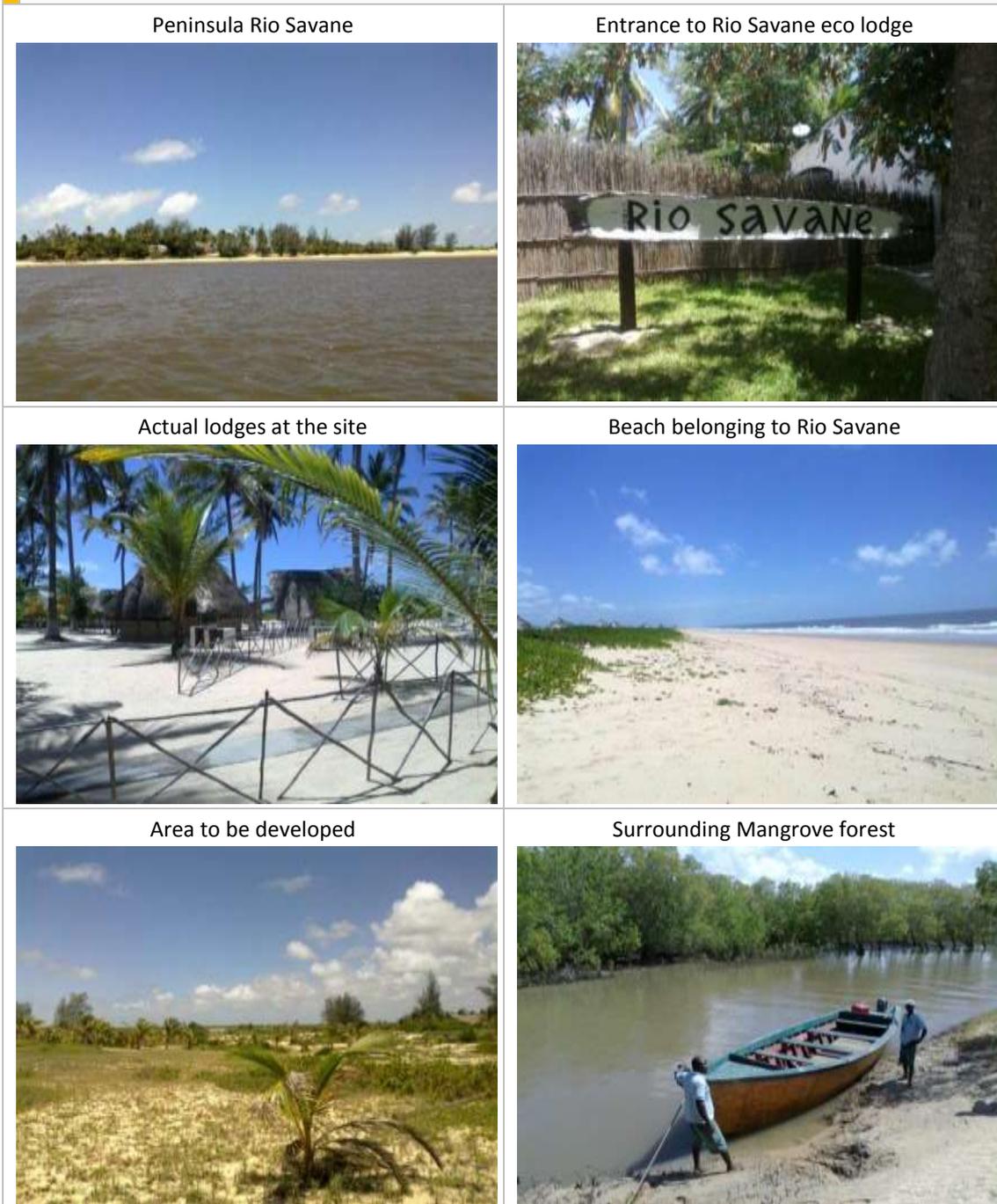
	pure eucalyptus plantations. If Company A demonstrates functional plantation diversification, other companies will follow this strategy.
Interest in scaling Up	Ambivalent. On the one hand, diversification of pure eucalyptus plantations mitigates production risk and can stabilize revenues. In addition, eucalyptus is grown in short production cycles and local / regional track record. The most effective way to convince forest companies to diversify their production is by demonstrating that this works.
Innovation and research, improvement potential	
General attitude of company	The improvement potential is high and Company A is open for innovation. Due to the company's size, Company A does not have its own research & development unit.
Products and markets	See also section "Product innovation". At the present Company A only use poles from their 2,800 ha of forest plantations. The product portfolio will be expanded when the plantation species diversity is increased.
Operations	See section "Management capacity, skills, operation performance".
Management	See section "Management capacity, skills, operation performance".
Monitoring	Company A uses an appropriate cost monitoring system. We recommend the implementation of a FIS (forest information system) to monitor production, changes in stock and social and environmental impact.
Customer relationship	Not assessed
Final assessment	
Financial viability	The total investment volume is approx. 3.0 million USD. A first rough assessment on project profits has been promising. A detailed business plan with excel spread sheets is required.
Management capacity, skills and operation performance	Company A has been working in the forestry and timber sector with good performance for decades. Management capacity is very good. Operations work well but can be improved by applying adequate technology and best practices.
Main improvement potentials	<ul style="list-style-type: none"> • Updated information-based silvicultural planning • State-of-the-art silvicultural management of plantations (seedling quality, spacing, tending and thinning regime) • Harvesting technology • FSC-certification
Red flags	No red flags have been identified.
Main risks	<ul style="list-style-type: none"> • Social risk (low to medium): Loss of forest area by fire, illegal logging • Production risk (low to medium): Fire • Market risk (low): Secured market for Eucalyptus poles; selection of other species will include market aspects. • Political risk (medium): No special political risks have been

	identified.
Readiness for due diligence	Additional documentation required; fairly early stage of project development.
Final recommendation	Highly recommended since this project will make the forest production system more diverse and climate resilient, combined with promising returns on investment. The approach of diversified forest plantations is exemplary and has the potential to be scaled up.

4.1.5 Eco lodge and mangrove protection

Company A is planning to set up an eco-lodge in Rio Savane – Dondo District – Sofala Province - Mozambique, some 46 km North of Beira.

Figure 11: Rio Savane near Beira



This place is the only high quality beach in Beira region and is highly frequented in the vacation period, but is also the most important beach for Beira. The site, which is owned by Company A

is surrounded by mangrove forests. These mangrove forests are of high importance for the coast protection against tsunamis, high tide, sea level rise, floods and for biodiversity conservation. It is an important shelter for fish breeding, shrimps, lobster, crabs, algae, oysters and sponges. The provision of these environmental services is of utmost importance in helping to adapt to climate changes, increased temperatures and sea level rise. In the INGC (National Institute for Disaster Management) report 2012, Beira was identified as the area most vulnerable to climate change.¹⁹ (See also chapter 1.2).

The mangrove forests are threatened by the local population, who burn charcoal to sell at the Beira market. The charcoal producers are individuals with very basic equipment. The product is transported by bicycle 40 to 50 km to the market. The margin for local charcoal operators is very low and the job is very labour-intensive. This business is a prototypic example of poverty-driven ecosystem destruction. An eco-lodge would guarantee a permanent presence of qualified staff, add value to the region, diversify the local economy, give job opportunities and therefore would be able to maintain the mangrove forests. In a business as usual scenario, the mangroves will disappear.

Figure 12: Charcoal burning in the mangrove forest near Beira



The project consists of designing a new concept for an eco-lodge, minimizing the impact of the construction in the landscape, with special care on construction materials. The use of local material from Miombo forests for construction has been planned. Green energy and rainwater collection for the eco-lodge and also for the surrounding villages is planned.

Best practices in ecotourism and promoting natural tourism with a special focus on bird watching are some of the intended objectives. This area is included in the Southern Africa Ornithologists books for having several protected species that use Savane river area as their habitat.

The lodge will offer tourism facilities as well as permanent apartments to expatriates and regional businessmen. There is a lack of good housing opportunities in the region. With increasing investments, high pricing of hotels and facilities in the region, the demand is high. The lodge will also have a permanent restaurant for weekend travelers.

¹⁹ INGC 2012: Responding to climate change in Mozambique. Phase II, Theme 2: Coastal planning and adaptation to mitigate climate change impacts

The Rio Savane has already been purchased by Company A. However, the investment project is still in an early stage. A feasibility study has been conducted with a focus on the technical and economic feasibility of the lodge construction. There was little emphasis on the ecological aspects of the lodge and the protection of the mangrove forests. This needs to be emphasized in an overall concept. The overall cost is estimated to be around 6.2 million USD: It is suggested to invest in 3 phases. The first phase would imply costs of about 3.5 million USD.

The project is highly relevant for climate resilience and could serve as a model for other enterprises since the potential of tourism is extremely high in Mozambique.

There is a low investment risk since there are only few tourist facilities in the region, prices are very high and the demand is growing. There is a potential conflict with the communities, who are currently using the mangrove forest resources to burn charcoal and sell it in Beira. For successful project implementation, the involvement of local communities must be addressed. Other aspects highlighted by the study are the following:

- The economic growth indicates that there will be demand for investments in secondary housing for leisure or as an investment opportunity
- Beira is the second largest airport in Mozambique with increasing movement
- WTTO is expecting growing tourism in Mozambique into the next decade
- Future investments (petroleum), tourism and conferences make it very likely that the demand for additional beds will increase in the Beira region.
- Foreign visitors increased in number by 65% in the last 2 years and is expected to further increase for leisure and business
- There are very few hotels in Beira, however prices are high, and occupation rate is at 52%, and there are new facilities in the planning process
- The number of personnel in the mining sector in Beira will increase from 700 to 27,500 by 2017/18
- For an eco-lodge, the installation of a windmill for energy and an appropriate sewage system, level of energy efficiency and water recycling has been recommended
- Camping facilities should be included
- Use of Company A wood for the eco lodge
- Construction in 3 phases, and 4 types of housing: Rooms, houses in the lodge, houses outside the lodge, camping
- Selling the first houses to investors in the first phase
- Total investment : 6.2 million USD (3.5 first phase)
- TIR 16,3%, Rate of return: 50.5%;
- The project is viable according to the developer.

The full study can be obtained from Company A.

4.1.6 Forest concession in existing hunting concession Nyala Safari

Company A is running the Nyala Safari hunting concession in Cheringoma and Marromeu districts, Sofala Province (just South of Zambezi River). It is a 300,000 ha hunting concession (Cou-

tada 12) with an annual turnover of about 250,000 USD per year. The core zone is fairly undisturbed and the hunting guests have an exclusive environment for hunting and contact with nature. The income for this concession however is not very high and its large size makes it difficult to control. Semi-nomads are threatening the reserve by entering the area for hunting, burning to clear for agriculture activities, charcoal burning and thus threatening the unique environment.

Figure 13: Company A's hunting concession Nyala Safari



The area is considered to be an important watershed area for the Zambezi River and provides high quality water to a number of streams and water sources. The ecosystem services of water, wildlife, flora and biodiversity are important in terms of climate resilience. Only by maintaining the function of these ecosystem services can the climate resilience be maintained and sustained.

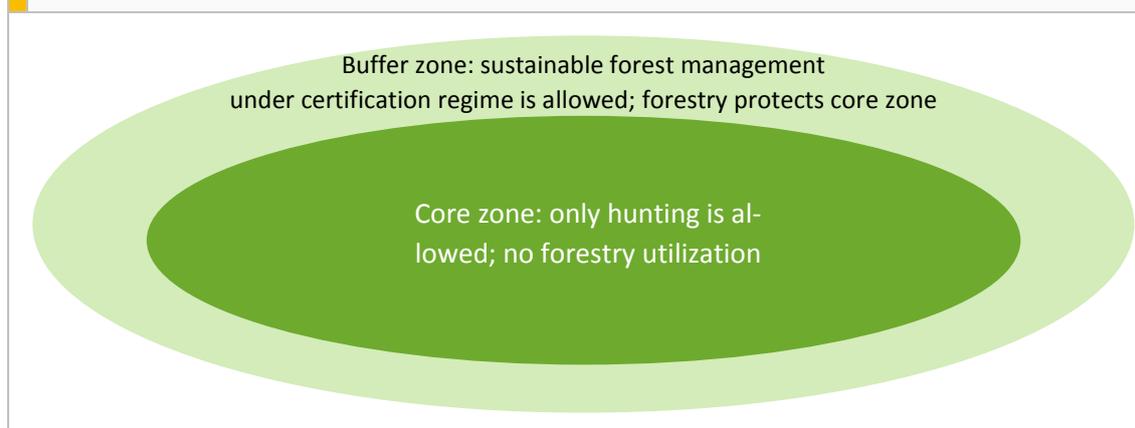
The project foresees adding a forestry concession in the hunting concession in order to:

- Have a better presence in the concession
- Better control the forest and wildlife resources
- Reduce forest fires and forest destruction by farmers, nomads and charcoal burners

- Add value to the concession area
- Maintain biodiversity and wildlife habitat
- Reduce illegal hunting and impact on the wildlife

The idea is to identify a core zone exclusively used for hunting purposes and to add a sustainable forest management concession in the buffer zone. Forest and biodiversity management will follow the sustainable practices of Miombo Forests, under FSC principles. The management of the forest would follow the description made under chapter 3.1 and 4.1.3.

Figure 14: Core and buffer zone concept



We believe that it is important that the forestry and wildlife management be the responsibility of the same entrepreneur in order to avoid potential conflicts of interest between wildlife and forests.

There is a conflict however in the current policy as highlighted in chapter 3.3.1. Currently no forest activities are allowed in a hunting concession although these activities are permitted under the current law.

Since this aspect could not be resolved, the project has stalled.

The project could offer job opportunities for the local people in forest management which demands a greater number of staff as compared to the hunting concession.

The project seeks to engage in social projects, e.g. the company has already built two schools, provided them with learning material and provided a small mill. This falls within a social responsibility program that is developed annually. Additional resources would allow substantial increases in support to schools, clinics and other social activities.

The project also intends to form and train communities in sustainable agriculture methods to reduce slash and burn and hunting. The risks of potential conflicts with the communities are significant, however, despite these measures.

The next step would be to seek out pilot areas in which the Government of Mozambique would allow the combination of hunting and forest concession. In parallel, an inventory needs to be conducted in order to assess the potential value of sustainable Miombo forest management.

We will not provide any further details since the policy issue needs to be clarified first before next steps can be taken and be planned.

4.2 Cotton production and diversification with smallholder farmers

4.2.1 The company

Company E is a cotton processor in the country. It is a holding company with activities in the car business, metallurgic and real estate, with an annual turnover of 40 million USD and 800 fixed and 300 seasonal employees. Company B is the company within the group that focuses on cotton.

In 2012, company B invested about 1.5 Million USD in a new cotton processing plant in Cuamba, Niassa with the capacity of 30,000 tons per year. For the year 2012 the harvesting volume is expected to be around 27,000 tons. This underlines the long-term interest company E has in the support for cotton production. In 2012 company B worked with 43,000 farmers and injected some 9 million USD in the region when purchasing seed-cotton. It is a family business with the CEO being able to make quick decisions and with high interest in starting the proposed project.

4.2.2 Cotton best practices and project A

Company B is expanding its effort to reach cotton outgrowers in Niassa Province under project A funded by Solidaridad's Farmer Support Programme (FSP). At the same time Company B is seeking viable pathways for diversifying crops in an effort to minimize climate and financial risks in their own production system as well as in the smallholders farming system.

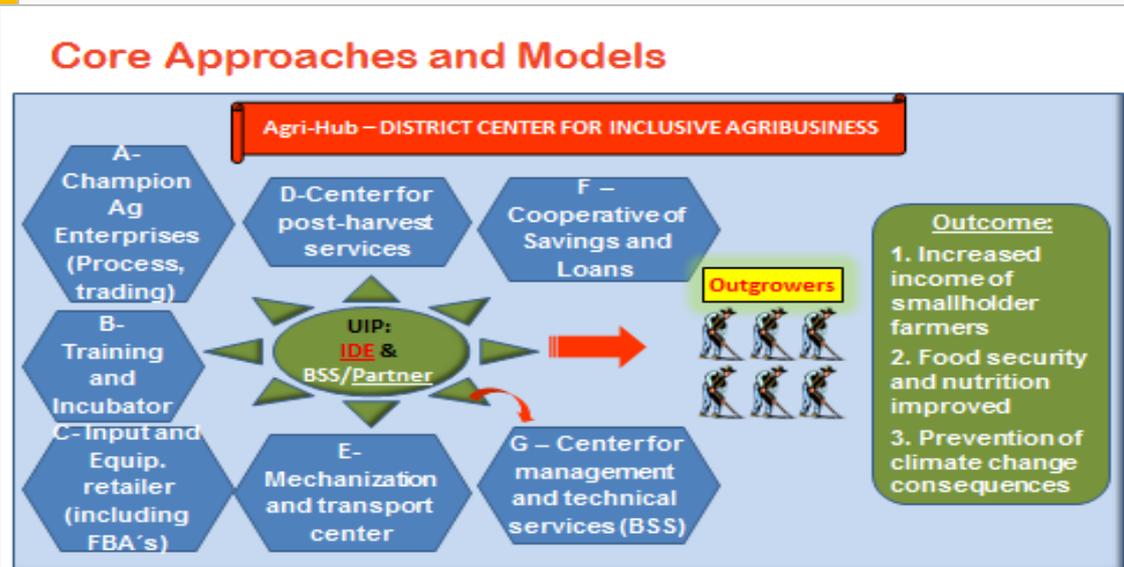
FSP is a public-private partnership designed to add value to the cotton and other select supply chains by supporting small-scale farmers and farm workers in their adoption of sustainable practices, management systems, and improved work and living conditions in line with the initiative A. Under this project, company B is implementing a unique extension program. The model is focused on one respected and trusted farmer elected by the small rural communities designated as their representative, called an "*Activista*." Company B supports the "*Activista*" in installing a demonstration plot (farmer school plot) where other farmers in the community can see improved techniques and inputs in use. This structure allows Company B's extension team to broaden the reach of their capacity building program. To support and leverage these *Activistas* and Company B's extension team, a network of "AGRI-HUBS" will be installed, where inputs and services and goods will be available, as well as a nucleus of production and technology transfer will increase business volumes, bring new actors to agriculture and will enhance skills development. Micro credit schemes are supposed to be supported within the AGRI HUBS to gradually finance micro irrigation schemes and agriculture inputs. Currently credits for farmers are provided 100% by Company B without interest and deducted from the farmers after the sales of cotton.

4.2.3 The climate resilient project investment

The proposed investment project will have four main expected outputs within 4 years:

1. Train up to 30,000 cotton outgrowers in Company B's initiative A in off-season horticulture production and wet season crop diversification, through irrigation systems and a private sector extension agent model (FBA – Farm business advisor).
2. Up to 400 demo plots for crop diversification (off season) and cotton best practices will be installed by Company B. (Off season irrigated horticulture and trials for irrigated cotton seed cultivation by outgrowers). The option of introducing woodlots through planting of fast growing trees will be assessed in the first phase of the project.
3. 100 Activistas will be trained as private extension agents (FBAs) in non-cotton production and 100 new FBAs will be trained, for a total of 200 FBAs who will, in turn, reach approximately 60 outgrowers each. FBA's model seeks to run parallel to company B's cotton-focused extension workers and *Activistas* to cultivate a system of self-sustainability in the long term. The FBA model will support off-season production of non-cotton crops.
4. 2 AGRI HUBS will be installed in Cuamba district and 1 Central Support Center to the AGRI HUBS sites will be installed in Cuamba City. This is a cluster concept bringing together a large number of players for a fully integrated value chain. The long-term vision of this model is to develop and strengthen rural enterprises and establish a functional and efficient agriculture value chain in the Niassa Province. Specifically, each Agri-Hub site will have three main components, the (A) "Production and Technology Transference Nucleus" (500 ha with all infrastructures for in growers including irrigation facilities, wet and dry season crops, extension) and the (B) "Trading and Services Nucleus" (Agro dealers, Mechanization, Transport Outlet for commercialization, post-harvest and processing, technology center, business services and the (C) "Central Support Center" in current center of operations in Cuamba city (silos, dryers, cool rooms, packing facilities, warehouse for wholesaler, for food and other consumables and warehouse for building and road materials, master franchisor office, micro credit schemes) The following figure outlines the concept of the Agri Hubs:

Figure 15: Agri – Hub concept

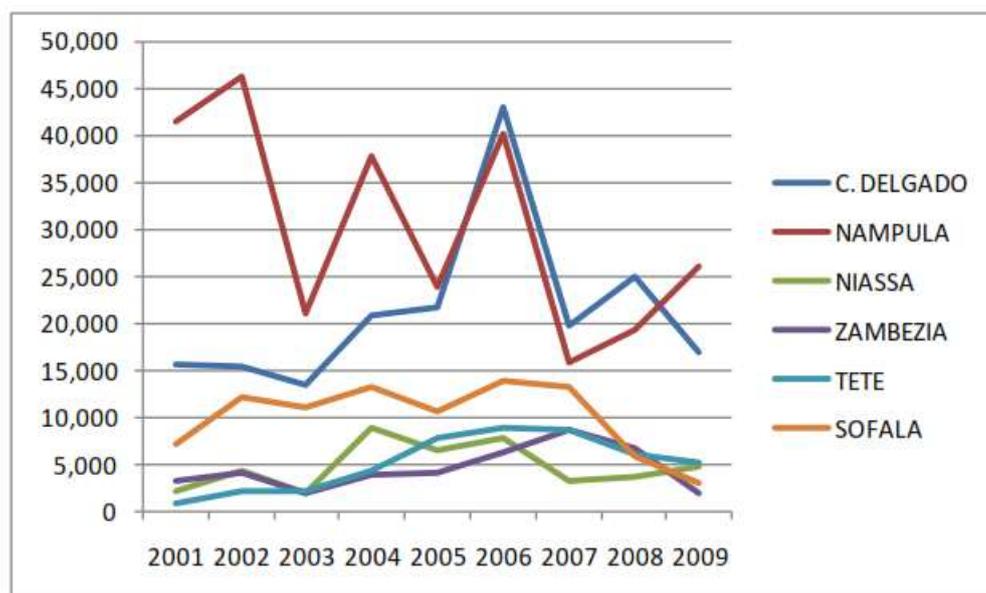


Source: Company F

4.2.4 Climate resilience and cotton

A study conducted by World Bank 2010²⁰ stresses the importance of cotton for Mozambique as it benefits around 300,000 families and highlights the “challenge to the strengthening of smallholder agriculture, agribusinesses, and small and medium-sized enterprises (SMEs) that will have to occur for growth to be shared”. The following figure indicates the fluctuation in cotton production in Mozambique per region.

