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Emerging Markets Forum

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Climate Change: Opportunities For Private Sector

Kevin Leo -Smith

Discussion Draft

Part of the EMF Series of Papers on Trade and Investments, Infrastructure,
Climate Change and Potential Business Opportunities for Africa

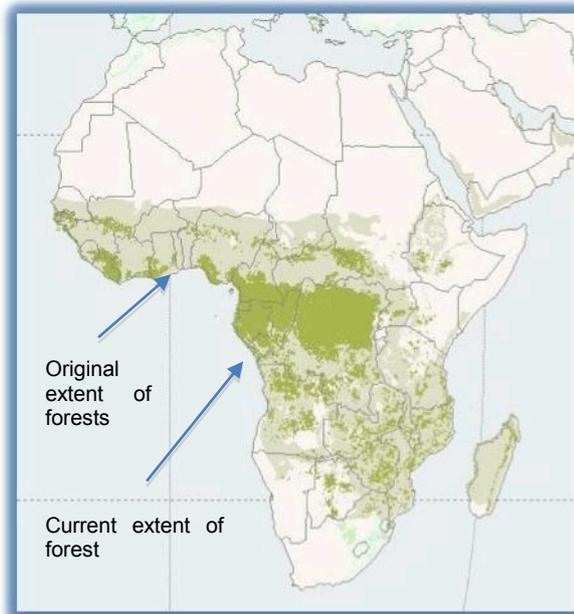
**AFRICA EMERGING MARKETS
FORUM 2008**

Executive Summary

Africa is a massive continent with vast natural resources, many of which are under increasing threat. In a climate change context, a forest is not the conventional gallery forests¹ that many people have in mind, but includes the famous African savannah's and bush scrub. Africa used to have a greater forest cover than South America but much of this cover has been lost to deforestation and human settlement especially in West Africa and Madagascar – see Map.

Climate change will lead to increased threats to these remaining forest resources. The need for climate change mitigation at an affordable price inevitably will lead to forests being required for large scale sequestration² and avoided emission³ projects in Africa. These projects will have to take place in mainly poor remote rural areas where underutilized or under valued land is available.

The consequences of such projects will be to change communities from resource dependency to a cash dependency and thereby enabling the protection or establishment of these projects, as the carbon credits generated by these activities will result in the communities receiving income, work and development for extended periods of time.



- Africa has large areas of land suitable for reforestation and afforestation.
- Africa has significant potential for avoided deforestation (reduced emissions from avoided deforestation and degradation REDD) projects.
- Many land locked countries in Africa cannot afford to refine crude oil into petroleum products and have to import expensive refined fuels and transport the fuel long distances. This situation makes selected biofuel projects in the hinterland viable at current oil prices.
- Africa is a tourism “hotspot” and is currently only exploiting a very small part of this potential. Climate change will facilitate the financing of the conservation efforts required to protect many forests from further degradation or deforestation and simultaneously enhance their tourism potential.

The governments in Africa can partner with creative private sector companies to develop these potentials up to landscape scales in most countries. In order to generate a carbon credit several factors are relevant:

- Increased sequestration needs to be shown or
- Reduced emissions need to be demonstrated.
- The carbon rights need to be capable of separate legal protection/registration.

¹ Gallery forests are tall closed canopy forests like the Amazon.

² Forests remove CO₂ from the air during photosynthesis and convert this into wood thereby “sequestering” the CO₂ from the air and lowering the CO₂ concentration of the atmosphere.

³ When forests are cut down or burned they release CO₂ into the atmosphere – adopting actions that reduce this are referred to as avoided emissions, avoided deforestation or reduced emissions from avoided deforestation and degradation (REDD).

- The land ownership rights need to be clearly provable in law.
- The land ownership needs to be undisputed.
- Company law needs to allow for a sophisticated shareholders agreement between the land owners/users and the project developers.
- In the case of community ownership of land a legal mechanism needs to exist for the cash flow to and to ensure that it is invested into the community equitably.
- Perverse incentives need to be minimized to support the survival of the existing forests. (e.g. agricultural subsidies that result in deforestation)
- Corruption needs to be minimal.

Most of the above points are under the control of government. It is not required for the carbon project to own land, it is required that the ownership of the land is not in dispute. The project developer then contracts with the land owners who retain equity (normally a majority) in the project through their land ownership. There are circumstances where a carbon project can resolve disputed land by facilitating the co-operation of parties in dispute in order to benefit from the carbon income.

