Climate Trading

The Clean Development Mechanism and Africa

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ABSTRACT

Global warming is today, without a doubt, one of the biggest international issues. Whilst no country will go completely unscathed by future consequences of climate change, the impacts thereof – in terms of loss of life as well as the relative effects on economies – are expected to be felt most severely in developing countries, specifically Africa. Nevertheless, the development of the Clean Development Mechanism (CDM) under the global environmental treaty – the Kyoto Protocol – has brought with it the potential of socially and environmentally sustainable industrial and energy development in Africa.

This paper examines the carbon trading system resulting from the Kyoto protocol, and investigates the implications of the associated Clean Development Mechanism for Africa. Although the carbon market is still in its formative stages, the benefits of this research are plentiful. Not only is such research critical for raising awareness, but also ensures that African countries get a foothold in this nascent market.

It is found that while producing carbon credits, CDM projects also have the potential to bring numerous benefits – such as sustainable development, transfer of skills and technology, improved adaptive capabilities, as well as access to new markets – to African host countries. If changes are implemented as suggested, the CDM has the potential to bring billions of dollars to Africa – a feat invaluable to the social and environmental development of the continent.

Keywords: Clean Development Mechanism, CDM, Africa, Climate Change, Emissions Trading, Policy, Carbon Credits, Carbon Markets
JEL: Q54, Q56, Q59

1. INTRODUCTION

Global warming is today, without a doubt, one of the biggest global issues. For over a decade now, it has become increasingly evident that the growing concentration of greenhouse gases in the upper atmosphere is leading to climate change – manifesting predominantly as increases in mean global temperatures, but also being accompanied by precipitation changes, variation in oceanic circulation and changes in extreme weather events, among other things.

Whilst no country will go completely unscathed by the future consequences of climate change, "the effects of climate change are expected to be greatest in developing countries in terms of loss of life and relative effects on investment and economy" (IPCC, 2001b). Of the developing regions of the world, Africa[1] is viewed as the most vulnerable to impacts of climate change. Small scale agricultural activities not only supply the bulk of food produced in Africa, but also provide 70% of all employment on the continent (Simms and Reid, 2005:2). Due to the dependence of farming activities on direct rainfall, African constituencies are exceptionally susceptible to weather uncertainties and extremes associated with climate change. The disproportionate exposure of African populations to climate related shocks such as floods, droughts, cyclones, heat waves and the spread of diseases greatly exacerbates this problem. Moreover, due to the extreme poverty that riddles much of the continent, African countries' adaptive capabilities are severely limited (Greene, 2005a:20). As such, those countries which have contributed least to climate change will be the first to face its consequences.

Since ownership of the air is absent, the upper atmosphere is essentially a global public good. Consequently, the emission of greenhouse gases into the atmosphere poses the problem of a widespread, or global, externality, in which the use of the atmosphere by one nation imposes costs on other nations. In the same breath, the benefits of emission abatement programmes accrue to all nations, while the costs of such programmes are borne by the country instituting these programmes alone. Owing to the nature of this problem, there is only a weak incentive for countries to institute emission control schemes independently – severely complicating policy solutions and at the same time necessitating global action to counter the problem of climate change.

[1] Africa will in this study refer to sub-Saharan Africa. North African countries are excluded from the study as "they do not share many of the problems and characteristics that are considered typical of the remaining group of African countries" (Burger, 2003:1).

In the light of the global climate crisis, international negotiations have led to the adoption of the first legally binding environmental treaty in the world in 1997 – the Kyoto protocol. Under the protocol, governments are held accountable for meeting specified emission reduction targets, while at the same time being encouraged to make use of the market based flexible mechanisms specified by the Protocol to realize their targets. These flexible mechanisms enable the trading of emission permits between countries, in essence providing the framework for an international carbon market.

The Clean Development Mechanism (CDM) is one of these flexible mechanisms. Under the CDM, projects in developing countries which decrease greenhouse gas emissions and simultaneously foster sustainable development can earn tradeable certified emission reduction credits (CERs). Developed countries can in turn purchase these CERs to meet a portion of their reduction commitments under the protocol. As such, the mechanism brings with it opportunities for both developed and developing countries. While developed countries are provided with a cost effective means of cutting emissions, developing countries benefit from sustainability promoting projects. Among other things, these projects promote the transfer of skills and technology, improve the host country's adaptive capabilities, provide access to new markets, as well as contributing to the general improvement of the economic, social and environmental milieu in the developing host countries. Consequently, the value of actions taken toward environmental protection is essentially doubled.

It is commonly recognized that Africa's main concern is sustainable economic development. As such, Africa's role in the climate change crisis is adaptation, not mitigation. Nevertheless, the synergy between emission abatement and sustainable development provided by the Kyoto Protocol's CDM, seems to be extremely suitable for Africa – providing the potential of socially and environmentally sustainable industrial and energy development in Africa. Unfortunately, however, Africa has hitherto only sparsely benefited from the financial and entrepreneurial gains associated with the CDM. Existing investments are overwhelmingly concentrated in the Asia Pacific and Latin America, with African CDM projects currently accounting for less than three percent of the international CDM initiatives (Fenhann, 2007). In the light of the above, it is critical that African countries channel resources toward investigating, and exploiting, the opportunities presented by this new global market.

This paper aims to examine the carbon trading system resulting from the Kyoto protocol, and to investigate the implications of the associated Clean Development Mechanism for Africa. This topic is critical for raising awareness and ensuring that African countries get a foothold in this nascent market. The structure of the paper is as follows: section 2 provides a basic introduction to climate change, examines the nature of this problem, and provides a theoretical overview of different mechanisms to tackle the global problem of climate change. Section 3 discusses the carbon market, its recent developments and the international regulatory systems that govern it. Section 4 examines the most important of these regulatory systems – the CDM. An overview is given of the workings of the CDM, as well as international CDM developments. Section 5 analyzes the CDM in an African context. It provides an overview of CDM developments in Africa; examines the potential and advantages of an expansion of the mechanism on the continent; investigates factors which prevent the exploitation of CDM related opportunities in Africa; and finally provides a number of policy recommendations to promote the development of the CDM in Africa. Section 6 concludes.

2. THE ECONOMICS OF CLIMATE CHANGE

2.1 What is climate change?

Both weather and climate are changing constantly – by location, season and time. 'Climate change' occurs when there is a noteworthy change in the 'average' climate state – specifically an extended (decades or longer) rise in the average mean temperature of the earth's surface. Climate change occurs due to both natural external changes (such as the expulsion of large amounts of aerosols during volcanic eruptions), as well as external human influences – such as changes in land use, deforestation and the combustion of fossil fuels (Stowell, 2005:3).

In order to fully understand climate change, it is necessary to elaborate briefly on the complex relationship between the sun and the climate system which makes the earth liveable. Solar energy, in the form of short-wavelength radiation (ultraviolet light) enters the earth's atmosphere and is absorbed by objects on the ground, warming the earth's surface. The energy which is not absorbed by the earth's surface, or is released by the warmed objects, is reflected in the form of long wavelengths (infrared radiation) – most of which are absorbed by greenhouse gases such as water vapour, carbon dioxide, ozone, methane,

nitrous oxide, halocarbons and other industrial gases, present in the earth's atmosphere. These greenhouse gases are transparent to ultraviolet light, but absorb infrared radiation, forming a heat preserving layer around the earth and resulting in a delicate 'greenhouse effect' which makes the earth inhabitable (McKibbin and Wilcoxen, 2002:108; Stowell, 2005:3).

The greenhouse effect constitutes a delicate balance – energy that enters the atmosphere also has to exit it. Since pre-industrial times, however, the earth has seen an unprecedented increase in emissions of carbon dioxide (through the burning of fossil fuels and the destruction of forests), methane (mainly from agricultural activities), ozone (from automobile exhausts) and other industrial gases, making it increasingly difficult for energy to be returned to space. In an effort to compensate for the additional energy, the earth climate adjusts through increases in mean global temperature, changes in precipitation patterns and more extreme weather patterns – a phenomenon referred to as the 'enhanced' greenhouse effect, or global warming (Davies, 1998:447; Stowell, 2005:4-5).

2.2 Climate change - a global externality problem

Greenhouse gases are a *par excellence* example of uniformly mixing pollutants – on entering the atmosphere, greenhouse gases mix uniformly, making the location of their emissions irrelevant to the location of their impact (Perman et al., 1999:360). Consequently, the problem of global greenhouse gas pollution can be examined from two angles. Firstly, the atmosphere is essentially an international common property resource, resulting in the common property resource dilemma: nations using the resource treat its services as free, while in reality, it is actually scarce. As a result, the use of the atmosphere (in this case as a waste sink) by one country imposes a negative externality on other countries making use of the same resource. Alternatively, all efforts made to reduce emissions can be viewed as the provision of a global public good. While the benefits of environmental pollution control accrue to all countries making use of the resource, the costs are carried only by the country instigating the pollution control – weakening incentives for countries to instigate pollution control schemes unilaterally (Wagner, 2002:127). On the contrary, outcomes may even be perverse, with countries having an incentive to free-ride on the abatement efforts of others (Perman et al., 1999:339; Nordhaus, 2005:2).