²⁰ World Bank 2010: Mozambique: Cotton Supply Chain Rapid Risk Assessment

Figure 16: Cotton production in Mozambique (2000 - 01; 2008-09)

Source: IAM

Source: IAM in World Bank cotton report 2010

By introducing the 4 key outputs the investment will achieve:

- Crop diversification and hence fewer risks to extreme climates and climate change for the company and the farmer.
- Increased yield for cotton from a very low yield (500 kg/ha) to at least 900 kg/ha.
- Value added in the farming system and in the company and thus higher incomes.
- Increased food security by having off season crops and better access to water.
- Better access to farm inputs, marketing channels and technical advice through better extension and AGRI – HUBs.

4.2.5 Risks

The main risks are:

- Application of pesticides, and potentially fertilizer, is a risk to the environment, specifically to water, as well as to human health. These risks will be minimized through introduction of best practices and technical supervision.
- Irrigation systems are expensive and the return might not recover the costs. Through trials, selection of appropriate farmers, close monitoring and seeking external advice, this risk will be minimized.
- There is a danger that the production of off-season horticulture crops might not have a sufficiently large market in the region. The AGRIC HUBS will have storing, cooling and packaging facilities that absorb the crops and find the appropriate marketing mechanism.

- The use of water for irrigation might lower the water table and cause water problems. Through close monitoring and well-planned and well-distributed system of irrigation, this risk will be minimized.

Figure 17: Integrated Pest Management



4.2.6 Investment

Companies B and E are the main benefactors of the economic activities the group already developed (Cotton mill; Tractors; others). This group will also benefit from the new activities currently being implemented, namely raw materials trading and edible oil extraction and refinery.

The total investment volume is estimated to be 13,730,000 USD in 7 years.

A detailed business plan yet has to be worked out.

4.2.7 Project brief

Figure 18: Project brief

Project Description	
Main Actors	<p>Company E, which has formed company B (a subsidiary) that is exclusively working in the cotton area.</p> <p>Company F is a recognized multinational NGO. They are very keen to integrate into the company B project. They have vast experience in micro-irrigation, off season crops, market linkages, micro-finance and project monitoring.</p> <p>Company F will support micro irrigation, AGRI HUB establishment and organizing the FBAs (Farm Business Advisors) based on a franchise system.</p>
Main products	<p>Company E is engaged in the import and selling of cars and tractors. In the past company E had produced tobacco, citrus, cotton, cashew nuts, cattle, sisal and other products. In 2004, the company decided on a downsizing process, where most of the businesses were sold and the remaining business focus was on cotton (within company B), metallurgic industry, car imports and distribution and real estate.</p>

	<p>Company E is re-launching its cattle farming and some 2000 ha of commercial farming with soy bean as the main product. Real estate is another activity where company E is active.</p>
Region	<p>Company B operates in Niassa province. The ginnery is based in Cuamba.</p> <p>The Concession area covers 9 districts: Mandimba, Cuamba, Mecanelhas, Metarica, Maúa, Nipepe, Marrupa, Mejune, Mecula with a total area of: 77,592km²; Total population: 334,831 pax.</p> <p>Niassa is one of the least populated provinces and one of the poorest. Poverty is rife and employment low. Most people live on subsistence farming and employment is negligible. The only other cash crop is tobacco and to a limited extent, sesame.</p>
Company description	<p>Company B has many years of experience in doing extension and profound knowledge of the rural areas. Aside from this, as a family company, it has high integrity and a long-term vision, and is aimed at sustained success. Company B is 100% owned by company E - a family group with 115 years of uninterrupted operation in Mozambique. The group operates in other areas like metallurgic industry, automotive and real estate.</p> <p>Company B is a cotton company in Mozambique, with 1 ginnery in Cuamba, employing around 60 permanent staff. Company E has a long history of working with smallholder cotton growers. It has a cotton concession of 9 districts in Niassa province. In this area Company E provides training and inputs to all smallholders interested in joining the crop. All seed-cotton grown in the concession is purchased by Company B, respecting the minimum seed-cotton prices defined by the Government. The lint is exported to the external market via international traders.</p>
Products and markets	<p>Company B has invested in 2012 about 1.5 Million USD in a new cotton processing plant in Cuamba, Niassa with the capacity of 30,000 tons per year. The 2012 season achieved a record harvest of about 28,000 tons and 40,000 farmers involved.</p> <p>The capacity of the old ginnery was about 8,000 tons per year.</p> <p>For 2013 the harvesting volume is expected to decrease due to lower prices, fewer farmers (32,000) and floods which have destroyed some of the cotton.</p> <p>The main market for cotton is Asia.</p>
Investment (total)	13,730,000 USD
Products and markets	
Products	<p>The main product of company B is cotton. The company wants to diversify their production and start producing pigeon pea, cow pea, vegetables, soy bean, maize (to be determined after field assessment) in an in-grower (up to 500 ha AGRI HUBS) and outgrower scheme.</p>
Markets	<p>For cotton the main market will remain Asia.</p> <p>Horticulture is mainly a local and regional market with marketing options in Cuamba, Nampula, Pemba. They plan to establish packing and cooling facilities in the HUBs and in the long run food processing facilities as well as drying facilities of some of the horticulture crops.</p>

	<p>They plan to establish oil milling capacities to process cotton seeds and other seeds (soy bean). The oil will have a local and national market.</p>
Product innovation	<p>The project invests in three innovations:</p> <ul style="list-style-type: none"> • Agriculture HUBs and Service HUBs to provide inputs and services to farmers • Extension system through FBAs (farm business advisors) on a franchise basis • Small scale irrigation systems for ingrowers and outgrowers
Marketing strategy	<p>The small-scale cotton sector is managed under a concession system, regulated by robust legislation and overseen by IAM, under the Ministry of Agriculture.</p> <p>In colonial times, assistance to small-scale cotton farmers (training and inputs) was done by IAM. At the end of the season, IAM would launch a public tender and the ginners would present their best bid for purchasing the cotton produced by small farmers. The best price would win, and the ginner would purchase the cotton directly from the growers at the proposed price. From that purchase price, IAM would retain a levy in order to finance extension work for the following season.</p> <p>With independence and civil war, IAM lost the capacity to continue with its public extension service, and thus it proposed that the ginners assume this role. The ginners accepted under the condition of establishing concessions, where only one ginner would operate. This was accepted under the condition that annual seed-cotton minimum purchasing price would be controlled by the government. And so the system currently in place was born. Every year (in April) minimum purchasing price is discussed, negotiated and then fixed by the government, based on an agreed-upon formula. The formula is based on the principle 50% of the potential ginners' revenue (coming from the sale of lint and seed) must go to the farmer (converted into purchasing price). The ginners have to pay a 2.5% levy on lint exports to IAM to fund IAM operation. The ginners perform 100% of the public service of assisting the rural communities in their concession areas.</p> <p>Mozambique has elected cotton as one of the strategic cultures, and the Government is making efforts to develop the cotton value-chain in the country.</p> <p>World Bank 2010 conducted a study concluding:</p> <p>"Whereas there has not been a downward revision of the indicative price since 2007, agreeing on an indicative price with farmers significantly in advance of their procuring seed cotton from farmers, clearly places the greatest risk of price volatility onto the cotton ginners and traders, as prices are indicated up to eight months before the cotton is ginned and delivered to clients". And: "Unexpected losses can occur when the world price, which is part of the minimum price formula, falls below the corresponding agreed-upon minimum seed cotton price." However, the indicative price is not mandatory and leaves some room for adjustment on the part of the ginners. A minimum price is fixed in April/ May right before purchasing the seed</p>

	<p>cotton from farmers.</p> <p>Another study was conducted by HORUS, in which the final recommendation was to maintain the current concession system.²¹</p>
Technical Feasibility	
Technical implementation description	<p>The extension system through FBAs is an approach which company F has implemented in other countries in the world and is expected to function in Mozambique as well.</p> <p>Irrigation is an approved technology. However little experience exists in Mozambique. The sustainability and feasibility of irrigation for cotton and other crops needs to be assessed. The main purpose of irrigation is the small-scale irrigation to produce off-season crops, mainly through horticulture (i.e. onions).</p> <p>AGRI HUBS consist of the facilitation of the necessary infrastructure to provide the intended services as described above (Technology Transference Nucleus), Trading and Services Nucleus” and the Central Support Center.</p>
New technology	<p>The major new technology to be introduced is small-scale irrigation. The irrigation area per “activista” is planned to be no larger than 0.6 ha. In the up to 500 ha plots next to the AGRI HUBS, up to 500 farmers will be able to produce their crops under improved conditions, but only a portion of these will be provided with irrigation.</p>  <p>Small traditional horticulture</p>
Production system uncertainties	<ul style="list-style-type: none"> • It may not be easy to identify the number of interested farmers for the up to 500 ha ingrower schemes. However this will be done gradually and depend on the interest of farmers. • The installation of the irrigation systems will require a feasibility study to assess water access and a detailed cost of installation.
Possible risks	<ul style="list-style-type: none"> • Irrigation systems use more water resources than available (water table). • FBA system does not work without long term payment from company B. • Franchise system does not work when services and inputs are not demanded from farmers. • Farmers are not interested in working in the ingrower schemes. • There is no market for the amount of off season corps produced (horticulture)
Financial Feasibility	

²¹ Horus 2005: Complementary study for perfecting the cotton development strategy for Mozambique

Financial capacity of the firm (turnover, capital, assets,)	The main asset is the ginnery with infrastructure. Turnover of 40 million USD
Total investment volume, investment period	Total investment will be 13,730,000 USD in 7 years.
Expected co-investment (volume, equity, loan)	Equity shareholder is an option with a clear exit strategy. Conditions need to be discussed bilaterally.
Positive DCF	Positive DCF is anticipated after 4 years
Repayment period	7 years
Expected IRR	13% after 7 years
Excel-Spreadsheets available (yes/no)	A first draft has been calculated which requires more detailed work. Some preliminary Excel sheets are available.
Analyzed parameters	See assumptions below
Methodological approach	<p>The following assumptions have been made:</p> <p>Investments:</p> <p>Total investment on Cuamba Support Center to the "Agri-Hubs" network: 1,500,000 USD; 3 years.</p> <p>Total cost of irrigation per hectare (land cleaning, leveling, drainage, infrastructure such as roads inside and outside, electricity, access to water, water storage etc., irrigation equipment. Cost per hectare = 5,000 USD.</p> <p>Total cost of production equipment, warehouse, etc. to the Technology Transfer Center within the AGRI HUBS: 500,000 USD each site of 500 ha.</p> <p>Total cost of infra-structure (road access in-out, fences, electricity, water, security, land preparation, etc.), buildings (general, outlets, offices, etc.) : 200 USD/sq.m of buildings ready to lease, total of 5,000sqm; and 500,000 USD for infra-structures). Total 1,500,000 USD 2 years each.</p> <p>Up to 250 FBAs will be trained. Cost per FBA per family will decrease from 70 USD to 20 USD per family.</p> <p>Up to 20,000 farmers will be targeted.</p> <p>Cost per Micro Irrigation: 3,000 USD per micro irrigation.</p> <p>Total investment: 13,730,000 USD.</p> <p>Credit volume is expected to be 53,000,000 USD for micro irrigation for the 7 years in total. Company B will play the role of giving credit at the beginning but slowly hand over to a micro credit scheme.</p> <p>Revenues</p> <p>Company B will invest and manage the AGRI HUB, and charge a management fee of 10% of the total sales (Company B will buy 100% of production)</p> <p>With the services provided by the AGRI HUB, company B will be able to add value to the production, and this will increase production year by year. Revenue will come from leases and royalties, from some management concessions of the trade and service activities installed</p>

	<p>in each AGRI HUB, profits from activities managed directly by company B, sponsorships and gross sale margin from aggregation from all the AGRI HUBS.</p> <p>Adoption rate is assumed to be 100% for cotton, 50% for wet season crops and 25% for dry season crops.</p> <p>Increases in efficiency, production, value added and diversification sales will add up to around 57 million USD in 7 years (up to 12.6 million annually from 689,000 USD annually)</p> <p>The global "net margin before taxes" will increase year by year, considering this project is a pilot, there is significant innovation that needs to be consolidated. If these processes are stabilized, huge economies of scale and increased negotiation power in markets will result.</p>
Assessment of main input data and assumptions	The investment in micro irrigation, off-season crops and FBA through a franchise system bears a risk, since it is a new technology and approach. The investment for irrigation might not be as profitable as foreseen. These aspects need further elaboration and studies.
Management capacity, skills, operation performance	
Financial and technical capacity	Company E has proven financial and technical capacity in the past as described in the company description.
Experience of the company	<p>Company E has been doing extension work in its cotton concession for decades. In 2010/2011 COMPANY E worked with 17,400 producers, who received training and inputs (some as a grant, some to be repaid by the producers with 0% interest). All seed-cotton purchasing is done by company E. Company has a highly professional technical team that can perform all of the functions needed.</p> <p>In 2011/2012, due to the high lint prices and as part of company E efforts to build up its smallholder base, the number of cotton smallholders increased to more than 40,000 (the highest increase at the national level). Despite the massive increase in numbers, the extension services have been delivered effectively.</p> <p>Company E successfully completed another project with UNICEF. It used its extension services to deliver comprehensive and integrated training to farmers on a multitude of issues that include those outside of the traditional production issues of farming practice. These included topics such as child labor, health and sanitation, and HIV/AIDS. The project (mobile communication unit) was successful mostly because company E has experience with the local people, farmers and the area.</p> <p>Initiative A has recently approved a project which includes improving extension services.</p>
Number of permanent staff	Company B has 800 permanent and 300 seasonal employees. In company B Cuamba there are 15 technical extension officers, 5 agriculture engineers and 6 administrative staff.
Financial and cost accounting, Monitoring system	Annual external audits are done by an external company.
Reputation (NGOs, newspapers, land grabber)	<p>Company E has a long history and a very good reputation in the country. Company E worked with UNICEF in several projects and is now working with initiative A.</p> <p>Company F, an international recognized NGO, works closely with</p>

	<p>company E and supports the company and farmers.</p> <p>There is a long relationship with the farmers. Company E has recently introduced the system of “activistas.” These are local farmers which are elected by the communities and play the role of community representative. Inputs are delivered to the “activista”’s house for all community members (usually around 60 – 150), training is provided on the “activista” site and the cotton field serves as a demonstration plot.</p>
Upper management capacity	Company B is a family business and has a small, efficient and effective upper management level, led by the CEO, with a professional governance model.
Middle management capacity	The financial unit in Cuamba consists of six qualified staff who manage the entire financial system.
Documentation and transparency	Company B is introducing a digital monitoring system with initiative A, where the main information of farm families will be monitored. Parameters like family members, area cultivated, yield, inputs, application of farm inputs, total harvest, etc., are monitored per family. Initiative A is based on monitoring and auditing.
Operational staff skills	<p>Currently Company B has five agriculture engineers to supervise the technicians. Fifteen technicians are currently employed on a permanent basis to provide technical assistance, inputs, facilitate communication and organize the purchasing of the cotton.</p> <p>The FBA will be added to this system. He/she will also provide extension services, sell products, and work in a franchise system.</p>
Operation performance	<p>Extension system is well organized, but will be improved through the current initiative A and FBAs with the “activistas”.</p> <p>The new ginnery is operating well so far in the first year of operation. Administration is lean and efficient.</p> <p>Technical staff is up to technical standards, permanently trained and are training farmers through the “activista”</p> <p>Production system of the farmers requires improvement. Productivity for cotton is very low (600 kg/ha).</p>
Climate Resilience	
Resilient Production	<p>In the 2012/2013 season farmers were facing flooding problems with around 500 mm of rainfall within one month, which had destroyed some cotton crops.</p> <p>There is no cultivation in the dry season (after cotton). Main subsistence crops are manioc, beans, sorghum and maize. Farmers usually have some chicken, but hardly any pigs, goats or cattle.</p> <p>The project will increase climate resilience in the production system through:</p> <ul style="list-style-type: none"> • Introduction of soil and water conservation measures • Control of pest and diseases • Provision of inputs to control pests and diseases and possibly fertilizer • Best practices in cotton production through the initiative A • Extension system • Crop diversification

	<ul style="list-style-type: none"> • Micro Irrigation • Off season production with horticulture • Better access to water and thus fewer diseases.
Resilient Markets	<p>The project will increase climate resilience through improved market facilities:</p> <ul style="list-style-type: none"> • by providing AGRI HUBS (where farmers can sell products and buy inputs); • by providing access to credits • through the extension system through FBAs • by introducing cooling, drying and packaging facilities in the AGRI HUBS • by introducing off season crops in the dry season • through diversification of service providers
Resilient people	<p>The local population's vulnerability to extreme climates will be reduced through:</p> <ul style="list-style-type: none"> • Crop diversification • Soil and water conservation techniques • Establishment of woodlots (to be assessed) • Micro irrigation systems to produce off season crops in the dry season • Access to a better extension service • Access to service Hubs
Supporting resilient institutions	<p>The local government institutions are participating and are very interested in supporting the AGRI HUBS. Currently there is no service available to buy agricultural products.</p> <p>Company B is continuing in the production of locally adapted cotton seeds; however, the role and importance of national research facilities is limited.</p> <p>IAM (Mozambique Cotton Institute) has a responsibility to: (i) supervise the entire cotton-sector, assuring that all parties (smallholders and ginners) are complying with their obligations; (ii) promote investigation and define national strategies in terms of agriculture practices, seeds, etc., (iii) provide training to the ginners extension teams in best practices; (iv) promote the development of the cotton sector in all its dimensions, involving the necessary stakeholders (legislation, value-chain, markets, financial services, insurance services, etc.).</p> <p>AAM (Cotton companies Association) represents the companies at the national level and before IAM and FONPA. It is an essential player, as it cooperates directly with IAM and the government in promoting the sector and defining policies.</p> <p>FONPA (Smallholders' National Forum) FONPA is still in a very immature stage, but they formally represent the smallholders at the national level. They are one of the key players in the sector, along with IAM and AAM. They have representation in all provinces (including where company E operates). One of their mandates is to assist smallholders with their organization. Company B hopes to continue cooperation with FONPA in its capacity-building process and to assist in linking them to the smallholders interested in becoming formally organized.</p>

Environmental Impacts	
Water	<p>Access to water is limited. Families usually source their water from rivers or streams. Many of them dry out during the dry season. This is the cause of health problems like diarrhea and even cholera.</p> <p>Only a minority of communities have wells or boreholes.</p>
Biodiversity	<p>Currently there is no specific information available on existing biodiversity. However, biodiversity monitoring is also part of initiative A.</p>
Land, land access, land use	<p>Niassa is a vast area of typical savanna. It is the least populated province, with no significant commercial farming. Most of the land is not being utilized, except around main villages and along the existing roads, where people tend to live and perform small-scale farming. The average temperature is around 22 ° C. Annual rainfall ranges from 800 to 1,200 mm, distributed along 5 months (from Nov-Dec to Mar-Apr). The soils are fertile and there are some important large rivers with constant water flow. Altitude is generally around 600 to 800 meters above sea level, with 2 important plateaus. The area is characterized by granite "Inselbergs"</p>
Use of pesticides, chemicals, fertilizer	<p>In the cotton production system pesticides are applied. Currently company B is introducing the initiative A criteria which include:</p> <ul style="list-style-type: none"> • Use of nationally-certified pesticides • Pesticides used are not listed in the Stockholm convention • Pesticides used are listed under one of the following 1) WHO class, 2) Rotterdam Convention, 3) Endosulfan (to be phased out gradually) • Pesticides are applied by trained personnel who are above 18 years old • Pesticide application equipment is stored in a safe area • Used pesticide containers are either recycled or disposed of safely <p>These first three criteria at the moment are fulfilled but there is a problem with child labor since children participate in farm activities and are considered to be adults from the age of 15.</p> <p>Pesticides are not yet stored in safe areas and containers are not recycled or disposed safely.</p> <p>Company E is working in a program to improve these aspects.</p> <p>Fertilizer is not yet applied, but there is the intention to use fertilizer in the future. Fertilizer will be made available to smallholders that comply with best practices, and according to soil necessities.</p> <p>Organic and foliar fertilizer will be considered and is currently used in pilot areas.</p>
Soil and soil erosion	<p>Soil and water conservation techniques are going to be introduced. These include: minimum tillage, no burning, cover crops and crop rotation.</p>
Invasive species	<p>The project or company does not introduce any invasive species. There is no monitoring system to observe invasive species.</p>
Protected forests	<p>There are no identified protected forests and no measures to protect specific forest areas. There is a negative influence of farmers on forests due to fuel wood collection and fires.</p> <p>Part of initiative A is to reduce fire.</p>

	The project intends to introduce woodlots with exotic species (Eucalyptus) to provide fuel wood to farmers and reduce the pressure on remaining forest resources. This still needs to be assessed properly in the first phase of the project.
Flora and fauna	No specific intervention planned. No assessment is done.
Endangered species	Not identified.
Monitoring system	No monitoring system on biodiversity in place or intended.
Social Impacts	
Economic benefits	<p>The project is expected to have a positive impact on local livelihoods. Increased productivity will increase farmer income. Crop diversification will reduce risks and open market opportunities. The AGRH HUBDS will provide access to markets and inputs. FBAs will assist technically and will provide inputs with the expectation that income will double per farmer.</p> <p>The monitoring system which is currently under implementation will facilitate the monitoring of the social and financial impact.</p>
Social projects	Access to water will be improved, which will have direct benefits on the health of children and adults.
Community health and safety	<p>Application of pesticides can have a negative impact on health. The use and improper storage along with inappropriate application of pesticides is a threat. Farmers normally do not use protective clothing when pesticides are applied.</p> <p>Initiative A is trying to reduce these risks and promote best practices as described earlier. This is a sensitive point and needs to be observed closely.</p> <p>Better access to water will improve the overall health situation.</p>
Grievance mechanism	There is no grievance mechanism in place and no intention to introduce one. The establishment of "activistas," however is giving farmers a voice.
Cultural aspects	<p>There are no activities planned in this area, but also no negative impacts expected.</p> <p>Company B is working on child labour issues; they are attempting to reduce child labour and insist that children attend school and reduce engagement in manual labour. However child work cannot be excluded totally.</p>
Risks and measures to mitigate them	
Red flags	Child labour is a potential risk in this context. Children usually participate in farm activities. They are not considered as children from the age of 15 years onward in these communities.
Social risks	<p>There are positive social impacts expected mainly in terms of higher income, food security, access to water and crop diversification.</p> <p>Access to land is not an issue. There is plenty of land available.</p>
Environmental risks	<ul style="list-style-type: none"> The use of pesticides is a risk as described earlier. Application of pesticides is common and necessary. Best practices are introduced to reduce the risk.