Focal points:

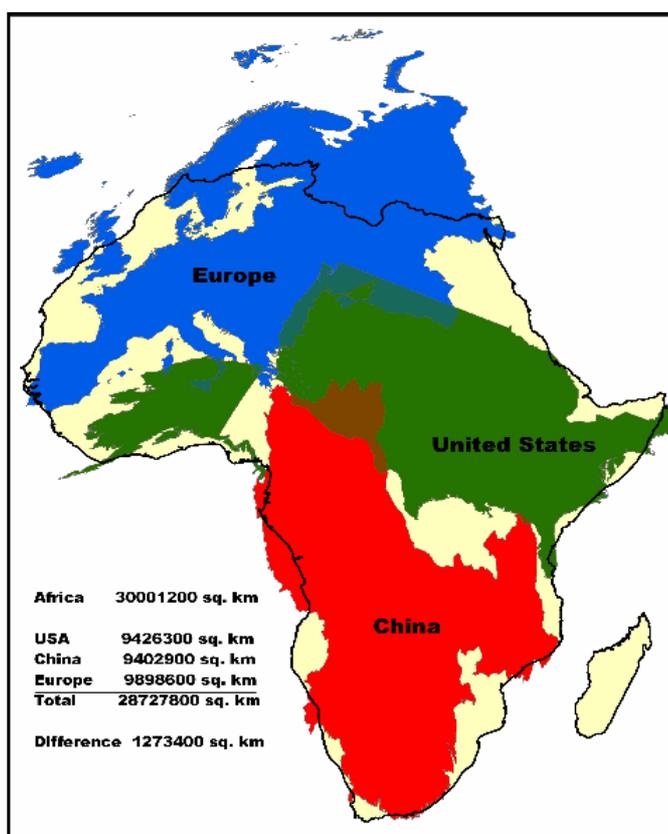
1. Land ownership in Africa?
2. Joint venture or other legal structures for project ownership?
3. Who advises the community?
4. Who gives/gets what?

2. Background

The paper is focussed on natural resource based climate change opportunities, which is the area of my main expertise. There are many other areas of opportunity in Africa that are a result of climate change mitigation plans but hopefully other papers will deal with these.

Africa is a massive continent – you can fit in the whole of the USA, China and Europe and still have South Africa left over which itself is as big as Germany, France and Holland combined. In fact 1/5th of the habitable land on earth is in Africa.

While the climatic conditions vary considerably in Africa the continent still has a relatively low population density and still has a relatively high forest cover in the inter-tropical zones.



In order to set the tone for the rest of the paper some relevant facts may be instructive - many of the facts I list are not often obvious to people not directly involved in the climate change mitigation debate.

Background factoids (specifics numbers vary from source to source):

- 17-20% of annual global emissions are from land use change – mainly deforestation – much more than air transport (3-4%) which seems to be the public whipping boy currently.
- The soil stores 3 times more carbon than forests.
- Deforestation releases massive amounts of soil carbon too.
- In many African countries **natural** forests provide up to 93% of the countries power and energy requirements through firewood and charcoal.
- Africa lost 20 million hectares of forests in the 1990's – equivalent to the area of Senegal or Uganda. This does not include savannah's cleared.
- The vast majority of Africa's population, urban or rural, are dependent on wood based energy.
- 40% of Africa has enough rainfall to sustain forests and woodland.

Africa has large areas of land suitable for reforestation, afforestation and avoided deforestation or REDD projects.

Many land locked countries in Africa cannot afford to refine crude oil into petroleum products and have to import expensive refined fuels and transport the fuel long distances to and within the countries. This situation makes certain biofuel projects in the hinterland viable at current oil prices.

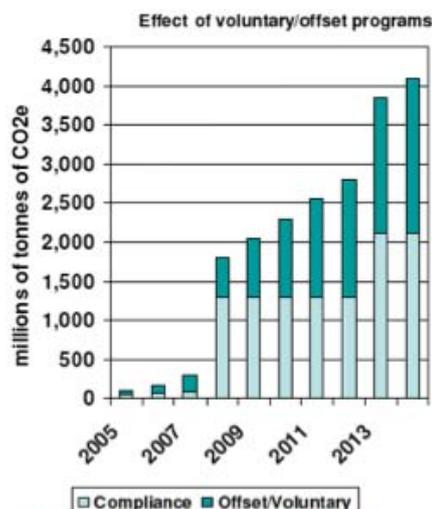
Africa is a tourism "hotspot" and is only exploiting a very small part of this potential. The prudent use of the financial opportunities that climate change mitigation offers will enable the enhancement of ecotourism opportunities in many areas of Africa while simultaneously improving livelihoods and conserving biodiversity.

