Payments for Carbon Sequestration in Africa: Status and Challenges to Scaling up

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Abstract: Kyoto Protocol's Clean Development Mechanism allows industrialized countries to set up carbon offset projects in developing countries. Similarly, environmental markets are now trading in carbon credits worth several million dollars, representing financial incentives for forest managers and other land owners in developing countries to conserve forests for their carbon sequestration functions. Such carbon investments are particularly relevant for Africa, given its extreme poverty and ecological vulnerability due to large-scale degradation of natural resource base in the region.

This paper presents an overview of the carbon sequestration sector in Africa and its potential for growth. It is based on field research with local communities in Mozambique and Kenya where new carbon projects are being taken up, and in all reviews 19 carbon sequestration projects in 16 countries. The present carbon market in Africa constitutes less than 10% of the international carbon trading. Most projects in Africa are non-Kyoto compliant and represent voluntary emissions reductions. However, this situation is now changing with seven new projects being funded by the World Bank's BioCarbon Fund.

Details of carbon credits were available in 13 projects, which are expected to sequester about 35.23 million tons of CO_2. There is evidence from the field that some of these projects have improved local incomes and contributed to sustainable development in the area. Household survey in Mozambique revealed that carbon payments represented a significant proportion of the annual incomes for many poor families. Similarly, forestry activities have improved the natural resource base in Uganda. However, there are also concerns that conversion of grasslands into tree plantations can be detrimental for the local ecology unless these projects are located carefully. Tenure insecurity and ambiguity in property rights in many African countries are major impediments against new carbon projects. In order to yield sustainable development benefits for rural communities, it is imperative to work with small landholders. This is associated with high transaction costs. Such costs can be overcome by building strong community institutions, as witnessed in the case of TIST, Tanzania. The CDM Executive Board is also simplifying guidelines to reduce transaction costs for small projects. Finally, African governments would need to build capacity at national level in order to attract more projects. This requires improving general governance as well as organizing Designated National Authorities that can identify relevant carbon projects.

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Keywords: Africa, carbon sequestration, CDM, Kyoto Protocol, carbon markets

1. Introduction

This paper reviews African experience with carbon sequestration projects. Atmosphere has long been treated as an infinite resource that could be used to absorb waste and pollution from industrial processes. However, increasing incidence of global warming due to high concentrations of greenhouse gases, has finally made the international community realize that atmosphere is a finite global common; action of each individual affects everyone else. National governments and civil society groups are looking for ways to maintain this common resource by reducing atmospheric concentration of greenhouse gases (GHG). A viable strategy in this regard is carbon sequestration through forestry activities. Forests can help mitigate global warming by serving as effective sinks that absorb excess carbon dioxide (CO_2) from the atmosphere (IPCC, 2001). Since the atmospheric effect is the same regardless of where forests are established, the Kyoto Protocol's Clean Development Mechanism[1] (CDM) allows industrialized countries to offset their carbon emissions by investing in afforestation and reforestation projects in developing countries, where costs of establishing such projects are much lower[2] (Fenhann, 2005; UNFCCC, 2003).

Carbon sequestration is also one of many valuable environmental services that forests provide. Traditionally society has consumed environmental services such as clean air, nutrient cycling, and watershed protection without payment. Such free-riding often leads to underinvestment in management and protection of environmental and natural resources, resulting in degradation. Unchecked emission of greenhouse gases into the atmosphere leading to global warming is a case in point. However, increasing awareness of environmental issues and innovations in market-based instruments have led to the emergence of markets for many environmental services. Private firms and individuals can now buy and sell some environmental services just like other goods and services, thereby providing an incentive for their owners to regulate their use (Pagiola, 2004; Jenkins *et al.*, 2004; Powell *et al.*, 2002). Worldwide, exchange of carbon offsets including carbon sequestration through forests represents the most mature example of these new markets for environmental services (Lecoq and Capoor, 2005; Landell-Mills and Porras, 2002).

[1] The Kyoto Protocol was adopted by the international community in 2005. It sets out mandatory targets for industrialized countries to reduce greenhouse gas emissions by an average of 5.2% below their 1990 levels by 2008-12 (UNEP, 2004). The Clean Development Mechanism (CDM) is one of three market mechanisms (along with Joint Implementation and Emissions Trading) introduced under Kyoto to make climate change mitigation more cost-effective.

[2] For instance, while the cost of carbon sequestration projects in tropical countries (mainly developing countries) could range from $0.10-$20 per ton of carbon, in industrialized countries it could range from $20-$100 per ton of carbon (IPCC, 2001). Clearly, for industrialized countries, investing in carbon sequestration in the developing world is a much cheaper option. In order to encourage reduction in actual carbon emissions at home, the Kyoto Protocol limits the use of carbon sinks from forestry and other land based activities to only 1% of their base year emissions for each of the five years of the commitment period from 2008-12.

The first large-scale project to yield carbon offsets through forests was established in 1992. Over its life this project will help sequester 15.6 million tons of carbon dioxide[3] by regenerating 25,000 hectares of rainforest in Malaysia (Aukland *et al.*, 2002). Since then, there has been a rapid growth in carbon sequestration activities. Over the last ten years, many new projects have been initiated, which will yield about 45 million tons of carbon dioxide offsets through carbon sequestration activities on more than 880,000 hectares of land. Taking an average price of $2.05 per ton of carbon dioxide (tCO_2), Ecosystem Marketplace estimates that the total market value of these carbon offsets will be more than $92 million[4]. Since most of these projects are in developing countries, the trade in carbon offsets represents increased income for them. Carbon sequestration projects may thus provide a win-win between environmental conservation and increased opportunities for economic development in poor countries (UNEP, 2004; Rosa *et al.*, 2003; Davis, 2000).

Carbon sequestration projects' economic and environmental benefits are particularly relevant for Africa, the world's poorest region. African countries need increased investment to support poverty alleviation and infrastructure development. With high dependence on land and forests for subsistence, there is also a growing threat of widespread natural resource degradation. Accordingly, efforts to mitigate climate change through carbon sequestration projects can bring in money both to regenerate natural resources and raise local incomes (Kituyi, 2002). This subject has begun to receive global attention: poverty alleviation in Africa and addressing global warming were the two lead issues for the G-8 Summit of industrialized nations in 2005. What is now required is to find ways to achieve synergy between the two objectives. However, little is known about the present status of carbon sequestration projects in Africa. What projects have been undertaken and where have they been implemented? What has been their impact on poor communities and what potential benefits could accrue in the future? What crucial challenges need to be addressed if the region is to increase its share of international carbon finance?