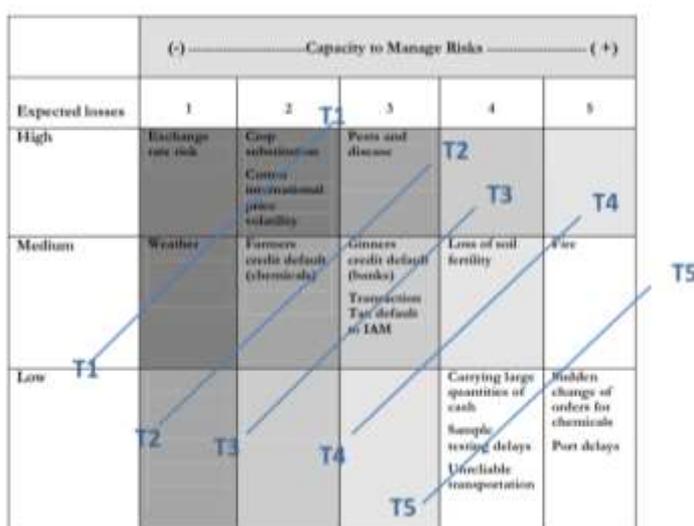
	<ul style="list-style-type: none"> • Pesticides and fertilizer might have a negative impact on water and ground water. • Improper storage of containers or use of containers for other purposes is another possible risk. • The introduction of irrigation systems tends to improve the water availability; however, it could also cause damage to the surface water due to possible pesticide influx and reduction of groundwater. Salinization might occur in the case of high evaporation and improper management of water in the irrigation scheme. 														
<p>Financial risks</p>	<ul style="list-style-type: none"> • The cotton price and cotton market is highly volatile. Since company B has long-term experience in dealing with this variability and the diversification of crops is reducing the risk, we do not see a major risk. • Irrigation systems are fairly expensive. If the farmers are not able to recover the costs of the investment they may risk falling into debt and dependency. • The production of off season crops (horticulture) is seen as a viable business opportunity. If there is, however, a large number of farmers engaged in crop production, there might be the risk that price will decrease and marketing might be in danger. The AGRI HUBS and FBAs are measures to reduce the risks. • Production and market risks are also mentioned in the World Bank report on cotton 2010, namely: Farmers credit defaults, Ginners' credit default, International price volatility, pests, crop substitution, loss of soil fertility and exchange rate risks. • UNIQUE thinks that most of these risks are addressed in the project proposal and will minimize these risks. The figure below indicates high cotton price volatility. • Company B is using a fixed price forward contract in order to minimize financial risks. <div data-bbox="719 1370 1332 1832" data-label="Figure"> <table border="1"> <caption>Approximate data points for Cotton, A Index (cents/kg)</caption> <thead> <tr> <th>Year</th> <th>Price (cents/kg)</th> </tr> </thead> <tbody> <tr> <td>Jan-05</td> <td>115</td> </tr> <tr> <td>Jan-06</td> <td>125</td> </tr> <tr> <td>Jan-07</td> <td>130</td> </tr> <tr> <td>Jan-08</td> <td>175</td> </tr> <tr> <td>Jan-09</td> <td>115</td> </tr> <tr> <td>Jan-10</td> <td>170</td> </tr> </tbody> </table> </div> <p><i>Source: World Bank. 2010, Commodities Markets Review, DECPG.</i></p>	Year	Price (cents/kg)	Jan-05	115	Jan-06	125	Jan-07	130	Jan-08	175	Jan-09	115	Jan-10	170
Year	Price (cents/kg)														
Jan-05	115														
Jan-06	125														
Jan-07	130														
Jan-08	175														
Jan-09	115														
Jan-10	170														
<p>Political / institutional risks</p>	<p>The current concessional system for cotton may be altered. The Council of Ministers approved the concession system as the one</p>														

which best suits the country, considering the present reality. However, within 7 years (of which 2 years have passed) the concession system should be reviewed and discussed.

There are suggestions to limit the concession time to less than 5 years. In this case company B and others might have less interest in investing in a long-term project. On the other hand, there is little probability that even when this policy is going to be altered, other concessionaires might be interested in Cuamba, since the area is very remote with difficult roads and conditions.

Reputation risks
 From the international and NGO perspective there might be criticism on the use of pesticide and the potential risks involved. A risk mitigation strategy, however, is in place as outlined under the risk section.

World Bank 2010 risk assessment
 The following figure shows the summary of the World Bank 2010 report on cotton:



The main risks are highlighted in the upper left corner: Exchange rate risks, weather, crop substitution, farmer’s credit defaults are all addressed by the project proposal apart from exchange rate risks.

Multiplication/ Scaling up

Potential for scaling up
 The FBA model is a model which has been accomplished in other countries and is now going to be introduced by company B or F. This model gives technical assistance to the farmers and the FBA at the same time as an input supplier working on a franchise system. Since the government extension system is weak and not very efficient, this model has the potential for scaling up with the private sector in favor of small-scale farmers. It might increase job opportunities and will offer better services in rural areas.

Irrigation systems are in place but are still not very common. The irrigation system for small-scale farmers, however, is a new model. If it were to be successful, this could be a new model to boost productivity.

Most rural areas do not have good services in terms of agriculture inputs and supplies, along with marketing chains. AGRI HUBs might be a model to provide these services in the remote areas together with the private sector.

In growing schemes for cash crops, this could be an appropriate

	model for scaling up.
Scaling up interest	<p>The Government has a high interest in the cotton sector since it employs and provides indirect benefits to about 250,000 families in Mozambique.</p> <p>Therefore the Government shows high interest in scaling up this model, once proven to be successful.</p>
Innovation and research: improvement potential	
General attitude of company	<p>Company E is very interested in trying out new technologies in favor of rural people.</p> <p>The investment in the new ginnery, investment in commercial farming (2,000 ha), in cattle farming, and in the proposed AGRI HUBs, FBAs and irrigation, shows a high commitment towards innovation and investments.</p>
Products and markets	Through the AGRI HUB, the diversification of the products, marketing facilities and market opportunities for Company E, and the smallholder farmers will be enhanced.
Operations	Irrigation for smallholders and for commercial farming is relatively new in Mozambique. Big commercial farming is currently in place only for sugarcane.
Management	No innovative management apart from the FBA model.
Monitoring	A monitoring system is in the process of being established as described in the management capacity section.
Customer relationship	No innovation or research.
Final assessment	
Financial viability	<p>The investment planned is convincing and appears to be realistic. Costs for irrigation are high compared to other countries but seem to reflect the reality in Mozambique. There is a risk when farmers have to bear the costs of the irrigation systems.</p> <p>The installation of the AGRI HUBs is within the expected investment for such a construction and facility.</p> <p>The recent investments of company E show that the company is investing prudently, economically and for the long-term.</p>
Management capacity, skills, and operation performance	<p>The management is in the hands of a family. Decisions can be taken quickly and in a goal-oriented way.</p> <p>Long-term compromises, the downsizing process in 2004, and the new investments show the capacity of company E in a changing environment. Partners of company E are known as serious and reliable.</p>
Major improvement potential	<p>On the management side, we do not have any recommendations.</p> <p>On the production side, there is great potential to increase productivity, reduce pests and diseases, work on appropriate application of pesticides, and crop diversification. Company E is working on these areas with partners. The project is expected to increase productivity.</p> <p>Soil and water conservation techniques, crop rotation, reduced tillage, adequate pesticide application and storage, including tree planting in the farming system, and improved cotton seeds are some of the improvement potentials where company E is currently working.</p>

Red flags	No red flags identified. Child labour may be a problem.
Readiness for due diligence	<ul style="list-style-type: none"> • A business plan needs to be elaborated in detail. The current calculation is a draft.
Final recommendations	<ul style="list-style-type: none"> • The project strongly contributes to increased climate resilience, food security and improved livelihoods • There are risks in investment in terms of small-scale irrigation, markets for off season crops, extension system on a franchise basis, credit schemes, and profitability of the investment. These aspects need to be further elaborated in order to minimize risks • The project is highly innovative with regard to small scale irrigation schemes for small scale farmers, service provision (Agri HUBs) and the extension system (FBA) • It is seen as a good investment opportunity although it includes some market risks and some technical risks • We highly recommend this investment for IFC/ PPCR

4.3 Niassa REDD+ Carbon project

Table 7: Project assessment - Niassa REDD+ project

Project Description	
Main Actors	<p>Companies K and L are planning to develop a Reduced emissions from deforestation and forest degradation (REDD+) project in the 4.2 million ha Niassa National Reserve (NNR) that comprise 36 % of Mozambique's formally protected areas.</p> <ul style="list-style-type: none"> • The Government of Mozambique (Ministry for Coordination of Environmental Action (MICOA) has signed a MoU with the Companies K and L endorsing the project. • The Ministry of Tourism (MITUR) is the management authority for the reserve. • Company D will be responsible for the technical development and implementation of the project. • Company C will be responsible for fund-raising, financial management, marketing and sales of carbon credits.
Main commodity	Verified Emissions Reductions (VERs), verified and registered under the Verified Carbon Standard (VCS).
Region	Niassa National Reserve (NNR), Niassa and Capo Delgado provinces, Northern Mozambique, adjacent to Tanzania
Company description	<p>Company C, founded in 2010 and based in London, is a private investment manager specialized in the financing of climate change mitigation projects based on the protection of forests. The company brings together expertise from the fields of biodiversity conservation and private capital finance in the structuring, marketing and managing of biocarbon investments.</p> <p>The three partners of Company C represent over 50 years of financial management experience, with global relationships & track records relating to property & other physical assets, environmental sustainability & risk management as well as experience in secondary markets, including derivatives and capital raising.</p> <p>Company D, founded in 1903, is an international conservation organization. The organization's work spans across the globe, with over 100 projects in nearly 40 countries, mostly in the developing world. Company D has worked in the Niassa Reserve for more than 10 years and maintains close links with communities, local authorities and the agricultural enterprises operating close to the Reserve. Company D has a dedicated team devoted to REDD project development. Since 2007, Company D has been involved in the development of national and sub-national REDD+ projects and programs in Aceh, Indonesia, Brazil, Nigeria, Liberia, Vietnam, and Philippines.</p>
Investment (total)	<p>Total working capital required: USD 18 million</p> <ul style="list-style-type: none"> • USD 2 million equity finance • USD 3 million social equity provided as a grant • USD 4 million equity finance • USD 9 million proposed IFC debt finance

	(USD 4.5 million from PPCR and 4.5 million from IFC) Company C and Company D are providing sweat equity worth USD 1 million.
Products and markets	
Products	Generation of 17.8 million carbon credits verified and registered under the Verified Carbon Standard (VCS) over the first 10 years. Annual average of 2.2 million tCO ₂ /year for year 3-10 and 151.9 million tCO ₂ over 40 years. Three tourist concessions within the most biodiverse portion of the Reserve will provide additional revenues for the Reserve and income generation activities for the population living inside the Reserve.
Markets	Voluntary and pre-compliance carbon markets.
Product innovation	The project would be the first one to generate carbon credits from improved fire management. With a 4.2 million ha project size, the project would be among the largest REDD+ projects worldwide.
Marketing strategy	<p>Company C has established a carbon marketing strategy and is targeting corporations as well as private and public financial institutions to receive equity investments, loan finance and forward contracts for emission reductions. Carbon forward contracts with payment on delivery, open delivery dates and a floor price of no less than USD 7 /tCO₂ are targeted (base case calculations assume a price of USD 6.7/tCO₂). Company C envisions securing commitments for at least 50% of the reserve's annual production of saleable credits for the first five years of production.</p> <p><u>Key target investors:</u></p> <p>Multi-national corporations operating in Mozambique in the natural resource management sector (mining, oil and gas, timber, plantations, agriculture) such as ENI and Swire Group and companies in manufacturing and retail sectors with strong public-facing brands that are committed to reducing carbon emissions and environmental impact investment.</p> <p>Pre-compliance: Kyoto obligated companies, especially those about to need a 'top-up' and/or where domestic markets are up and running, may not meet their obligations without an additional injection of voluntary credits; (e.g. BP; IATA; Virgin Australia; Ryanair; Barclays; Permian Global; Co-operative Group; EDF; Puma; Tesco; and Marks & Spencer's).</p> <p>Bilateral donor agencies: Funding for developing countries under bilateral offset credit mechanisms, e.g. Japan's recent commitment to development of REDD+ projects in Asia-Pacific, regional Emissions Trading Schemes: e.g. California Emissions Trading Scheme; bilateral donors (e.g. UK Department of Energy and Climate Change; USAID; Japan International Cooperation Agency; Norwegian Agency for Development Cooperation).</p> <p>Corporate Offset Scheme Managers seeking projects from which to source offsets on behalf of multi-national corporation clients for whom they provide third-party corporate offset scheme management services.</p> <p>Carbon brokers sourcing credits for onward sale to parties seeking offsets either for retirement or investment purposes.</p> <p>By March 2013, Company C has had no agreement for any equity, loan finance or forward contract. Swire group and FMO confirmed interest de-</p>

	pending on the ongoing IFC feasibility assessment.
Technical Feasibility	
Technical implementation description	<p>The project goals are to protect the existing forests, flora and fauna, which are the fourth largest continuous wilderness area in Africa. The Reserve primarily consists of Miombo woodlands interspersed with seasonally wet dambos and drier areas of bushland savannah in the lower-lying river valleys.</p> <p>The reserve is threatened by frequent and intense forest fires, mainly due to arson or linked to traditional hunting and agricultural expansion by the population living within the reserve. In addition to this forest degradation, agricultural expansion for subsistence farming by the rapidly growing population inside the park is the main driver of deforestation.</p> <p>The project will implement a forest fire management system and support community development in an economic zone in the southern part of the Niassa Reserve.</p> <p>The development phase, including the following implementation steps, is envisioned to be completed within three years:</p> <ul style="list-style-type: none"> • Reaching legal and financial agreement with the Government of Mozambique for this REDD+ pilot project and to clarify to the relationship with the national REDD+ process; • Development of a new fire management carbon accounting methodology for VCS will require minimum 1 year and minimum USD 0.3 million investment; • Carbon baseline survey to reduce the uncertainty related to the expected emission reductions and background research to improve related assumptions; • Development and effective implementation of a community-based fire management system at this scale is challenging since there is no proof of concept in Africa; • Effective agricultural improvement activities and reduction of deforestation by 50% based on consent and strong incentives for communities to resettle outside the Reserve; • Project description (PD) for VCS and PDD for Climate, Community and Biodiversity Standards (CCBS) validation and completion of third party validation and verification in order to return debt capital and sell carbon credits; • Development of improved climate-smart agriculture-related livelihoods in the economic buffer zone to attract people living in the reserve to voluntarily relocate to outside the reserve. The agricultural production could be cotton, cassava, tobacco and fruits. In addition there is a rapidly growing plantation forestry industry in the region that is providing employment opportunities. Company D already has already established partnerships with commodity producer and members of the Forestry Association of Niassa (FAN) operating in the region.²² • In addition four major conservation areas exist, with Company D and partners responsible for the largest and most northerly (presently under development). They currently have together 30 beds and tourists pay on average \$400 /night. The planned development of wildlife tourism will provide additional revenues for the Reserve and income gener-

²² SUPPLEMENTARY BRIEFING- Company D/Company C, 2013. ECONOMIC LEVERAGING OPPORTUNITIES FOR NIASSA CLIMATE RESILIENCE INITIATIVE, NORTHERN MOZAMBIQUE.

	ation activities for the population living inside the Reserve.
New technology (if any)	Development of a fire management carbon accounting methodology, which will be the first of its kind globally with significant scaling up potential in Mozambique and globally. In addition, the project will demonstrate proof of concept for a fire management system in large-scale wilderness areas to protect the existing biodiversity.
Uncertainties in the production system	<ul style="list-style-type: none"> • Carbon calculations as a base for business planning are highly uncertain because no baseline data exist and ecological response to fire prevention is unclear • Mozambique's draft REDD decree envisions limiting the REDD+ project size to 10,000 ha • Local population's interest --those living inside the Reserve-- to move outside the reserve or to maintain the Reserve and not expand the agricultural production area, despite high population growth • Uncertainties with respect to the acceptance and adoption of newly-promoted agricultural practices by the population living within the Reserve.
Possible risks	<ul style="list-style-type: none"> • Financial projections based on an optimistic carbon price of USD 6.7/tCO₂; Break-even price is USD 5.83/tCO₂ (after 8 years) • Limited carbon market liquidity in particular for forward sales • Expenditures for agricultural improvement and economic zone development are quite low to tackle the degradation drivers. However, if existing resources can be matched with investments by agricultural commodity companies and plantation forest enterprises working in the region, the drivers of deforestation can be effectively reduced • Lacking a legal framework to integrate sub-national REDD+ projects into national REDD+ framework • Insufficient incentives to stop frequent use of fires and for communities to voluntarily resettle to economic zone.
Financial Feasibility	
Financial capacity of the company (turnover, capital, assets,)	Not applicable since the project is a start-up
Total investment volume, investment period	Required investment capital: USD 18 million (USD 10 million in year 1 and USD 8 million in year 2. The project lifetime is intended to be 40 years. Break-even from carbon sales is achieved 8 years after project start. Term of investment will be eight years and full return of capital to investors is expected after 8 years.
Expected co-investment (volume, equity, loan)	See investment above
Positive DCF after xy years	Break-even from carbon sales is achieved 8 years after project start at a carbon price of USD 6.7 /tCO ₂ (at current costs and prices)
Repayment period	8 years
Expected IRR	Negative after 8 years (1.3 % after 10 years and 25.7 % after 15 years)

Excel-Spreadsheets available	<p>Pdf file with financial analysis for a period of 8 years extracted from an Excel sheet:</p> <ul style="list-style-type: none"> • Total gross annual income starting from year 3 onwards: USD 9.2 million (year 3-6) and increase to USD 23.5 million in year 8. • Annual expenditures: <ul style="list-style-type: none"> ○ Project development costs over 3 years: USD 3 million ○ Annual implementation costs: USD 2.5 million (year 1 and 2); USD 4.7 million (years 3-8) ○ Annual carbon transaction costs: USD 0.8 million (year 3-7) ○ Annual project management costs: USD 0.5 million (year 1-2) and increase to USD 1.35 million in years 3-7) ○ Annual special purpose vehicle (SPV) admin. costs: USD 0.94 million ○ Annual financing costs: USD 0.62 million.
Analyzed parameters	<ul style="list-style-type: none"> • Calculation of the break-even point at current costs and prices • Expected internal rate of return negative after 8 years (1.3 % after 10 years and 25.7 % after 15 years).
Methodological approach	<ul style="list-style-type: none"> • The financial analysis is based on current costs and prices. It includes financing costs for debt capital with an interest rate of 1 % for USD 4.5 million and 5 % for the remaining debt capital.
Assessment of main input data	<ul style="list-style-type: none"> • The assumed carbon price of USD 6.7/tCO₂ is relatively optimistic given the large quantities of credits the project will produce and the limited demand within the voluntary carbon market. Even though the average REDD+ carbon credit prices in 2011 was USD 8.5/tCO₂, prices varied significantly between USD 5 and 9/tCO₂ depending on the vintage, implementation status and the associated risk of non-delivery. According to our experience most large REDD+ carbon transactions ranged between USD 1-5/tCO₂. • Assessment of carbon price sensitivity shows that a minimum carbon price of 5.83 USD/tCO₂ is required to achieve break-even after 8 years. • Cost for project implementation at USD 4.7 million for Niassa Reserve includes the annual fire management costs of USD 1.2 million and agricultural investments outside of the Reserve of USD 1.2 million. Depending on the infrastructure development costs, the investment might not be sufficient unless additional private sector funding can be leveraged.

Management capacity, skills, operational performance

Financial and technical capacity	<p>Company D has been working in and together with the Reserve, the local authorities, communities and the private sector closely for more than 10 years. Company D also has engaged a competent fire management consultant for this project.</p>
Company's experience	<p>Company D works on conservation projects in about 140 project in over 40 countries globally and has a CCBA-validated REDD+ project in West Kalimantan (92,000 ha) which is undergoing VCS validation. Furthermore, Company D has been involved in the national and sub-national REDD+ processes in several African and Asian countries.</p> <p>Company D has been working in the Niassa Reserve since 2003, providing financial and technical support for conservation and sustainable management of the reserve. As part of this support, Company D has been investigating the</p>

	<p>potential for using REDD+ mechanisms to financially support reserve management and development.</p> <p>Company C was founded in 2010, comprised of three partners with extensive experience in financial management, with global relationships & track records relating to property & other physical assets, environmental, sustainability & risk management. The Niassa REDD+ is the first project of the company.</p>
Number of permanent staff	Unknown
Financial and cost accounting, Monitoring system	Not yet established
Reputation (NGOs, newspapers, land grabber)	Company D is one of the oldest international conservation NGOs, founded over a century ago. The organization is recognized as one of the most credible international NGOs globally.
Upper management capacity	<p>Company D works in over 40 countries and has access to a large pool of conservation and community development experts. Company D has a team devoted to REDD project development. For the Niassa project three senior management staff members will be responsible.</p> <p>Company C is comprised of 3 partners with extensive experience in financial and risk management expertise with strong global networks.</p> <p>[Confidential information has been removed.]</p>
Middle management capacity	<p>International consultants</p> <p>[Confidential information has been removed.]</p>
Operational staff skills	<p>The Niassa REDD+ project is not yet operational and significant capacity building efforts are required. The Reserve Management staff will be the primary implementing agency of the Project. They will appoint one officer as the Niassa Reserve Fire Management Coordinator to manage the Project in the field. Other staff will be trained as Facilitators to implement the Niassa Reserve Fire Management Strategy.</p> <p>A new agricultural extension team has to be established to manage the agricultural investments and to promote conservation agriculture and other climate resilient agricultural practices such as agroforestry, crop rotation, green manure etc.</p>
Operation performance	The Reserve Management operational capacity is very poor which may lead to serious deforestation and forest degradation. Major barriers are a lack of financial resources, sufficient staff and capacity to effectively manage the Reserve. Proposed project activities will need to build this capacity and develop a professional operational management.
ClimateResilience	
Resilient Production	<p>Climate models predict slightly more rainfall in the Niassa region, but also more evaporation due to higher temperatures, frequent droughts and flooding (see section 1.2).</p> <p>Frequent forest fires prevent the establishment of regeneration, resulting in the forest canopy gradually opening up. Combined with increasing deforestation and forest degradation pressure, the dense Miombo forests will either be directly converted into agricultural land or gradually transformed into open</p>

	forests and savannahs. Fire management will reduce the fire frequency and intensity and therefore will prevent this transformation. This will therefore increase the existing ecosystem resilience. Reducing deforestation combined with sustainable agricultural intensification will also increase economic resilience. With regard to the social resilience there is also the risk that people are disrupted from their existing livelihoods, but there are potential benefits related to the new livelihood and income generating opportunities from the project.
Resilient Markets	An economic zone will be developed in the proximity of the project, which will reduce the distance to the next market of between 6 and 16 hours, generate agricultural employment opportunities, and therefore is expected to enhance economic resilience. However, at this early development stage, the information provided is insufficient to assess the climate benefits and risks in more detail.
Resilient Population	<p>The local population is highly vulnerable to climatic changes: The majority of households grow three crops or less. Maize (90%), cassava (28%), sweet potatoes (18%), beans (21%). The existing rain-fed agricultural production is characterized by low input, low output subsistence farming. Communities are heavily reliant on forest products.</p> <p>The economic development zone outside the Reserve has more fertile land and the planned agricultural investments in infrastructure and extension will increase people's livelihoods and resilience and as a result will attract migration from inside the Reserve and many other locations. The planned agricultural improvement inside the Reserve is also expected to improve livelihoods and to increase economic resilience.</p>
Supporting resilient institutions	If the project will be approved by the government, it has great potential to support the national REDD+ framework development through this sub-national pilot scheme. Thus it will contribute to institutional learning and capacity development of MICOA. In addition, the capacity building of the current reserve management team will enable it to effectively manage the development path of the project. The involvement of the local population will require building of institutional structures of communities.