The balance of the paper will expand on these opportunities for private sector involvement in climate change mitigation and natural resource management in Africa. However, there are many areas in Africa that have very low rainfalls that do not have much or any potential in this regard. Climate change mitigation is essentially a wholesale business and therefore by implication is most efficient when done on a large scale where carbon stocks are high or potentially high.

The development of carbon markets globally will drive the involvement of the private sector. It is our contention that the development of other environmental rights markets (ecosystem services) will follow soon after the formalisation of the carbon markets.

3. Carbon Markets

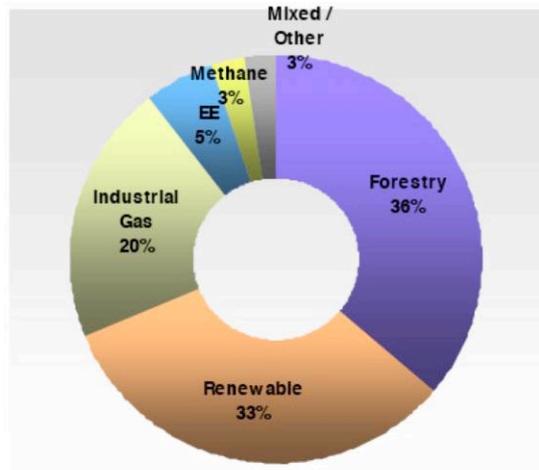
Carbon markets can be broadly divided into 2 categories – compliance markets, like those associated with the Kyoto Protocol and the voluntary markets. With respect to forestry in Africa in particular, the compliance markets, for all practical purposes do not exist. The European Emissions Trading scheme (EU ETS), the largest of the compliance markets, does not even recognise forestry. The rules and decision making processes within the Kyoto markets are so convoluted that so far only one small forestry project in China has been



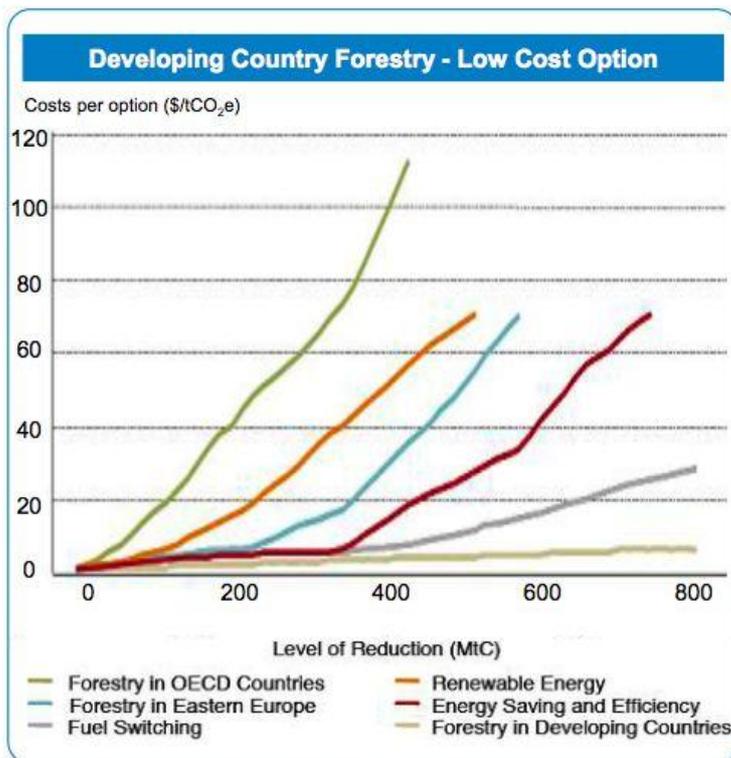
The Non-compliance markets have the potential to be larger than the Compliance markets over the medium term

approved to date. Given that Kyoto expires in 2012 and that a new order is still under active negotiation, any forestry project under development will not be approved and implementable by 2012.