From whichever angle it is viewed, it is clear that owing to the absence of property rights of the atmosphere, global warming is essentially a global externality problem – resulting in the emission of inefficient amounts of greenhouse gases (Nordhaus, 2000:502). The critical distinction between national and global externality problems is that while governments exist to ensure the internalization of national externalities, the same is not true for global commons. Nations are sovereign and no supranational government exists which can ensure the internalization of global externalities (Hanley et al., 1997:163). It follows that global cooperation is necessary to address the problem of climate change.

2.3 Possible solutions to the global externality problem - lessons from theory

"... Policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost."

(UNFCCC, 1992: Article 3.3)

A large amount of scientific uncertainty still surrounds the precise effect of increased greenhouse gas concentrations: how much warming will occur, when warming will occur, and how different areas will be affected (McKibbin and Wilcoxen, 2002:108-109). While some academic research has been devoted to the task of finding the 'optimal' level of emission abatement,[2] uncertainties about both the costs and benefits associated with climate change, as well as uncertainty about the costs of reducing emissions, make this task practically impossible. However, minimization of the costs of abatement is nevertheless possible through the equalization of the marginal abatement costs across emission sources. In order to achieve this, especially in the light of the above mentioned uncertainties, standard economic theory prescribes the use of market-based instruments such as a tax on emissions or a tradable emission permit system (Perman et al., 1999:316; McKibbin and Wilcoxen, 2002:116).

Market-based policies recognize that different sources encounter different emission abatement costs, and accordingly sources are provided with flexibility as to how they are going to meet specified emission targets – through implementing better technologies, implementing efficiency measures, or (in the case of a trading system) purchasing reductions with other sources whose internal abatement costs are lower (Stowell, 2005:13).

[2] See for example Nordhaus, 1991.

In essence, firms are given the liberty to seek the lowest cost method of pollution abatement available to them (Hanley et al., 1997:108).

Under an emission tax system polluters are charged a predetermined price for each unit of emissions. Cost effective allocation of control responsibility is ensured under an emission tax system, as polluters will continue to abate until their marginal abatement costs are equal to the tax rate, and so are equalized across emission sources. Although there are numerous advantages to instituting a system of emission taxes, this system also has a number of shortcomings. In circumstances where the costs of control are not known, control authorities are not able to determine the tax rate which would lead to the desired level of emission reduction. Finding the appropriate tax rate through trial-and-error, makes future planning for industry role-players difficult, and so would be met with large opposition (Tietenberg, 1996: 336-337). Moreover, as emission levels depend on many other factors besides the tax level, desired reductions in emissions are not guaranteed under a tax system (Field, 1997:231-265). A further disadvantage is that if emission charges are uniform across emission sources – a necessary requirement for cost effectiveness – they are likely to have considerable impacts on international terms of trade[3] (Perman et al., 1999:368).

While environmental taxes set a *price* for emissions, but not a *quantity*, tradable emission permits set an *absolute cap* on the level of emissions but allow the *price* of permits to be determined by the market (accordingly this type of system has become known as a 'cap-and-trade' system). In contrast to a taxation system, a system of tradable emission permits provides certainty of environmental performance, while at the same time making it possible for authorities to achieve a cost effective allocation without any knowledge of control costs – the only condition being, that total global emission must be equal to the total permissible annual emissions (Tietenberg, 1994:27; Tietenberg, 1996:397). This is attributable to the fact that agents will have an incentive to trade pollution allowances as long as marginal abatement costs are different between sources. As long as the marginal abatement costs of one nation are lower than that of a second nation, it will always be in the interest of the first to abate emissions and sell the excess permits to the source with higher marginal abatement costs. As such, trading will continue until marginal abatement costs are equalized across pollution sources and the permit market is in equilibrium. Thus, this system allows

[3] The exact extent of such an impact is still essentially unexplored, but would depend on factors such as the magnitude of the tax, as well as whether the tax is levied on producers or on consumers (Perman et al, 1990:369).

governments to attain their policy objectives while at the same time permitting increased flexibility on how these objectives are met (Tietenberg, 1996: 338).

Beside the above, a system of tradeable emission permits is accompanied by a number of other prospective advantages. Firstly, the presence of an international market in emission permits brings with it the potential of significant cost savings due to the fact that allowances will automatically move from countries which are able to cut emissions most cheaply, to those which face comparably high abatement costs (Tietenberg, 1996:397). Further, like taxes, marketable permits have been found to encourage technological innovation. If a new technology allows a firm to reduce its emissions at a marginal cost which is lower than the equilibrium permit price, it is in the interest of that firm to develop and adopt the new technology (Tietenberg, 1996:337). Due to the large uncertainty surrounding the ultimate damages which will be caused by climate change, technological innovation could be viewed as critical to effectively deal with the problem.

The issue of whether an emission taxation system or a permit trading system is the most appropriate way to deal with climate change is a very controversial one, and is the focus of many an academic paper[4]. It is, however, not within the scope of this paper to enter this debate. This paper will examine the architecture of the current Kyoto protocol – i.e. absolute, binding emission targets with complete freedom to trade in emission permits – and will investigate the implications of this system for Africa.

3. ADDRESSING CLIMATE CHANGE: THE KYOTO PROTOCOL AND THE CARBON MARKET

3.1 International developments leading to the adoption of the Kyoto Protocol

Although the Swedish scientist, Svante Arrhenius, identified the “greenhouse effect” as early as 1896 (Encyclopedia Britannica, 2007), it was only in 1988, when the UN General Assembly endorsed the International Panel on Climate Change (IPCC) and recognized the “conservation of climate as part of the common heritage of mankind” (United Nations, 1988:133) that concerns about climate change can be said to have truly reached the international agenda (Stowell, 2005:7). Most of the twenty years since have been spent debating how and by whom greenhouse gas emissions are should be abated. The first formal

global commitment came in 1992 when the UN Framework Convention on Climate Change (from here on referred to simply as 'the Convention') adopted the Convention in 1994[5]. Although the Convention did not set quantitative restrictions on greenhouse gas emissions, it laid the foundation for future negotiations (Stowell, 2005:12).

It was in December 1997, in Kyoto, Japan, that the international community for the first time made tangible progress in tackling the global environmental problem of climate change. In December 1997, parties to the Convention adopted the Kyoto Protocol to the Convention ('the Protocol') which stipulated individual, legally-binding quantitative commitments for developed countries to cut greenhouse gas emissions, with the overall goal of cutting emissions to just under 95% of 1990 levels during the period 2008 to 2012[6] (Stowell, 2005:12) (UNFCCC, 2007a). Developing countries were excluded from emission targets under the Kyoto protocol. As developed countries have attained much of their wealth through energy-intensive industrialization, it was decided that it would only be ethical to give developing countries the 'right to develop' without burdening their development with emission constraints. Furthermore, although developing countries are home to approximately 80% of the world's population, their historical contribution to global greenhouse gas pollution is only around 25% (Jotzo, 2004:2).

Although the international commitment for reducing emissions was in place, country specific circumstances made the prescription of rigid policies and measures to cut emissions impossible. Key international players, in particular the United States, argued that the marginal costs of emission reductions varied between countries and sectors, making it inefficient and ineffective to meet targets through the use of a prescriptive list. As such, flexibility became the key for the adoption of the Protocol and the legally binding commitments that came with it (Stowell, 2005:15). Due to the complexity of negotiations, it was not until 16 February 2005, with the adoption of the Marrakesh Accords at the seventh Conference of the Parties (COP), that the Kyoto Protocol entered into full force (UNFCCC, 2007a).

[4] See for example Weitzman, 1974; McKibbin and Wilcoxen, 2002; Johnson, 2007; Schimmoller, 2007.
[5] The full text of the Convention is available from http://unfccc.int/resource/docs/convkp/conveng.pdf.
[6] The full text of the Kyoto Protocol is available from http://unfccc.int/resource/docs/convkp/kpeng.pdf.

3.2 The Kyoto Protocol – a framework for an international carbon market

Countries that are party to the UNFCCC, are divided into two main categories: Annex I countries, or developed countries (which have accepted legally binding obligations to cut greenhouse gas emissions) and non-Annex I countries, or developing countries (which have no legal obligation to cut greenhouse gas emissions). The wealthier Annex I countries also fall under Annex II of the Convention, as countries which not only have to meet emission targets, but also have to pay for the costs incurred by developing country parties in meeting their obligations under the Convention (UNFCCC, 1992: Article 12.1)[7]. Annex I countries of the Convention are included under Annex B of the Kyoto Protocol, which specifies each country's "quantified emission limitation or reduction commitment" as a percentage of the respective base year chosen. As of June 2007, 174 countries have ratified the protocol, making 61.6% of world emissions subject to the Kyoto Protocol (Stowell, 2005:29) (UNFCCC, 2007a).

