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„Performance of the Clean Development Mechanism (CDM) in Least Developed Countries with a Focus on Sub Saharan Africa“

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ABSTRACT:

Climate change is affecting all countries. However, developing countries and, in particular, Least Developed Countries (LDCs), will be hit earliest and hardest as these have the smallest capacity to deal with climate change. The Clean Development Mechanism (CDM), introduced under the Kyoto Protocol in 1997, has two objectives: It shall help developing countries (non Annex I countries) in achieving sustainable development and assist developed countries (Annex I countries) in reducing the costs of meeting their emission reduction targets. As the Kyoto Protocol has closed its first commitment period, it is reasonable to assess now the overall effectiveness of CDM with reference to non Annex I countries and to scrutinize the highly unbalanced regional distribution of CDM activities.

Against this background, the objective is to investigate whether the CDM can play a significant role in sustainable development of non Annex 1 countries and to analyze barriers/ constraints for CDM activities in Africa, with a special focus on African LDCs.

The research process is based on literature review and interpretation of data on CDM activities, whereas the analysis and assessment of CDM relies mainly on key theoretical research on the impact of CDM and the CDM portrayal in numbers is based on available data/ statistics.

The CDM was not able to uphold the promise of its dual-objective as stated in Art 12 of the Kyoto Protocol. Aside from this, CDM‘s potential to contribute to sustainable development in non Annex I countries does not sufficiently meet the objective of assisting them in achieving sustainable development and depends on the nature of the project, especially the type of technology. The unequal regional distribution of CDM project activities reflects the uneven state of economic development, the different attractiveness for investment of many African countries, in particular LDCs, and potential by sector/project type not in line with CDM developer preferences. These constraints are limiting CDM‘s potential to contribute to sustainable development in African LDCs.

Nevertheless, the CDM has considerably contributed to the awareness of climate change as an issue to key stakeholders in non Annex I countries.

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LIST OF ABBREVIATIONS:

AAU	Assigned Amount Unit
BOAD	Banque Ouest Africaine de Développement
BSA	Burden Sharing Agreement
CDM	Clean Development Mechanism
CER	Certified Emission Reduction Unit
CH4	Methane
CO2	Carbon Dioxide
CoP	Conference of the Parties
DNA	Designated National Authorities
DOE	Designated Operational Entity
EADB	East African Development Bank
EB	Executive Board
ER	Electrification Rate
ECCP	European Climate Change Programme
EE	Energy Efficiency
ERPA	Emission Reduction Purchase Agreement
ERU	Emission Reduction Unit
ET	Emission Trading
EUA	EU Allowance
EU ETS	European Emissions Trading Scheme
EU	European Union
FDI	Foreign Direct Investments
GCCA	Global Climate Change Alliance
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse gas
GNI	Gross National Income
GS	Gold Standard
HFC	Hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LDCs	Least Developed Countries
LoA	Letter of Approval
LULUCF	Land Use, Land Use Change and Forestry
MAC	Marginal Abatement Cost
MACC	Marginal Abatement Cost Curve
MATA	Multi-Attributive Assessment Methodology
MCA	Multi-Criteria Assessment
MDGs	Millennium Development Goals
MoP	Meeting of the Parties
NAP	National Allocation Plan
NF	Nairobi Framework
NGO	Non Government Organisation

N2O	Nitrous Oxide
OECD	Organisation for Economic Co-Operation and Development
PD	Project Developer
PDD	Project Design Document
PFC	Perfluorocarbon
PIN	Project Identification Note
PoA	Programme of Activities
SBL	Standardizing Baseline
SF6	Sulphur Hexafluoride
SIDS	Small Island Developing States
SSA	sub-Saharan Africa
tCO2e	metric ton CO2 emitted
TERI	The Energy and Resources Institute
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WMO	World Meteorological Organization
WWF	World Wide Fund for Nature

1. Introduction

1.1 Background

Climate change is widely recognized as a global issue, not only posing the major challenge to the environment, but also presenting a development problem, overburdening developing countries and potentially undermining efforts towards achieving the Millennium Development Goals (MDGs).