This means that businesses will have to take a view on the development of the carbon markets and base their business plans on more rapid development within the voluntary markets. However this does raise the risk of undertaking climate change mitigation projects in Africa, as the ability to sell the credits generated is not assured. The developments at the Bali COP in December 2007 has had a significant impact on the approach in the various voluntary markets, especially as it relates to reduced emissions from REDD. It is clear from the chart that forestry is important component of the voluntary markets even if the compliance markets do not currently recognise forestry credits.



Climate change mitigation without REDD will cost the world economies much more than anticipated as unless REDD is dealt with as part of the problem, CO₂ concentrations will rise more rapidly leading to much more expensive mitigation measures being required.



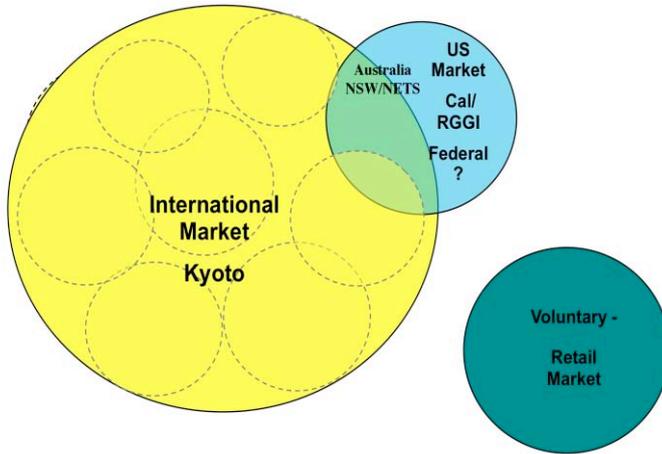
Source: Intergovernmental Panel on Climate Change

REDD is one of the cheapest tools currently available to reduce CO₂ emissions. A study done by McKinsey suggests, that at carbon prices of not more than €40/ton, forestry (which includes REDD) will have to account for 25% of the abatement required to keep temperature rises at 2°C or less by 2030⁴. The study further suggest that deforestation in Africa will need to be reduced by 50% over current rates to achieve this temperature target.

Therefore the in principal acceptance in Bali that REDD will form part of the post Kyoto regime has given the voluntary markets new direction. The post Kyoto rules for REDD will only become

clear in December 2009. The convergence of the carbon markets is being driven by the greater consensus emerging in the compliance markets – see diagram below.

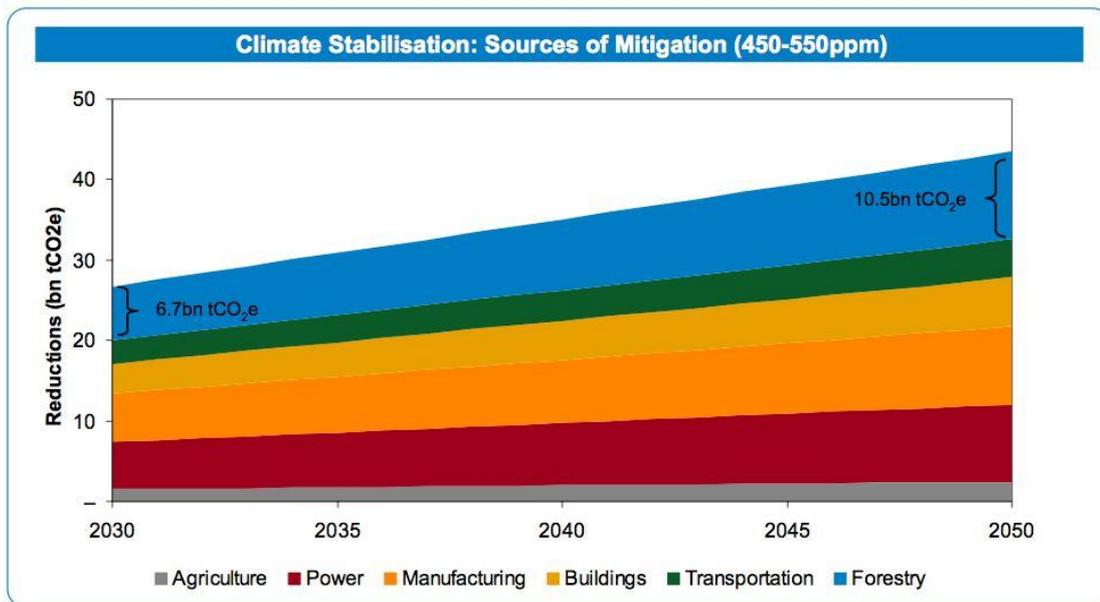
⁴ A Cost curve for green house gas reduction – McKinsey 2006



Source: Cantor Fitzgerald in association with Price Waterhouse Coopers

The real problem for Africa therefore is not the potential for suitable forestry projects but the problems associated with finding a viable markets for the credits being generated by the projects. This requires private sector companies with an appetite for risk combined with creativity in developing a market for the credits. Companies will also need to ensure that the credits will

meet the required standards for these markets. Many voluntary offset projects to date have failed under the intense scrutiny that is often applied to these projects especially in the holiday travel offset business.