The Kyoto protocol is essentially made up of three commitment periods, each of which gradually imposes tighter caps on greenhouse gas emissions. The first period, from 2005 to 2008, serves as a trial period in which parties to the protocol are able to put in place the relevant mechanisms in order to begin cutting emissions. The second period, from 2008 to 2012, sets explicit emission caps for participating countries – requiring them to cut emissions by at least 5% below 1990 levels (see Table 1 below for Annex B countries as well as their emission targets) (United Nations, 1998: Article 3.1). The final period, beginning in 2012, is currently under negotiation (Lindow, 2005:60). While details for the third period and beyond are not yet specified, the "Kyoto Protocol framework is [...] defined for an infinite period of time." Accordingly, countries which have ratified the Protocol are compelled to negotiate targets for each consecutive committment period (ie. 2013 – 2017, 2018 – 2022 etc) (Point Carbon, 2007:43).

[7] "[D]eveloped Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention" (UNFCCC, 1992: Article 4.5). Obligations of parties to the convention include among other things: i.) the establishment of a national system for the estimation and registry of greenhouse gas emissions levels, ii.) a general description of the ways in which the party to the Convention aims to mitigate climate change (UNFCCC, 1992: Article 12.1).

Table 1: Emission Targets of countries included in Annex B of the Kyoto Protocol

Country	Target reduction percentage from base year (1990*)
EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, United Kingdom Liechtenstein, Monaco, Switzerland **Economies in Transition***: Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Romania, Slovakia, Slovenia	-8%
US**	-7%
Canada, Hungary, Japan, Poland	-6%
Croatia	-5%
New Zealand, Russian Federation, Ukraine	0%
Norway	+1%
Australia	+8%
Iceland	+10%

* Some economies in transition have a base year other than 1990.
** The US indicated its intention not to ratify the Kyoto Protocol.
Source: UNFCCC (2007a)

The maximum amount of emissions allowed by each country over the commitment period is known as the country's *assigned amount* – which is equal to the country's 1990 emission levels, minus it's respective reduction commitment. To meet these targets, Annex I countries have to put in place a number of domestic policies and measures. However, emission targets may also be reached through the use of the market based trading mechanisms (also known as "flexibility mechanisms") specified under the protocol – international Emission Trading, "Joint Implementation" and the "Clean Development Mechanism." The use of mechanisms must however be supplementary to each country's domestic emission reduction efforts[8] (United Nations, 1998: Article 17).

Article 4 of the Kyoto Protocol establishes the system of *Joint Implementation*, under which an Annex I country can invest in emission reduction projects in other Annex I countries and

[8] While the exact quantity of domestic abatement efforts required is not specified, countries are required to demonstrate that the use of mechanisms is merely supplementary to domestic abatement efforts in their national communications under the protocol (UNFCCC, 2006).

credit the resulting 'emission reduction units' (ERUs) against its own target. Joint implementation projects are most likely to take place in transition economies, where the scope of low cost greenhouse gas emission reductions is the highest (UNFCCC, 2007a) (Erion, 2005:91).

Under the *Clean Development Mechanism* (CDM) (specified by Article 12 of the Protocol), Annex I countries can invest in projects reducing emissions in non-Annex I countries (developing countries) and use the Certified Emission Reductions (CERs) received in return for this investment to help fulfil their domestic abatement responsibilities (United Nations, 1998: Article 12.8) (Erion, 2005:91).

Finally, under *Emissions Trading* (United Nations, 1998: Article 17), Annex I countries may trade some of the emissions from their assigned amounts (known as Assigned Amount Units or AAUs) amongst themselves. Carbon credits[9] obtained through the CDM, Joint implementation or sink activities may also be traded under this mechanism (UNFCCC, 2007a) (Erion, 2005:91).

Of the three mechanisms, the CDM has played the most significant role in the international carbon market (UNFCCC, 2007b:152). A summary of Kyoto reduction units under different trading mechanisms is given in Table 2 below.

Table 2: Kyoto reduction Units

Name of Credit	Abbreviation	Legal Status
Assigned Amount Unit	AAU	Allocated to Parties to the Kyoto Protocol.
Emission Reduction Unit	ERU	Derived from Joint Implementation project activities.
Certified Emission Reduction	CER	Derived from Clean Development Mechanism project activities.

Source: Greene (2005a:5)

Through the inclusion of the above specified innovative market mechanisms, the Kyoto protocol has become the basis for an international carbon trading system (UNFCCC, 2007a). The international carbon trading system or "carbon market" is so-named, because

[9] In this paper, the term 'carbon credits' or 'credits' will be used to describe all tradable credits resulting from projects aimed at reducing greenhouse gas emissions.

carbon dioxide is internationally the most produced greenhouse gas. Further, other greenhouse gas emissions are measured and recorded in terms of their "carbon dioxide equivalents[10]" (Centric Austria International, 2007:18).

The implementation of various trading mechanisms, multi-year commitment periods, as well as the ability to earn carbon credits by reducing any one of six main greenhouse gases provides a way to minimize the economic burden accompanying climate change mitigation by ensuring that countries are given flexibility in terms of where, when and how they reduce emissions (Stowell, 2005:12-16). The free market system further guarantees, that while the ultimate responsibility of reducing emissions lies with the governments which are party to the protocol, virtually anyone – including individuals, non-governmental organizations and large companies – can participate in emissions trading (Lindow, 2005:56).

3.3 Developments in the carbon market

Since the official start of the Kyoto protocol in February 2005, the carbon market has matured considerably and has grown at a tremendous pace. The value of the carbon market has tripled from 2005 to 2006 – growing from an estimated US$ 10.8 billion in 2005 to around US$30 billion in 2006 (see Table 3 below) (Capoor and Ambrosi, 2006:3). Volumes traded in the carbon market increased by 130% from 2005 to 2006 and are expected to increase further by at least 50% in 2007 (Point Carbon, 2007:i). Project based transactions likewise flourished, with volumes traded increasing from 382 $MtCO_2e$ (million tons of carbon dioxide equivalent) to 508 $MtCO_2e$, accompanied by a rise in value from US$ 2.8 billion to US$ 5.4 billion. This increase in value is partly due to the significant rise in prices of the project-based emission reductions, with the average price for CERs being around US$10.90 per tCO2e in 2006 – a 52% increase from 2005 levels (Kapoor and Ambrosi, 2007:31).

[10] Greenhouse gases considered under the carbon trading mechanism include Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6). Each carbon credit generated is measured in terms of tonnes of CO_2 equivalent (tCO_2e). Equivalency rates are calculated according to global warming potential of the respective greenhouse gases over a 100 year time horizon (UNFCCC, 2006).

Table 3: An overview of the carbon market - Volumes and Values for 2005 and 2006 (until September 30).

	2005		2006	
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
Allowances				
EU ETS	321	7,908	1,101	24,357
New South Wales	6	59	20	225
Chicago Climate Exchange	1	3	10	38
UK-ETS	0	1	na	na
Sub total	**328**	**7,971**	**1,131**	**24,620**
Project-based transactions				
Primary CDM	341	2,417	450	4,813
Secondary CDM	10	221	25	444
JI	11	68	16	141
Other compliance	20	187	17	79
Sub total	**382**	**2,894**	**508**	**5,477**
TOTAL	**710**	**10,864**	**1,639**	**30,098**

Source: Capoor and Ambrosi, 2007:3

In essence, carbon credits have essentially become another financial instrument. Beside their basic use of satisfying Kyoto emission reduction requirements, credits can be bought, sold, traded and even kept for future use. Moreover, a voluntary market for emission reductions as well as a secondary market for CERs has developed to meet different demands arising in the market[11]. Major greenhouse gas trading programmes already exist in the EU, New South Wales, Chicago, the UK and Denmark with many other countries planning and opening exchanges around the world (Lindow, 2005:56).

[11] Although increased focus on, and development of, the voluntary market are also likely to carry numerous benefits for Africa, it is beyond the scope of this paper to examine this market in detail. For more information on the voluntary market as well the secondary market for CERs, see Greene (2005a) and Kapoor and Ambrosi (2007) respectively.

4. THE CLEAN DEVELOPMENT MECHANISM

4.1 About the Clean Development Mechanism

The Clean Development Mechanism (CDM) is currently the most developed of the three innovative market mechanisms under the Kyoto protocol. It is a mechanism which encourages parties to the protocol to invest in emission reducing projects, which simultaneously promote sustainable development, in emerging markets – effectively integrating these countries into the carbon market. Moreover, a certain percentage – or "share of the proceeds" – of each CDM project will go toward meeting administrative costs, as well as financing adaptation activities in developing countries which are "particularly vulnerable to the adverse effects of climate change" (United Nations, 1998: Article 12.8) (UNFCCC, 2007a) (Erion, 2005:91).