Climate change is affecting all countries. Developing countries, however, and, in particular, Least Developed Countries (LDCs), while contributing the least to greenhouse gas (GHG) emissions, will be hit earliest and hardest as these are the countries with the smallest capacity to deal with climate change. Having their economies heavily dependent on natural resources, such as agriculture, forestry and fisheries, they will be disproportionately affected due to their vulnerability to more frequent extreme weather events and a lack of financial resources, adequate technology and effective institutions that may limit their capacity to adapt. Some are already experiencing the effects of climate change as food and water are becoming scarcer.

The political process to protect the climate began in the late 1980s and, in 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was signed in Rio de Janeiro. This international environmental treaty was amended on December 11, 1997 in Kyoto, Japan by the so called ‚Kyoto Protocol to the Framework Convention on Climate Change‘. The Kyoto Protocol, a milestone by being the first agreement worldwide to mitigate climate change, was ratified by 191 states, is binding under international law and commits 39 industrial states to reduce their greenhouse gas (GHG) emissions of six different climate damaging gases by 5,2 per cent between 2008 and 2012 (the first commitment period). The European Union has committed itself to reduce its GHG emissions by 8 per cent until 2012, which was to be reached primarily by national measures. As an additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms, i.e. Emissions Trading, the Clean Development Mechanism (CDM) and Joint Implementation (JI), whereas JI and CDM are the two project-based mechanisms which feed the carbon market. JI projects are hosted in developed countries that have adopted binding emission reduction targets and CDM projects are hosted by developing countries that do not have legally binding greenhouse gas (GHG) emission reduction targets.

The Clean Development Mechanism (CDM), introduced under the Kyoto Protocol in 1997, became fully operational after its modalities and procedures had been agreed on in Marrakech in 2001 and gained momentum with the Kyoto Protocol entering into force in 2005.

The CDM has two objectives: It shall help developing countries (non Annex I countries) in achieving sustainable development and assist developed countries (Annex I countries) in reducing the costs of meeting their emission reduction targets. Following the CDM guidelines, emission reduction projects are undertaken in developing countries having lower GHG abatement costs than in developed countries. For each ton of CO2 equivalent that is reduced as a result of a CDM project, a Certified Emission Reduction Unit (CER) is issued which can be used by developed countries for the fulfillment of their commitments. CDM projects provide participants with tradable CERs which can be traded and sold on the carbon market. The CDM also raised high expectations in developing countries for its potential to contribute to sustainable development triggered by foreign investments, technology transfer, and for its potential to alleviate poverty.

Since its operational implementation in 2005, the CDM presents an impressive record. The status of CDM projects in various project cycles as of December 2012 shows a total of 3,521 projects at validation, 336 projects in process of registration and 5,194 projects registered, resulting in a total of 9,051 CDM projects in the pipeline (UNEP Risoe a. s.a.).
From the total of 5,194 projects registered, 1,896 CDM projects have CERs issued and the number of CERs issued passed the significant milestone of 1 billion (UNEP Risoe b. s.a.). In less than 10 years, the CDM has attracted more than USD 215 billion in investment in registered CDM projects in 81 countries worldwide (UNCC 2012: 1).

However, the regional distribution of CDM projects has been highly unbalanced in the past, revealing that only 3 per cent of the CDM project pipeline, respectively 2 per cent of all projects registered with the CDM Executive Board, are located on the African continent (UNEP Risoe c s.a). Considering that about 1 per cent of the projects in the pipeline are hosted by Least Developed Countries (LDCs) across continents, implies that countries in areas such as sub-Saharan Africa (SSA) with particularly low levels of development have not yet benefited accordingly from CDM.

As the Kyoto Protocol has closed its first commitment period (2008–2012), it is reasonable to assess now the overall effectiveness of CDM with reference to developing countries and, in particular, the performance of CDM activities in Africa.

1.2 Objective of the study and research questions

Against this background and supported by an introduction to promote an understanding of the CDM, the objective is to investigate whether the CDM can play a significant role in sustainable development of non Annex 1 countries and to analyze constraints for CDM activities in Africa, with a special focus on African LDCs.

This twofold objective translates into a set of specific research questions and connected items to be addressed and guides the research process.

1. Was the CDM able to uphold the promise of its dual-objective as stated in Art 12 of the Kyoto Protocol in its first commitment period?
Has the CDM been able to contribute to sustainable development in non Annex I countries ?
Did the CDM contribute to sustainable development and to what extent ?