Sources: McKinsey & Co. - A Cost Curve for Greenhouse Gas Reduction 2007, Intergovernmental Panel on Climate Change 2007

4. Forestry

For the purposes of this paper “forestry” is defined to cover reforestation, afforestation, conservation forestry and REDD projects. However in this section each division will be considered separately.

4.1 Plantation Forestry

Africa has significant potential for plantation forestry in many countries. The requirements for plantations include high rainfall, warm weather, good soils and moderate slopes. Many of the highland and coastal areas of Africa meet these requirements. Some areas are not suitable due to high population densities, as this form of forestry also requires large blocks of land to make management efficient.



The productivity of these plantations in Africa exceeds the northern hemisphere plantations by a significant margin. An example would be the use of pine species for the production of saw logs for the construction industry. In Africa these plantations reach harvesting age in 25-30 years whereas in Europe these plantations take up to 50 years.

The production of pulp and wood chips in Africa can also be very efficient and profitable with growth cycles of 10 years or less leading to quicker cash flows and more jobs from these plantations due to the faster harvesting cycles.

The demand for industrial roundwood for the global construction industry is forecasted to increase from the current 1.57 billion m³ to 2.63 billion m³ in 2030. Global timber supply will grow at a much lower rate resulting in a tighter supply/demand balance in many regions of the world⁵.

The supply of timber is being and will increasingly be augmented by illegal harvesting of natural forests in Africa, Asia and South America and by limited plantation development in the developing world. The competition for natural forest timber in Africa has increased dramatically with rising roundwood prices.

The large scale entry of both India and China into roundwood harvesting in Africa in the past 15 years has led to significant over exploitation of many old growth forests. Therefore the expansion of plantation forestry, in Africa, into degraded former gallery forest areas and into other areas suited to plantations will be required to meet global demand and to reduce the devastation of current gallery forests through unsustainable illegal logging.

Plantation forestry often results in the net sequestration of CO₂ while the unsustainable harvesting of old growth forests always results in CO₂ emissions, aggravating the climate change problem. Furthermore plantation forestry results in more jobs, more fixed investment and downstream factories to process the



⁵ Global timber supply and demand to 2030 dictates profound changes - Canadian Forest Industries, Apr/May 1999

roundwood produced. Exporting selected large trees from gallery forests as round timber does not benefit the source country much, if at all.

4.2 Conservation Forestry

Conservation forestry is the managing of forests in a sustainable way that results in their biodiversity being conserved.

4.2.1 Avoided Deforestation (REDD)

The application of REDD interventions that result in the slowing or the elimination of deforestation and degradation activities may result in the generation of carbon credits. The test applied is that the presence of a project will result in the greater retention of carbon in the forest than would be the case without the project.

For REDD projects to be successful they need to be able to generate substantial income for the dependent communities that form the basis of the threat to the forests. The business concept is to establish a joint venture structure with the land owners/users in such a way that secure rights to the carbon sequestered can be recognised. Baseline carbon stocks have to be ascertained by independent parties and periodic assessments are done to verify that the carbon is still stored in the forest, over the life of the project. As these certificates are issued they can then be sold and the cash generated disbursed to the joint venture shareholders in an agreed manner. Generally speaking the community share should be invested into an annuity fund and only the income from this fund disbursed to the community management structure. This results in a permanent income source for these communities even when the flow of credits ceases in 30-50 years.

In many instances REDD forms part of entire rural development projects that involves conservation forestry including sustainable harvesting, REDD, biodiversity conservation, alternative energy projects and ecotourism. This will be expanded up in section 0 later. In general poor local people only chop down trees for survival not out of choice as it is a high energy and unpleasant task.