This paper seeks to answer these questions through a detailed review of existing carbon sequestration projects in Africa. The purpose is twofold; firstly, to assess the status of the forest carbon sector in Africa in the context of global markets for carbon offsets, and secondly, to draw lessons for scaling up these initiatives. The paper is organized as follows: the first section introduces the general institutional structure of carbon markets, which is used in the second section to analyze the forestry carbon sector in Africa. This is followed by a review of potential benefits of carbon sequestration projects in Africa. The section also highlights the need to select the location of carbon sequestration projects carefully so that they do not create negative impact on the local ecology. The last section discusses important issues that need to be addressed if African countries are to attract more investments for carbon sequestration projects.

[3] This is equal to 4.25 million tons of carbon, 1 ton of carbon being equal to 3.67 tons of carbon dioxide.

[4] For details of these projects, please see www.ecosystemmarketplace.com maintained by the Katoomba Group.

1.1 Carbon Markets: Background

In carbon markets, buyers and sellers trade in 'carbon offsets' or 'carbon credits' which are units of carbon emissions reduced at source (for example by reducing consumption of fossil fuels) or units of carbon dioxide that have been absorbed by forests from the atmosphere (Landell-Mills and Porras, 2002).[5] Broadly, these markets consist of two types of transactions (Lecoq and Capoor, 2005):

(i) Project Based Transactions occur when a buyer invests directly in a carbon emission reduction or carbon sequestration program and gets emission credits in return, e.g. a company pays money to a local community in a developing country to raise forests and then claims carbon sequestration credits in return. The local community in this case acts as a service provider, being responsible for actually generating the carbon credits. There may even be a contract that specifies the kind of service to be provided (e.g. 'x' number of trees to be planted per hectare per year), and how benefits will be shared (e.g. the investor may own the carbon credits but timber and other non-timber forest products belong to service providers). In project based transactions, compensation to service providers may include direct payment or other development benefits such as provision of social services and infrastructure, in-kind technical assistance and support for commercialization, or even expansion of rights over local natural resources (Rosa *et al.*, 2003; Scherr *et al.*, 2001). It is important to note that there are several types of project based transactions, with carbon sequestration being one of them. Other types of project based transactions include methane collection from landfill sites and conversion of power plants from fossil fuels to renewable resources.

(ii) Trade in Emission Allowances refers to commercial trading in carbon offsets under various regimes that have emerged in different parts of the world. These include markets arising under regulatory regimes, such as trading in carbon credits through the European Union Emission Trading Scheme (EU-ETS) under the Kyoto Protocol, and voluntary markets such as the Chicago Climate Exchange (CCX) in the US. These systems operate like equity markets with buyers and sellers trading well-defined carbon units at particular prices. Buyers do not invest in any particular project and they simply purchase carbon credits from sellers who may have actually invested in emission reduction or carbon sequestration projects.

In general, apart from buyers and sellers, carbon markets also include intermediaries and supporters. Intermediaries link investors with service providers and facilitate transactions between them. Supporters are institutions or individuals who create an enabling environment and a legal basis for carbon markets to function (Noordwijk *et al.*, 2003). When carbon sequestration projects are taken up with local communities, intermediaries such as non-government organizations (NGOs), government agencies and research organizations frequently assume other support responsibilities such as capacity building, monitoring and supervision of the project.

[5] Although this paper mainly dwells on trade in carbon sequestration credits, it also draws relevant lessons from the carbon market in general.

Both project based transactions and trade in emission allowances can be either compliant under the Kyoto Protocol (Kyoto-compliant), or operated on a voluntary basis and thus not Kyoto-compliant. Examples of Kyoto-compliant transactions are all CDM activities in the case of project based transactions, and exchange of carbon offsets in the EU-ETS. All carbon credits exchanged through these systems count towards countries' emission reduction targets under the Kyoto Protocol. On the other hand, non Kyoto-compliant or voluntary reductions include projects that yield carbon offsets but are not formally registered under the Protocol, and trades on voluntary exchanges such as the CCX where the carbon credits do not count towards the emission reduction targets under Kyoto[6].

1.2 Global extent of the market for carbon offsets

The global carbon market is rapidly growing. In 2004, carbon offsets exchanged under project based transactions were worth US$570 million, bringing the total value of such transactions since 1998 to an impressive $1.38 billion. Volume wise, 107 million tons of carbon dioxide were exchanged in 2004, a 38 percent increase over 78 million tCO_2 traded in 2003 (Lecoq and Capoor, 2005). These data refer to all types of carbon offsets traded through project based transactions, including carbon sequestration projects. It is estimated that offsets from carbon sequestration comprised about four percent of these project based transactions (Lecoq and Capoor, 2005). However, this is a conservative estimate, as it does not include many carbon sequestration projects taken up by the Global Environment Facility (GEF)[7].

In terms of trade in emission allowances, four major markets have come up in different parts of the world; the European Union Emission Trading System (EU-ETS), the UK Emission Trading System, the New South Wales Greenhouse gas Abatement Scheme and the CCX. The former two are Kyoto-compliant and the latter two are not. Volume of carbon offsets exchanged on these allowance markets has been increasing steadily and is now comparable to the quantity exchanged through project-based transactions. From January 2004 to December 2005 the cumulative volume of carbon offsets exchanged through these four markets was 893 million tons of carbon dioxide, with 799 $mtCO_2$ traded in 2005 alone, (Point Carbon, 2006)[8]. Out of these, the EU-ETS is the biggest trading system. The average price of carbon offsets traded on this exchange increased from €7 in 2004 to €17 in April 2005 (Lecoq and Capoor, 2005). Since then, EU-ETS has continued to grow exponentially and the total trading between January 2005 and February 2006 exceeded 450 million tCO_2, with prices reaching a high of €28 or about $35/$tCO_2$.

Despite the growth of carbon markets, there are strong concerns that it will bypass Africa. Although the international carbon market including carbon sequestration projects is now worth hundreds of millions of dollars, Africa as a whole contributed just three percent of

[6] Firms and organizations invest in voluntary carbon projects for several strategic reasons, e.g. as part of their corporate social responsibility, to experiment with these new markets before making a formal entry, influence policy, improve goodwill or public image, or for philanthropic reasons.
[7] Forestry projects funded by the Global Environment Facility reduce carbon emissions, but carbon offsets from these projects are not necessarily exchanged in international markets.
[8] For details, see Bayon (2004); Scherr *et al.* (2004); Lecoq and Capoor (2005).

the global volume of carbon offsets that were traded in 2003-04, and a negligible share in 2004-2005. This compares poorly with Asia and Latin America, which contributed 43 percent and 35 percent respectively of the global trade in carbon offsets during 2003-2004 (Lecoq and Capoor, 2005). This under representation of Africa raises equity concerns about the distribution of the carbon market and the region's inability to attract sizeable carbon sequestration projects. Therefore, it is imperative to review existing African carbon sequestration projects to draw lessons for scaling up these initiatives.