Environmental Impacts

Water	With frequent and intense fires, and the removal of plant and litter cover, the soil is exposed to wind and water erosion, indirectly modifying both the post-fire microclimate and soil biota activity. This process alters soil moisture balance by increasing evaporation and affecting water infiltration through changes in soil surface structure. Fire management will increase the soil function, productivity and long-term nutrient status of the Reserve ecosystems through increasing plant biomass and soil surface cover, fertility and moisture content. This will maintain and enhance the soil carbon carrying capacity by manipulating the energy, carbon and water fluxes between the soil, plants and atmosphere.
Biodiversity	The project area is located in the Zambezian Caesalpinoid woodlands, which is predominant in south-central Africa. These woodlands are relatively intact compared to other woodlands in Mozambique. A range of unexplored flora and fauna including an array of endemic species are expected in the reserve. Hippopotamus, lion, leopard, hyena and wild dogs, buffalos, crocodiles are all present within the reserve but with a relatively low density compared to other protected areas, mainly due to the historical armed conflicts and poaching in the reserve. Conservation activities in the reserve may further increase the density of large mammals. Of the 40 amphibian species of Northern Mozambique, 30 appear in the reserve along with over 53 reptile species. 55 fish species were collected in the reserve of which 9 were newly recorded in 2003. The reserve includes nine different "bird habitats" with over 280 recorded bird

	species including 4 globally threatened species. Without the project, population pressure is likely to increase the wildlife –human conflicts, and increase pressure on forest degradation and deforestation. Effective conservation of the Reserve will maintain and rehabilitate the wildlife populations and reduce the pressure of further deforestation and forest degradation.
Land, land access, land use	Under Mozambique’s 2004 Constitution, the land is owned by the state. Mozambicans are allowed to freely use the land; however, they are not able to obtain a land usage title for land that is part of a protected area such as the Niassa Reserve. The project envisions incentivizing voluntary resettlement of communities inside the project area to economic development zones and facilitating t obtaining legal long-term perpetual land use rights for communities, known as DUAT (Direito de Use e Aproveitamento dos Terras). Voluntary resettlement plans may cause conflicts between within-reserve communities and the already settled communities in the economic development zone.
Use of pesticides, chemicals, fertilizer	The conservation project is not planning to apply any pesticides, chemicals and fertilizer for forests management. Depending on the economic and agricultural improvement activities application may be an option outside the Niassa Reserve.
Soil and soil erosion	The prevention of forest degradation and deforestation due to improved fire management will reduce soil erosion and soil degradation. Improved agricultural practices will avoid deforestation and soil degradation.
Invasive species	Not anticipated
Protected forests	The project will be implemented in a National Nature Reserve, a legally protected area in Mozambique which forms the fourth largest contiguous wilderness area in Africa.
Flora and fauna	See section on biodiversity above.
Endangered species	See section on biodiversity above.
Monitoring system	The validation and verification of the project according to the CCBS will require the development and implementation of a thorough monitoring plan including the monitoring of climate, community, and biodiversity impacts of the project, subject to third party auditing.
Social Impacts	
Economic benefits	Subsistence farming is the primary land use and main economic activity. Commercial activities are limited to trading of crop surpluses, including sesame and tobacco. The principal crops presently grown are maize, rice, cassava and beans. In order for the project to maximize benefits to the region, an economic zone is planned to the south of the reserve. Part of the carbon revenues will be used to invest in economic activities such as agricultural extension, water sanitation, and the provision of medicine, micro-loans, or the construction of community buildings. All these activities will generate additional employment.
Social projects	Part of the carbon revenues will be invested in vocational training, micro-enterprise development and practical trades, e.g. mechanics, construction, agriculture, tourism. However, the original financial planning does not budget such activities.
Community health and safety	The planned social projects include community health projects, but only limited specific information is provided. The project is not expected to have any negative community health and safety impacts.

Grievance mechanism	The project is planning community consultation and free, prior and informed consent (FPIC) sought where community rights are affected. The project will provide information and plans to garner feedback from all parties throughout the life of the project in accordance with the 3 rd party standard Climate, Community and Biodiversity (CCB).
Cultural soundness	Not clear how voluntary resettled communities will have access to their cultural sites. The project may or may not have negative impacts on existing cultural activities.
Risks and measures to mitigate risks	
Red flags	<ul style="list-style-type: none"> • The carbon modeling and projections are considered one of the most critical aspects since carbon credits are the main revenue stream and projects are highly uncertain. The approach taken by Company D is subject to large uncertainties related to the general modeling approach, determination of the baseline scenario, and leakage effects due to agricultural expansion and voluntary relocation of the within-reserve population. About 30 % of the carbon benefits are generated assuming the expansion of agriculture can be reduced. However, additional economic activities may also increase agricultural expansion and related leakage. The baseline scenario most likely overestimates the carbon benefits after year 10, because the VCS requires that the baseline has to be re-established after 10 years which will likely reduce the baseline emission. The existing uncertainty can be only reduced if baseline data is collected that are required to make more reliable carbon projections. • The development of a new carbon accounting methodology normally takes more than one year and costs about USD 0.3 million. There is a risk that the approval of the carbon accounting methodology may lead to delays or non-acceptance by VCS. • Providing agriculture-related additional income outside the Reserve is among the main incentives to reduce the population and the related fire and deforestation risk inside the Reserve. The respective plans are not very detailed and limited related capacity and experience exists among the management team. • There is a fine line between voluntary resettlements planned by the project and involuntary resettlements considering that the project hinges on voluntary resettlements. Therefore, the project would trigger the IFC performance Standard 5 and 7 “Land Acquisition and involuntary resettlement” and “Indigenous People” and a more in-depth analysis would be required before the project can be approved. • The financial projections are based on a relatively high carbon price of USD 6.7/tCO₂) to achieve break even after 8 years. If the average carbon price is below USD 5.83/tCO₂ the project will not generate positive cumulative cash flows after 8 years. Given the carbon market and carbon price risks (see below), investments in the underlying assets such as the development of the three tourism concessions recently bought by Company D can reduce the reliance on carbon sales and reduce the overall business risk. These additional income generation opportunities need to be investigated further. • The financial projections tend to underestimate the costs for the economic development zone and the agricultural investments. The respective planning is not detailed enough to make a final assessment but information provided on potential partnership with existing agribusinesses in the region looks promising that additional investments can be leveraged.

	<ul style="list-style-type: none"> • There is a risk that the estimated carbon benefits will not materialize if project implementation is not as effective as predicted, thus thorough planning and project design are crucial.
Social risks	<ul style="list-style-type: none"> • Insufficient incentives to communities to stop the frequent use of fires for agricultural purposes. • The socio-economic baseline survey revealed that the population may increase from 40,000 to 250,000 by 2050. Given this strong population pressure, it will be challenging to reduce migration into the Reserve and increase voluntary resettlement without creating social conflicts. • Insufficient incentives to communities to voluntarily resettle to economic zones. • Potential conflicts between project implementation entity and communities within and outside of the project area. • Incentives to communities may not be sufficient to resettle and migration may not be stopped.
Environmental risks	<ul style="list-style-type: none"> • Fire prevention will increase fuel load and at least temporarily the risk of stand-replacing fires. • Increasing drought frequency will increase the non-permanence risk, i.e. that high intensity stand replacement fires may release the emission reductions that have already been claimed.
Financial risks	<ul style="list-style-type: none"> • Market risk: Voluntary carbon markets currently have a very limited liquidity, i.e. a demand for REDD+ carbon credits of 7.4 million tCO₂ in 2011 down from 19.5 million tCO₂ in 2010. The annual project sales of 1.5 million tCO₂ would comprise 20 % of the total market volume in 2011 thus flooding the market. Due to the low demand and the large project scale it will be difficult to ensure substantial forward contracts. • Carbon price risks: The assumed carbon pricing of USD 6.7/tCO₂ is very optimistic given the current market risks described below. • Economic development investment risks: The planned investments of USD 1.2 million in socio-economic development activities and the action plan for livelihood development and community consultation with USD 0.9 million over 2 years seem to be underestimated. A more detailed plan and budget should be outlined to minimize the risks of unexpected additional costs.
Political / institutional risks	<ul style="list-style-type: none"> • Mozambique's draft REDD decree²³ envisions limiting REDD+ project size to 10,000 ha, which would not allow the development and implementation of the Niassa REDD+ project, although there is pressure to change this draft legislation. Public consultations scheduled for March 2013 have been postponed but may change this threshold. (see chapter 3.3.2) • A MoU between the Ministry for Coordination of Environmental Action (MICOA) and Company C for the development of the REDD+ project has been signed. A binding financial agreement still needs to be agreed upon. Given the national policy on REDD+ projects, this remains uncertain. • There is a lack of governmental guidance on the integration of sub-national REDD+ project activities into the national REDD+ framework with respect

²³ The Decree will officially create the Technical Unit for REDD+ as well as the REDD+ Technical Group. Various discussions took place lately to clarify roles and responsibilities between the Minister y of Environment (MICOA) and the Ministry of Agriculture (MINAG), both of which have critical roles in implementing REDD+ in Mozambique

	<p>to reference emissions levels / reference Levels (REL/RL), Measurement, Reporting and Verification (MRV), and benefit sharing. Clarity on this depends on international REDD+ policy development and national REDD+ framework development over the next years.</p> <ul style="list-style-type: none"> Controlled hunting is an alternative income opportunity for the Niassa reserve. However, under the current policy, hunting is not permitted within reserves. (see chapter 3.3.1)
Reputational risks	<ul style="list-style-type: none"> Voluntary resettlement might cause conflicts and give way to heavy criticism on the part of NGOs and the international community.

Multiplication/ Scaling up

Potential for scaling up	<p>There is high demand for REDD+ -improved fire management carbon accounting methodology globally. With the development of a new methodology, there is great potential to scale up similar activities in Sub-Saharan Africa and Asia. Technically, carbon MRV could feed in the national process and provide crucial lessons for national REDD+.</p> <p>In Mozambique, fire is used for agricultural activities leading to forest degradation and deforestation. Effective implementation in Niassa could provide valuable lessons to the national REDD+ strategy and be replicated elsewhere.</p>
Interest in scaling up	<p>Mozambique is interested in attracting REDD+ finance to protect its forests. A successful REDD+ pilot project provides the Government, not only with a proof of concept, but also with a track record.</p>

Innovation and research: improvement potential

General company attitude	<ul style="list-style-type: none"> Start-up not applicable. Company D one of the project promoters is globally engaged in a number of innovative conservation finance initiatives.
Products and markets	<ul style="list-style-type: none"> Demonstrates new innovative conservation financing mechanisms for one of the largest contiguous wilderness areas in Africa. Informs the national REDD+ process with a concrete and tangible project example. Provides a fire carbon accounting methodology which would be the first of its kind globally with significant scaling up potential in Mozambique and globally. Strikes a balance between conservation and agriculture-based community development.
Operations	<ul style="list-style-type: none"> The proposed operations are highly innovative but there is no proof of concept.
Management	<ul style="list-style-type: none"> Demonstrates effective community-based fire management with a high potential for scaling up throughout Mozambique and other dry forest ecosystems.
Monitoring	<ul style="list-style-type: none"> One of the key benefits of REDD+ projects is the establishment of robust measurement, reporting and verification (MRV) systems that allow performance tracking against a defined baseline. Combined with frequent inventories, this allows the investor to follow progress.
Customer relationship	Not applicable

Final assessment

Financial viability	Highly uncertain
Management capacity, skills and operation performance	Proposed management team has no track record related to the proposed investment.
Main improvement potential	The carbon accounting methodology and the carbon baseline should be developed with research funding or development aid; the agricultural development activities in the economic zone should be planned in more detail together with existing agri-businesses, and agricultural extension NGOs in the area to leverage additional finance. The three tourism concessions that have been recently purchased by Company D should be integrated into the project to diversify the revenue streams. Strong support should be ensured from the government and the project should be classified as a national REDD+ pilot project to attract political support as well as prospective funding.
Red flags	<p>No proof of concept.</p> <p>No carbon accounting methodology available.</p> <p>Carbon accounting assumptions are highly uncertain.</p> <p>Success relies on the carbon market incentives to reduce the currently rapidly increasing population within the reserve.</p>
Readiness for due diligence	<ul style="list-style-type: none"> • More detailed planning is required before any due diligence can be conducted including a social safeguard assessment against the IFC standards.
Final recommendation	<ul style="list-style-type: none"> • The project strongly contributes to protecting and increasing the resilience of one of the largest wilderness areas in Africa. • The project is highly innovative, but risky, considering that it plans to establish one of the largest REDD+ projects in the world, without an approved methodology and strong country support in a country with very limited management capacity. • The project is at least partly a research and development project, without a strong business case and no proof of concept. Therefore, it requires a potential investor to leave their investment comfort zone to consider this investment opportunity. • Given the country context and that there are investment opportunities with strong climate resilience benefits, but less risks and a proof of concept we do not recommend investment in this project.

4.4 Other projects/ companies screened (as presented in the interim report)

In the following chapter we give a summary of the projects screened during the first step, which were presented in the interim report.

4.4.1 Project Ranking/ Scoring of companies screened

The following table gives an overview of the projects screened and a preliminary scoring according to criteria assessed.

Company	Climate Resilience	Economic Viability	Social Impacts	Risks	Potential to scale up and act as Best Practices	Region	Overall
Company G	5	4	3	3	3	Gorongosa	++
Company M	5	3	4	3	4	Zambezia	+++
Company N	4	2	3	2	4	Maputo	+
Company O	3	3	4	2	3	Niassa	+
Company A (3 projects)	4	4	3	4	4	various	++
Company P	2	4	3	4	3	Gorongosa	+
Company Q	5	2	5	3	5	Gorongosa	++
Company R	3	3	4	3	4	Zambezia	++
Company S	2	5	3	3	3	Niassa	+
Company T	3	4	2	3	4	Pemba	+
Company T	4	4	2	3	4	Pemba	++

Niassa REDD+ Carbon Project	3	2	2	1	1	Niassa	+
Company K	5	3	5	3	4	Cabo Delgado	+++
Company E	5	4	5	3	4	Niassa, Nampula	+++

Note: "5" indicates a high score, "1" is a low score. In the case of risks, 5 indicate a high score which means low risk and 1 vice versa.

4.4.2 Companies not cleared by IFC

As mentioned in the introduction, UNIQUE has contacted a total of 53 companies.

The following table gives an overview of the companies which were identified as potential investors, but could not be cleared by IFC due to internal reasons. Some of these companies might be viable in future, but are not eligible for the PPCR program for the time being.

[The aforementioned table contains confidential information and has been removed.]

4.4.3 Companies contacted but without further interest

UNIQUE contacted a number of companies, which did not respond or did not show further interest in presenting a project under the PPCR umbrella. These are shown in the following table:

[The aforementioned table contains confidential information and has been removed.]

4.4.4 Companies with some constraints

This block of projects was presented in the interim report. However the projects according to our assessment showed some constraints.

4.4.4.1 Company G

Company G was selected as a project to be studied in depth. However Company G decided not to invest in outgrowing schemes in the Gorongosa area after some consultations.

Company G was founded in 1999 to take advantage of the changing commercial and economic conditions in Mozambique.

The present shareholding of Company G is as follows: Stakeholder A 64 %; Stakeholder B 36 %.

One of the early negotiations completed by Company G was the acquisition of the Company V. This company, previously owned by the Mozambican government, consists of large tracts of

orchards. The old citrus orchards have been removed and 600 hectares of irrigable and arable lands are being developed. These lands are irrigated from the Umbeluzi River.

The first 45 hectares were developed by Company G in 2002 as banana orchards completely with its own funds. Company G's first investment, known as Block# 5, has recently been integrated into Company W, a newly formed company in partnership with South African investors. Company G participates in this company as a shareholder detaining 30% of its social capital. Company G has made another 500ha available for Company W, who has in recent years developed this area into macadamia and banana orchards.

Company W is presently one of the larger exporters to South-African markets, achieving more than 10,000 tons per year of export grade fruit. Company W has been actively trading for 7 years and in that time has established an enviable record of very fast growth, sound management and world-class protocols.

Company G is also part of a new company called Company I, who is developing the remaining 500 hectares for Company V. These 500 ha are also being developed into banana orchards for export. Infrastructure, such as buildings, houses and underground irrigation systems exist on these lands.

Company G is a member of private sector association which makes efforts to assist the development of agriculture in Mozambique.

Company G has good relationships with foreign aid agencies, and various NGO's in the agricultural arena.

UNIQUE was not able to obtain more detailed information from Company G. Our impression is that this is a viable option but Company G might not be ready for the investment.

Assessment: Company G presented a very interesting climate resilient project which could benefit Gorongosa area. There is, however, more information required to gain a full picture of its viability.

Project brief – Title: Macadamia in Gorongosa, Company G	
Company Name	Company G
Contact Person	Stakeholder B
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Macadamia, Banana, Citrus
Annual Turnover in Mozambique/ total	Not known
Number of employees in Mozambique/ total	Not known
Name of the project/ investment	Investment volume around 8 Million USD.
Brief description of the climate project/ investment	Investment in growing bananas in Gorongosa region. Partially it could be an outgrower scheme.
Region of implementation	Gorongosa

Key player	Company G, is a registered Mozambican company. Its field of activity is in Agriculture. [Confidential information has been removed.]
Legal frame work for envisaged project	Not clear - the present shareholding of Company G is as follows: Stakeholder A 64 %; Stakeholder B 36 %.
Climate resilience justification / impact	Growing macadamia as an outgrowing scheme could improve climate resilience of farmers as an alternative perennial cash crop. At the same time Macadamia is fairly drought resistant and could reduce soil erosion. Watersheds are can be protected. As a long lasting tree Macadamia can sequester carbon and has some mitigation effects. By cultivating Macadamia it is expected that burning will reduce and farmers would have a stable cash income.
Technical description	Macadamia as outgrowing scheme and plantation. Further technical description is not available. It is not clear how extension would be done and if outgrowing really is an option for Company G or not.
Social impact	Cash income for the farmers and employment in Gorongosa area.
Economic description	No economic description or business plan has been forwarded so far. Macadamia has a good marketing potential
Certification	Currently no certification
Risks and risk mitigation strategies	Gorongosa area is a conflictive area at the moment. Land disputes and political disputes may discourage new investors for the time being. The strategy of Company G is not so clear. Access to land is also another constraint in the region. Company G might end up investing in other areas. Macadamia plantation has so far not shown major problems in terms of pest and diseases. However we do not have precise information about Macadamia in Mozambique.
Potential for scaling up	If Macadamia is proven to be successful, this might have a good potential for scaling up. Linking Company G with Company H and Company Q might help to upscale in agroforestry systems.
Best practice potential	Macadamia is supposed to be adequate for Mount Gorongosa area. Yet too early to know whether it can be used as best practice.
Observation	<ul style="list-style-type: none"> Stakeholder B seems well-connected in business and political world, incl. in Gorongosa area, and has interest to expand operations in Manica To expand his business in Manica, they started discussions with Company X to produce macadamia in parts of the forest concession area. According to stakeholder B, the main constraint to expanding Macadamia production in Gorongosa area is access to land. <p>[Sensitive information has been removed.]</p>

4.4.4.2 Company M

The promoters of Company M operate in Mozambique since 1995. During this period, Company M became involved with various property developments through Mozambique (incl. farming, industrial development and engineering). The promoters farmed commercially in South Africa for 20 years before selling farms to mining groups (Eskom coal). The first ethanol was

produced on 25 August 2011 - this was for the commissioning of the plant. The biofuel commercial production will commence April 2013.

The project is located in Mocuba District, Zambézia Province and presents an innovative food, fodder, bio-fuel and bio-energy initiative fostering the development of a national value-added food and bio-energy industry in Mozambique. Through a modular approach, it plans to establish several 1,000+ ha self-contained commercial farming units throughout the rural areas of Mozambique to manufacture value-added food products, ethanol and bio-electricity and from sweet sorghum, maize, soy, wheat and sunflower as feed stocks. Enhanced resilience to climate change impact is supposed to be achieved through efficient water use, low cost food security, low cost entry to markets and downstream economic opportunities via by-products. Total investment volume is US\$ 9.2 million.

Company M has a clear climate resilience focus by using and introducing drip irrigation, drought resistant crops and efficient use of energy. It is envisaged to assist farmers in crop production, which would reduce the conflict of food versus fuel. Moringa will be introduced which is a suitable crop for the region and would provide additional food to communities.

A business plan is currently being developed by a consultant.

Assessment: Company M project appears as a good investment opportunity, which meets the PPCR criteria. It is recommended to further investigate the project.

Project brief : Modular Biofuel and Food Farming (Company M)	
Company Name	Company M
Contact Person	Stakeholder C
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Maize, soy, sunflower, wheat, ethanol
Annual Turnover in Mozambique/ total	1,000ha production unit: Expected turnover: USD17m per annum
Number of employees in Mozambique/ total	72 presently, in full production 350 employees per 1000ha.
Name of the project/ investment	Modular Biofuel and Food Farming
Brief description of the climate project/ investment	Modular ethanol production, bio-gas – bio-electricity production for own consumption and distribution to local communities. Establishment of a food security hub under irrigation. Investment would be 9.2 Million USD
Region of implementation	Town- Mocuba, Province – Zambezia, Mozambique
Key player	Stakeholder C & Associates
Legal frame work for envisaged project	All been established as per Mozambican Law. Company M is a private owned company.