4.2.2 Sustainable Harvesting

Sustainable harvesting of natural forests generally takes the form of concessions granted over extensive areas of natural forests under long term agreements. These businesses generally strive to achieve Forestry Stewardship Council

(FSC) certification of their timber output. In theory the expense and effort of achieving FSC certification should result in higher prices for the timber. This has not always been the case but rising awareness among the main timber consuming countries should lead to the recognition of sustainably harvested natural timber enabling it to attract a premium price.



The benefits for the countries are long term employment, rising values of the forest estate versus declining values under short term aggressive logging regimes, as well as the potential for earning carbon credits. The proving of the value proposition for carbon credits under this management system is more complex. Large tracts of old growth

forests and even Miombo woodlands could conceivably fall under such long term sustainable harvest regimes. These management regimes are also supportive of eco-tourism activities in the concession areas.

4.3 Agro-Forestry

Agro-forestry includes a wide range of forestry and agricultural crops but generally nurse trees are planted to provide a food product between rows of staple food crops like maize, cassava, sorghum and potatoes. One of the better definitions is - Agroforestry combines agriculture and forestry technologies to create more integrated, diverse, productive, profitable, healthy and sustainable land-use systems. -National Agroforestry Center (NAC).

However, in some systems leguminous trees are planted to provide nitrogen as a fertiliser for the row crops as well as shade and erosion protection. Examples of this form of forestry include shade coffee farming, nut trees and fruit trees. Generally the sequestration of carbon from this system is relatively low and therefore the business case is often less than ideal. However agro-forestry can form part of the project mix but seldom will it drive the climate change opportunity on its own.

5. Alternative energy

The focus globally on alternative and green sources of energy is being driven by the high price of oil and the ability to generate credits for substitution of low carbon emission power generation in replacement of high emissions power generation. The rising cost of normal petroleum fuels and the rising climate cost of cheap electricity from coal means that Africa stands to benefit from the fast reducing costs, both capital and operating, for alternative energy sources. The rapid improvement in efficiency of solar energy systems coupled with the large amount of sunshine in Africa will lead to wider deployment of solar based power systems with the extra advantages of solar being able to be implemented both on and off grid and in small and large scale deployments.

There is substantial potential for hydro-electric, nuclear and biomass power generation in Africa. The Congo River alone can generate enough hydro power to supply all of Africa's current needs on its own. However, the use of alternative energy is not my field of

expertise. It is clear that Africa stands to benefit greatly from new research and systems in the short to medium term. All these developments will be climate positive.

5.1 Bio-fuels

Bio-fuels are either diesel or alcohol based fuels that can be used directly in conventional internal combustion engines in direct replacement of all or part of mineral oil based fuels. Essentially, there are two main types of biofuel sources – row crops and horticultural crops.

5.1.1 Agricultural – row crops

Row crops are generally annual in character and require to be planted each year from new seed. These crops include maize, soybeans, canola (rape seed) and sunflowers. An exception is sugar cane which is both a grass and a perennial crop but is considered a row crop.

5.1.1.1 Alcohol

Crops high in sugar content are generally converted into alcohol based fuels in direct substitution of petrol (gasoline). These fuels can be used in pure form or blends with petrol. Generally methanol or ethanol is the end product from these crops. The energy efficiency of alcohol from row crops is very low and this means production costs are high. This efficiency issue is not true for perennial grasses like sugar cane.

Another major disadvantage of these crops are their need for land that is also suitable for food crop production. The general concerns about these crops affecting food security are probably misplaced as the global economic system ensures that products, including food crops, are delivered to people with cash. Africa's poor have no cash and therefore are not as directly affected by world food prices as many believe. It is true that higher food prices will affect more people on the bread line but a rise in employment may result from bio-fuels expansion. Jobs on the other hand are more valued than subsistence and therefore many rural poor will support a row crop based scheme in their area even if it lowers local food production.

5.1.1.2 Diesel

Biodiesel can be made from any oil crop and many perennial crops have high oil content. However, the production of diesel from row crops, while more energy efficient than alcohol row crops, is still relatively inefficient. This will always mean that world oil prices will need to be high to make production economic and hence the call by row crop producers in developed countries for subsidies and other state assistance.

5.1.2 Horticultural

Generally horticultural fuel production is geared towards biodiesel production from a diverse range of trees including the African Oil Palm, *jatropha curcas*, Olive trees and many others. The energy efficiency from plantations is much higher than that achieved for row crops. Combine this with significantly lower operating costs and higher per hectare oil yields and profit margins are much higher. Consequently biodiesel can be produced from trees without the need for subsidies.