2. Why is the CDM‘s regional distribution highly unbalanced ?
What is the current status of CDM in Africa and in African LDCs ?
What are the barriers of CDM development in Least Developed Countries (LDCs) ?
What are CDM related and non related barriers in sub-Saharan Africa (SSA) and its LDCs ?

1.3 Approach and methodology

The research process is based on literature review and interpretation of data on CDM activities.
With respect to the historical and theoretical background of the CDM, the material mainly comes from the legal framework of the UNFCCC, the Kyoto Protocol and the European Commission. The presentation of main features and characteristics of CDM‘s procedure and governance is primarily based on the UNFCCC‘s CDM Methodology Booklet and the CDM Rulebook, an online database of the CDM rules developed by Baker & McKenzie which is freely available to the public.

The analysis and assessment of CDM relies mainly on key theoretical research on the impact of CDM. The initial literature probe revealed that most studies have been focusing on CDM‘s contribution to emission reduction in a cost efficient way in Annex I countries, followed by evaluations of CDM‘s capacity to contribute to global emission reduction. However, the research focus of this analysis will be on CDM‘s impact on sustainable development in non Annex I countries. The aim is to gain an overview of the ongoing debate on whether or not the CDM has fulfilled its dual - objective, how the sustainability issue is addressed by project developers and which aspects are prioritized, complemented by a survey of key theoretical research on multiple perspectives. The evidence mainly comes from research, policy, working and discussion papers published both on behalf of the UNFCCC, European Commission, ministries, e.g. by CDM Policy Dialogue (1), CD4CDM (2), Wuppertal Institute for Climate, Environment and Energy (3) and from researchers outside the CDM framework, e.g. The Energy and Resources Institute (TERI) (4) and Carbon Market Watch (5).

The CDM portrayal in numbers is based on available data/statistics provided by UNEP RISOE and UNFCCC. UNFCCC (CDM) Analytical Database is maintained by the UNFCCC secretariat and comprises individual CDM project information for all projects in the CDM pipeline. The United Nations Environment Programme (UNEP) Risoe Centre, a leading international research and advisory institution on energy, climate and sustainable development, provides monthly updated data for most CDM projects. These data were used to demonstrate CDM activities, including Programme of Activities (PoAs) in Africa, by number, region, country and to classify projects by their type, such as wind, hydro, etc.

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(1) The CDM Policy Dialogue, established by the CDM Executive Board (EB) in late 2011, has the objective to provide recommendations on how best to position the CDM to ensure its effectiveness in contributing to future global climate action. Implemented by a High-Level Panel, it is composed of distinguished individuals having a broad range of experience and expertise in fields of relevance to the operation and aims of the CDM.

(2) The Capacity Development for the Clean Development Mechanism (CD4CDM) is a project implemented by The United Nations Environment Programme (UNEP) with financial support from the Dutch Government supported by the UNEP Risø Centre (URC) an organization contracted by UNEP to implement the project. CD4CDM aimed to generate in participating developing countries a broad understanding of the opportunities offered by the CDM, and to develop institutional and human capabilities necessary to formulate and implement projects under the CDM.

(3) The Wuppertal Institute for Climate, Environment and Energy was founded in 1991 is in the responsibility of the Ministry for Innovation, Science, Research and Technology of North Rhine-Westphalia and third-party funding supports most of the Institute's budget and projects. The institutes‘ research work interlinks aspects of climate, environment and resources by combining ecological questions with issues related to economic and societal change.

(4) The Energy and Resources Institute (TERI) is an independent, non-profit research institute focused on energy, environment and sustainable development in India.

(5) Carbon Market Watch is an initiative of several international NGOs to provide inter alia an independent perspective on individual CDM projects.

In order to obtain a detailed picture of the CDM constraints in SSA, major sources from entities such as Wuppertal Institute for Climate, Environment and Energy, OECD and a number of other specific studies have been synthesized.

1.4 Content outline

The paper is structured into three main chapters that track the objectives defined above.

Following this introductory chapter 1, chapter 2 aims to provide the historical and theoretical background of the CDM, an important prerequisite to becoming familiar with CDM terms, procedures and stake holders in order to discuss the objectives and specific research questions targeted by this paper.