> The CDM has three stated objectives (Greene, 2005a:6):
>
> 1. *"To assist parties not included in Annex 1 of the Kyoto Protocol (i.e. developing countries) in achieving sustainable development.*
> 2. *To contribute to the ultimate objective of the convention, to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.*
> 3. *To assist Parties included in Annex 1 (developed countries) in achieving compliance with their quantified emission limitation and reduction commitments under article 3 of the Kyoto Protocol."*

Stated simply, the main aim of the CDM is to provide a cost effective way for developed countries to meet their emission targets, while simultaneously promoting sustainable developments in developing countries. Developed countries are able to receive carbon credits through CDM projects either by (co-)financing emission mitigation projects via equity investment, via forward purchases, or by buying CERs which have already been produced on the secondary market (Jung, 2005:3).

4.2 Complexities of the CDM

In order to ensure that the CDM retains its credibility, a number of international rules have been developed and set out in the CDM rulebook[12] which forms part of the Marrakesh Accords (UNFCCC, 2007a). This rulebook plays a crucial role in ensuring that CDM projects result in "real, measureable and long-term" greenhouse gas emission reductions, which are additional to the baseline scenario (Article 12.5, Kyoto Protocol). The 'baseline' is defined in the CDM rules as "the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity" (United Nations, 2006:16). The baseline criterion is critical, as it determines how many CERs a project will earn. The additionality criterion is complementary to the baseline criterion in that it specifies that a CDM project's greenhouse gas emission reduction must be 'additional' to those which would have occurred in the absence of the project activity or policy intervention (Stowell, 2005:64,66).

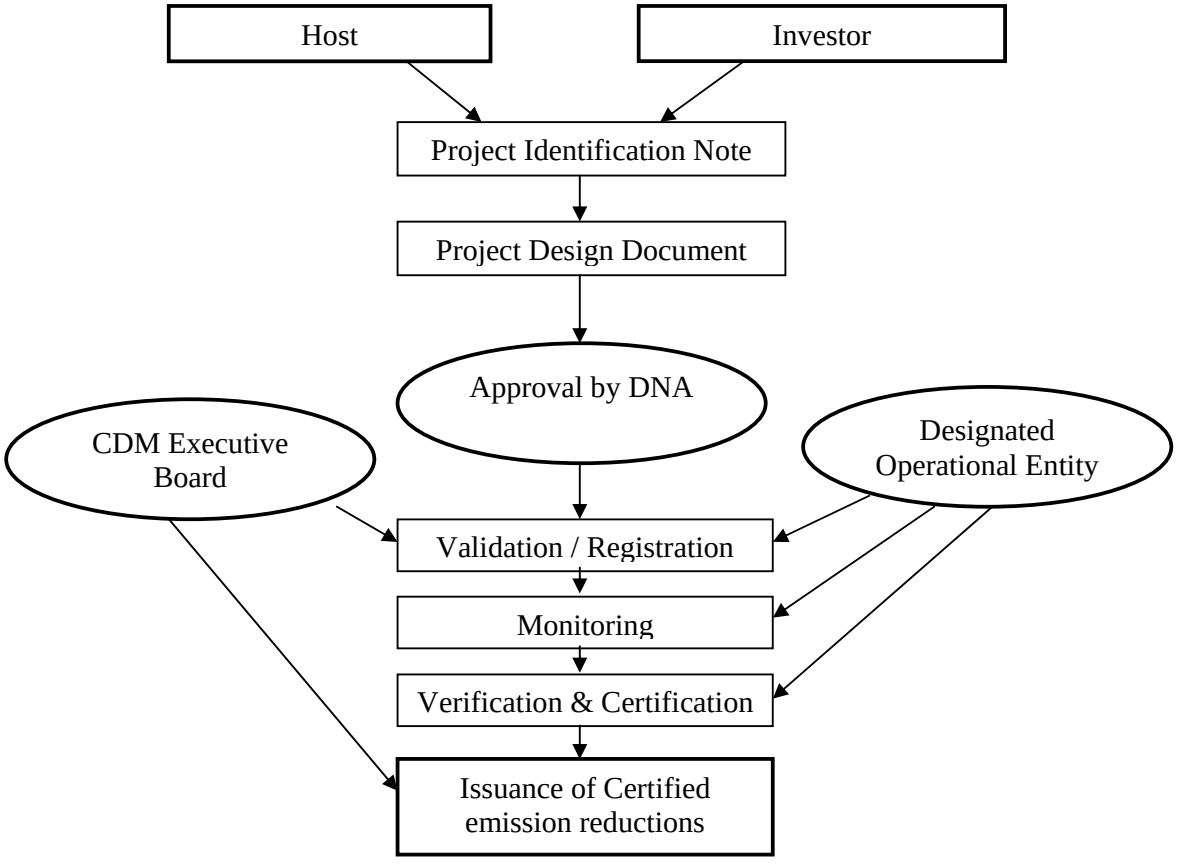
Although in theory the process of the CDM might sound relatively simple, it is evident that if a project is to satisfy all the stringent requirements which need to be met and is to be beneficial for both the host and the investor country, then the practicalities of the CDM will be rather complex. The complexity lies both in the methodology of determining standards for additionality and measuring subsequent emission reductions, as well as in the process of CDM project approval (Lindow, 2005:57).

There are a number of stages involved during the verification of a CDM project. The first step toward verification is voluntary and entails the submission of a Project Identification Note (PIN) by the project developer to the country's Designated National Authority (DNA). The purpose of this first step is to inform the DNA of the details of the project, and consequently give the project developer a feel for how the project will be received by the DNA. The next step entails project development, and therewith the submission of a more formal, Project Design Document (PDD) to both the DNA and the Designated Operational Entity (DOE) of the respective country or region. The DNA must, at this stage, give final approval of the project and make sure it satisfies the country's or region's sustainable development requirements. The purpose of the DOE is, through examination of the PDD, to ensure that the methodology of the project is valid, that the baseline scenario and the alleged emission reductions are accurate, and that the project satisfies the additionality condition.

[12] The bulk of the CDM rulebook was decided upon at the COP-7 in Marrakesh in 2001.

The third stage thus entails project validation and registration. During this time, the public is also allowed to comment on the project. If a positive validation by the DOE is made, the project is registered by the CDM Executive Board. The fourth stage involves systematic monitoring and surveillance of a project's performance by the DOE to verify that the project satisfies various performance-related indicators. If the project meets the objectives laid out in the PDD, the CDM project enters the fifth stage where emissions reduced or sequestered are subsequently verified and certified by the DOE. After reviewing reports submitted by the DOE and the DNA, the final decision of whether a project is granted certified emission reductions (CERs) lies with the Executive Board. All projects are at this stage also open to a further, 30 day, public comment period (Erion, 2005:91-92; Stowell, 2005:73-77). A visual representation of the different stages involved in the generation of CERs is given in Figure 1 below[13].

Figure 1: The CDM process



Source: Own drawing based on Erion, 2005:91-92; Stowell, 2005:73-77

[13] More information about the CDM project cycle, as well as the institutions which govern the CDM, can be found on http://cdm.unfccc.int/index.html.

4.3 Analyzing the CDM pipeline[14]

The CDM contributed to an impressive 90% of the demand for project based credits in 2006 (Kapoor and Ambrosi, 2007:3). The increasing confidentiality surrounding prices and contract structures in the project based transaction market, which is accompanying the growing competitiveness of the market, is making it difficult to correctly approximate the size of the CDM market. Nevertheless, the current portfolio of CDM projects is expected to yield 2 billion tons of CO_2 equivalent reduction in greenhouse gases by 2012 – corresponding to around 17% of the base year greenhouse gas emissions by Annex I parties. In response to this booming market governments and companies have set aside over US$ 11 billion for CDM project funding to 2012 (Ellis and Kamel, 2007:6).

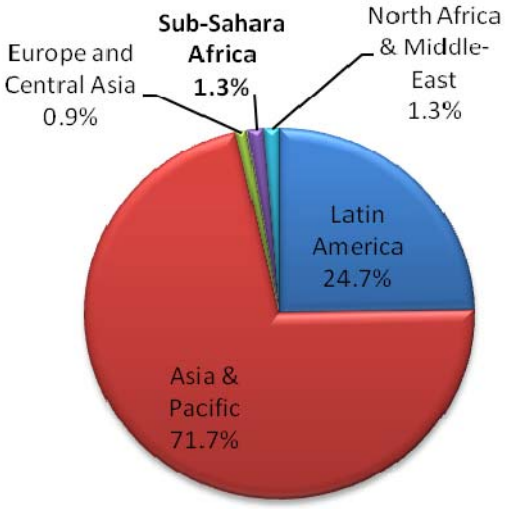
Despite the fact that the Marrakech Accords accentuate the importance of an "equitable geographic distribution of CDM project activities at regional and sub regional levels" (UNFCCC, 2001:20), the global geographical distribution of CDM projects is still very uneven, with most projects and the highest carbon credit production occuring in China, India, Brazil and Mexico. These countries account for a full 79% of internationally proposed projects and 84% of total expected credits by 2012.

China remains the largest CDM player, accounting for just over 53% of the expected credits till 2012. Moreover, specific sectors tend to dominate the CDM market, with 40% of expected credits to 2012 being the product of reducing HFC emissions and industrial sources of N_2O. The above abatement projects are popular because they "have a short lead time, offer large volumes of credits for low capital investment and mitigation costs, and additionality assessments are relatively straightforward" (Ellis and Kamel, 2007:7). A more detailed overview of the geographical and sectoral distribution of CDM projects is given in Figures 2 and 3 below.