The warm wet zones of Central and West Africa are ideal for Palm oil production as this is the area from which the tree grown, in the rest of the world, is originally from. The climatic zones suited to these oil palm trees are meant to be under gallery forests which naturally had distributed oil palm trees within them. It is possible to harvest the palm nuts from these natural forests in several countries in West Africa but per tree yields are low.



Natural trees in Guinea



Oil Palm plantation

The current world price of food grade palm oil is high enough to preclude wholesale conversion of the oil into diesel.

Jatropha on the other hand is being widely touted as a “new miracle tree” and is purported to grow just about anywhere and therefore ideal for growing in areas not suited to food production. While the plant is hardy and adaptable, it is not a miracle crop. The plant does have significant potential for economical biodiesel production but only in suitable climatic and rainfall zones. The tree produces a high quality oil that is toxic to humans and animals. The tree does not tolerate cold and produces much better yields on better soils with higher rainfall and contrary to popular opinion is susceptible to weed competition as well as pests and diseases.



Young Jatropha curcas plantation

The conversion of these natural oils into biodiesel of an acceptable standard is a relatively simple chemical process and the efficiency of these processes are being improved constantly further reducing costs and raising output. It is likely that Africa will become a significant producer of biodiesel. The production of the vegetable oil and its conversion into diesel can take place on the farm, making the diesel available in the areas far from distribution infrastructure. It is unlikely that much of the biodiesel will ever be exported, due to local demand and high prices locally. Palm Oil has a very high freezing point and therefore it is not readily suited for biodiesel in cold climates.

The harvesting of these trees is highly labour intensive making the production system ideal for remote rural Africa. Much of the hype surrounding these trees is as a result of people claiming to plant the tree through press releases – far fewer plantations actually exist than are “advertised” but it is an area of significant opportunity for agriculturalists in Africa under the right conditions.

Many governments have been extensively lobbied and have in the main agreed to approve large scale jatropha plantations and have even made land available but the results have been less than spectacular as many of these companies do not have financing in place and require the land to secure the finance and in other instances the people promoting the schemes have no agricultural experience at all.

5.2 Wood for Power (Bio-mass)

In most African countries wood is the primary source of power and energy in the economies – even in large cities. This the largest driver of deforestation in Africa followed by slash and burn agriculture. Unless the conundrum of using wood for power and energy and the need to avoid emissions from forests can be solved in Africa the contribution of REDD projects to climate change mitigation will be limited.



Slash & Burn Agriculture

5.2.1 Charcoal



Fire-wood

Fire wood is used widely in Africa mainly at a local level, due to the difficulty/expense in transporting the wood and its relatively low calorific value compared with its weight and volume. Vast areas of southern and east Africa use fire wood to cure tobacco which is a popular cash crop. Consequently, vast areas of bush and forests are cleared to plant tobacco for a season or two, followed by a food crop before the fields are abandoned and new fields cleared.

The wood from the newly cleared fields is then used for drying the tobacco from the previous fields. This type of “commercial” agriculture is a significant contributor to deforestation in the areas where it is practiced.



Charcoal for Maputo by rail

The majority of the deforestation is as a consequence of the charcoal industry which supplies charcoal into the villages and cities of Africa. In almost all countries the cutting down of natural forest for conversion into charcoal is technically illegal. However, should the governments be successful in implementing these laws they would in effect shut down their economies simultaneously.

Solving the charcoal problem is the single

biggest challenge facing the proponents of REDD in Africa. A study done in Tanzania in 2000 determined that the charcoal industry in that country, generated a turnover in excess \$150m per annum. This estimate could even be conservative as the industry operates under ground. Many people are employed in very low paying and insecure jobs in the charcoal industry. The production methods are very inefficient and results in low output relative to potential, with efficiencies as low as 30% even before charcoal wastage is considered.



Charcoal being retailed in the city



A traditional "kiln"

and could lead to transformation of the landscape over much of the medium to high rainfall areas of Africa. The communities would receive both cash and electricity from the projects.

SFM Africa is developing a plan to try to use charcoal to drive conservation of indigenous Miombo woodlands by enhancing efficiencies in plantation forestry with industrial kilns to produce charcoal efficiently and also producing electricity as a by product. The theory being that reforestation carbon credits, REDD credits, fuel switch credits and electricity can all become income streams. Eventually the areas that benefit from REDD could be developed into viable ecotourism destinations.