2. Overview of carbon sequestration projects in Africa

This review covers 19 carbon sequestration projects from 16 different countries in Africa (see table 1). Project details were collected from a wide range of sources – field research with local communities in Kenya and Mozambique, case studies and other published research, project documents, and international policy updates on carbon markets. Latest information on carbon markets was accessed from Point Carbon,[9] and the Ecosystem Marketplace maintained by the Katoomba Group[10]. Information was also obtained from research institutions such as the World Resources Institute and International Institute for Environment and Development, which maintain online databases on carbon sequestration projects. Finally, websites of multilateral donors such as World Bank[11], Global Environment Facility and Face Foundation were useful in collecting data on their carbon investments in Africa.

Out of 19 carbon sequestration projects in Africa, seven are based in Kenya, Uganda or Tanzania. This indicates that East Africa is currently the favored destination for international carbon investors. In terms of implementation, some projects are being jointly implemented by more than one country, such as the Participatory Rehabilitation of Degraded Lands Project in trans-boundary areas of Mauritania and Senegal. Projects range from conservation activities in a small area of about 100 hectares (Community based Rangeland Rehabilitation for Carbon Sequestration, Sudan) to several thousand hectares under the Forest Rehabilitation Project in Mount Elgon and Kibale National Parks, Uganda. Locations span diverse agro-ecological zones and land uses, including rangeland conservation (Sudan), farm forestry (Tanzania), rehabilitation of dense forests (Uganda), and restoration of Lake Victoria basin (Kenya). Many projects follow a multi-sector approach; for example, apart from carbon sequestration, Burkina Faso's Sustainable Energy Management Project aimed to improve the energy situation through a shift from wood fuel and charcoal to non-carbon energy sources such as solar photovoltaics. Some projects are mainly research initiatives on carbon sequestration; in Mali's Carbon from Communities Project the National Aeronautical Space Agency (NASA) conducted research to measure the sequestration potential of local crop and pasture management systems.

[9] www.pointcarbon.com
[10] www.ecosystemmarketplace.com
[11] www.carbonfinance.org

Table 1: Details of Carbon Sequestration Projects in Africa

	Project Title	Host Country	Investor	Fund Invested	Start Year	Implement. Agency	Carbon offsets	Nature of Benefit Sharing	Other details
1.	The International Small Group and Tree Planting Program (TIST)	Tanzania, Uganda, Kenya	World Bank BioCarbon Fund, USAID, Dow Chemical Company	Dow - $1.2 million, WB's share n.a.	Since 1999	CAAC, I4EI	2.3 $mtCO_2$# by 2017	Carbon rights transferred to CAAC. All others, viz. timber, NTFPs with community.	No.of Farmers > 3,000 organized in 315 groups. Live trees > 400,000 Seedlings in millions
2.	Participatory Rehabilitation of Degraded Lands	Mauritania and Senegal	GEF African Devl. Bank, UNDP, National Govt.	GEF – $7.996m* Co-fin. - $4.370m	Since 2000	National Governments UNOPS	n.a. +	All benefits belong to community. Carbon credits not claimed.	Aims to reach 80,000 people in 100 villages. Target area = 6,000,000 ha.
3.	Community based Rangeland Rehabilitation for Carbon Sequestration	Sudan	GEF	GEF - $1.5 million, Co-finance - $0.085 million	n.a.	National Government (Environment Ministry)	n.a.	All benefits including timber and NTFPs belong to local community.	Area covered = 100 hectare.
4.	Village-Based Management of Woody Savanna & Estbl. of Woodlots for Carbon Sequestration	Benin	GEF	$2.5 million	n.a.	National Government (Environment Ministry)	5.3 $mtCO_2$	Woodlots with all products belong to community. Information on carbon offsets n.a.	176,000 hectares of land under conservation.
5.	Sustainable Energy Management Project	Burkina Faso	World Bank, Government of Norway, DANIDA	n.a.	1997 – 2003	National Government (Energy Ministry)	1.5 $mtCO_2$	Carbon offsets with World Bank. All other benefits with community.	Project registered as AIJ (Activity Implemented Jointly).
6.	Forest Rehabilitation in Mt. Elgon & Kibale National Parks	Uganda	FACE Foundation	n.a.	Since 1994	Uganda Wildlife Authority	7.1 $mtCO_2$ over 99 years	Carbon offsets with FACE. All other rights with Uganda Wildlife Authority.	Project registered as AIJ, and has FSC Certification

	Project Title	Host Country	Investor	Fund Invested	Start Year	Implement. Agency	Carbon offsets	Nature of Benefit Sharing	Other details
7.	Nhambita Community Carbon Project	Mozambique	European Union	n.a.	Since 2003	Envirotrade, ECCM, Univ. of Edinburgh	-	Carbon rights with implement. orgs. All others with locals.	Community receives cash payments for carbon sequestration.
8.	Plan Vivo Project	Uganda	UK DFID, USAID, START, Tetra Pak UK	€ 1 million (expected)	2003 - 2012	Ecotrust Uganda, ECCM, ICRAF	0.9 $mtCO_2$ by 2012	Timber and other biomass benefits with farmers. Tetra Pak buys carbon credits. 60% of the sale money goes to farmers.	Carbon sequestration through small-scale tree planting on 5,000 ha. In 2003 alone, Tetra Pak bought 14,000 tCO_2 from the project.
9.	Western Kenya Integrated Ecosystem Management Project	Kenya	GEF, Co-financed by National Government, Japan PHRD	GEF- $4.1 m. Co-fin.- $2.7 m	2005	KARI, ICRAF, KEFRI	-	Local community to get all timber, NTFP benefits. Carbon rights yet to be worked out.	The project will promote conservation activities to control sediment and nutrient flow into Lake Victoria.
10	Sequestration of Carbon in Soil Organic Matter (SOCSOM)	Senegal	USAID	n.a.	1999 - ?	Senegal-USAID, Several Univ. Rockfeller	n.a.	All benefits with local community. Carbon rights not traded.	Pilot project to assess the potential for carbon sequestration in soils.
11	Commercial Plantation Projects	Tanzania and Uganda	Tree Farms AS of Norway (local subsidiaries)	At least $600,000 in Uganda. Tanzania n.a.	Since 1997	Green Resources, Busoga Forestry Company	2.3 $mtCO_2$ expected in Uganda	Commercial plantation, all rights including carbon credits with the company.	SGS Products Certification in Tanzania. 6,500 ha already planted.
12	Carbon from Communities	Mali	NASA	$143,236	2002 - 2005	SANREM-CRSP (USAID),Univ of Georgia, Local Univs.	n.a.	All benefits with local communities.	Mainly a research project.
13	Bateke Fuelwood and timber Plantation	DR Congo	World Bank BioCarbon Fund	n.a.	2006	Novacel (a private enterprise)	2.81 $mtCO_2$ by 2017	Timber and other benefits will be with villagers. Carbon credits may belong to World Bank and Novacel.	Afforestation on 8,000 ha of degraded grass savanna for timber production and charcoal making. Will benefit 250 villages.