Climate resilience justification / impact	<p>Adaptation benefits include:</p> <ul style="list-style-type: none"> • Low cost food security • Low cost entry to market place (for farmers) • Creates downstream opportunities via by-products • Water savings: Regarding irrigation: Company M works closely with Company Y in South Africa - all being related to the most effective (cost, energy and water application) systems that could be introduced. This is also why Company M is installing the TL Irrigation (USA) pivot systems - the pivot machine is hydraulically driven and the oil is organic plant oil that will not contaminate soils with a pipe burst or spillage. Further to the irrigation is the evaporation that will have a major impact on effectively applying water to crops. Company M envisages irrigating only as from 17h00 in the afternoon until sunrise in the morning - three millimeters of water will make a difference. Moreover, Company M envisages that all land and crops that could not be irrigated by pivot will be irrigated by drip. The company Netafim (leaders in drip irrigation) consult Company M regarding its needs. Moringa is an excellent crop to be irrigated by drip and Company M will pursue it. Moringa is probably the most outstanding crop for establishing food security in rural areas. Solar will be applied as energy.
Technical description	<p>The project's goal is the balancing of inputs & outputs to create a no waste agro-industrial unit that produces food, feed, fodder, fuel, organic fertilizer from bio-gas plant and bio-electricity.</p> <p>The major focus is on self-sustaining and sustainable agricultural-industrial development (carbon neutral). A 1000ha development will produce the following without any external energy or chemicals applied:</p> <ul style="list-style-type: none"> • 1.6 MW bio-electricity, • 7,000 tons solid and 12,000 tons high value organic fertilizers, • 1,800kg steam per hour for ethanol production (360,000 liter per month) from waste heat, • Bio-diesel (from soy & sunflower) only for internal use (no mineral fuels will be utilized) – balance of oils will be food products. • This 1,000ha farm will be totally independent from all external negatives. The farm will have a zero carbon footprint and will produce climate friendly products that can be utilized by neighboring farms or be exported. <p>Company M did trials with all agricultural products in the region. What we further do is to establish trial sites before planting the bigger commercial lands - the trial sites will always be an indicator of what is coming - insects, weeds etc. Further we do follow indicator plants - roses (two or three plants placed strategically in the lands) for lice and fungal etc. Company M has the full support of suppliers Envitec/ZORG - manufactures and suppliers of biogas/electricity/organic fertilizer plant - turnkey operation.</p>

Social impact

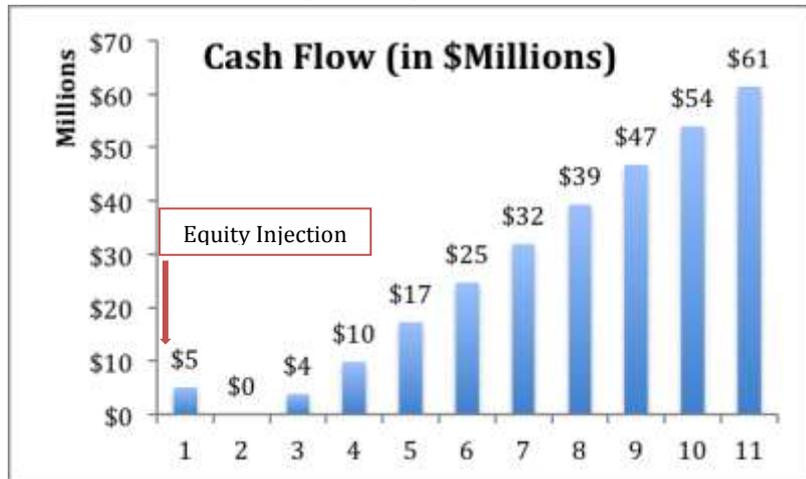
- Company M created a well-planned social development program via sustainable irrigated farming practices. Company M is in the process with the support from USAID/AgriFuturo to establish 120ha under pivot irrigation for the neighboring communities. Upgrading 120 families into a new class of commercial farmers, benefiting permanently from the development.
- This will be an ongoing development and Company M envisages developing 1,500ha where the local communities will benefit from the community irrigation scheme, will benefit from organic fertilizers and bioelectricity from Company M.
- Company M envisage to supply bio-energy to local communities in the rural area where established.

Economic description

A business plan is currently under development (by ConsultUs)
 Investment volume: \$9.2million

- Equity Injection=\$5million
- Loan = \$4.2million (3year loan at 5% interest rate)

Project Cash flow (reflecting financing) :



Financial Indicators:

Payback Period	3,4
Project IRR	79,0%
Equity IRR	106,0%

Sensitivity Analysis:

		Impact on IRR				
		Revenues				
		-20%	-10%	0%	10%	20%
Costs	1	66,3%	80,0%	93,7%	107,4%	121,2%
	-20%	59,3%	72,7%	86,2%	99,7%	113,2%
	-10%	52,4%	65,7%	79,0%	92,2%	105,5%
	0%	45,7%	59,0%	72,0%	85,0%	98,1%
	10%	39,0%	52,3%	65,2%	78,1%	90,9%

Certification	None
Risks and risk mitigation strategies	The risk in terms of food versus fuel is mitigated by crop production and involvement of farmers. Whether commercially the concept will work still needs to be explored in future. Biofuel might not be competitive with other energy sources. The commercial farming approach is not yet clear and would need some further evaluation.
Potential for scaling up	The development was conceptualized to benefit the environment and has potential for upscale and replication to other parts in Mozambique. To create the Company M conceptualized model, one has to take all impacts that could influence the environment negatively in mind and apply the positives. Company M works on the premise that a liability can usually be converted to an asset.
Best practice potential	Company M is in consultation with ICRISAT, India, which is doing immensely important research on developing better varieties on Sweet Sorghum – drought resistant, better sugar production in the stalk and higher production on the seed. Company M is constantly in collaboration with developing seed companies such as Agricol, Pannar and Kabalt.
Observation	

4.4.4.3 Integrated composting system (Company N)

Company N is located in Maputo Province producing piri-piri for export, and cassava and vegetables for the local market. Company N has a sustainable business vision and would like to implement a composting system based on water hyacinths. Specifically, water hyacinths are currently polluting drainage canals on the farm, which impedes the use of this water for irrigation purposes. The idea is therefore to use water hyacinths for composting, while allowing the scaling up of Company N's operations. The benefits include the following: (i) producing organic compost that can substitute chemical fertilizers, (ii) potentially rehabilitating sandy soil areas, and (iii) water hyacinth-free canals render additional water available for irrigation purposes.

The main adaptation rationale consists in that compost application is an organic way to rehabilitate sandy soils for agricultural production by increasing the soil's agricultural productivity, which (i) reduces the need for chemical fertilizer, and (ii) alleviates pressure for farmers for 'shifting cultivation', i.e. moving on to open up new farm lands. Important other adaptation benefits include (i) addressing the water pollution problems in canals caused by water hyacinths (water hyacinths kills fish, takes oxygen out of water, decreases water quality), (ii) more efficient water use by "recycling" water currently covered by water hyacinths for farm operations, and (iii) mulching with water hyacinths in wetter soil condition helps controlling weeds and reduces the need herbicides.

A business plan for the operation including the composting system would yet need to be developed.

Assessment: Despite the positive climate resilient and sustainability aspects of this project, we anticipate a risk that start-up costs (including costs associated with developing appropriate technologies and production processes) could be higher than the initial benefits in terms of cost savings from substituting chemical fertilizers and rendering sandy lands viable for agricul-

tural production. We therefore recommend considering providing grant finance to (i) test the production of compost from water hyacinths and its effects on up-scaling overall Company N operations, and (ii) develop a clear business plan. Overall, we do see potential for deriving best-practice lessons and replication in other places, such as around Lake Victoria where water hyacinth is a major problem for fishing and navigation.

Project brief: Composting system (Company N)	
Company Name	Company N
Contact Person	Stakeholder D
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	<ul style="list-style-type: none"> - Chili pepper for export market - Cassava nursery (multiplication of viable cassava plants for community uptake) - Vegetable production for local market
Annual Turnover in Mozambique/ total	n/a
Number of employees in Mozambique/ total	<ul style="list-style-type: none"> - 50 employees (full-time, permanent) - ca. 50 seasonal, 6-7 months/year - ca. 50 in-growers (currently)
Name of the project/ investment	Composting system to upscale Company N operations
Brief description of the climate project/ investment	<p>Company N has a sustainable business vision and would like to implement a composting system based on water hyacinths. Specifically, water hyacinths are currently polluting drainage canals on the farm, which impedes the use of this water for irrigation purposes.</p> <p>Objective: Use water hyacinths for composting, and ultimately to upscale Company N operations while rendering them more climate-resilient.</p> <p>The benefits include the following: (i) producing organic compost that can substitute chemical fertilizers, (ii) potentially rehabilitating sandy soil areas, and (iii) water hyacinth-free canals render additional water available for irrigation purposes.</p> <p>Project components:</p> <ol style="list-style-type: none"> 1. <i>Water Hyacinth Composting System</i>: in collaboration with communities, use water hyacinths to produce organic compost for local market and outgrowers. 2. <i>Mangrove rehabilitation</i>: use 10ha for a mangrove nursery using compost, then replant mangroves along water bodies (work with communities to also raise their awareness to avoid mangrove deforestation) 3. <i>Ecotourism project</i>: i.e. accommodation and ‘work on the farm’ options to promote, raise awareness, and get additional support for the project

Region of implementation	Marracuene, Maputo Province
Key player	Operating since 2010 [Confidential information has been removed.]
Legal frame work for envisaged project	Company N company framework Shareholders: Stakeholder E (25%), Stakeholder F (5%), Stakeholder G (70%)
Climate resilience justification / impact	<p>Main adaptation rationale:</p> <ul style="list-style-type: none"> - Compost application is an organic way to rehabilitate sandy soils for agricultural production by increasing the soil's agricultural productivity, which (i) reduces the need for chemical fertilizer, and (ii) alleviates pressure for farmers for 'shifting cultivation', i.e. moving on to open up new farm lands. - Mangrove restoration secures the provision of important environmental services and coast protection. <p>Other adaptation benefits:</p> <ul style="list-style-type: none"> - Addresses water pollution problems in canals caused by water hyacinths (water hyacinths kills fish, takes oxygen out of water, decreases water quality) - More efficient water use by "recycling" water currently covered by water hyacinths for farm operations. - Mulching with water hyacinths in wetter soil condition helps control weeds and reduces the need herbicides. - Charcoal production from water hyacinths is possible and may become an alternative energy source to mangrove wood (currently deforested for energy purposes).
Technical description	<ul style="list-style-type: none"> - Vermicomposting technique: use of worms in the composting process implies set up of a worm-breeding program. Possible to explore benefits of the 'red wriggler' (Australian composting worm, already approved and exported to South Africa). - A technique to collect water hyacinths out of the river would need to be designed or developed, and adapted to local conditions.
Social impact	<ul style="list-style-type: none"> - Employment opportunities in compost production. - Income generation through sale of compost to local markets (market feasibility study yet to undertake, but many opportunities assumed to exist due to predominant sandy soils in peri-urban areas of Maputo). - Establishment of a community-training center on composting (currently no such center is existing), which will help upscale the program.

Economic description	<p>Commercial viability and business plan for the composting system would be developed during initial phase.</p> <p>Estimated personal for composting needed (start-up phase):</p> <ul style="list-style-type: none"> - technical assistants person – would be special hire in composting to set up foundation of the program to be able to scale it (determine production chain) - project manager (probably full-time) - ca. 25 people (compost labor) <p>Estimated equipment needed (start-up phase):</p> <ul style="list-style-type: none"> - specialized machinery (mulches, tractors, trailers, compost turning machine, packaging vehicle) - water hyacinths collection equipment (to take out from water) - nurseries for mangrove seedlings
Risks and risk mitigation strategies	<p>Currently no clear business plan exists, which makes it difficult to assess the commercial viability of composting. However, latent demand for compost as a result of predominant sandy soils seems to exist in the agricultural belt of Maputo, which requires extensive fertilizer use.</p> <p>Due to its innovative nature, the project idea will require upfront investments in identifying appropriate technologies and training people that may not be immediately profitable in the short-run. A pilot phase financed through grants seems more appropriate to explore cost-effective technologies and production processes.</p>
Potential for scaling up	<p>There is Potential for scaling up by collecting bio-waste from surrounding companies (e.g. breweries), training more people via the community training center, and export possibilities to South Africa (e.g. Nelspruit agricultural zone).</p>
Best practice potential	<p>The concept looks technically feasible and could become a best practice on organic compost and to rehabilitate sandy soils, and potential for replication in other places plagued with water hyacinths (e.g. Lake Victoria). Yet at this stage, it is too early for a detailed assessment.</p>
Observation	<ul style="list-style-type: none"> • Stated investment need: USD 3-5 million • Equity preferred

4.4.4.4 Community-based agriculture and ecotourism project (Company O)

Company O is a forestry company operating in Niassa province. Its shareholders are Company Z (80%) and Company AA (20 %)

The project covers an area of 210,000 ha in three districts: Lichinga (45,000 ha), Muembe (140,000 ha) and Majune (ca. 25,000 ha). Company O has provisional land use rights (DUATs) for 42,158 ha, all in Lichinga district. The objective of Company O is to plant 120,000 ha - 40% pine (sawn wood) and 60% eucalyptus (8% for sawn wood and 52% for cellulose). Currently, 5,200 ha are planted and another 4,000 ha will be planted in 2013. The total investment will be of 90 million USD until 2020. Until now Company Z has invested 18,9 million USD. The export volume is expected to be 500 million USD annually from the year 2038 onwards. There is a social fund of about 250.000 USD for community projects.

The idea of Company O to help build climate resilience is to upscale of current community-based agriculture (rain fed cultivation of maize and beans) and ecotourism activities – initiated by Company O and implemented with support from Company AB - should there be interest by other private partners such as IFC to invest more in these projects on a commercial basis (see annex for more details).

The adaptation rationale is seeing in the following: (i) conservation of forests (and associated environmental services) by reducing shifting cultivation practices through improved agricultural productivity (x10 via better plowing technology and seedlings), food security benefits through development of more productive agricultural practices , higher societal resilience by improving rural income.

Please note that Company O wasn't originally planning to expand the current community-based agriculture and tourism activities at the level of an additional US\$ 4-5 million. If IFC was interested in co-financing the scaling up of the community-based agricultural component, Company O would be open to explore it further as well.

Business plan of Company O operations exists and has already been shared with IFC during an earlier exchange with IFC in Washington D.C.

Assessment: Although reforestation in plantation forests might not be the focus of PPCR investments, the accompanied community program, food security aspects and reduced burning and deforestation would have a positive economic and environmental impact, plus it would contribute to building climate resilience in one of the priority regions, Niassa province. [Sensitive information has been removed.] We assess this project of lower priority for consideration by IFC within the scope of the PPCR. If IFC would like to further explore the project UNIQUE would need to sign a NDA and investigate further.

Project brief : Community-based agriculture and ecotourism (Company O)

Company Name	Company O
Contact Person	Stakeholder H
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Afforestation in 2 plantations (39,000 ha) with the objective to plant 120,000 ha - 40% pine (sawn wood) and 60% eucalyptus (8% for sawn wood and 52% for cellulose). Currently, 5,200 ha are planted; another 4,000 ha will be planted in 2013.
Annual Turnover in Mozambique/ total	Nil
Number of employees in Mozambique/ total	1600
Name of the project/ investment	Community-based agriculture and ecotourism

Brief description of the climate project/ investment	<p>Scaling up the current Company O-run community-based agriculture and ecotourism activities should there be interest by other private partners to invest more in these projects on a commercial basis.</p> <p>Currently 10% of the plantation area (ca. 4000 ha) are set aside for a pilot project promoting rain fed agriculture (maize & beans) by local communities rather than shifting cultivation. Current pilot is being implemented with extension service by Company AB and from the government. Idea is to expand these pilot activities to more areas and to add an ecotourism component (currently being explored with technical advice by Company AB). Ecotourism potential is seen in the areas proximity to Lichinga and Niassa Reserve.</p>
Region of implementation	Lichinga District, Niassa Province
Key player	Company O registered in 2006 ; Company AB provides technical advisory services
Legal frame work for envisaged project	Company O company framework (has provisional DUAT for the area)
Climate resilience justification / impact	<p>forest conservation (and associated environmental services) by reducing shifting cultivation practices through improved agricultural productivity (x10 via better plowing technology and seedlings)</p> <p>food security through development of more productive agricultural practices</p> <p>higher societal resilience by improving rural income</p> <p>rain fed agriculture (no irrigation needed)</p>
Technical description	none particular beyond tillage, improved seeds, fertilizers
Social impact	<p>27 farmers are employed in first year (each farmer contracted means another 4 family members involved in the business, so total number of benefiting people would be 27 x 4 = 108)</p> <p>Access to market (chicken farm as buyer of agricultural produce)</p> <p>Value addition by producing chicken feed.</p>
Economic description	<p>Business plan of Company O operations exists and has already been shared with IFC during an earlier exchange with IFC in Washington D.C.</p> <p>Note that Company O wasn't originally planning to expand the current community-based agriculture and tourism activities at the level of an additional US\$ 4-5 million. If IFC was interested in co-financing the scaling up of the community-based agricultural component, Company O would be open to explore it further as well.</p>
Certification	No certification so far, considers certification under a national scheme (current effort underway – via Mozambican association AGREF - to develop nationally appropriate FSC standards.)
Risks and risk mitigation strategies	<ul style="list-style-type: none"> - Uncertainty over commercial viability of proposed activities. - It might be difficult that communities are able to manage a lodge or other kind of ecotourism business. - Risk in terms of forest fires are reduced by a strong community participation program.
Potential for scaling up	Further details on current activities are needed, especially on whether the activities are commercially viable on their own (and not simply part of the company's CSR strategy).

Best practice potential	We do not see a major best practice model in this project.
Observation	

4.4.4.5 Company A

The projects presented by Company A were studied in depth as shown in chapter 4.1.

4.4.4.6 Company P

The main business of Company P is selling sawn timber products on the national and international markets and rough sawn, treated and untreated timber on the local market. The company manufactures wooden houses ideal for construction sites and rural development projects. Company P has a 45,000Ha forestry concession in central Sofala with a large sawmill and CCA-treatment plant within the concession. The company has been certified by the Forest Stewardship Council (FSC). Company P is a joint venture company and has 155 employees.

Company P was visited in Beira. The company was FSC certified but has lost certification. In their concession in Gorongosa area, they have about 1/3 savannah, 1/3 dense forest and 1/3 open forest. They are currently mainly producing sleepers out of Masasa (*Brachystegia spiciformis*) specie. In limited quantities other species such as Umbila/Kiaat (*Pterocarpus angolensis*) and Panga Panga (*Millettia stuhlmannii*) are used. Otherwise they do not use any other species. The annual allowed cut is 10.000m³ but they only harvest about 6.000 m³. He thinks that annual allowable cut is overestimated.

Company P has a very strong social involvement not only by employing about 150 people but also assisting with school and health projects in Cheringoma and Muanza districts and support local initiatives such as charcoal production of forest residues to create employment. The business is commercially viable and Company P is looking into new investments for another forest concession in the range of about 100.000 ha.

Assessment: Unique does not see the project as one of the priority ones. The innovative character is missing, it has not a strong climate resilience aspect and the negotiation with the company owners might be difficult.

Project brief – Title: Expanding forest concession area

Company Name	Company P
Contact Person	Stakeholder I
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Hardwood products, sleepers
Annual Turnover in Mozambique/ total	1 million USD
Number of employees in Mozambique/ total	150
Name of the project/ investment	Expanding forest concession area and industrial investment. The investment would be in the range of 3 to 4 Million USD In total.
Brief description of the climate project/ investment	FSC certified forestry (until recently). 46,000 ha concession with intention to expand to around 100,000 ha and new industrial investments
Region of implementation	Sofala, Mozambique
Key player	[Confidential information has been removed.]
Legal frame work for envisaged project	Yet to be defined. Most likely there will be new players coming in. It is expected that there would be an equity investor, but it has not yet been defined.
Climate resilience justification / impact	Maintaining forests in an area that is very rapidly being deforested by slash and burn agriculture and logging. Large scale carbon production using residues from logging and industrial processes
Technical description	The management of the forests will continue to follow sustainable forest management practices of Miombo Forests, under FSC principles. Control of fire and natural regeneration are the main management aspects. The intention is to use more species for the carpentry and locally sawn timber for furniture and industry abroad.
Social impact	Employment in an area with few alternatives, community development. Assistance in schools and clinics. The project also intends to assist communities in sustainable agriculture to reduce slash and burn. The production of charcoal from residues is another project which will be supported.
Economic description	So far 3 MUSD invested in the company
Certification	FSC, but recently lost the status
Risks and risk mitigation strategies	The main risk in terms of forest management is forest fires, which are reduced through community involvement. It might not be easy to identify and lease a new forest concession. Since the company is owned by Swedish and local church it might be difficult to come to a business model which is satisfying all partners.
Potential for scaling up	The project itself has the intention to upscale from 47.000 ha to about 100.000 ha. A sustainable forest management of Miombo woodlands can be scaled up and serve as a model. Community involvement is a good “showcase”.

Best practice potential	So far we do not see any outstanding best practices. May be the charcoal production out of residues could be something interesting to further work on.
Observation	<ul style="list-style-type: none"> There is no strong climate resilience link. It is rather a mitigation project (reduced burning, sustainable forest management, increased carbon stock) and a strong social commitment. <p>[Sensitive information has been removed.]</p>

4.4.4.7 Company Q, Stakeholder K

Company Q is working with about 5.000 families in an outgrower scheme in Gorongosa area. The main crops are: pulses, grain and cereals (sorghum, maize rice) fruit (litchi, mango, cashew, and macadamia), groundnut, cow pea, sunflower, sesame and castor oil and pigeon pea. One important aspect is the improvement of soil fertility with soil conservation techniques through technical assistance and inputs to farmers (crop rotation and low cost input supply). Company Q also has commercial farming for seed production. The products are sold in Beira and Mauputo market but also China and India (1 Mio. kg of sesame). Company Q also has 60.000 ha of forest concession.

The main investment is private capital, but Company Q got some support from Institution A and Gate foundation. The plan is to extend to about 15.000 families through an extension system.

Stakeholder J is currently contracted to Institution A and Institution B to implement a C.A scheme, together with intensive training and extension work with all the communities around the entire boundary of Gorongosa Park; these activities take place outside the park. There is grant funding for this program on an annual basis and expect this to continue for the next 3 years. Currently there are 3550 families registered. In 3 years, this should, increase to 15000-20000 families. Within the Park boundary, 4000-6000 families currently reside. Part of Institution B's goals are to encourage these communities to voluntarily relocate themselves to outside of the Park, where they would be promptly included them in our program.