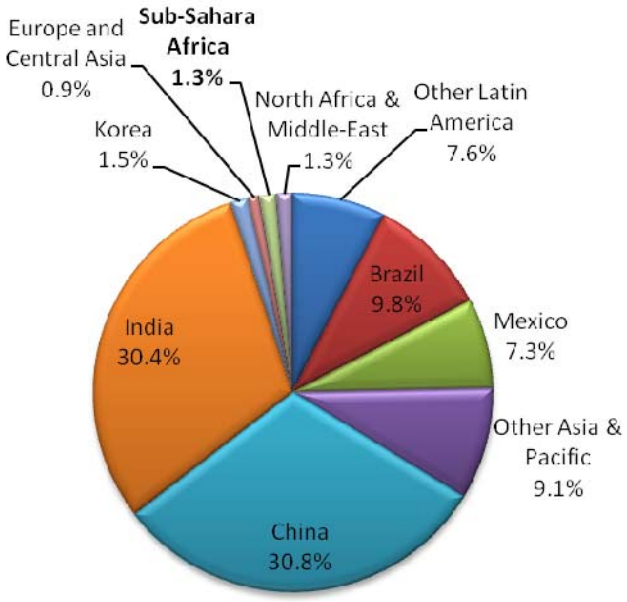
[14] "The CDM Pipeline includes CDM projects from the validation stage (start of the 30 days public comment period), through registration and to issuance of certified Emission Reductions (CERs). [..] No Project Idea Notes (PINs) or projects at a stage before validation are included" (Fenhann, Vincentz and Lema, 2006:1).

Figure 2: Geographical distribution of projects in the CDM pipeline

Geographical distribution, by region



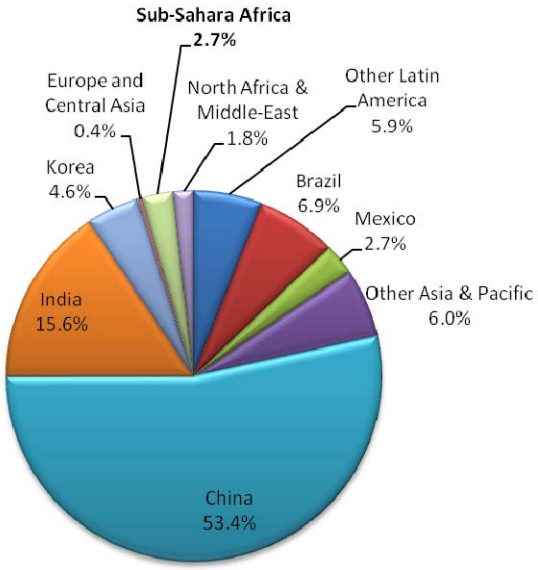
Geographical distribution, by main CDM players



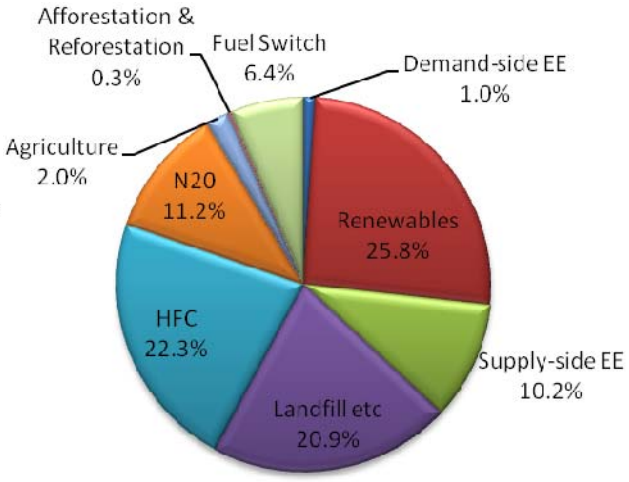
Source:Own Calculations; Data from Fenhann, 2007

Figure 3: Volume of CERs until 2012 from projects in CDM pipeline: by region and sector

Volume of CERs until 2012 by region



Volume of CERs until 2012 by sector[15]



Source:Own Calculations; Data from Fenhann, 2007

[15] The following subcategories are contained in the above used categories: *Landfill etc*: Cement, Coal bed/mine methane, Fugitive and Landfill gas; *Renewables*: Biogas, Biomass energy, Geothermal, Hydro, Solar, Tidal, Wind. EE categories represent credits resulting from Energy Efficient activities.

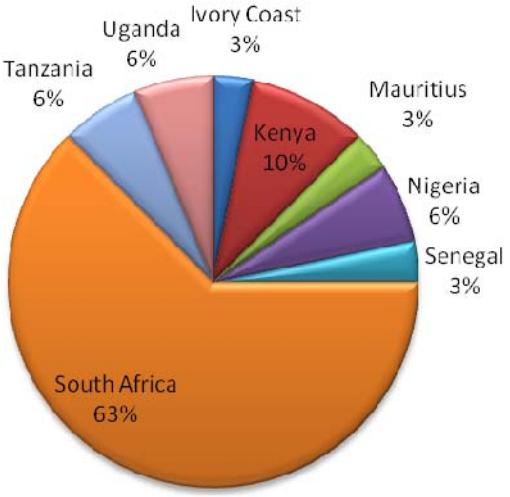
5. AFRICA AND THE CLEAN DEVELOPMENT MECHANISM

5.1 An overview of current CDM developments in Africa

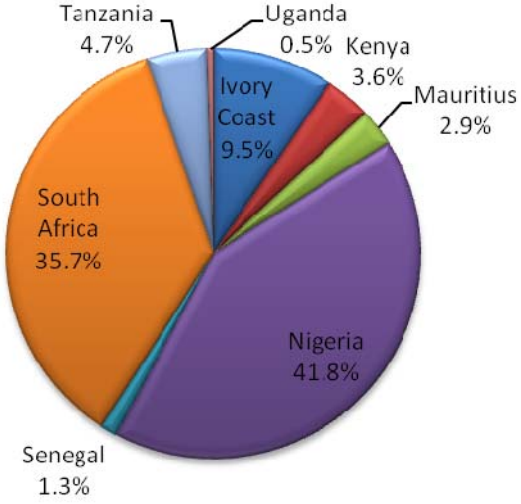
African participation in the Clean Development Mechanism (CDM) market has been slow to develop. Notwithstanding a significant increase in participation both in 2006 and in 2007, African CDM projects still represent only a small part of the total CDM pipeline. Moreover, even within Africa, the geographical distribution of CDM participation is highly uneven, with more than 60% of projects situated in South Africa (Capoor and Ambrosi, 2006:1). The distribution of African projects in the CDM pipeline, as well as their expected credit production, is given in Figure 4 below.

Figure 4: African Projects in CDM Pipeline, by country

Projects in CDM pipeline, by region



Volume of expected credits, by region



Source:Own Calculations; Data from Fenhann, 2007.

The Kuyasa low-cost urban housing energy upgrade project in Khayelitsha, South Africa, was the first Sub-Saharan African project to enter the CDM pipeline, at the end of 2004. By the end of August 2007, 32 projects from Sub-Saharan Africa were in the CDM project pipeline, out of a total of 2392 projects for all less developed countries. Nine African

countries had at least one project in the CDM pipeline: Equatorial Guinea[16], Ivory Coast, Kenya, Mauritius, Nigeria, Senegal, South Africa, Tanzania and Uganda (Fenhann, 2007).

5.2 Advantages of the Clean Development Mechanism for Africa

5.2.1 Sustainable development and success of projects

The Delhi Declaration[17] recognizes that although "significant cuts in global emissions will be necessary to meet the Convention objective of stabilizing atmospheric greenhouse gas concentrations... economic and social development and poverty eradication are the first and overriding priorities" for developing countries (Venema and Cisse, 2004).

By including the sustainable development requirement under the CDM, developing countries are effectively given the opportunity to address economic, social and environmental issues within a context of reducing greenhouse gas emissions (see Table 4 below for sustainable development criteria identified by different host countries). Consequently a strong incentive for CDM participation is provided even for those African countries which would normally only be concerned with addressing immediate economic and social needs (Figueres, 2002 cited in Greene, 2005a:14). What is more, is that unlike much of the other Foreign Direct Investment (FDI) which flows into Africa – which is often linked to "extractive and other export orientated primary commodity industries" – "carbon finance is a highly productive form of FDI often targeted at small to medium size enterprises (SMEs), bringing technology transfer, local job creation and local environmental benefits" (Greene, 2005a:18).

[16] Equatorial Guinea's proposed project of Reduction of Flaring and Use of Recovered Gas for Methanol Production was rejected (Fenhann, 2007).
[17] A product of the 8th Conference of the parties held in New Delhi, India, in November 2002 (Greene, 2005a:13).