This plan should result in formal and secure jobs without affecting the jobs in the current charcoal distribution system. Should this business model be successful it will be replicable throughout Africa



More industrial but still inefficient – South Africa

5.2.2 Electricity

Biomass and timber in particular can be used to generate power for the national power grids at prices lower than imported diesel, which several countries in Africa are forced to use, to generate power. Plantation forestry can also produce electricity from co-generation using waste saw dust from their saw mills. Again this can take place in remote rural areas that are off grid too. There is significant potential for such projects in many of the tropical and sub tropical zones in Africa.



6. Biodiversity conservation – an integrated approach



Elephant in front of a safari lodge in a forest

Considering the above opportunities, it becomes clear that by using multi-disciplinary and integrated project approaches, the scale and influence of these climate change mitigation opportunities can be immense. Unless these businesses are done at a significant scale then the potential benefits for the communities dependent on these resources will be limited and will in all likelihood lead to project failure.

Unless the communities believe that the future will be better than the past or present they will not change their behaviour to support the desired outcome. The advent of carbon credit projects has introduced a new source of revenue for these impoverished communities but as the credits only last for the project crediting period, it is essential that the results of the project will also lead to long term cash security from other related activities.



Therefore ideal projects will enhance the biodiversity value of the project area in such a way that the long term will be taken care of, through the sale of environmental rights (ecosystem services) and sustainable uses of the resources. It is considered that services such as water and bio-prospecting rights as well as sustainable logging are the result of ecosystem services. However, it is also just as true, that ecotourism can be used as a proxy for biodiversity value in some situations in Africa.

National parks that are under threat of deforestation and consequent biodiversity loss may be able to reverse this trend through the development of a business plan that involves the use of REDD and other credits to move the neighbouring community from a resource dependency to a cash dependency and simultaneously enhance the ecotourism potential of the park for the long term.

7. Project Development Requirements

For large scale private sector investment in climate change mitigation driven projects certain minimum requirements need to be met. Many of these requirements are in the hands of governments.

1. Increased sequestration needs to be shown or (private sector)
2. Reduced emissions need to be demonstrated. (private sector)
3. The carbon rights need to be capable of separate legal protection/registration. (government)
4. The land ownership rights need to be clearly provable in law. (government)
5. The land ownership needs to be undisputed. (government)
6. Company law needs to allow for a sophisticated shareholders agreement between the land owners/users and the project developers. (government)
7. In the case of community ownership of land a legal mechanism needs to exist for the cash flow to and to ensure that it is invested into the community equitably. (government and private sector)
8. Perverse incentives need to be minimized to support the survival of the existing forests. (e.g. agricultural subsidies that result in deforestation) (government)
9. Corruption needs to be minimal. (government)

In the presence of good government institutions for land title recognition, company law and good local government to advise the communities in their discussions with the private sector without bias or corruption – many large scale projects could be developed.

In some countries the government is unable to help project developers or communities, as they are unsure of what to do as they only understand Kyoto compliant carbon credits. The Kyoto and Clean Development Mechanism is spawned is the only area in which they have developed some institutional capacity and for reasons explained in section 0 these markets are not likely to be supportive of forestry projects until after 2012. Unfortunately, many of these Designated National Authorities (DNA's) refuse to recognize the voluntary or other compliance markets and actively work against these forestry projects.

For carbon credits to benefit all local stakeholders and the project developers all that is required are established and enforceable property rights in a proper company law structure – most countries already have these. Government should be supporting these projects at highest levels and then ensure that project developers work with senior officials to get these projects established and are not consigned to middle management without the creativity and understanding to get the projects implemented. These projects invariably cover Ministries of Agriculture, Commerce, Environment, Tourism, Wild Life, Local government and Community Development. Red tape can quickly kill the projects off before they get to implementation stages.

In situations of weak local government NGO's tend to be advisors of the communities. Again the local representatives often oppose these projects as they do not understand what is involved and are often suspicious of any private sector for profit initiative. That said many of the conservation NGO's are well aware of the potential benefits of carbon credit projects for conservation and are very supportive.

To date there are not many large scale projects in the implementation stages due to the above mentioned issues. The potential exists today and these projects can be functioning and in place in a much shorter time frame than many other large scale projects and last for 30-50 years much longer than other development projects.

It is rare indeed when a conservation development project in remote rural areas can claim to benefit the local poor communities, biodiversity conservation, the private sector project developer and help prevent a climate disaster for the whole world all, at the same time

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