Section 2.1 and 2.2 review the international climate regime, the theoretical and historical background which led to the idea of the CDM; section 2.3 further explores the European Union‘s GHG mitigation policies in which the CDM has priority status. Section 2.4 explores CDM objectives, modalities and procedures and section 2.5 provides an introduction to the carbon market, whereas the focus is laid on the concept of emissions trading and the principles of EU emissions trading scheme (ETS) and the inclusion of certificates from CDM (CERs) in that scheme. Finally, section 2.6 presents an overview of CDM outcome of the period 2005 - 2012, also displaying sectoral and regional distribution.

Chapter 3 provides a critical analysis of CDM project activities in respect to the claims as stated in Article 12 of the Kyoto Protocol. Particular emphasis is paid to CDM‘s contribution to sustainable development in non Annex I countries, on equal level with the achievement of cost-effective emission reductions by Annex I countries. The purpose of this chapter is to analyze if the CDM was able to uphold the promise of its dual-objective during the first commitment period (2008 - 2012).

This chapter begins with a short introduction, in section 3.1, of CDM‘s benefits for Annex I countries which usually comprises of an assessment of certificates as a political instrument for climate mitigation with respect to ecological effectiveness, economic efficiency and political enforceability but, in this study, will be limited to basic statements with respect to economic efficiency.

The main focus of chapter 3 is laid on CDM‘s contribution to sustainable development and its impact on development countries, which is detailed in section 3.2 Due to the lack of a general

definition/understanding on sustainable development and a set of indicators for measurement, this section outlines the challenges to define and assess such development. It further aims to elaborate on how the CDM contributes to sustainable development by asking what criteria do host countries Designated National Authorities (DNAs) currently use to determine whether a CDM project duly fulfills this specification. Against this background, a survey of key theoretical research on multiple perspectives will be given, based on a literature review of CDM‘s contribution to sustainable development. Section 3.3 furnishes a resume of the literature review.

The purpose of chapter 4 is to undertake a review and analysis of the current status of CDM activities in Africa, whereas CDM related and non related barriers will be examined, with a special focus on sub-Saharan Africa (SSA) and African LDCs.
Section 4.1 begins with a general view on the actual CDM performance in Africa vis a vis other regions, puts forth the issue of CDM‘s regional imbalances and presents a range of initiatives and activities which has been established so far at the international level to tackle this matter. This will be followed in section 4.2, by an overview of the project pipeline (2005-2012) in respect to African countries and, especially, to African LDCs, displaying the performance of CDM projects and PoAs by number and regional distribution within Africa, based on available data/statistics provided by UNEP RISOE and UNFCCC.
Section 4.3 analyzes barriers for CDM project activities in Africa. From the very beginning, an extended body of literature has existed on potential barriers in general for CDM projects. With the appearance of unequal distribution among regions, the focus was shifted to Africa and, in particular, to SSA and its LDCs. A number of recurring barriers identified and various existing approaches to categorize the different barriers for CDM projects will be presented. With respect to CDM related and non related barriers for project development, general assumptions on process related barriers, technical barriers, structural and institutional barriers made in the relevant literature will be evaluated with reference to the African countries. Finally, assumptions /findings made on African countries will be deliberated based on the continent‘s present CDM project pipeline.

Chapter 5 provides a conclusion on the main findings and gives answers to the main research questions and its supporting items as outlined in chapter 1.

2. International Climate Regime and Clean Development Mechanism (CDM)

2.1 Theoretical background

Many environmental resources such as clean air or the atmosphere do not have defined property rights. As a public good, they are used without being traded through markets and therefore have no market price. Markets are likely to generate inefficient outcomes such as negative externalities or unintended effects on others, caused by consumption or production activity for which no compensation is paid because external effects are unpriced products and people affected by externalities have no property rights that can be exploited to obtain compensation for the external effects (Perman et al. 2011: 11). As the issue cannot be adequately addressed through unregulated market mechanisms, government intervention and policy control instruments are needed.

The rise in the average temperature of the Earth‘s atmosphere and oceans and its projected continuation, referred to as global warming, is a concern where policy responses are deemed to be relevant. In order to slow global warming, various options/instruments can be implemented by national and international environmental policy to limit or reduce GHG emissions, the increasing concentration of which are considered to be the primary cause of the warming of the climate system.