	Project Title	Host Country	Investor	Fund Invested	Start Year	Implement. Agency	Carbon offsets	Nature of Benefit Sharing	Other details
14	Nile Basin Reforestation	Uganda	World Bank BioCarbon Fund	n.a.	2006	National Forest Agency	0.25 $mtCO_2$ by 2017	Timber benefits shared with locals. Carbon credits with World Bank.	Planting of pine and mixed native species on 2,000 ha. New jobs will be created.
15	Acacia Community Plantations	Niger	World Bank BioCarbon Fund	n.a.	2006	Achats Services Int. (ACI) ICRISAT	1.8 $mtCO_2$ by 2017	Gum, firewood and timber to be shared with locals. ASI will sell carbon credits.	Acacia plantations on 22,800 ha. Project will benefit 15,000 farming families in the area.
16	Acacia Community Plantations	Mali	World Bank BioCarbon Fund	n.a.	2006	Deguessi Vert, Malian Rural Economic Institute(IER)	0.95 $mtCO_2$ by 2017	Gum, firewood etc. to be shared with locals. Deguessi-IER to sell carbon credits.	Acacia plantations on 14,000 ha. Extension of Acacia Community Plantations in Niger.
17	Andasibe-Mantadia Biodiversity Corridor	Madagascar	World Bank BioCarbon Fund, GEF	Part of $150 million grant for biodivrst. conservtion	2006	ANGAP, Conservation Int., Ministry of Env, water and Forests.	0.40 $mtCO_2$ (Kyoto) 4.0 $mtCO_2$ (Non-Kyoto) by 2017	Mainly a biodiversity conservation project. Some benefits including carbon payments will be shared with locals.	Afforestation on 5,000 ha and protection of 80,000 ha to conserve biodiversity.
18	Green Belt Movement	Kenya	Green Belt Movement, World Bank BioCarbon Fund	n.a.	2006	Green Belt Movement, Community Forest Associations	0.60 $mtCO_2$ by 2017	Farmers will receive payments for carbon sequestration to carry out conservation activities.	Project builds on the thirty year old Green Belt Movement in Kenya.
19	Humbo Assisted Regeneration	Ethiopia	World Vision Australia, World Bank BioCarbon Fund	n.a.	2006	Word Vision, Ethiopian Agr., Rural Devl., & Forestry Coord. Office	5.02 $mtCO_2$ by 2017	Biomass benefits will be shared with local communities. Carbon payments to improve local infrastructure and food security.	Restoration of 15,000 ha of biodiverse natural forest in Rift Valley. About 3,000 local households will benefit from the project.

Note:
$mtCO_2$: million tons of carbon dioxide
* m: million
+ n.a.: not available

2.1 Nature of carbon market in Africa

As discussed in section 1.1 above, carbon markets can be broadly distinguished into two categories, i.e. project based transactions and trade in emission allowances. In addition, all transactions can also be differentiated on the basis of whether they are Kyoto-compliant or are voluntary in nature (and not for compliance under Kyoto). This can lead to four possible kinds of transactions as shown in table 2.

Table 2: Four major kinds of transactions under carbon markets

	Trade in Emissions Allowances	**Project Based Transactions**
Kyoto-Compliant	Trade in carbon offsets under European Union Emission Trading Scheme, UK – Emission Trading System 2	All Clean Development Mechanism and Joint Implementation Projects 1
Voluntary, not for compliance under Kyoto	3 Trade in emission reductions on Chicago Climate Exchange, NSW Greenhouse Gas Abatement Scheme	4 *Voluntary Reduction Projects, such as Carbon Sequestration Projects in Africa*

Quadrant 1 represents all project based transactions that are compliant under Kyoto Protocol. Examples include all Joint Implementation and Clean Development Mechanism Projects, which have been approved by the respective Executive Boards of the United Nations Framework Convention on Climate Change. Quadrant 2 indicates trading in carbon offsets under regulatory regimes such as European Union Emission Trading System (EU-ETS) and the United Kingdom Emission Trading System that are compliant under Kyoto Protocol. On the other hand, quadrant 3 includes carbon trading in voluntary markets that are not compliant under Kyoto Protocol. Most of these markets such as the US based Chicago Climate Exchange and the Australian New South Wales Greenhouse Gas Abatement Scheme operate in countries that have not signed the Kyoto Protocol. It should be noted here that both these markets (quadrant 2 and 3) mainly exist for industrialized countries that need to cut down on their carbon emissions. Since none of the African countries falls in this category, the region as a whole does not figure in these transactions.

This leaves Quadrant 4, which represents all voluntary reductions under project-based transactions in carbon offsets that are not for compliance under Kyoto Protocol. Until recently, most carbon sequestration projects in Africa were in this category. Since maturity of a carbon market can be ascertained from the proportion of transactions that are Kyoto-compliant (located in quadrant 1 and 2), the carbon market in Africa was perceived to be in its infancy. However, this situation is rapidly changing with seven new carbon sequestration projects in Africa that are potentially Kyoto-compliant (see table 1) and many other types of emission reduction projects in Morocco, South Africa etc. (UNEP and IETA, 2005b).

2.2 Prominent Investors, Service Providers and Intermediaries in Africa

World Bank is the biggest carbon investor in Africa[12]. It is developing seven new carbon sequestration projects in Africa (see table 1), as part of a global portfolio of 23 carbon sequestration projects to be financed by its BioCarbon Fund[13]. However, it is important to note that all these investments in Africa still comprise less than 10 percent of $629 million worth of global carbon business managed by the World Bank's carbon finance unit (World Bank, 2006). This shows that carbon projects in Africa have a long way to go before they achieve the same level of carbon investment as enjoyed by other regions such as East Asia and the Pacific.

In all, nine carbon sequestration projects in Africa are funded by the World Bank, four by the Global Environment Facility, two by the United States Agency for International Development (USAID), and one each by the Forest Absorbing Carbon Emissions (FACE) Foundation, and the European Union. One project was sponsored under a research grant from NASA and one was paid for by a commercial plantation company – Tree Farms AS of Norway. Some projects were co-financed by UN organizations such as the United Nations Development Program (UNDP) and the United Nations Environment Program (UNEP). In addition, national governments of industrialized countries such as Norway and United Kingdom (Department for International Development) are also funding carbon sequestration projects in Africa.[14]

Local communities act as service providers for most carbon sequestration projects in Africa, indicating that many of these projects have a community development focus rather than only profit making for carbon investors. In such projects, intermediaries (such as NGOs and local governments) have taken up additional responsibilities of community organization, capacity building of community representatives, monitoring and supervision, apart from their main role of obtaining funds from investors. Other service providers include Uganda Wildlife Authority for the Forest Rehabilitation Project in Mount Elgon and Kibale National Parks, Uganda, and local subsidiaries of Tree Farms AS for Commercial Plantation Projects in Tanzania and Uganda.