Table 4: Taxonomy of Sustainable Development Benefits with general criteria identified by host countries

Social Criteria
Improve quality of life
Alleviate Poverty
Improve Equity
Economic Criteria
Provide financial returns to local entities
Result in a positive impact on balance of payments
Transfer new technology
Increased provision of energy
Environmental criteria
Reduce greenhouse gas emissions and the use of fossil fuels
Conserve local resources
Reduce pressure on local environments
Provide improved health and other environmental benefits
Meet local renewable energy portfolio standards and other environmental policies
Other Benefits
Sustainability Tax
Corporate Social Responsibility

Source: Pembina Institute for Appropriate Development, 2003; Olsen and Fenhann,2006:16

Greene (2005:14) maintains that, especially in the case of Africa, the sustainable development benefits accruing from CDM projects should be viewed in the light of their contributions to meeting the Millennium Development Goals (MDGs)[18]. CDM projects, especially small-scale energy projects, could be seen to help meet the following goals (Greene, 2005a:14; United Nations, 2007):

MDG 1: *Eradicate Extreme Poverty and Hunger* – through the creation of jobs, electricity provision to rural areas, and the creation of sustainable livelihoods.

MDG 4: *Reduce Child Mortality* – by improving the air quality in homes (through charcoal efficient stoves or roof top solar) and so reducing the cases of respiratory illness among children.

MDG 7: *Ensure environmental sustainability* – through the reduction of air pollution and through reforestation and afforestation activities.

MDG 8: *Develop a global partnership for development* – CDM activities promote collaboration between host countries and Annex I countries, as well as providing an additional incentive for the participation of non-Annex I countries in international climate negotiations.

[18] The Millennium Development Goals are eight international development goals that 189 United Nations member states have agreed to aim to achieve by 2015. See http://www.un.org/millenniumgoals/.

Most importantly however, through the revenue created by the sale of carbon credits, development projects that would normally not be viable due to lack of funding suddenly become sustainable (Lindow, 2005:55). The above is partly a reflection of the additionality clause under CDM. As carbon credits can only be obtained through projects that would normally not have taken place, CDM funding makes desperately needed, yet unprofitable, projects feasible (Pfifer, 2007). Moreover, in the context of the CDM, it is in the interests of Annex I investors that sustainable development projects in non-Annex I countries – which are the source of carbon credits – are successful. Annex I investors are able to drive project developments in non-Annex I countries based on "practical, hands-on experience" (Chicago Climate Exchange, 2007), making projects instigated under the CDM more likely to have long run success than projects instigated without it.

5.2.2 Transfer of skills and technology

With the entry into the carbon market, comes the transfer of knowledge and technology from Annex I producer countries to non-Annex I host countries. Under the technical description section of the project design document of the CDM, information must be provided as to how technology, if any, will be transferred to the non-Annex I host country (United Nations, 2006:23). The transfer of technology from producer countries – in the form of experience, know-how and equipment – is viewed as one of the main benefits of CDM, potentially leading to fulfilment of economic criteria under the different sustainable development dimensions (IPCC, 2000) (Olhoff et al., 2004:18).

Through the attainment of the latest environmentally friendly technologies, host countries of CDM projects are given the opportunity to leapfrog the dirty stage of development without incurring the costs that would normally be associated with the acquisition of these technologies. What is more is that the infusion of advanced technologies is likely to increase the efficiency of African factories and electricity generating plants – leading to a lower cost structure and higher profits (Centric Austria International, 2007:18). With energy being one of the main drivers of economic development, the production of relatively cheap, clean energy is key to the international competitiveness of African countries (Greene, 2005a:13).

Due to the close cooperation between host countries and Annex I recipients of carbon credits required by CDM projects, these projects also have a number of secondary benefits. Important role players of non-Annex 1 countries – such as universities, companies and even

individual entrepreneurs – are exposed to international business, global policy processes and financial negotiations, fostering skills development and international linkages, thus making them more internationally competitive (Greene, 2005a:14).

5.2.3 Improved adaptive capacities

Based on the theory of the sustainable livelihoods model of development, CDM projects are likely to lead either directly or indirectly to improved adaptive capacity of host countries due to the expansion of economic, social and natural capital they invoke (Greene, 2005a:20). Certain types of CDM projects are, however, associated with specific direct benefits likely to accrue to African communities most vulnerable to climate change. A number of these benefits are given in Table 5 below.

Finally, it must be remembered that the above mentioned benefits are purely a result of the CDM under the Kyoto protocol. Financial and technological resource commitments of Annex II parties, specified in Article 11.2 of the Protocol, are separate to the benefits discussed, and remain valid under the CDM. Moreover, CDM rules ensure that CDM projects do not lead to the displacement of other, regular development assistance (UNFCCC, 2007a).

Table 5: Direct benefits associated with different types of CDM projects

Type of CDM project	Benefit	Reason for benefit
Afforestation / Reforestation	Protection from floods	Improved soil consistency can assist in preventing landslides
	Protection from drought	Improved growing conditions for crops through increased shade & decreased water evaporation after rains.
	Preservation of biodiversity	The use of endemic species for A/R projects can help conserve indigenous flora and fauna through the regeneration of habitats.
	Preservation of indigenous forests	Plantations under CDM are a potentially sustainable source of construction material, decreasing pressure on indigenous forests.
	Reduced soil erosion	
Dams for micro hydro projects	New source of water for irrigation and drinking – critical in many drought stricken African countries.	Retention of water before being absorbed in the water table
Installation of solar powered water heaters	Decreased dependence on charcoal and non-renewable resources	
Methane capture projects (from Landfill sights)	Cleaner suburban environment Helps prevent the spread of vector borne diseases	
Charcoal efficient stoves	Reduce dependence on biomass from local forests	
Roof insulation projects	Assist poor communities to adapt to extreme temperatures	

Source: Greene, 2005a:20; Capoor and Ambrosi, 2006:2,3

5.2.4 Access to new markets

If, as argued under section 3.3, carbon credits really are just another type of financial instrument, the CDM provides an opportunity for African countries to enter this global market while it is still in its nascent stages. It allows African parties to "acquire cutting edge measurement and trading skills that will be needed in a global context in the short and long term" (Chicago Climate Exchange, 2007).

However, it is not only to a budding market to which Africa receives access, but rather to a global trend of cleaner development, cleaner technology and a philosophy of countering global warming. Although legally binding emission targets are currently only relevant to developed countries, it is likely that middle income countries will also be subject to emission targets in the future (Greene, 2005a:15). Through instituting cleaner technologies, raising awareness about environmental issues and cooperating with major global role-players, African countries can be part of, and play a role in, global developments; an aspect likely to positively contribute to Africa's role in future international developments.

5.3 Examining the potential of the CDM in Africa

Ten years after the signing of the Kyoto protocol, hopes of extensive investment in African CDM projects have remained largely unfulfilled. To a certain extent it is obvious that the continent with the lowest greenhouse gas emissions will have the fewest opportunities for abatement projects. Due to the relatively slow pace of both its current as well as its expected future development, it is clear that Africa will have a more limited amount of CDM investment opportunities than, say, Asia (Bess, 2005:1). Nevertheless, Africa's relatively low rate of emissions is not sufficient to explain the current state of affairs.

The last 20 years have shown record growth of Foreign Direct Investment (FDI) levels to Africa. Increased investor confidence can largely be attributed to the improved infrastructure, macroeconomic and political management, as well as foreign ownership laws – all of which have created a more favourable investment climate in many African countries over the last few years. Most of this investment has gone to mining, fuel and other energy sectors (UNCTAD, 2005:4,12), all of which have large potential for carbon mitigation projects due the large amount of greenhouse gas emissions which result from activities in these sectors (Greene, 2005a:16).

Accompanying the improved investment climate in many African countries is a large potential to realize the development prerequisite of the CDM. The high demand for jobs and foreign currency, and the acute need for industrial development and sustainable livelihoods in most African countries, makes the creation of a sustainable development dividend through CDM projects easier in Africa than in many other regions (Greene, 2005a:18). Moreover, the demand for energy throughout the continent, but especially in poorer countries, is enormous. Over three-quarters of Sub-Saharan Africans do not have access to

electricity, compared to only approximately 14% of Latin Americans and East Asians. With the contribution of exploitation of fossil fuels to the development and security of African people being questionable, and with resources for energy such as biomass, geothermal and hydropower being abundant, this provides a sizeable potential market for sustainable and renewable energy (Simms and Reid, 2005:4,20).

In sum, an improved investment climate, abundant carbon mitigation opportunities, as well as the potential to create large development dividends in African countries, suggests that numerous CDM opportunities in Africa still remain unexploited (UNCTAD, 2006:1).