There is another contract with Company AC (based in Nairobi) funded by the Bill and Melinda Gates Foundation. Company Q responsibility is similar to that of Institution B, whereby we introduce C.A is introduced to rural, small scale farming families (throughout Manica and Sofala), monitor and manage these families for the entire season, through a team of qualified and motivated extension officers.

C.A demonstration plots are a very important tool in our training program, which include the sourcing of quality seeds, correct planting dates, selection of crops that suit soil types, rainfall and altitude. Finally, production of crops that have good and reliable markets and that these crops get to the markets as soon as possible and at the correct price.

Company Q is also contracted to introduce C.A to the rural communities that Company AD has relocated as a result of coal reserves being found in their previous areas of residence. Located in the Tete Province; this is a very dry, arid region, hence the importance of C.A. At present, as part of the training and awareness of the communities, Company Q has introduced large scale demonstration plots of 1 hectare each, consisting of drought resistant crops.

The mines find themselves in a desperate position, as large numbers of communities are in need of assistance regarding sustainable agricultural projects.

Company AE is purely a cotton company based in Cabo Delgado. Company Q has been contracted to introduce C.A within their 90 000 families, including both cash and food crop production. Through good cropping rotations and an Integrated Soil Fertility Management Program, cotton yields are increased, returns to the farmers and create sustainable food production.

All in all UNIQUE sees this project as highly valuable for the PPCR project. Although it is not clear what would be the investment volume and to which extent this project is profitable, since margins are fairly small. This project looks more like a donor funding project, not like a business model.

Assessment: We would recommend this project to be supported rather by other funds than PPCR, but it is seen as a very interesting model to increase climate resilience, protect Gorongosa Park and other biodiversity spots. If Company Q can provide a profitable business model, the project might be eligible for PPCR as well.

Project brief – Company Q	
Company Name	Company Q
Contact Person	Stakeholder K
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	The current Conservation Agriculture projects are associated with the following companies: <ul style="list-style-type: none"> - Institution B - Bill and Melinda Gates Foundation - Company AD - Company AE
Annual Turnover in Mozambique/ total	US\$1 400 000.00
Number of employees in Mozambique/ total	24
Name of the project/ investment	Company Q
Brief description of the climate project/ investment	Currently, Company Q currently has 3500 families (1 hectare per family) and we are looking to increase to 15000 families in year 1 between the boundary of Gorongosa National Park and the boundary of Marromeu Reserve where we focus on teaching the communities, through well trained Extension Officers and agronomists, Conservation Agriculture, ISFM (Integrated Soil Fertility Management) and Bio Diversity, re forestation and honey production. This is in the effort of inducing them to move out of the Park to minimize poaching, land degradation and other forms of deforestation practices.
Region of implementation	Gorongosa National Park and Marromeu Reserve, Sofala Province, Mozambique.
Key player	Institutions A and B

Legal frame work for envisaged project	Company Q is a fully registered, legal, private company based in Mozambique.
Climate resilience justification / impact	Conservation Agriculture, re forestation (15000 hectares x \$400 = \$6 million), 15000 families x 10 trees= 150 000 trees), Bio Diversity and wetland conservation of 2.5 million hectares. 3000 top bar beehives x 20kg = 60 000kg of fully organic honey Eco tourism in Marromeu Reserve
Technical description	Production levels have enormous potential on a 50 000 hectare program. With a 4000 hectare mixed cropping program at present, we plan to produce with our small scale farmer program 1 million kg's of sesame. This crop would produce up to 400 000 litres of sesame oil. Company Q has recently applied the ATL program to its projects. During registration, the farmers will undergo a mobile device based questionnaire (through the Extension Officer) that collects the farmer's demographics, arable land profile, cropping data as well as a Geo-Tag of the farmer's location. This information is then compounded onto a web page where it can be viewed in the form of tables and graphs (also monitoring the work of the Extension Officers). Company Q has also applied GPS tracking devices to each of the Extension Officers' motorbikes that records their every movement.
Social impact	Company Q employs staff that are local to the areas of operation. This project will keep the 15000 families occupied for 11 months of the year. Each family, conservatively, will produce a profit of \$400 a hectare/year through the combination of cash and high protein food crops. Company Q supplies reliable and sustainable markets as well as transport for the produce. Company Q works closely with the Chiefs of villages, Gorongosa Park Officials and Government Officials. Once a month, a field day is hosted at each demonstration plot, creating awareness, education and an amicable alliance. When registering farmers, we target/include illegal charcoal producers.
Economic description	\$5.2 million (budget still needs to be finalized)
Certification	Nothing at present
Risks and risk mitigation strategies	The opposition party is operating in the area, which is causing irritation and uncertainties in terms of safety. The company has established communication with the opposition group and is confident that they can continue working without any problems. Land issues are conflicted, but the company is working on a trust and confidence basis and can minimize these conflicts. It needs to be verified if the whole model is commercially viable. Low profit margins in the farm are risky. What is role does the donation play. What will happen if there is no more support from other stakeholders? What would be the exit strategy? Does the company have the capacity to expand to 15.000 people?
Potential for scaling up	The project is a scaling up project.
Best practice potential	Very good best practices (conservation agriculture, introduce trees in to the farming system, beehives)

Observation	<p>Company Q is supporting climate change adaptation techniques (conservation agriculture) which will increase climate resilience.</p> <p>There is a strong commitment to the Gorongosa National Park and to keep on working within the region. The envisaged areas of operation requires serious and urgent attention as proposed above</p> <ul style="list-style-type: none"> • There is a strong commitment to help farmers in their agriculture practice but having the business model in mind. • The company has a clear vision in order to protect the Gorongosa National Park and surrounding areas. • It is outstanding that the company has established a good relationship with the communities and is willing to invest in an area which is conflictive.
-------------	--

4.4.4.8 Company R

Company R is an Agro-Industrial business in the Zambezia province and has been in existence for the past century. The company processes coconut products from its own plantations and from a bigger proportion bought from small holder producers. Coconut has been a major source of income for both companies and communities generating millions of dollars in annual revenues. Coconut industry is still the basis of livelihood for 1 million people living along the coastal lines of Zambezia Province.

Zambezia province has had coconut farming for decades and has been like a culture. It has been the source of revenue for communities and commercial companies. In the communities, it has been the basis of livelihood. Communities harvest for food and from the rest of their production, they produce copra and sell to commercial companies raising the much needed cash for their day to day survival. The branches that naturally drop from the coconut tree are used as roofing materials. Excess shells and fiber are often used as source of energy for cooking reducing destruction of other trees types including the mangroves for the same purpose. From the trunk they build houses, make doors, windows, tables, chairs and as coffins as per traditional practice. From the flowers, the population collect sugar milk to make Sura and when it ferments becomes an alcohol drink.

Company R has its own plantations. At its peak it employed more than 4000 employees, providing the much needed economic support to the local communities. Together with other commercial companies buy semi processed copra from small holders. From the resultant copra, all the companies extract coconut oil. The oil is either exported or used domestically. Company R has predominantly exported its oil to Switzerland where it is mainly used in food production. Other commercial companies also export to Switzerland and into the region. For domestic use the oil is used for consumption as food and in soap manufacturing. From extraction of oil process is a byproduct the cake used for animal feeding and is sold locally and exported to South Africa. Company R also produces from fibre coconut substrate used by agriculture companies for nursery development. From resultant shells, Company R produces charcoal which it exports as charcoal to India and also further develops it into charcoal briquettes and export to Portugal. On social level apart from providing employment and market for small holders produce, Company R has provided infrastructure for schools and clinics in all the districts it carries its operations.

Coconut industry in the Zambezia Province has fallen victim to an incurable Coconut Lethal Yellowing Disease (CLYD), a viral infection. Together with the deadly Rhinoceros beetle has caused deaths of more than 70% of the trees in the province in the last ten years. It is such a loss that has brought hardships to local communities and the economic potential of the province. The disease has been responsible for the wiping out of the hybrid variety that proved very susceptible to the disease. **The local Tall Green Giant Variety has proved highly tolerable to the disease.** It is however, unfortunate that this local Tall Variety is now of age and almost at the final stage of its life cycle.

CLYD does not have cure. The best practice all over the world is to identify highly tolerant variety and reproduce and replant the material. For those producing trees that fall victim to the disease, it is essential that we cut down and burn the trees. Cutting down affected trees reduces the spread of the disease to healthier ones and burning eliminates the habitat for larva for the Rhinoceros beetle thereby inhibiting the beetle's multiplication.

Company R's participation in MCC funded Coconut Rehabilitation project- Company R is currently part of effort by MCA (MCC funded project) aiming at mitigating the effects of lethal yellow and replanting of high tolerant Local Green variety. In this project Company R has been responsible for:

1. Identifying and eliminating disease affected trees within producing trees/ areas identified as Epidemic areas (600 000 trees over 4 years)
2. Clearance of areas where the disease has already destroyed production and disease no longer active identified as Endemic areas (7 700 ha over four years)
3. Producing nursery with the local green variety for replanting in both Epidemic and Endemic areas (600 000 seedlings in total)

The project is carried out in partnership with ACDI/VOCA. Over and above functions, the project goes as far as capacitating communities in other income generating projects. It also includes training and education of small holder farmers on how to combat the disease and reestablish the industry in the future

Company R has replanted 2 400 ha of the Tall Green Variety.

Assessment: UNIQUEs position is that the rehabilitation of the coconut industry with an improved coconut variety would increase climate resilience and contribute to coastal rehabilitation, income generation, carbon sequestration and soil conservation.

The project has a strong community component which will decrease vulnerability to climate changes. The project can help to rehabilitate this important industry, which has a market potential and tradition. Company R has long term experience in the industry and is committed to the project.

Project brief – Title: Rehabilitation of climate resilient coconuts

Company Name	Company R
Contact Person	Stakeholder L
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Coconuts and Coconut Oil
Annual Turnover in Mozambique/ total	The present estimated turnover of coconut business is \$10m annually but at the peak before CLYD it was estimated at \$ 80m annually.
Number of employees in Mozambique/ total	Employees' 1500/month heads but at the peak before CLYD was 5000/month. Commercial and smallholders sectors in the past would absorb 100 000 families
Name of the project/ investment	Community Income Support Project- Coconut Industry Rehabilitation
Brief description of the climate project/ investment	Improving small famers and private sector income through rehabilitation of coconut industry diversified with short term income crops that include sesame, groundnuts, pigeon peas and low irrigation horticulture practices.
Region of implementation	Zambezia Province, Mozambique
Key player	<p>Company R has been a key player in getting NGO, private sector and governmental agencies coordination on working on smallholder agricultural projects.</p> <p>Company R has been involved in a number of projects funded by SOF-RECO, GTZ and currently just about to end MCA funded.</p> <p>In the future Madal will work with Company F and any other organization that will be interested with Company R.</p>
Legal frame work for envisaged project	<ul style="list-style-type: none"> - Consultation with Ministry of Agriculture - All the legislation that control NGO activities in the country have to be observed
Climate resilience justification / impact	<p>-Coconut tree form part of the ecosystem that supports life to all living organisms through safeguarding erosion, natural photosynthesis process, water cycle process etc.</p> <p>- Presents of coconut trees reduce the destruction to mangrove as leaves and branches the tree regularly sheds off are used for building shelter.</p> <p>-Use of fibre and shells by local population as energy is an alternative the destruction of forests and mangrove to make charcoal. The shells themselves can be used to produce raw charcoal and charcoal briquettes for energy instead of using firewood.</p>
Technical description	Replication of Local Giant Green variety through controlled nursery production

Social impact	<ul style="list-style-type: none"> - Millions of US\$ from sale of nuts, copra, fibre, shells and sura (toddy). It is estimated the annual value from coconut industry before CLYD was US\$80 million. - Employment opportunities in commercial companies that does large scale processing and marketing of coconuts derivatives - Self-employment for communities - Intercropping with other short term income generating crop is a good way of keeping plantations whilst at the same time generating value. - Infrastructure created by commercial companies e.g. roads, schools and clinics. - Information dissemination by commercial companies regarding health issues (HIV/AIDS). Information on how to develop short term crops, horticultural crops will also be disseminated. - Reducing social unrest- Most of the population living on coconuts have migrated to cities looking for greener pastures but this is now resulting in increase in crime as they cannot secure employment. This project will be a correct step in addressing this problem
Economic description	For coconut only in the past the IRR was 10%. IRR will increase with diversification as per business plan to be elaborated.
Certification	So far none
Risks and risk mitigation strategies	The main risk for coconut is the CLYD disease. By introducing a new variety this risk can be reduced.
Potential for scaling up	The project itself is about scaling up or the rehabilitation of the coconut industry
Best practice potential	The introduced variety can be regarded as a best practice. Agriculture activities with the communities can also be considered as best practices.
Observation	Rehabilitation of coconut industry in the Zambezia area is key to survival of the population and private industrial companies Horticulture and other crops provide additional capital and nutritional values communities need.

4.4.5 Potential investors Potential investors with concrete business ideas and plans

4.4.5.1 Company S

Company S, part of the Company AF, is an African forestry company with activities in Uganda, Ruanda and Mozambique. Company AF was established in Niassa Province in late 2007, with the administration office in Lichinga and the plantation operations close to Chiconono. Pines and eucalypts are grown for sawn timber production applying the principles of FSC. Company S has a strong social commitment to work with and uplift local communities through education, health and income-generation projects. According to Company AF CR all projects must satisfy the following criteria: be demand-driven, involve local and national partnerships, be sustainable, have a measurable impact on communities, be located such that the project can positively benefit Company AF as a business (by improving the supply-side of timber products or posi-

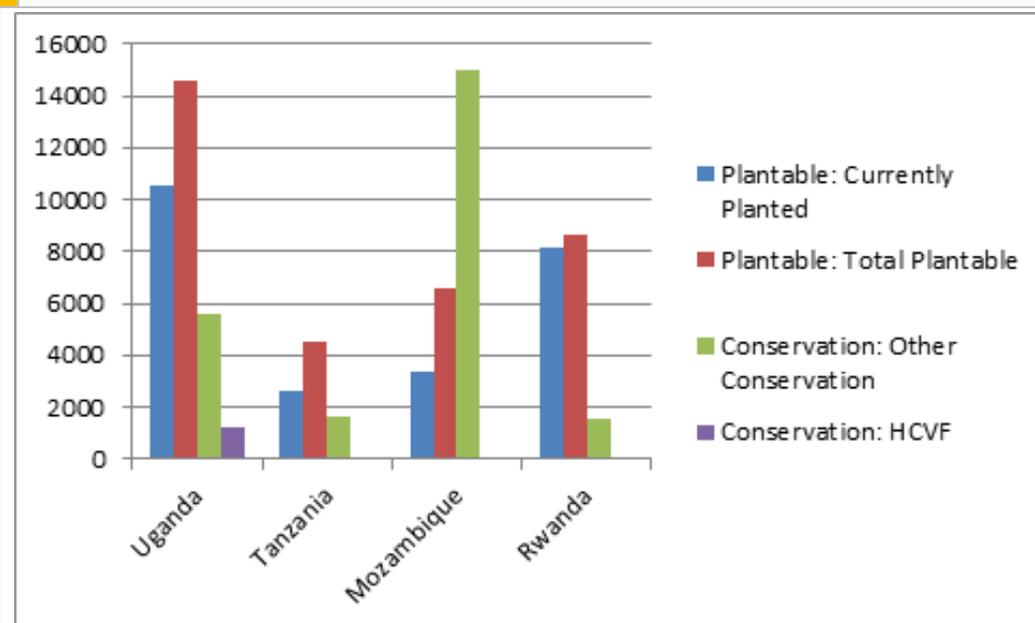
tively impact the regard for tree growing nationally), satisfy local and regional stakeholders and provide value-add to the company. Projects commonly supported include health and educational infrastructure and livelihoods projects such as community tree growers associations and agricultural diversification programmes through a Community Trust. The trust has developed an outgrower small-holders scheme. Planted and maintained by local villagers with Company AF providing gratis seedlings and contracting to buy their future timber at market value.

Company AF claims pioneering a best practice forestry model in Mozambique which seeks to substantially accelerate planting and maximize all possible uses of timber and fibre resource in a variety of value added activities to meet Mozambique's wood, energy and employment requirements. In the long-term the Company plans a range of investments to maximize the production and utilization of the total timber resource and woody biomass in a variety of income-generating activities including further processing facilities such as furniture manufacture, particle board, veneer, briquettes and the subsidiary industries associated with value-adding products.

Company AF has the intention to develop the Muembe-based forest properties into a centre of forestry excellence and best practices, with investment in saw milling and other value added processing, providing a role model for both Mozambique and East Africa. The Muembe sawmilling operation is supposed to reach a 45% recovery rate. Further investments are planned in processing particle board, furniture, veneer and energy from thinning, pruning, and sawmill waste which will further enhance the contribution of forestry resources to Mozambique's growing economy. Further a containerized nursery systems and clonal plant propagation including the development of a large scale commercial hybrid nursery is planned.

Company AF further seeks to pioneer developing commercial forestry as a means of sequestering carbon, combating global warming and allowing the Company to create additional income and investment capital from the generation and sale of carbon credits

As part of Company AFs commitment to responsible land stewardship, Company AF actively preserves conservation areas. To date, the company is actively preserving over 15,000 hectares of land across its three territories.

Figure 19: Company AF plantation and conservation area

Source: Company AF

Assessment: The presented project does not have a strong climate resilience aspect although it will reduce forest fires and preserve natural habitat. It will have a positive commercial impact to communities.

Economically the project is viable. Increased need for timber, pulp and energy will guarantee high demand and good prices.

[Sensitive information has been removed.]

We suggest further discussing the project.

Project brief : Chiconono Plantation

Company Name	Company S
Contact Person	[Confidential information has been removed.]
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Trees; for eventual timber harvest and replanting
Annual Turnover in Mozambique/ total	Nil
Number of employees in Mozambique/ total	375
Name of the project/ investment	Company S Chiconono Plantation
Brief description of the climate project/ investment	The project comprises of tree plantation and conservation of remaining native forests.

Region of implementation	Niassa Province, Mozambique
Key player	[Confidential information has been removed.]
Legal frame work for envisaged project	Relevant Legislation with which Company AF complies: -Lei do Ambiente no. 20/97 = (Environment Law no. 20/97) -Decreto no. 45/2004 de 29 de Setembro (Regulamento sobre o Processo de Avaliacao do impacto Ambiental) = Decree no. 45/2004 of 29th September (Law regarding the Process of Evaluation of Environmental Impact)
Climate resilience justification / impact	The areas surrounding Chiconono have been subject to varying levels of human influence. Machambas (gardens) have been established and because of this bush is cleared and cash crops are cultivated until the soil is depleted, then the farmers move on and clear a new patch. There are also some areas that are not conducive to cultivation where natural forests or woodlands prevail. Establishment of plantation forestry and corresponding conservation of the precious remaining indigenous forested areas, conserving indigenous forests, wetlands and woodlands are some of the key elements to enhance ecosystem climate resilience. Establishment of plantation forests including outgrower schemes protects the watershed compared to ongoing cutting and burning.
Technical description	Plantation forest
Social impact	Company S has a community engagement program, where communities are encouraged to grow trees as a viable economic activity.
Economic description	An investment has been approved by CPI amounting to \$15,000,000 for 5 years from 2008. The company costs are on average \$130,000/month. The company is now still in its investment period; thus no revenues have been earned yet and the activities are being financed by the shareholders. The target is to secure \$10 million in loan financing.
Certification	Company AF has achieved ISO 9001 certification at the pole treatment plant in Uganda and has achieved and maintained FSC certification at two of its plantations in Uganda. The Mozambique operation, as with all Company AF plantations, adheres to FSC standards and will submit itself to external audit and certification in the next two years. The company adheres to FSC, ISO and ILO standards through the company Integrated Management System (IMS), which houses company policies and proscriptions for how to carry out all core company functions and ensures a high level of standardized adherence to internationally recognized labour, development and forestry policies.
Risks and risk mitigation strategies	The main risk in terms of forest management is forest fires, which are reduced through community involvement. Another risk is the use of a reduced number of species (2) and clones. A close monitoring of potential diseases would be required. Plantation forests have a bad reputation in the NGO and environmental scene. A good documentation and community engagement is mitigating the risks of bad reputation. [Sensitive information has been removed.]
Potential for scaling up	The techniques applied and promoted do have the potential to be scaled up. The outgrower scheme might have a positive impact in terms of up scaling within the surrounding communities.

Best practice potential	The project is seeking to promote best practices through community engagement, outgrower scheme, social commitment, technical innovations (tree nursery and sawmilling) and efficient use of resources.
Observations	In 2012, the Company AF (including Company S) was honoured by a 5-star rating by the Global Impact Investing Rating System (GIIRS), a project of the non-profit B Lab, assessing the social and environmental impact and practices of companies and funds using a methodology that has now been used by over 6,000 companies. GIIRS ratings are reviewed, rigorous, transparent, comprehensive, and comparable ratings of company impact.

4.4.5.2 Company T

[Sensitive information has been removed.]

The options and ideas submitted by company T are still in a pre-mature stage and the information submitted is not very structured and sometimes inconsistent. Nevertheless the concept of combining forest management and residential housing development has charm. One of the main restrictions for the forest management is the missing market for many native species, the so called secondary or non-commercial species. Parts of them can be used in the construction part of the project and therefore help to forestry economically more feasible. Of course the own consumption for housing construction is a temporarily and quantitatively limited market. However, the successful utilization of secondary species in the own construction project could become a best practice and door opener for external sales markets.

Of sure it is a limitation that company T is a start-up. However the two founders, stakeholders M and N, are very experienced persons. Stakeholder M brings in a good national and international “green” network from his former activities with WWF and stakeholder N seems to be a fully based and successful business case developer.

In continuation we present the two best documented projects presented by Company T. After this we give some general considerations on Miombo forest management.

The two interlinked projects are:

5. Pemba Sun Miombo **Forest Mangement**

Management of a Miombo forest area of around 180,000 ha. Productive forest will be around 50% and the annual harvesting volume as per management plan around 20,000 m³.

6. Maringanha **Tourism and Residential** Site development

The project will consist of a mix of short and long term high end residential housing, with some houses potentially for sale, plus a number of high end “chalets” linked to a hotel complex. Total number of units all told will likely be between 75 and 90.

The two projects were presented and discussed during a meeting in the IFC office in Maputo. Many documents have been submitted and analyzed by the consultant team. The results of the desk analysis are presented below.