Most projects are covered under bilateral agreements and managed by host country national governments (respective Ministry of Environment) or other national agencies (National Forest Agency). Other implementing organizations include private companies or their local subsidiaries (six projects), international and local NGOs (three projects) and projects being jointly implemented by research institutions or universities (four projects). This indicates that many carbon sequestration projects in Africa have a strong research component.

[12] The World Bank has launched three carbon funds; Prototype Carbon Fund (PCF), Community Development Carbon Fund (CDCF), and BioCarbon Fund, to invest in projects that reduce carbon emissions and promote sustainable development activities. Two of these funds, i.e. CDCF and BioCarbon Fund currently support carbon sequestration projects in Africa.

[13] See www.carbonfinance.org for details.

[14] Funding from industrialized countries is expected to increase further with bilateral agreements between several Africa countries (Morocco, Algeria, Egypt, and Mali) and their European partners such as France, Italy and Germany (Point Carbon, 2003).

2.3 Other institutional components of carbon sequestration projects in Africa

In most carbon sequestration projects in Africa, rights to benefits such as timber and non-timber forest products (NTFPs) are being given to local communities. The only exception was the Commercial Plantation Projects in Tanzania and Uganda, where the implementing organization (Green Resources Ltd.) owned the wood and non-wood products generated by its plantations[15].

As regards carbon benefits, evidence of actual or intended transfer of carbon credits was available for 13 projects. Although it is difficult to aggregate the total amount of carbon that these 13 projects will sequester as they use different time lines, broad estimates indicate about 35.23 million tCO_2. Carbon credits will be sold in international markets for all World Bank BioCarbon Fund projects. In other projects such as the Forest Rehabilitation Project in Mount Elgon and Kibale National Parks, Uganda, carbon offsets are clearly owned by the investors (in this case the FACE Foundation). Similarly, the Tree Farms AS intends to sell carbon credits to private firms in Norway from its plantations in Tanzania and Uganda. In Plan Vivo Project in Uganda and the Nhambita Community Carbon Project in Mozambique, the implementing agency – Edinburgh Center for Carbon Management – is selling carbon credits to UK based companies and sharing the carbon revenue with local farmers. However, in some projects, it is not clear whether investors would actually trade these credits or just retain them as voluntary reductions.

Concerning payment mechanisms, most projects provide broad development support to local communities, including technical and financial assistance to adopt conservation activities. Only in a few projects do the local communities receive specific payments linked to their carbon sequestration efforts. For example in Small Group and Tree Planting Program (TIST) in Tanzania, Uganda and Kenya, farmers groups receive quarterly payments on the basis of the number of trees they protect.

3. Potential benefits from carbon sequestration projects in Africa

The main objective behind any carbon sequestration project is to absorb excess carbon dioxide from the atmosphere and thus help mitigate climate change. This directly benefits global society and generates carbon credits or voluntary reductions for the investor. But what is in it for the host country and the local communities? This section looks at some potential local benefits.

3.1 Sustainable development benefits

Sustainable development is an important issue for carbon sequestration projects. Many researchers have documented the livelihood and other development benefits of various carbon sequestration projects around the world[16]. The Kyoto Protocol stipulates that all CDM projects including carbon sequestration activities should achieve sustainable development benefits for host countries (UNEP, 2004; Olhoff *et al.*, 2004).

[15] In the Forest Rehabilitation Project in Mount Elgon and Kibale National Parks, Uganda, it was difficult to ascertain whether any timber/NTFPs were being harvested from the project sites.
[16] For instance see Rosa *et al.* (2003); Smith and Scherr (2002); and Totten (1999).

Although most current carbon sequestration projects in Africa are not for compliance under Kyoto, they often follow broad CDM guidelines. The major developmental benefits for local communities from these projects are increased timber and NTFPs from regenerated forests, employment opportunities from forestry activities, and increased incomes from sale of carbon credits. For instance, in the Nhambita Community Carbon Project in Mozambique, local households will receive a cash payment of $242.60 per ha over the next seven years for carbon sequestered by various land-use activities. Thus each household will receive $34.70 per annum, taking an average ownership of one hectare of land per household. This represents a significant increase in cash incomes for most households and addresses their felt need of obtaining access to a regular income source (Jindal, 2004). Similarly, in TIST, Tanzania, local farmers receive regular payments on the basis of number of trees they can manage on their lands. Other project benefits include increased awareness on HIV/AIDS issues and help in developing compassionate care strategies among the local community (see Box 1 for details on TIST). These examples signify that many carbon sequestration projects have the potential to achieve sustainable development in Africa and to provide increased financial inflows for host countries.

Box 1: Sustainable Development through Carbon Sequestration-
The case of TIST, Tanzania.

The International Small Group and Tree Planting Program (TIST) began in Mpwapwa, Tanzania where the Anglican Church organized groups of poor farmers to undertake reforestation and conservation practices on their degraded lands. Group members were encouraged to meet regularly and identify local development goals that included tree planting and sustainable agriculture. Each group consisted of 10 – 12 people, who were mostly subsistence farmers. The program provided them with necessary inputs to take up conservation activities such as financial assistance, training, and planting material to set up tree nurseries etc.

Starting with 40 groups in 1999, the program today extends to about 2700 groups, linking more than 20,000 small farmers in Tanzania. As of March 2005, these groups were protecting 5,033,570 trees apart from raising another 4,022,859 seedlings in their nurseries. Direct benefits to members include increased access to fruits, timber, firewood and other NTFPs produced by these trees. Members also receive carbon payments, which are linked to the number of trees they can plant and protect. Indirect benefits include training on conservation farming and increased awareness on HIV/AIDS issues. The project also helps the groups in developing compassionate care and orphan care strategies.

TIST is financially supported by the World Bank's Bio Carbon Fund. Other important donors are Dow Chemical Company, which provided a grant of US$1.2 million and Global Development Alliance that includes various international NGOs. In addition to Tanzania, TIST has now been extended to India, Uganda, and Kenya.
(Source: http://www.tist.org/**)**

3.2 Biodiversity conservation and protection of natural resources

Many natural resource management projects are not viable either because their benefits are uncompensated environmental services or because national governments and other local agencies do not have adequate funds to undertake conservation activities. Carbon projects can address these concerns in two important ways, first by paying for some of the services such as carbon sequestration, and secondly by providing financial assistance to national governments to invest in natural resource projects (Gutman, 2003). This is particularly relevant for Africa where precious natural resources are being rapidly lost for want of conservation investments.