5.4 Factors preventing the exploitation of CDM opportunities in Africa

A number of rules have been implemented under the Kyoto protocol in an attempt to make CDM projects in host countries which provide less lucrative CDM investment opportunities, more attractive. The above include the exemption of least developed countries' (LDCs) CDM projects from the adaptation levy, as well as the creation of special rules for small scale CDM projects (Jung, 2005:17). However, a number of barriers which impede the success of CDM project development in African countries remain. According to Ellis and Kamel (2007:17,34), these barriers can broadly be divided into four categories. National barriers are country specific rather than being related specifically to the CDM. Examples include a countries policy or legislative framework – barriers which are particular to the context in which CDM projects operate. CDM-related barriers are specific to the CDM and include factors such as institutional capacity as well as country awareness about the CDM and its potential. Project-related barriers are specific to individual projects, and include barriers such as availability of finance and project specific risks. Finally, international barriers include barriers such as investor criteria on project type, location or size; exclusion of certain types of CDM projects in the pre-2012 period; and uncertainty about post-2012 rulings – all of which influence geographic location of CDM activity.

5.4.1 National barriers: policy and legislative framework

A country's policy and legislative framework, which plays a large part in determining the general investment climate, has a large bearing on a country's CDM activity. Among other things, factors contributing to a favourable CDM investment climate include a legislative system which is stable and enforced, a stable political regime and macro-economic climate, a tax-incentive framework encouraging investment, limited barriers to foreign ownership, a

skilled pool of workers, as well as a clear policy regarding CDM-related issues (Ellis and Kamel, 2007:18). Unfortunately, few African countries satisfy the above criteria (World Bank, 2007).

5.4.2 CDM-related barriers: lack of infrastructure and awareness

Research conducted by numerous institutions (such as the UNIDO, UNEP, the World Bank and the EU, among others) has shown that many African countries are still in need of extensive capacity building before they will be able to become effective players in the competitive carbon market (Greene, 2005b:11). As is evident from section 4.2, the CDM process may appear bureaucratic and convoluted, especially from the view of African governments. With a lack of local infrastructure and qualified personnel in most African countries, the fulfilment of numerous requirements of the CDM process – the establishment of a DNA, conducting project baseline studies, fulfilling approved methodologies, registering projects with the CDM executive, etc. – becomes difficult (Goldsmith and Mckeown in Greene, 2005a:35).

The lack of CDM infrastructure is accompanied by, and can often be attributed to, a general lack of awareness of the CDM among numerous African governments. Furthermore, many African constituencies are not yet convinced of the development and financial benefits associated with hosting CDM projects, making them resistant to the diversion of scarce resources from more immediate development concerns such as healthcare and education (Greene, 2005b:11; Nanasta, 2007:5). This lack of awareness is in turn directly linked to a scarcity of data and statistics which normally assist local entrepreneurs in developing PDDs for CDM projects, as well as serving as a means for governments to discover sectors with potential for CDM development (Upadhyaya, 2007:14).

5.4.3 Project related barriers

a. Access to finance

Not only is the CDM project cycle relatively complex, but it also a reasonably lengthy and expensive procedure. Mariyappan, et al. (in Greene, 2005a:29) have found development costs for small-scale CDM projects to be no less than US$ 30 000, while large-scale projects come no cheaper than approximately US$ 80 000.

Most private carbon funds will not issue carbon finance until shortly before the CERs are delivered. Usually only public carbon funds are willing to accept the risk of non-delivery by providing up front funding for CDM projects. As such, project developers from non-Annex I countries have the choice of making use of public funds or, alternatively, finding access to capital to cover project expenses until CERs are issued. Issued CERs from this 'Unilateral CDM' financing structure can then normally be sold at a premium (Cosbey et al., 2005:51 ;Greene, 2005a:9).

The prevalence of unilateral CDM thus depends largely on the accessibility of project finance for CDM projects. In most African countries, access to project finance is generally a problem. Due to most African financial intermediaries' lack of knowledge about the profitability and risks associated with CDM projects, and due to the general persistence of high interest rates in African countries, attracting finance for CDM projects is exceptionally difficult for African developers – deferring entry into initial stages of project preparations (Greene, 2005a:9; UNEP Risø, 2007).

b. CDM specific project risks

A number of standard risks, attributable to the CDM process, accompany investment in CDM projects. These include the risk of delayed approval by the DNA; the risk associated with problems or delays with project validation and registration; the risk of erroneous calculation of emission reductions or sequestration during the monitoring stage; as well as risks associated with the demand for, and so price of, CERs on large trading schemes (Ellis and Kamel, 2007:31). As such, for investors, there is always a risk associated with the delivery of CERs, the timing of delivery, and the quality of CERs eventually delivered (Kapoor and Ambrosi, 2007:32). Although the above risks are standard to investment in CDM projects, they are likely to be aggravated by factors such as unstable governmental regimes or a labour force characterized by a large proportion of unskilled labour – both of which are typical of many African countries.

5.4.4 International barriers

a. Sustainability as a non-market good

In a competitive market, smaller, community-based projects which promote efficient or renewable energy have little scope due to their high costs relative to large projects which

destroy industrial gas to generate large amounts of relatively cheap credits. Thus, although community-based projects with large sustainable development dividends is what most hoped the CDM would deliver, carbon credit buyers are naturally inclined to rather make use of cheaper, but much less environmentally and socially attractive projects (Lohmann, 2006:272)

As discussed in section 4.1, achieving sustainable development in non-Annex I host countries is one of the primary objectives of the CDM. Notwithstanding, to what extent CDM projects have actually led to sustainable development has been subject to much debate. The reason for the scepticism is that the CDM rulebook delegates the responsibility for achieving sustainable development to the respective host country's DNAs: allowing non-Annex I host countries to determine their own national sustainable development criteria, rather than delegating standards for sustainable development criteria from an international level. Non-carbon elements of CDM projects, such as sustainable development benefits, do however not possess a monetary value in the carbon market – serving as a disincentive for host countries to establish rigorous sustainable development criteria in an internationally competitive market. The above may in turn lead to projects with minimal positive, and sometimes even negative, social and environmental impacts (Worthington, 2005:52; Olsen and Fenhann, 2006:1-2).

b. Project types

i. 'Land Use, Land-use Change and Forestry' (LULUCF)

Until 2012, afforestation and reforestation (A/R) projects[19] are the only eligible LULUCF projects eligible under the CDM (Ellis and Kamel, 2007:36). This results in the systematic exclusion of large classes of LULUCF assets – such as soil sequestration, fire management and avoided deforestation – which provide potentially attractive opportunities for natural resource rich African economies.

African countries have been forerunners in finding pioneering methods to sequester carbon through A/R activities which simultaneously deliver large social, environmental and economic benefits (Capoor and Ambrosi, 2006:2). Due to the large extent of land degradation in many African countries, as well as the heavy reliance on wood resources for energy, the African continent offers considerable potential for large-scale A/R activities.

Moreover, low technology requirements associated with growing trees make A/R projects accessible even to rural communities (Desanker, 2005:25). A/R projects have further been identified as those projects which most assist African countries in the adaptation to climate change (Greene, 2005a:21,29).

The inclusion of 'sink' projects under the CDM has, however, been one of the most contentious issues under the mechanism due to the large degree of scientific uncertainty about the amount of carbon which is removed through these types of projects, as well as due to concerns about the permanence of such sequestrations – i.e. fears that carbon absorbed through forests could potentially be re-emitted in the future (Worthington, 2005:52). Accordingly, the Marrakech Accords placed a cap of 1% on the number of A/R CDM project credits which could be used to meet Annex I compliance levels. Further, credits from A/R project activities have been assigned a temporary nature, with their validity expiring after a number of years (Ellis and Kamel, 2006:36). Due to the same reasons, the EU Emission Trading Scheme outlaws the sale of CERs resulting from LULUCF activities. The temporary nature of the credits, as well as exclusion from the world's largest carbon trading scheme, has resulted in the price of LULUCF CERs remaining lower than those from other CDM activities.

The rules surrounding A/R activities have further potential to inflict harm on African societies and ecosystems, in that they currently offer no protection for existing forests and grasslands, while single species plantations are included under the present definition of forestry. This leads to the potential threat of the destruction of diverse indigenous ecosystems, in an effort to obtain credits through fast-growing, monoculture plantations. Mono-plantations come with their own disadvantages, having ecologically detrimental qualities such as "biodiversity loss, water table disruption and pollution from herbicides and pesticides" (Bachram, 2004:8), while at the same time leading to the possible displacement of local communities in order to appropriate land for plantations (Bachram, 2004:8; Lohmann, 2006:241).