Overall assessment: We recommend a more detailed check of the project in the second phase of our mission. It is planned to visit the areas and discuss further the models and ideas.

Project brief: Forestry and residential housing at Pemba East Coast

Company Name	Company T
Contact Person	Stakeholder M, Stakeholder N
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	n/a (start-up company)
Annual Turnover in Mozambique / total	n/a (start-up company)
Number of employees in Mozambique / total	n/a (start-up company)
Name of the project / investment	Forestry and residential housing at Pemba East Coast (working name determined by consultants)
Brief description of the climate project/ investment	Management of natural forests (Miombo forests) and reforestation of deforested areas combined with tourism and residential housing development
Region of implementation	Capo Delgado
Key player	Stakeholder M, Stakeholder N
Legal frame work for envisaged project	<p>Forest management</p> <p>Three concession with a total area of 186,000 ha will be brought together under one management scheme:</p> <ol style="list-style-type: none"> Original Pemba Sun concession with about 66,000 ha and approved management plan North of Pemba Sun lies a nameless (?) concession of about 20,000 ha; no approved management plan Former Mozwood concession that Company U took over with about 100,000 ha and approved management plan. <p>The pre-feasibility study carried out by stakeholder M mentions: “The concessions are issued within the context of the law of forest and wildlife, Mozambique. All appears to be in order, though as noted, the paperwork for the second and smaller of the two Pemba Sun concessions has not been fully complete.”</p> <p>The legal structure of the management company to be built up is not yet defined. Most probably it will be a corporation (S.A.).</p> <p>Tourism and residential housing</p> <p>The land for the projects development is available. A Mozambican-registered land development company owned by stakeholder M has acquired legal land title to 13.35 ha of beachfront land. The land lies 0.9 km south of the Maringanha lighthouse along the Pemba East Coast.</p>

Project brief: Forestry and residential housing at Pemba East Coast

<p>Climate resilience justification / impact</p>	<p>Forest management</p> <p>The project aims to conserve native forests by using them in a sustainable manner (sustainable forest management --> forest conservation by sustainable utilization). To a smaller extent deforested and degraded areas will be reforested with a mix of exotic and native tree species.</p> <p>Conserving indigenous forests, wetlands and woodlands are key elements to build climate resilience. So is the establishment of new forests in highly degraded areas. When the project is implemented professionally and sustainably it will have an evident positive impact on climate.</p> <p>Tourism and residential housing</p> <p>The climate resilience impact of this part of the project is not as evident as in the other projects presented. The architectural concept is innovative. Solar power, biogas, and rain capture all are used to reduce environmental impacts to near zero. Botanic garden development and reforestation will mean that the overall carbon footprint of the project will be positive.</p>
<p>Technical description</p>	<p>Forest management</p> <p>The forestry project has the following elements:</p> <ul style="list-style-type: none"> • Sustainable harvesting • Establishment of wood processing and export industry • By products and charcoal production • Reforestation • Carbon trading <p>Tourism and residential housing</p> <p>This project will set a counterpoint to the fun-overloaded touristic offers at Wimbi Beech and to the high pressure high stress oil business. The project consists in:</p> <ul style="list-style-type: none"> • Short and long term high end residential housing (some houses potentially for sale), • high end “chalets”, and • hotel complex.

Project brief: Forestry and residential housing at Pemba East Coast

<p>Social impact</p>	<p>Forest management</p> <p>Positive: Job and income generation for local population</p> <p>Potentially negative: The current concession seems to have some conflicts with neighboring communities and with employees of the management company. According to the pre-feasibility study carried out by stakeholder M both seems not be a big problem. However, further investigation on both issues should be conducted.</p> <p>Tourism and residential housing</p> <p>The concept mentions: “(...) a variety of engagement mechanisms will insure that the local Maringanha Village community will share in the benefits of the project. The project proponents have recently committed to combine all of these diverse design elements and build and be accredited according to “One Planet Living” principles.”</p> <p>The engagement and participation of local communities is not only positive for the social impact and the improvement of local living standard. It is also important to create a stable and secure business environment, what is a key aspect of touristic and residential projects. Therefore it is highly recommended that this point should be developed much more detailed in the business plan.</p>
<p>Economic description</p>	<p>Forest management</p> <p>As part of the pre-feasibility study by stakeholder M, a rudimentary economic analysis of the forestry projects has been performed. It resulted in required investment capital of 4.2 million USD and an IRR of 17 %. [Sensitive information has been removed.] When going ahead with a detailed check of this project, an in-depth review of the economic calculation is one key aspect.</p> <p>Tourism and residential housing</p> <p>No economic analysis available</p>
<p>Certification</p>	<p>Forest management</p> <p>[Sensitive information has been removed.]</p> <p>We highly recommend insisting in FSC certification before an investment in the concession takes place. FSC is not only for marketing but also for communication. Management and sustainable harvesting of natural forests provokes environmentally motivated contrary wind by single persons / groups / organizations. To do a proper job and to certify this by external auditors is the best way to answer unfair criticism.</p> <p>Tourism and residential housing</p> <p>An accreditation according to “One Planet Living” principles is planned. One Planet Living is a jointly owned trademark of BioRegional and WWF International. The standard has 10 principles and focuses on biodiversity and footprint.</p>

Project brief: Forestry and residential housing at Pemba East Coast

<p>Risks and risk mitigation strategies</p>	<p>Forest management</p> <p>The main risk for forest management is market risk (missing market for secondary species) and social risk (fire, illegal logging, clearing of forest land for agricultural purposes)</p> <p>The market risk is mitigated in the first years due to the linkage to a housing project. All secondary species which cannot be sold in the market will be used as construction material.</p> <p>The social risk has to be mitigated by adequate community health and safety programs. This is rudimentary considered in the draft business plan and seems to be feasible.</p> <p>Tourism and residential housing</p> <p>The main risk is market risk due, this means insufficient</p> <p>Because of the gas and oil resources Pemba is a booming city. It is expected that more than 5,000 expats will work and life in Pemba. Additionally the tourist master plan of Mozambique states: “By 2020, Mozambique is Africa’s most vibrant, dynamic and exotic tourism destination, famous for its outstanding beaches and coastal attractions, exciting ecotourism products and intriguing culture, welcoming over 4 million tourists a year.” Pemba is one of the identified tourism destinations. In summary: there will be growing demand on hotels and residential housing. The market risk for tourism and residential housing projects seems to be quite low when counting to the “early movers”.</p>
<p>Potential for scaling up</p>	<p>Forest management</p> <p>The up-scaling and repetition potential is high, hence Mozambique has various millions of hectares of Miombo forests.</p> <p>Tourism and residential housing</p> <p>The objective of Mozambique is to attract more than 4 million tourists per year. If this can be realized, the touristic infrastructure has to be increased significantly in the next years. Still to be confirmed by market studies is the reproducibility of the high-end touristic and residential housing concept.</p>
<p>Best practice potential</p>	<p>Forest management / Tourism and residential housing</p> <p>A social and environmental sound and economic viable project implementation will have a lighthouse effect. Due to the large availability of natural forest resources, and due to the Government efforts to enhance tourism in Mozambique significantly the generation of best practices on sustainable forest management and eco-sound tourism / residential housing should be targeted.</p>
<p>Observations</p>	<p>The project is interesting for the combination forestry and house / building construction. One of the main challenges of sustainable Miombo forest management is the sale of the secondary species. With this combination at least for the first years this “problem timber” can be brought into the value chain. This gives time (and good examples) to develop domestic and international markets for these timber assortments.</p>

4.4.5.3 Niassa Carbon

The Niassa REDD+ Carbon Project presented by companies K and L has been studied in depth as presented in 4.3.

4.4.5.4 Company K

Company K is located in Chiure District, Cabo Delgado Province. The investment is to establish a vertically integrated value-adding agro-energy facility. It includes the establishment of an initial 95 ha of organic sugar cane in an underdeveloped rural area in Mozambique. The area chosen has high agricultural potential with good soils and available water rights, but which has been typically degraded through subsistence and small-scale agriculture (slash and burn) to the point of being unsustainable in terms of agricultural production. There is only a local market for primary agricultural produce, so in order to develop a sustainable investment, the raw product (organic sugar cane) will be processed on site into an exportable organic product, thus not only earning the necessary premium to ensure profitability in an undeveloped and remote area, but also beginning the formation of an agricultural hub around which other businesses involved in the value chain can begin to develop. The sugar phase has already started and it has kick-started agricultural development in the district.

There are six adaptation investment components within Company K. These are:

- Selection of high performing, water efficient sugar cane varieties and implementation of water saving measures,
- Organic production which excludes reliance on fossil and petro-chemical based fertilizers and improves the organic content, structure, fertility and natural resilience of the soil over time,
- Restoration of high value conservation areas around rivers, wetlands and inselbergs which will return vital resilience which nature itself holds.
- Employment of local self-subsistence farmers to work at Company K. This will lead to a transition from subsistence toward a salaried economy for the people living close to the project. Additional income to farm surplus cash has proven to be an important measure of
- Phase 2 ethanol: Efficient use of the full cane plant and waste, using vinasse as a fertilizer and through co-generation of energy using sugar cane bagasse. This will make the plant self-sufficient in energy and diminish soil nutrition costs. Additional remaining plant waste will be used for briquette production.
- Phase 2 ethanol: Development of an outgrowers scheme using Sweet Sorghum. Sweet Sorghum is an alternative/substitute crop to sugar cane when used for ethanol production. The Sorghum takes only 50% of the water compared to sugar cane and is a hardier crop, able to resist climate change better than Sugar Cane. A scheme for Semi-processing of the Sweet Sorghum in to a syrup with a longer shelf-life is under evaluation in collaboration with ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) and with the Mozambique National Agriculture Research Institution IIAM.

The last adaptation components will be developed as separate projects and submitted to donors for grant finance.

The Company K Project is currently applying to financial institutions to obtain a loan of 2.250 million USD to complete the first phase, which includes production of organic raw unrefined sugar. In the second phase, ethanol will require an additional equity partner and loan finance of approximately 7 million USD. In terms of IFC support, Company K would prefer a combination of equity and loan finance.

Assessment: Company AH (one of sponsors of Company K) has provided very good information, has a clear concept and suits to the overall PPCR project goals. UNIQUE is confident, that Company AH will contribute to climate resilience and benefit local communities. We do not see major conflicts in terms of competition between food and fuel, since both aspects are covered by the project (sorghum). See also section “risks” in the project brief. Sorghum is a drought resistance crop and with the introduction of an irrigation system the production of food and crops will enhance climate resilience.

Project brief : Company K	
Company Name	Company K
Contact Person	[Confidential information has been removed.]
Phone, e mail, website	[Confidential information has been removed.]
Main products (currently)	Organic, raw unrefined sugar (factory under construction, sugar test run expected to be done in May 2013). In a second phase the project will produce ethanol from the second grade sugar juice and power using the bagasse from the cane. The first phase financials and technical details are provided in this summary.
Annual Turnover in Mozambique/ total	Zero in 2012, Expected annual turnover from 2015 is + 1.6 million USD per year
Number of employees in Mozambique/ total	25 expected to grow to 95 in 2013/2014
Name of the project/ investment	Company K

Brief description of the climate project/investment	<p>The investment is to establish a vertically integrated value adding agro energy facility near Ocuca in the Cabo Delgado province of Mozambique. The development includes the establishment of an initial 95 ha of organic sugar cane in an underdeveloped rural area in Mozambique. The area chosen has high agricultural potential with good soils and available water rights, but which has been typically degraded through subsistence and small scale agriculture (slash and burn) to the point of being unsustainable in terms of agricultural production. There is only a local market for primary agricultural produce, so in order to develop a sustainable investment, the raw product (organic sugar cane) will be processed on site into an exportable organic product, thus not only earning the necessary premium to ensure profitability in an undeveloped and remote area, but also beginning the formation of an agricultural hub around which other businesses involved in the value chain can begin to develop. The sugar phase has already started and it has kick started agricultural development in the district.</p> <p>The Agro Energy Project will be developed in Phases:</p> <p>Phase 1 includes the establishment of 95 ha irrigated land for organically grown sugar cane with relocation and operation on site of a natural sugar processing plant. Production will be 1 000mt of Organic sugar for exports (80%) and a local factory sales outlet (20%). Preparation of the first commercial area of 30ha is already initiated. The factory is being built at site. Full scale sugar production is planned to start in 2013-2014. Organic certification has been granted for the sugar cane nursery.</p> <p>Phase 2 consists of an expansion of irrigated sugar cane land and the inclusion of sweet sorghum crop land production. It will involve approximately 380 ha of crops to feed a mini ethanol and power co-generation plant processing cane into approximately 3 million liters of ethanol annually for regional blending.</p> <p>Phase 3 consists of outgrowers contracts of up to 60 hectares for sweet sorghum.</p>
Region of implementation	Ocuca locality, Chiure district, Cabo Delgado Province, Mozambique

Key player	<p>The sponsors are operating through a Mozambican registered company - Company K that formally started operations on 1st of March 2012. The sponsors are;</p> <p>Company AG and Company AH</p> <p>Company AG is the project implementation arm of Company AG which has worked with the industrial solution of producing small scale organic sugar over a period of 5 years, and Company AH has since 2006 worked on developing a platform for large scale AgroEnergy production in Mozambique. The Company K project is an expansion of an existing sugar cane and sweet sorghum test plantation in Cabo Delgado Province of Mozambique which was started by Company AH in 2007. Company K is situated in Ocua, Chiure District, by the Lúrio River. The management expertise and work experience of the project sponsors are based firmly in the areas of agricultural and socio-economic development in Mozambique.</p> <p>Company AG, an Agricultural Engineering and Development company, founded in 1996 have offices and operations in 7 Southern and Central African countries. The Directors, Partners and Associates of the Agricane Limited group have many years of experience in Agricultural development, processing and management. Collectively, they have had involvement in both small and large sugar cane operations encompassing commercial and small-holder developments in twelve countries in Africa.</p> <p>Company AH is a Mozambican Project Development daughter company to Company AH which signed a MoU with the governments of Mozambique and Tanzania with the purpose to develop role model agro-energy projects in these two countries. Company AH initiated its activities in Mozambique in 2006 and Company AH was formed in 2007. The sponsors hold cutting edge expertise from global ethanol handling, distribution and production technology, project development in Africa as well as experience from agricultural and socio-economic sustainable agro energy development in Africa. Company AH has hands-on experience from four years of close collaboration with local communities and with test and development of suitable varieties of sugar cane and sweet sorghum at the Company K site in Cabo Delgado. The Company K project has been built from the grass root level, with the local communities embracing the project as a corporate citizen that is part of the community.</p>
Legal frame work for envisaged project	<p>All legal requirements have been completed and licenses and permits have been obtained:</p> <p>Business License</p> <p>Agriculture License</p> <p>Environmental License</p> <p>Water Rights</p> <p>Permanent Land Use title (50 years + 49 years renewal)</p> <p>Construction Permit</p> <p>Industrial License</p>
Climate resilience justification / impact	<p>There are six adaptation investment components within Company K. See above in the description:</p>

Technical description

Raw unrefined natural Sugar differs from crystal sugar mainly in that it contains all the molasses normally centrifuged off in conventional sugar processing. It is also processed at a higher temperature than conventional sugar giving it a unique and strong caramel flavour.

Company K plans to produce a golden to dark tanned sugar which can be pressed into cubes or sold in grain form. The pictures below give a good idea of what the Company K Sugar will look like:



Pictures; Raw, unrefined natural sugar in various forms

The best way to describe Natural Sugar is “that it is to normal refined sugar as whole-wheat bread is to refined wheat bread”, and it is truly distinct from any other sugar produced commercially in Southern Africa. It contains fifty times more minerals and vitamins compared to conventional white sugar.

The processing of the first extract juice and the natural sugar consists of the following elements: The sugar cane enters the factory as whole cane sticks. After having been cut into 5cm pieces (mechanically), the cane is milled, squeezing out the juice and separating the bagasse (biomass). The juice goes through a number of tanks where it is purified and reduced in boilers. At the end of the process, the juice becomes thick syrup and is left to cool and solidify. The solid pieces are then granulated.



Economic description

Projected Income Statement

Company K

2014/01/08		PROJECTED INCOME STATEMENT- NATURAL SUGAR PRODUCTION											
Agricultural Production Parameters		Units	March 2012	Apr 2012- March 2013	Apr 2013- March 2014	Apr 2014- March 2015	Apr 2015- March 2016	Apr 2016- March 2017	Apr 2017- March 2018	Apr 2018- March 2019	Apr 2019 - March 2020	Apr 2020 - March 2021	Apr 2021 - March 2022
Cane Harvested	ha			5	47	95	95	95	95	95	95	95	95
Cane in Production	ha			47	95	95	95	95	95	95	95	95	95
Cane/ha	ton			125	124	120	110	105	104	103	101	100	100
Cane delivered to Mill	ton			625	5 825	11 355	10 359	9 946	9 799	9 669	9 537	9 396	9 374
Cane Cost	\$	3074.85 3538.85		15 374	144 518	292 111	292 111	292 111	292 111	291 726	291 726	290 573	290 573
Factory Production													
Sugar Produced	2012=60% mt	1tsug/9tc		21	384	1 272	1 181	1 154	1 156	1 141	1 125	1 109	1 106
Turnover													
Sugar Revenue	\$/t	1400		28 875	538 230	1 780 464	1 653 257	1 615 170	1 618 754	1 597 257	1 575 533	1 552 240	1 548 564
Total Turnover				28 875	538 230	1 780 464	1 653 257	1 615 170	1 618 754	1 597 257	1 575 533	1 552 240	1 548 564
Cost of Production													
Sugar Production	\$/t	337		6 942	129 405	428 072	397 488	388 331	389 193	384 024	378 801	373 201	372 317
Cost of Cane	\$		117 355	15 374	144 518	292 111	292 111	292 111	292 111	291 726	291 726	290 573	290 573
Total Sugar Production Costs			117 355	22 317	273 923	720 183	689 599	680 442	681 304	675 751	670 528	663 774	662 891
Gross Profit													
Gross Profit – Sugar				21 933	408 825	1 352 392	1 255 768	1 226 838	1 229 561	1 213 232	1 196 732	1 179 039	1 176 247
Total Gross Profit			-117 355	6 558	264 307	1 060 281	963 658	934 728	937 450	921 506	905 005	888 465	885 674
Gross Profit Percentage of Sales				0.00%		59.55%	58.29%	57.87%	57.91%	57.69%	57.44%	57.24%	57.19%
ADD: Grant Funding-PSI		752319.6	505 967	58 000	188 353								
Expenses													
Total Expenses			210 325	623 152	414 577	275 837	275 837	275 837					
Tax (2 % for 3 years, thereafter 6.4%)													
Profit after Taxation			178 287	-558 594	38 082	784 444	687 821	658 891	661 613	645 669	629 168	612 628	609 837
Profit Percentage of Sales					7.08%	44.06%	41.60%	40.79%	40.87%	40.42%	39.93%	39.47%	39.38%

Economic description	<p data-bbox="1205 236 1507 264"><u>Projected Balance Sheet</u></p> <p data-bbox="510 272 994 304">[Sensitive information has been removed.]</p>
----------------------	---

Economic description

Projected Cash Flow

[Sensitive information has been removed.]

Certification	<ul style="list-style-type: none"> • EcoCert Organic Sugar certification obtained, • Pre-assessment RSB approved in 2011, • Fair Trade Certification will be applied for in 2013.
Observations	<p>Win-Win</p> <ul style="list-style-type: none"> • The Company K sugar production provides around 95 permanent jobs. When the distillery is in place this figure will increase substantially. Salaries and benefits are comparatively high with 20% added to the minimum salary at the lowest level - and a meal provided to employees at the site every working day. • Small scale development will create economic inflows without negatively impacting on the social or ecological status of the area. The project has already proven that it is able to open doors and be accelerator to rural development. Company K was the pioneer in the area when it started testing sugar cane and sorghum varieties in Ocua five years ago. Three other sustainable agriculture investments that will produce food and bananas have recently started their investments close to Company K. A close collaboration has been established with these investors. • The ecosystem in the area is being improved. Nature has so far proven to be the best protector of the systems we have on this planet. Spin-off in terms of new business opportunities will likely more than double the number of households that can directly profit from Company K. <p>The issues which are unique to this project and make it particularly strong are:</p> <ul style="list-style-type: none"> • Vertical Integration: Risk control through vertical integration of agricultural production, feed stock supply and factory processing through to wholesalers. The project “stands on its own” and holds the small size and the niche product as strength of its business concept. • Strategic location and growth potential: Sustainable business concept which is strategically placed in an underdeveloped geographical area with adequate land, soil, water, social and environmental conditions. There is ample land, soil, climate and social and environmental opportunity to expand organic sugar production within the current project site, to involve local farmers as outgrowers and to establish scale production in the vicinity. • Revenue stream: Letter of intent for off take of the entire production has been received for the Organic Natural Sugar that will be sold to an established market actor. There are other buyers which have expressed interest to purchase smaller quantities. This would involve packaging at site – and would provide substantially higher revenue. • Waste beneficiation will ensure the processing facility utilizes all of the feedstock to reduce dependency on the power grid and decrease waste products. • Pre-certification Conformation with organic production and fair trade criteria from start of development. • Increase their income and improve their standard of living from Company K.

Risks	<u>Fuel-food land use competition</u> : not perceived as a risk for the area of Ocua where the Company K project is operating. There is plenty of land, and water available for food production in close-by areas that currently are unused as is shown in the attached summary report. Secondly, the Company K concept includes a food product - sugar - alongside that of fuel. Furthermore the project plans to rotate food crops with sugar cane and sweet sorghum. Since the majority of the area occupied by the project was standing unused by the local communities (degraded soils) the food production of the project will be a net increase of provincial production. Finally, reports such as "Rising Global Interest in Farmland Can It Yield Sustainable and Equitable Benefits (Deniniger, Byerlee, Lindsay, Norton, Selod and Stickler (2011) confirm that Mozambique has idle land that can be used sustainably and without compromising food production.
Investment volume needed	The Company K Project is currently applying to financial institutions to obtain a loan of 2.250 million USD to complete the first phase which includes production of organic raw unrefined sugar. In the second phase, ethanol will require an additional equity partner and loan finance of approximately 7 million USD. Company AH would prefer a combination of equity and loan finance.
Potential for scaling up	Up scaling in other areas might be difficult since the investment is quite high. On the other hand, scaling up in the sense of expanding the area could be a viable option.
Best practice potential	This project has a potential to show best practices at national and international level. Ones proven to be economic viable, social fair and ecologically beneficiary, the project can become a showcase.
Observation	In general UNIQUE sees this project as a viable investment option to increase climate resilience and have a positive social and environmental impact.