There is evidence to show that many carbon sequestration projects in Africa have been successful in improving the local resource base in the area and in conserving precious biodiversity. For example, the World Bank BioCarbon Fund's Andasibe-Mantadia Biodiversity Corridor Project will protect several endemic species by linking fragmented parts of Malagasy rainforest in Madagascar. Similarly, the Participatory Rehabilitation of Degraded Lands aims to conserve biodiversity in the trans-boundary region of Senegal and Mauritania, as well as to restore natural ecosystems that would enhance carbon sinks in the area. The project is being implemented in an area of 6,000,000 ha along the Senegal River Valley and is funded by the Global Environment Facility. Another prominent initiative is the FACE Foundation supported forest rehabilitation project in Mount Elgon and Kibale National Parks, Uganda. The project has been able to regenerate the severely degraded areas in the two parks while producing carbon credits for the investor (see Box 2 for details).

Box 2: Biodiversity Conservation and Carbon Sequestration in Uganda

Since 1994, FACE (Forest Absorbing Carbon Emissions) Foundation of the Netherlands and the Uganda Wildlife Authority, have been involved in a project to restore the degraded parts of Mount Elgon and Kibale National Parks in Uganda. The national parks were widely deforested during 1970s and 1980s when various ethnic groups fled from political instability and sought refuge in them. This influx of human population put increased pressure on these forests as refugees allowed their livestock to graze, and felled trees to provide fuelwood and timber for construction. Soon large tracts of these nature reserves had been cleared, threatening the precious biodiversity in the area. The Forest Rehabilitation Project seeks to reverse this degradation by planting indigenous tree species and educating local communities on the value of conservation. These activities are helping in conserving the local biodiversity and in protecting endangered wildlife such as chimpanzees. The project is being implemented in an area of 24,000 hectares – 14,000 hectares in Mount Elgon National Park and 10,000 hectares in Kibale National Park. It is estimated that at an average, the Mount Elgon National Park will sequester 10 tons of CO_2 per hectare per year while the Kibale National Park will sequester 12 tons of CO_2 per hectare per year, over the first 20 years of the project. Thus over the lifetime of the project (taken as 99 years), the total carbon sequestered by the project could be 7,172,000 tons. The project has a certification from Forest Stewardship Council (FSC) for sustainable forest management.

(Source: http://www.facefoundation.nl/Eng/projectAfrica.html)

3.3 Ecological restoration

Carbon sequestration in the form of afforestation and reforestation activities can often generate other co-benefits for locally valued ecosystem goods and services such as more regular and higher quality water supplies, control of soil erosion and sedimentation and improvement of the hydrology in the area (*Scherr* et al, 2004). In Western Sudan, for example, a carbon sequestration project has been working toward improving local rangelands. Rangelands are a mainstay of Sudan's economy as they cover about 60% of the country and provide fodder for one of Africa's largest concentrations of livestock. However, many rangelands have been badly degraded due to recurrent droughts and overgrazing. The project aims to restore these rangelands through conservation activities such as planting trees and grass to stabilize sand dunes and create windbreaks. A project report published on the Near East Foundation's website states that "*Project activities have resulted in much of the area being reseeded with increased soil cover, reduced soil erosion, and greater carbon sequestration. The local ecosystem is healthier with increased species diversity of plants and a reduction in airborne particulates."*

Similarly, the afforestation and reforestation projects in Uganda and Ethiopia aim to regenerate local ecosystems. The Nile Basin Reforestation Project (Uganda) will establish a mix of pine and native species to mitigate land degradation in upper catchments of the Nile River. The Humbo Assisted Regeneration Project will help to restore 15,000 ha of natural forest in the Rift Valley (Ethiopia). Both these projects will be funded by the World Bank's BioCarbon Fund. Another example is the Western Kenya Integrated Ecosystem Management Project in Kenya (see Box 3).

Box 3: Ecological restoration of the Lake Victoria Basin in Kenya

The overall aim of the Western Kenya Integrated Ecosystem Management Project is to restore the ecology of the Lake Victoria Basin. In the past three decades, Lake Victoria has experienced significant environmental damage from large amount of sediment flowing into the lake leading to eutrophication, pollution, and invasion by water hyacinth. The project activities will focus on erosion control and water management on-and off-farm in selected river basins (900 km^2) to reduce sedimentation draining into the Lake. The project will focus on agroforestry and other land management techniques that aid in carbon sequestration. The total outlay for the project is US$ 7.65 million; US$ 4.1 million being provided by Global Environment Facility. The overall responsibility for implementing the project is with Kenya Agricultural Research Institute (KARI). Other project partners include Kenya Forest Research Institute (KEFRI), World Agroforestry Centre (ICRAF), and other local NGOs. (Source: ICRAF, GEF Project Database)

However, it is important to note that carbon sequestration projects may not always benefit the local ecology. Plantations can often result in substantial losses in stream flow, and increased salinization and acidification (Jackson *et al*., 2005). A global study on hydrological effect of forestry projects found that annual runoff reduced by as much as 75 percent when grasslands were converted into eucalyptus plantations (Farley *et al*., 2005). Considering that many parts of Africa are rain deficient, there is a need to locate carbon sequestration projects carefully and to encourage native plant species over exotics.

3.4 Improved land productivity through soil carbon sequestration

Sub Saharan Africa contains large tracts of degraded lands with extremely low agricultural productivity, especially in the Sahel. For instance, average crop yields in sub Saharan Africa are a meager 1.5 t/ha for maize, 0.8 t/ha for sorghum and 0.7 t/ha for millet. This is due to poor soil quality, which occurs when soil organic carbon is lost to the atmosphere, thus leading to desertification. Estimates of the affected area range from 3.47 to 3.97 billion hectares (Lal *et al.*, 1998). The process can be reversed through improved agricultural practices such as conservation tillage, soil erosion control, establishment of appropriate shrubs and woody perennials, soil fertility enhancement, and crop residue management. This not only restores soil quality by increasing its organic content but also aids in mitigating climate change by returning more carbon to the soil. Thus, carbon sequestration activities that improve soil carbon content have the potential to improve productivity of large tracts of land in Africa. The SOCSOM Project in Senegal is carrying out further research on this issue (Box 4).

Box 4: Sequestration of Carbon in Soil Organic Matter (SOCSOM), Senegal

SOCSOM is a prototype pilot project designed to advance understanding on dynamics of soil carbon and its role in improving agricultural productivity and sustainability. It is based on the premise that restoration of soil organic matter could be associated with both enhanced fertility as well as income opportunities for local farmers through sale of carbon credits. The specific objective of this project is to develop a quantitative analysis of the environmental, ecological, and economic potential for the sequestration of carbon in the soil organic matter of three spatially explicit sites in Senegal.