Luckily, the above problems have largely been recognized by the international community. A new facility, the Forest Carbon Partnership Facility (FCPF), is being developed by the World Bank in an effort to assist developing countries to conserve their forests. This facility aims at providing future large-scale incentives, also in the form of carbon credits, for

[19] A/R projects are often referred to as 'sink projects' (Desanker, 2005:25).

decreasing the rate of deforestation (Capoor and Ambrosi, 2007:30; Nicholls, 2007:3). Further positive future developments include the possibility that LULUCF project activities will be allowed under the EU ETS for the second commitment period (2008-2012) (European Union, 2007:6).

ii. Renewable energy

The additionality rule of the CDM has been subject to much criticism. The judgement as to which emission reductions are additional to reductions which would have occurred in the absence of the project activity, is viewed as a subjective one – one which is unlikely to be correctly made by a remote panel with limited knowledge of business decision making (Greene, 2005a:29). As development status and electricity access are so different in Africa compared to most other countries, satisfying the additionality criterion is often more difficult, especially for projects in the electricity sector. Due to the use of small scale clean energy technologies (mainly hydro-energy) in many of the least developed African countries, any project introducing clean, grid-connected electricity, will struggle to receive carbon credits, as it has to, under the additionality rules of the CDM, demonstrate that it supplants 'carbon-intensive' electricity (Capoor and Ambrosi, 2007:25).

c. Uncertainty about post 2012 developments

One of the reasons why the CDM may not yet have reached its full potential is due to the uncertainty surrounding the future of the carbon market. International consensus about the most appropriate way to address global warming has yet to be reached, and as such no emission targets have yet been set under Kyoto for the commitment period post 2012. This raises the question of whether CERs or other types of project based trading mechanisms will be valid in the future, making project credits issued beyond 2012 largely worthless. This is particularly relevant for Africa, where many countries are only starting to enter the carbon market. Furthermore, much of Africa's CDM potential lies in forestry and renewable energy projects – the project types which generally require the longest credit periods in order to make projects viable (Greene, 2005a:29).

Despite the above mentioned uncertainty, however, the Kyoto protocol remains the only game in town, with 90% of respondents of a recent International Emissions Trading Association (IETA) Market Sentiment survey indicating that they believe that the greenhouse gas market will continue post 2012 (Capoor and Ambrosi, 2007:38).

Furthermore, in an effort to scale-up carbon finance 'post-Kyoto,' the World Bank has just approved a carbon fund valuing around $500-million, which is to specialize in purchasing credits beyond 2012 (Nicholls, 2007:3).

5.5 Policy suggestions

5.5.1 Policy suggestions for CDM oversight bodies

In an effort to increase the efficiency of – and increase the demand for – African CDM projects, a number of changes in CDM modalities and procedures should be considered by CDM oversight bodies. Decreasing project registration fees, as well as increasing the maximum size of projects qualifying for the simplified modalities and procedures of small-scale projects could, for example, be used to fast-track CDM project start-up. Further, numerous actions relating to LULUCF activities could be taken to increase Africa's share of CDM projects. These include increasing or abandoning the cap on the amount of CERs from LULUCF activities that may be used to meet Annex I emission targets; including projects which prevent deforestation as permissible greenhouse gas reduction activities; and fast-tracking the acceptance of other LULUCF project types as permissible greenhouse gas reduction methodologies (Greene, 2005a:38).

Finally, it is critical that efforts be taken to prevent the continued weakening of sustainable development standards of CDM projects propelled by the need to attract investment. Although internationally determined sustainability prerequisites would in many cases be desirable, this solution is politically very unlikely. An alternative solution would be the creation of sustainability 'principles and guidelines' at an international level, which could then be tailored at the domestic level to fit country specific circumstances and needs (Cosbey et al., 2005:44).

5.5.2 Policy suggestions for the UNFCCC

The UNFCCC is both the principal, and the most powerful decision making body on climate change. As such, the UNFCCC should adopt the role of encouraging and supporting the private sector and provide it with the necessary confidence to make continuing, long term investments in the CDM project market. This can be achieved by explicitly demonstrating support of the elements of the current system as cardinal constituents of a potential post Kyoto Climate Treaty, as well as possibly guaranteeing the validity of CERs for a post 2012

period (Cosbey et al., 2005:52). Further, by increasing affirmation of the primacy of the sustainable development component of both current and future project based mechanisms, the UNFCCC would encourage long term investment in more environmentally and socially beneficial CDM projects – indirectly encouraging increased CDM investment in Africa (Greene, 2005a:38).

5.5.3 Policy suggestions for CDM host countries

Although the international organizations and decision making bodies can make a large contribution to the success of the CDM in Africa, the final and most critical determining factors will be the actions of African host countries to provide lucrative and attractive opportunities for CDM project development. Continued, active and explicit support for good governance, a stable and reliable legislative system, infrastructure development, institutional and industrial development, as well as the systematic elimination of other barriers related to CDM investments are critical for the success of the CDM in Africa.

There are, however, also actions relating more specifically to active promotion of the CDM which should be taken by African host countries. These include the development of a lucid policy on CDM-related issues; the collection and provision of data and statistics to facilitate the establishment of CDM projects; the creation of small DNA oversight bodies in areas where sectoral potential for CDM projects are identified; and limiting the role of existing DNAs to approving sustainability criteria and endorsing the commencement of project activities (Greene, 2005a:38; Bakker et al., 2007:18; Ellis and Kamel, 2007:18). Further, countries should identify flagship CDM projects, both in an endeavour to heighten investor confidence and to provide blueprints for future CDM projects (Bakker et al., 2007:18). In an effort to reduce operational costs and develop existing CDM capacity, African countries should also consider bundling projects across sectors, and possibly even between countries (Desanker, 2005:26).

Finally, it is critical that African experts begin to participate actively in international climate change negotiations, and in particular in CDM design - both at the COP level, as well as in grassroots project management. Additionally, the above involvement should be bolstered by research and analysis conducted by African scientists who are able to make allowance for local conditions (Desanker, 2005:26).

5.5.4 Policy suggestions for international institutions and agencies

Although much work is already being done in an effort to build CDM capacity and so increase the supply of CDM projects in Africa[20], it is essential that assistance to the continent is both broadened and deepened (Greene, 2005a:35). Further, increased provision of official development assistance (ODA), could aid in developing the capacity of CDM related institutions (especially DNAs), could assist in the start up of valuable African CDM projects, as well as assist projects in achieving their sustainable development goals (Capoor and Ambrosi, 2006:23).

5.5.5 An integrated approach

All of the above policy recommendations are seen as viable and effective ways to encourage the growth of the CDM in Africa. However, isolated actions by any one of the above mentioned parties is unlikely to lead to the desired growth and development of the CDM in Africa. As such, an ideal situation would be an integrated approach in which global actors cooperate and the above policy recommendations are amalgamated in an effort help the CDM reach its true potential in Africa.

However, although the expansion of the CDM in Africa holds promising opportunities for many African countries, it is nevertheless necessary to remain realistic about the probability of certain African countries attracting carbon finance for CDM projects. Africa is made up of many diverse countries – some with more potential to attract, and make use of carbon finance, than others (Greene, 2005a:37).

Further, although the CDM has the potential to bring many additional investment resources, and other benefits to host countries, it must be remembered that the CDM is not a way to solve all African development issues. It is merely another opportunity which can be levered in an effort to promote the sustainable development of African countries, while at the same time involving Africa in creating a cleaner future (Stowell, 2005:65).

[20] The largest recent capacity building initiative was the launch of the Nairobi Framework of Action at the COP12 in 2006. This framework is a joint initiative of the UNEP, the UNDP, the UNFCCC, the African Development Bank and the World Bank, among others, and aims to improve the participation of Sub-Saharan Africa in the CDM (Bakker et al, 2007:15). For more information on the Nairobi Framework of Action, see http://cdm.unfccc.int/Nairobi_Framework/index.html.

6. CONCLUSION

The issue of climate change has in the past decade taken a front seat on the international agenda. Global warming is no longer a worry restricted to the scientific community, but has become a reality affecting the entire international community. While the repercussions of climate change will be felt everywhere, impacts will be worst in poorer, developing countries which have less ability to adapt to adverse effects of global warming. Owing to the heavy reliance on agriculture and the extreme vulnerability of African populations to climate related shocks, African countries are expected to be amongst the worst affected by climate change.

Due to the nature of climate change as a global externality problem, tackling the issue is problematic and requires global cooperation. The Kyoto protocol of 1997 is the product of this cooperation and specifies emission targets for developed countries which can be met both via local emission reductions and through the use of flexible trading mechanisms. The size of the carbon market, created as a result of these free market mechanisms, has mushroomed since the official inception of the protocol in February 2005.

The most developed of the "flexibility mechanisms" is the Clean Development Mechanism (CDM), which allows developed countries to meet part of their obligations under the protocol by investing in emission reducing, sustainability promoting, projects in developing countries; providing an effective means for developing countries to both participate, and benefit from, the budding carbon market. Due to the sustainable development dividend accompanying CDM projects, the CDM has the potential to bring enormous social, economic and environmental benefits to Africa – effectively embodying a means of clean, sustainable development for African countries. Although Africa represents a vast untapped market for CDM project opportunities, a number of national, CDM-related, project-related, and international barriers still prevent the full exploitation of CDM opportunities in Africa. As such, it is critical for major international role players to cooperate and promote the development of the CDM in Africa by streamlining the rules pertaining to CDM related projects, strengthening the international carbon trading system, and taking actions to emphasize the importance of the sustainability component of CDM projects.

If the above is successful, and the demand for emission reductions from Africa burgeons, millions, and possibly even billions of dollars of carbon finance would flow into Africa. Not only would this aid in attaining a clean energy future, but it would play an invaluable role in

the social and environmental development of the continent, and possibly be the cornerstone in the realization of the Millennium Development Goals by 2015. This, unquestionably, is a goal worth striving for.

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