4.4.5.5 COMPANY E

The COMPANY E project proposal was selected as one of the projects to be studied in depth and is presented in chapter 4.2

4.4.5.6 Company AI EcoFarm Project

During the in depth studies another company was identified, which produces 3,600 ha of organic Eco sugar for baby food. The owner was interested in presenting a project to IFC; however at this stage another agriculture project was not within the priorities.

We present the project idea without having analyzed it further, for possible future considerations.

Scope:

1,250 tons cane per day intake which will produce \pm 140 tons of organic brown sugar. Due to the low rainfall in the area harvesting operations will take place for 270 days per annum resulting in \pm 35,000 – 40,000 tons of organic brown sugar produced per annum. The value at the guaranteed price is US\$ \pm 27 Million

The project will comprise 4,400 ha of irrigated agriculture, 3,600 of this will be organic sugar cane and 800ha irrigated pastures. Of this 1,800 will belong to the local communities and 1,800 to the project. The additional 800 ha of pastures will be established on which cattle and

goats will be reared in semi-intensive conditions. This is essential to supply the manure for compost production.

Access to the Zambezi River for more than 10,000ha of irrigation.

The area is situated in lower Zambezi River valley and can be described as Equatorial Steppe savannah with dry winters. The region is semi-arid with an annual water deficit of 600 – 800mm. Irrigation is essential as the average rainfall is 500 – 600mm from December to March-April. Summers are hot and winters warm, creating excellent conditions for cane-growth.

Approach:

Social – the project is located in a rural area with very low employment. The project will be implemented in an "inclusive" manner whereby the local population own \pm 50% or 1,800 ha of the total of 3,600 ha of organic sugar cane. This will increase the formal employment in the area by at least 500% and improve the disposable income of these communities by \pm 4 Million US\$ per annum, an increase of more than 1000x.

2. **Environmental** – the sugarcane will be produced in a "certified" organic manner that is environmentally friendly. Furthermore "corridors" of natural vegetation will be left and maintained to preserve the bio-diversity of the fauna and flora of the area. EcoFarm will also play an active role in reducing the number of bush-fires that create an environmental disaster in the area annually. It is also the aim to acquire a dedicated area of fauna and flora preservation as "off-set" to the area that is now intensively farmed.

3. **Profit** – because there is an "off-take" agreement that contains pricing protection from an AAA rated off-taker in Hipp GmbH the financial risk is vastly reduced. Furthermore the project IRR's are \pm 20% and minimum DSCR above 2x.

Cost:

The total project cost is estimated at US\$ 92,54 million which would be funded on an anticipated 55:45 debt: equity basis.

Climate resilience:

The EcoFarm project is designed and will be implemented to have maximum climate resilience. This includes but is not limited to:

- full irrigation meaning there is no drought risk ,
- situated outside the Zambezi river flood zone therefore zero flood risk,
- far enough inland to avoid major cyclone risk,
- fully organic meaning our soils are improved over time which ensures long-term yields,
- energy independent meaning that our carbon footprint is positive,
- rurally situated resulting in rural job creation and rural food-security.

More details can be given by the company

Annex

Annex 1: Terms of Reference

Annex 2: References

Annex 1: Terms of Reference

TERMS OF REFERENCE

MOZAMBIQUE PILOT PROGRAM FOR CLIMATE RESILIENCE (PPCR)

Private Sector Investment to Build Climate Resilience in Mozambique:

Woodland and Watershed Management

The IFC Advisory Services in Africa is seeking consulting firms to work on the pre-implementation phase of the “*Private Sector Investment to Build Climate Resilience in Mozambique*” project. This will be implemented through the Pilot Program for Climate Resilience (PPCR) in Mozambique.

A. Background

General overview

The Strategic Climate Fund (SCF) is a multi-donor trust fund within the World Bank’s Climate Investment Funds (CIF) implemented through five Multi-lateral Development Banks (MDBs) including the World Bank Group/IFC. The PPCR is funded by the SCF and focuses on piloting interventions in developing countries for managing risks and building climate resilience. PPCR interventions in Mozambique will be country-led with the ultimate aim of integrating climate change risks into national development planning and investment programs. The PPCR is structured into two phases. Phase 1 supported the preparation of a Strategic Program for Climate Resilience (SPCR). The SPCR aims to integrate climate resilience into national priority development plans, budgets and investments. Phase 2 will focus on the implementation of the SPCR, specifically on programmatic support, investment in priority sectors and support to on-the-ground adaptation activities identified during Phase 1.

The IFC-managed component of the Mozambique SPCR, “Private Sector Investment to Build Climate Resilience in Mozambique” (hereafter referred to as the IFC project) focuses on engaging the private sector and catalyzing private sector investments in climate change adaptation activities. These investments will take place across Mozambique and will focus primarily on agribusiness including forestry and tourism.

The IFC project

Mozambique is located in south eastern Africa, with a coastline of ~2700 km from south to north. It is one of the poorest countries in the world, with more than 50% of its population living below the poverty line. It is also very susceptible to natural disasters (e.g. floods and

droughts), with 68 such disasters, affecting ~28 million people and resulting in ~100000 deaths, occurring over the last five decades. It is estimated that flooding and droughts in Mozambique annually cost the country on average USD ~80 million and USD ~15 million, respectively²⁴. Climate change is expected to increase the frequency of floods, droughts, cyclones and storm surges, and by 2030, the annual cost of such disasters is expected to exceed USD 3 billion²⁵. Associated negative impacts of climate change will include a greater frequency of famine, greater rates of topsoil loss, reduced agricultural productivity, an increase in disease epidemics and a reduction in potable drinking water.

The objective of the IFC project is to build climate resilience by catalyzing private sector investments in the agribusiness sector and providing technical support to relevant private sector players. Adaptation to climate change is a relatively new area for the private sector globally and more specifically in Mozambique. The focus of private sector interventions for building climate resilience will be to reduce the negative impacts of climate change (i.e. mitigate risks) and capitalize on new commercial opportunities. The investments within the IFC project will, in particular, aim to diversify and enhance income streams and agricultural productivity for vulnerable communities in the face of climate change impacts.

The IFC project comprises the following two parts:

1. Support to adaptation investments through financial intermediaries.
2. Natural resource management to build climate resilience.

The present study pertains to part 2 above. Managing natural systems to buffer communities against damages from extreme climate events is increasingly seen as a highly cost effective way of adapting to climate change. There are several ways to manage natural resources to build climate resilience. Firstly, vegetation cover in both agricultural and natural landscapes can be managed to protect the soil surface from intense and damaging raindrop impact, thereby reducing soil erosion in the face of extreme rainfall events. Increasing natural vegetation cover also increases infiltration of water into soil profiles, thereby reducing surface flooding during extreme rainfall events and increasing base flows of rivers (i.e. during the dry season and during droughts). Secondly, vegetation can be managed to reduce fire risks given expected increases in temperature and longer dry seasons. Such risks, namely a greater frequency of intense fires in natural forests, are predicted to increase in Mozambique and need to be managed in order to secure ecosystem goods and services and to prevent physical damage to infrastructure and communities. And thirdly, natural resources such as natural woodlands and forests can be managed to maximise yields of food, medicine, fibre, timber, carbon credits and other products for local communities. Such goods can be used to diversify livelihoods, increase income flows and thereby provide economic buffers for communities during droughts and floods.

The IFC has identified three investment options in natural resource management within part 2 that will build climate resilience. These include: a) woodland management and agriculture in and adjacent to Niassa Reserve; b) sustainable timber harvesting of miombo woodlands in

²⁴ World Bank. 2005. MEMORANDUM - The Role of Water in the Mozambique Economy - Identifying Vulnerability and Constraints to Growth.

²⁵ Ibid.

central Mozambique; and c) watershed management and tourism in Gorongosa National Park. Income from these investment options would be primarily in the form of carbon credits, timber and agricultural produce, respectively. These are summarized below.

Investment 1: Carbon in Niassa Reserve. Several adaptation interventions in natural resource management and agricultural practices need to be investigated to develop new income streams and to ensure the rate of natural resource extraction from the miombo woodlands and adjacent to Niassa Reserve is sustainable in the face of climate change. The interventions will focus on innovative management of the miombo woodlands and changes in agricultural practices to diversify livelihood options, increase income streams, increase agricultural productivity, reduce environmental degradation and build climate resilience. The primary income stream is likely to be from carbon credits through changed fire management practices.

Investment 2: Timber in miombo woodlands in Central Mozambique. By investing in the maintenance of miombo woodlands in central Mozambique and harvesting timber in a sustainable manner, the resilience of local communities to climate change will be increased by creating jobs, conserving topsoil, increasing the tourism potential of the region and maintaining watersheds. The primary income stream in this investment is likely to be from the sale of miombo hardwoods. Restoration of degraded woodlands could also be a component of the investment that generates income via carbon trading.

Investment 3: Agriculture in Gorongosa. Private sector investments in watershed management (of the Mount Gorongosa watershed, in particular) and tourism in Gorongosa National Park will provide adaptation benefits for local communities in that water supplies will be maintained, the agricultural potential of the area could increase, the tourism potential of the area will increase, jobs will be created, topsoil will be conserved and availability of commercial non-timber forest products will increase. The primary income stream in this investment is likely to be agricultural produce, with income from carbon credits as a supplemental stream.

As a result of the innovative nature of private sector investment in natural resource management and agriculture, consultants are required to conduct a feasibility study in the pre-implementation phase of the IFC project to assess the viability of the above-described investments and to identify additional investment opportunities in this sector.

All investment opportunities identified by the consultants need to qualify as adaptation interventions defined by the World Bank as:

- reducing the risk, exposure or sensitivity of human or natural systems to climate change and climate variability;
- increasing the potential or capability of a system to adapt to the effects and impacts of climate stimuli;
- building problem solving capacity to develop responses to climate variability and change;
- incorporating climate hazard risk information into decision-making; or
- addressing impacts exclusively linked to climate variability and change.

Additionally, identified and proposed adaptations need to be discussed according to whether there will be incremental or transformational adaptations²⁶.

It should be noted that another Terms of Reference (ToR) covering part 1 will be advertised simultaneously with this ToR. There are strong linkages between both ToRs. As a result, it is preferable that a single firm undertakes both studies. Consultants or firms are encouraged to submit single overarching proposals that encompass both ToRs, as opposed to separate proposals for each ToR.

B. Scope of Work:

The consultant or firm will carry out the tasks listed under the three investments below. The primary objectives of the work will be to determine the **commercial viability** of the proposed investments and identify **additional potential investment opportunities** in similar natural resource sectors in Mozambique. For all investment opportunities analyzed, the following will be required:

Commercial viability. Provide a detailed assessment of the commercial viability of investing in the identified adaptation activities. This should include projected cash flows, internal rates of return, barriers and risks for each activity.

Investors. Identify potential private sector players and ascertain their willingness/readiness to invest in the proposed activities. Describe why the identified private sector players were selected. Importantly, determine the information needs of each private sector player and address those needs through the focus of the market assessment work described in this TOR.

Public-private partnerships. Assess the potential role of public-private partnerships (PPP).

Investment description. Enumerate and summarize the potential investment opportunity for the IFC. The summary should include *inter alia*:

- the economics of the investments (i.e. a revenue model including capital required, payback period, internal rate of return and incremental costs over the length of the investment);
- operating requirements;
- the area/location of the proposed agricultural/reforestation/harvesting activities, and the predicted harvesting/growth rates;
- specific costs and returns involved with each individual activity;
- market, financial and technical risks involved;
- financial gap projections (if any); and
- consideration of the replicability of these investments and approaches across Mozambique.

²⁶ Kates, R.W; Travis, W.R and Wilbanks, T.J. 2012. Transformational adaptation when incremental adaptations to climate change are insufficient. *PNAS* 109 (19): 7156-7161.

INVESTMENT 1: CARBON IN NIASSA RESERVE

Practicality and cost. Determine the practicality and cost of changing fire management practices in and adjacent to Niassa Reserve to considerably reduce fire frequency and intensity in the face of climate change.

Carbon sequestration potential. Provide a detailed technical analysis of the carbon sequestration potential in and adjacent to Niassa Reserve, with a focus on fire management activities, reduced slash and burn agriculture and conservation agriculture to increase soil carbon stocks. The technical analysis should use prior work conducted in 2012 on this topic as the starting platform. IFC will make this prior work available to the consultants.

Potential returns. Undertake a sensitivity analysis of potential returns from carbon sequestration occurring as a result of changes in fire management. The analysis should be based on variables such as the price of carbon and the likely rate of carbon sequestration.

Risks. Undertake a detailed technical assessment of the risks of a carbon sequestration investment in and adjacent to Niassa Reserve that is underpinned by changes in both fire management and agricultural practices. The assessment should include an in-depth analysis of leakage risks, additionality, likely changes in soil carbon stocks and carbon market volatility.

Forest products. Undertake in-depth market research on non-timber forest products (NTFPs) (e.g. fruit, nuts, fibre, medicines, honey) and the commercial viability of developing such markets to diversify income streams for local communities in the face of climate change.

Viable alternative livelihoods. Identify appropriate, viable, alternative livelihood activities based on sustainable use of natural resources, including reforestation, agro-forestry, tourism, bee-keeping and carpentry. Assess the commercial viability of these alternatives under a changing climate.

All of the above tasks should build upon and greatly expand upon the detailed studies conducted in and adjacent to Niassa Reserve during 2012 on community livelihoods and fire management.

INVESTMENT 2: TIMBER IN MIOMBO WOODLANDS.

Climate change effects. Determine the likely effects of climate change on the miombo forestry sector and on the local communities living within and adjacent to forestry concessions. This should include an analysis of the effects of climate change on appropriate harvesting rates and the impact of these effects on the commercial viability of the industry.

Tropical hardwood market. Describe the current Mozambican tropical hardwood markets. This should include a review of market information (commodity prices, supply and demand), market trends, customers, competitors, products and marketing effectiveness.

Financing for sustainable harvesting. Identify innovative financing and market mechanisms for developing commercially viable sustainable harvesting operations in miombo woodlands in Mozambique given expected climate change impacts. These mechanisms should include an assessment of *inter alia* water quality trading, carbon credit trading, mitigation markets, over-the-counter retail markets, fee-based hunting, eco-labelling and PES schemes.

Review of existing best practice operations in miombo woodlands in Africa. Describe the *modus operandi* of at least five successful sustainable timber harvesting projects in miombo woodlands in Africa. This should include details, where available, of the rate of extraction, the profitability and size of the operations, the tree species used, the method of replanting (if any) and the adaptation benefits for local communities. It should also include lessons learned, and barriers experienced by the private sector.

Adaptation activities. Identify commercially viable adaptation activities to build climate resilience in the miombo forestry sector which also provide adaptation benefits to local communities living in and adjacent to forestry concessions in central Mozambique. Activities to be considered include *inter alia* replanting of specific drought-resilient tree species, improved cookstove operations (in conjunction with tree planting and improved agricultural techniques, as well as fuel substitutes which reduce unsustainable tree harvesting practices in the region); undertaking harvesting in a strictly sustainable manner (given expected climate change), developing local industries based on the harvesting operations, restoring degraded landscapes using commercially valuable tree species, generating carbon credits, and improving agricultural productivity of local communities to reduce encroachment into the woodlands.

INVESTMENT 3. AGRICULTURE IN GORONGOSA

Biophysical and socio-economic data for Mount Gorongosa watershed. Provide a detailed description/map of land use and population density in and adjacent to the Mount Gorongosa watershed. The following should be highlighted:

- areas important for the effective functioning of the watershed e.g. wetlands;
- activities impacting on the effective functioning of the watershed e.g. deforestation; and
- areas suitable for creating agricultural buffer zones between the national park and the local communities.

Climate change effects. Assess the risks posed by climate change to the Mount Gorongosa watershed and the local communities living in and adjacent to the watershed. This should include an assessment of current livelihood activities, and the likely impacts of climate change on the income streams associated with these activities.

Adaptation activities. Identify adaptation activities that will maintain the watershed functioning of Mount Gorongosa in the face of climate change and build resilience in local communities. Identify and assess the viability of alternative revenue streams (e.g. payment for ecosystem services and/or carbon credit generation) that might be tapped in conjunction with the conservation/restoration of the forest and associated watershed. Examine in particular the practicality and commercial viability of developing a belt of commercial agriculture around Mount Gorongosa to act as a barrier to entry to the national park and as an alternative livelihood for people engaged in deforestation activities.

Tourism and adaptation. Identify the potential climate change impacts on private sector tourism operators in Gorongosa National Park and identify appropriate adaptation activities to build the climate resilience of the above tourism operators.

Watershed, hydro-power and adaptation. Assess the willingness/readiness of private sector hydro-power operators in other regions of Mozambique to invest in adaptation interventions in water catchments (e.g. improved management and restoration) that will increase water flow and water quality thereby building resilience to climate change impacts.

Commercial viability specifics. Aspects to consider in these watershed investments would include *inter alia*:

- the economics of generating carbon credits (i.e. VERs from VCS and CCBA validation/verification) from reforestation activities, taking leakage, additionality, expected growth rates of indigenous trees, expected carbon prices, potential buyers of VERs, costs of validation and costs of implementation into account;
- risks associated with carbon credit income (e.g. market volatility, disease of trees, logging of trees);
- the biophysical and socio-economic feasibility of farming commercial crops (e.g. tea, coffee, macadamia nuts) within a buffer zone;
- the extent to which local authorities will support an agricultural buffer zone project; and
- the willingness/readiness of the targeted individuals to work in the commercial agriculture operations.

C. Deliverables/Specific Outputs Expected from Consultant

This assignment will have an approximate duration of 16 weeks (80 working days) in total.

The following specific deliverables will be provided by the consulting firm:

1. A detailed work plan of activities to be undertaken during this assignment with a description of intended target groups, methodologies and budgets. It is anticipated that the initial step in the workplan will be the identification of potential project developers and discussions with them to inform the focus of the market assessments in each sector identified by this TOR. This will be provided 5 days after the start of the assignment.

2. A set of Powerpoint slides (and accompanying report) on the findings and recommendations of the analysis undertaken as described in the scope of the work above. The set of slides will be used to present proposals to the identified private sector investors.
3. A report should be submitted to IFC according to the following schedule:
 - Interim report: 8 weeks after the start of the assignment.
 - Draft final report: 14 weeks after the start of the assignment.
 - In addition, the consultant or firm will prepare PowerPoint presentations summarizing key findings of the feasibility study to be presented during a stakeholder validation workshop in Mozambique.
 - Final report: two weeks after receiving feedback on the draft report from the IFC.
 - The final report should be submitted in Portuguese and English.

During the assignment, weekly progress updates will be provided in the form of e-mails including details on the progress since the last update, proposed steps forward and any other relevant aspects. This will be discussed, if required, through conference calls.

The consultant or firm will liaise with the Mozambique government's PPCR focal point during field missions to Mozambique.

D. Special Terms & Conditions/Specific Criteria

Consulting firms with extensive experience in climate change adaptation and private sector development are required for this assignment. The selection of candidates will be based on the criteria below.

1. Relevant qualifications and experience. The consultant or firm should have:
 - relevant academic qualifications in the following fields: actuarial science, economics, finance, forestry or related field.
 - a minimum of 10 years combined experience in private sector development or in developing strategies that engage private sector business and their financing to achieve public sector objectives.
2. Experience in the design and assessment of agribusiness projects, including woodland management, carbon sequestration and alternative livelihood interventions is of particular importance.
3. Strong numerical and analytical skills with an understanding of financial/portfolio indicators, budgeting and financial projections.
4. Fluency in English and Portuguese with excellent oral and written communication skills and the ability to communicate ideas and complex concepts clearly and confidently.
5. Excellent project planning skills.
6. Working experience in Africa and/or developing countries; work experience in Mozambique will be a distinct advantage.
7. Availability to conduct this assignment as soon as possible.

Proposals should provide estimated logistical expenses including travelling costs. A continuous or regular presence of at least one consultant in Mozambique is recommended.

Annex 2: References

References

Arthur D Little. 2012. Responding to climate change in Mozambique: Theme 4B: Building resilience with the private sector. Maputo: INGC.

Cammaer, R., Branks, M. & Vaz, K. 2012. Respondendo as mudanças climáticas em Moçambique: Tema 4A: Moçambique: Construir resiliência com o sector privado. Maputo: INGC.

Dell, Melissa, Benjamin F. Jones, and Benjamin A. Olken. 2012. "Temperature Shocks and Economic Growth: Evidence from the Last Half Century." *American Economic Journal: Macroeconomics*, 4(3): 66-95.

Guariguata, M.R., Cornelius, J.P., Locatelli, B., Forner, C. and Sánchez- Azofeifa, G.A. 2008 Mitigation needs adaptation: tropical forestry and climate change. *Mitigation and Adaptation Strategies for Global Change* 13: 793–808.

INGC. 2009. Main report: INGC Climate Change Report: Study on the impact of climate change on disaster risk in Mozambique. [Asante, K., Brito, R., Brundrit, G., Epstein, P., Fernandes, A., Marques, M.R., Mavume, A , Metzger, M., Patt, A., Queface, A., Sanchez del Valle, R., Tadross, M., Brito, R. (eds.)]. INGC, Mozambique.

IPCC. 2007a. Working Group II: Impacts, Adaptation and Vulnerability (http://www.ipcc.ch/publications_and_data/ar4/wg2/en/, accessed 21 March 2013).

IPCC. 2007b. Working Group I: The Physical Science Basis (http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch11s11-2-3-3.html, accessed 21 March 2013).

Locatelli, B., Kanninen, M., Brockhaus, M., Colfer, C.J.P., Murdiyarso, D. and Santoso, H. 2008. Facing an uncertain future: How forests and people can adapt to climate change. *Forest Perspectives* 5. CIFOR, Bogor, Indonesia.

McSweeney C., New M., Lizcano G. undated. UNDP Climate Change Country Profile: Mozambique. (http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Mozambique/Mozambique.lowres.report.pdf, accessed 21 March 2013).

MICOA (Ministry for the Coordination of Environmental Affairs). 2007. Mozambique - National Adaptation Program of Action (<http://unfccc.int/resource/docs/napa/moz01.pdf>, accessed 21 March 2013).

SIWI report 31, 2012: Feeding a thirsty world. Challenges and Opportunities for a water and food secure future.

(http://www.sivi.org/documents/Resources/Reports/Feeding_a_thirsty_world_2012worldwaterweek_report_31.pdf), accessed 28.03.2013

Van Logchem B., Queface A.J. 2012, *Responding to Climate Change in Mozambique: Synthesis Report*. Maputo. INGC.

World Bank 2010. Cotton Supply Chain Rapid Risk Assessment

World Bank 2013. (<http://sdwebx.worldbank.org/climateportal/>, accessed 21 March 2013).