The project is funded by USAID while there are several agencies which are cooperating in its implementation, viz. Centre Suivi Ecologique (CSE), Senegal ISRA, Senegal, USAID/AFR/SD, University of Arizona, Tucson, Arizona, Colorado State University, Ft. Collins, Lund University, Lund, Sweden, SACRED Africa, and Rockefeller Foundation. There are plans to take up similar projects in Kenya and Cameroon. (Source: USGS)

4. Carbon Sequestration Projects in Africa: Challenges to Scaling Up

The global carbon market is on the rise. The annual demand for carbon credits will increase steadily as the first commitment period under the Kyoto Protocol (2008-12) draws near. The recent United Nations Climate Change Conference in Montreal has also indicated that carbon emission reductions may continue beyond 2012, which will further boost the market. Moreover, the United States and Australia have forged the Asia Pacific Partnership in Clean Development and Climate, which is expected to provide a fillip to markets for voluntary carbon credits.

In such a scenario, more and more industrialized countries will look for cost-effective alternatives to achieve emission reductions, and carbon sequestration is certainly one of them. The total volume of the international carbon market could be worth 4.6 to 200 billion euros by 2010 (GTZ, 2005). Assuming an average value of $10 per ton of carbon, carbon sequestration could account for about $300 million annually in this market. This becomes significant when

compared to the total official development assistance of $1 billion-1.2 billion that was available for sustainable forestry projects during the early 2000s (Scherr *et al.*, 2004).

All these developments could translate into increased financial inflows for developing countries that can demonstrate the ability to host viable carbon projects. However, as discussed earlier, Africa is still a laggard in international carbon markets. This is in contrast to other developing regions such as East Asia and Latin America where such markets are already well developed. The following section looks at possible reasons for the slow growth in Africa and important challenges it must meet to attract more carbon investments.

4.1 Property rights and land tenure

Tenure security is crucial for implementing carbon sequestration projects. Without clear and defendable rights to land, forest or the sequestration service itself, suppliers cannot make a credible commitment to supply carbon offsets (Gutman, 2003). For projects where local communities act as service providers, it means that unless they have secure rights to the land on which forestry activities are taken up, the investor may have little confidence in financing the project.

Most African tenure systems are characterized by the existence of multiple tenures, i.e. several users may have access to different resources on the same piece of land (Lund, 2000). For instance, in the Nyando basin in Kenya, land may be held under individual title but is used communally for grazing and wood collection (Swallow *et al.*, 2001). This can often cause confusion as to whether the land belongs to the group or to specific individuals, and it may be difficult for the investor to identify actual service providers. In general, there exists a duality between customary and statutory land rights in many African countries (Woodhouse, 2003). In Ethiopia, for example, even though all land was officially nationalized in 1974, there continues a system of inheritance and hereditary rights in several parts of the country. This can lead to tenure insecurity, a big impediment for long gestation forest carbon projects.

If carbon sequestration projects are taken up where property rights are unclear, it is also possible that more powerful people may take control over the land and poor people who may have been occupying it not only will not receive any benefits from carbon sales but could even end up losing their access to the land (Kerr *et al.*, 2006). For instance, a 50-year concession, owned by Tree Farms AS of Norway, to raise commercial plantations and generate carbon credits from 5,160 hectares of land in Bualeba Reserve, Uganda, continues to threaten the livelihoods of the local poor. As local people do not possess formal land titles, there are strong concerns that the project may threaten eviction of about 8,000 people who depend on the area for farming, collection of timber and NTFPs, cattle grazing and fishing (Eraker, 2000).

Solving this problem is not as easy as simply establishing formalized land rights, because many land titling projects in Africa have failed where they were inconsistent with customary practices (e.g. Ensminger, 1996). Where local economic systems are more amenable to titling, this can be facilitated through coordination of government departments involved in allocating rights and strengthening dispute resolution mechanisms (Gutman, 2003). Regardless of the land rights

system, countries need to improve their monitoring and enforcement procedures so that rights can be effectively defended when challenged.

One possible way for carbon projects to operate in areas under customary tenure is by working on land held as common property by an entire community, rather than taking up plantations only on privately held land. Project benefits can be shared amongst the entire community. For example, the Nhambita Community Carbon Project (Mozambique) will deposit $40.50 per hectare in a community fund on the basis of the number of hectares that are brought under carbon sequestration. Since all land is registered in the name of the village chief and no household has individual titles, the entire community gains from these group payments (Jindal, 2004).

4.2 Transaction Costs

Transaction costs include costs of negotiating, contracting, implementing, and monitoring a project. In carbon sequestration projects and other CDM-based activities, transaction costs can be a significant component of total project costs; for instance, the World Bank Prototype Carbon Fund's upfront costs for each project is about $265,000 (UNEP, 2004). Usually, transaction cost per ton of carbon dioxide for large projects is very small or even negligible while for small-scale projects it is quite high. Similarly, transaction costs are much higher in absolute terms when dealing with multiple parties rather than a single party (Kerr *et al.,* 2006). Gaining information about landowners, contacting them, establishing contracts, and certifying changes in land use, all increase the cost per hectare and per unit of carbon sequestration when working with many small holders (Smith and Scherr, 2003). As a result investors usually prefer large-scale projects with only a few partners rather than dealing with many partners with small pieces of land.

In Africa, most rural people are small landholders. Although many African countries have large tracts of privately held lands that present an opportunity for large carbon sequestration projects (White and Martin, 2002), sustainable development of poor African communities would instead require projects to be taken up with small landholders. However, the prospect of high transaction costs associated with small-scale projects usually makes these ventures unattractive to investors.

This problem can be addressed in two ways – firstly, by simplifying guidelines for design and formulation of carbon sequestration projects, and secondly, by encouraging participation of intermediary organizations with experience in setting up community based projects. As regards CDM-based carbon projects, the guidelines are already under review by the Executive Board of the Kyoto Protocol. The recommendations are to simplify requirements (design, validation, registration, and monitoring) for small-scale carbon sequestration projects that target low-income communities and generate emission reduction of less than 8000 tCO_2 per annum (UNEP, 2004)[17]. Once finalized, the new guidelines may help reduce transaction costs associated with small-scale CDM projects, thereby inducing more investors to finance Kyoto-compliant carbon sequestration projects in Africa.

[17] See www.unfccc.int for all the recent modifications in CDM guidelines.

Transaction costs can also be lowered by creating an enabling environment for intermediary organizations to participate in carbon sequestration projects. At present, most carbon projects in Africa are directly implemented by national government ministries. One major limitation of this approach is that these centralized agencies are unfamiliar with local conditions and cannot identify and target small holders effectively. Further, these agencies can take up only a certain number of projects, thereby constraining their expansion. Therefore, African countries need to promote NGOs, research institutions, companies, and other public agencies as intermediaries for carbon sequestration projects. Examples are organizations such as Kenya Agricultural Research Institute (KARI), Kenya Forest Research Institute (KEFRI), and NGOs such as Bureau for Environmental Analysis-International (BEAI), which act as intermediaries in Kenya.

In addition, transaction costs can be greatly reduced by developing projects in communities where local organizations are already active and participatory development processes are in place (Landell-Mills and Porras, 2002). For instance, TIST (Tanzania) has reduced transaction costs in several ways. First, carbon sequestration has built upon earlier community based forestry and natural resource management initiatives. Local farmers were organized into groups of 10-12 people and encouraged to meet regularly to identify local development goals. These groups were provided the necessary inputs through technical and financial assistance to take up reforestation and conservation on their degraded lands. As farmers realized benefits from the program, membership spread from just 40 groups in 1994 to more than 2500 groups at present (linking about 20,000 small farmers in the area). Out of these, 315 groups are now directly involved in carbon sequestration. Second, the two project partners – Institute for Environmental Innovation (I4EI) and Clean Air Action Corporation (CAAC) – have registered a local subsidiary called UMET Ltd. (Ukuzaji Maendeleo Endelevu Tanzania), which manages the project. Local groups transfer all carbon credits to UMET Ltd., which sells them on their behalf and pays them quarterly on the basis of the actual number of live trees. Finally, all activities including afforestation, monitoring and supervision of plantations, and disbursing carbon payments are performed jointly by farmers' groups and representatives of UMET Ltd., which helps to further reduce transaction costs.

4.3 Governance

Good governance is critical for most market mechanisms to function properly. A stable and well-defined regulatory environment is necessary to promote international carbon investments, just like other foreign investment, Considering that most carbon sequestration projects have a long gestation period, any investment is liable to be risky unless backed by long-term economic and political stability. Moreover, governments are important buyers and sellers of environmental services and also act as intermediaries (as seen in several projects in Africa). Therefore, in order to attract and sustain international carbon projects, it is essential to have good governance practices at national and local levels.

However, many African countries face political volatility and unpredictable governance systems making carbon sequestration investments a risky preposition. Several Sub-Saharan countries are under the grip of long-term civil strife, making it difficult to imagine international carbon sequestration investments. On the brighter side, in many other African countries the political leadership is taking ownership of conflict resolution, good governance and poverty reduction.

Substantial improvement in economic governance has taken place across sub-Saharan Africa since the mid-1990s; the gross domestic product in 15 countries grew consistently at the rate of six percent per year. Skilled political leadership, international support, and desire for peace have led to real progress in addressing conflicts in countries such as Uganda, Mozambique and Rwanda (World Bank, 2005). These initiatives are bound to instill confidence amongst investors to invest in carbon sequestration projects in these countries. But there are others where considerable progress still needs to be made.

4.4 Institutional Capacity

Facilitating successful implementation of carbon sequestration projects requires having adequate national institutional capacity. The Kyoto Protocol requires each developing country to establish a Designated National Authority (DNA) to promote carbon projects that are aligned with national development priorities, beneficial for local communities, and in support of general sustainable development goals (UNEP, 2004). The DNA serves as the point of contact between international investors and local service providers. One important factor in establishing a DNA is its institutional sustainability, reflected in its capacity to ensure a coherent, justifiable and transparent assessment of carbon projects and to generate enough revenue through these assessments to finance itself.

However, there is a concern that many countries in Africa lack institutional capacity to recognize, package and promote potential opportunities for funding carbon projects. Not only is there an absence of supporting policy and legal frameworks, but some countries even lack a general awareness about carbon payment processes (Kituyi, 2002). Therefore, it is imperative to invest in capacity building of these national governments. Although organizations like UNDP and UNEP are already involved in capacity building initiatives, much remains to be done. One way is to include capacity building as an integral component of each carbon project. For example, the Western Kenya Integrated Ecosystem Management Project includes a comprehensive capacity building phase, supported by Japan PHRD. Under this component, the project will train the Kenya Agricultural Research Institute to measure carbon baselines and end of project carbon stocks, and to participate in international forums for climate change. The aim is to establish a national carbon assessment and certification capacity within Kenya's national research system.

On the other hand, a downside of this strategy is a possible escalation in project overheads, which may be unacceptable to international investors. Therefore, apart from donor led efforts, host countries should also be willing to invest in capacity building. A beginning in this direction can be made through developing national level CDM/carbon programs in line with national development plans and Poverty Reduction Strategy Papers. This would ensure that carbon projects meet the goal of sustainable development for the host countries as well as convey a transparent set of project assessment criteria to investors. The success story of Morocco demonstrates that investments in capacity building can yield long-term economic gains through increased financial inflows for more carbon projects (see Box 5).

Box 5: Morocco gains from Capacity Building

Morocco ratified the Kyoto Protocol in 2002. Since then, it has been actively involved in building institutional capacity to take up CDM and other carbon projects. Due in part to the support provided by UNDP and UNEP's CD4CDM project, Morocco now has an operational DNA (in the Ministry of Land Use Management, Water and Environment), national project evaluation procedures, qualified experts in the field, and different promotional and information materials for carbon projects in the country. It has also signed MOUs with European partners such as France and Italy to take up CDM projects (Point Carbon, 2003). Morocco's overall CDM portfolio consists of 34 projects, of which 4 are afforestation and reforestation projects. Though most of these projects are still in the planning phase, their estimated potential for reduction of emissions is more than four million tons per year. With this dynamic effort at capacity building, Morocco is currently ranked in the top 10 of Point Carbon's CDM host country rating, the first African country to do so. (Source: UNEP and IETA, 2005a)

5. Conclusion

Led by international efforts to contain global warming and recent innovations in market mechanisms to trade in environmental services, carbon sequestration projects have been growing steadily. The major potential for such projects exists in developing countries where forestry based carbon sequestration is much cheaper than in industrialized countries. For Africa this represents an opportunity to attract additional investments for poverty alleviation and natural resource management initiatives.

However, this review has shown that the carbon market in Africa is still in its infancy with most projects representing voluntary emission reductions. Although field evidence suggests that many existing carbon sequestration projects are beneficial for host countries, there are concerns regarding location of these projects and choice of tree species. Expanding carbon sequestration investments in Africa will require meeting many challenges. Prominent among them is the need to ensure secure tenure and property rights. This is a formidable challenge in a region where land continues to be a major reason for civil strife. High transaction costs for small landholders pose an additional challenge, creating the need for intermediaries that can bring together small farmers as a collective to deal with international investors. African countries also need to instill transparent regulatory systems and good governance practices. Another key challenge is to build institutional capability at national and local levels. The recent success stories of countries such as Morocco demonstrate that other African countries can also play a significant role in international carbon markets once they have addressed some of these key challenges.

Finally, it is worth noting that even though the CDM Board and other international bodies have put sustainable development and equity on their agenda, carbon projects essentially represent an emerging market and not a grant-in-aid scheme. Only those countries that are well prepared and capable of participating in this competitive market will be able to seize this new opportunity.

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