The variety of national instruments available includes regulations and standards, taxes and charges, tradable permits, voluntary agreement, subsidies and information instruments. However, global warming is a ‚transboundary environmental problem‘ (Perman et al. 2011: 282) and „[...] environmental cost borne, or benefits received, by citizens of one country does not depend only on that country‘s actions but also depends on the actions of the other countries“. (ibid: 283) Cooperative solutions, unless they are binding agreements with penalty clauses for defection, have the tendency that each country has an incentive to defect from the agreements once it has been reached and to obtain the benefits on ‚free-riding‘ on the others pollution abatements. (ibid: 286).

While GHGs are emitted locally, the consequences, i.e. global warming and climate change, have become a global phenomenon, to be addressed on a global scale in order to tackle the ‚free riding‘ issue. The global nature of the problem implies the engagement of multiple

countries in addressing climate change. One prerequisite to effective cooperation between countries in dealing with the issue is the existence of an institutional regime which prices GHGs and has the authority and power to construct, administer and enforce a collective agreement on GHG reduction and limits (ibid: 296).

The discussion of global climate change and the political process to protect the climate began in the late 1980s. „The Intergovernmental Panel on Climate Change (IPCC), the leading international body for the assessment of climate change, was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts“ (IPCC s.a.). As an intergovernmental and scientific body under the auspices of the United Nations (UN), the IPCC „[...] reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change.“ (ibid)
The IPCC claimed in its first assessment report, published in 1990, the emission of GHGs as the major anthropogenic impact on the climate, whereas CO2 is considered to be the most relevant one (IPCC 1990: 52). This report played a decisive role in leading to the creation of the United Nations Framework Convention on Climate Change (UNFCCC), the key international treaty to reduce global warming and to cope with the consequences of climate change which was signed at the ‚Earth Summit‘ in Rio de Janeiro in 1992. This international environmental treaty was amended on December 11, 1997 in Kyoto, Japan by the so called ‚Kyoto Protocol to the Framework Convention on Climate Change‘.
The Kyoto Protocol, the first agreement worldwide to mitigate climate change, has been ratified by 191 states. It is binding under international law and commits 39 industrial states to reduce their greenhouse gas (GHG) emissions of six different climate damaging gases by 5,2 per cent between 2008 and 2012.
The European Union has committed itself to reduce its GHG emissions by 8 per cent until 2012.
The reduction target shall be reached primarily by national measures. As an additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms i.e. Emissions Trading, the Clean Development Mechanism and Joint Implementation.

2.2 United Nations Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted on 9 May 1992 and opened for signature at the United Nations Conference on Environment and Development, also known as the ‚Earth Summit', in Rio de Janeiro, 4 June 1992. The Convention came into force on 21 March 1994 after having been ratified by 50 states.

As stated in Article 2, the ultimate objective of the Convention is

> [...] the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. (United Nations 1992 : 9)

The Convention divides countries into those listed in Annex 1 which are industrialized countries and countries that are undergoing the process of transition to a market economy and those not listed (Non-Annex 1) (United Nations 1992 : 2). Annex 1 countries have historically emitted the most GHGs, their per capita emissions are higher than those of most developing countries and they have more financial and institutional resources to address the problem.

To achieve the objective of the Convention and to implement its provisions, the countries shall be guided concerning developing countries by the following (Article 3-1, 3-2):

> [...] the developed country Parties should take the lead in combating climate change and the adverse effects thereof [...] in doing so full consideration should be given to [...] the specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention. (United Nations 1992 : 9)

On the principle of equity and of common but differentiated responsibilities as set out in Article 3 of the Convention, developed countries should take the lead in changing emission trends. With this in mind, the Annex 1 countries agreed to adopt policies and measures on the mitigation of climate change with the (legally non-binding) objective of returning individually or jointly by the year 2000 to their 1990 level of emissions (ibid: 12 /Article 4.2b).

Annex 1 countries that are members of the OECD (included in Annex II) have an obligation to provide new and additional financial resources including transfer, or access to, environmentally sound technologies and know-how to enable developing countries to implement the provisions of the Convention (ibid: 13 /Article 4.3 and 5). They „[...] shall also assist the developing countries that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaption to those adverse effects" (ibid: 14 /Article 4.4). In

their actions with regard to funding and transfer of technology, the developed countries shall take full account of the specific needs and special situations of the least developed countries (LDCs) (ibid: 15 /Art. 4.9). The United Nations has classified 49 Parties as least developed countries (LDCs) and, under the Convention, they are given special consideration on account of their limited capacity to respond to climate change and to adapt to its adverse effects. (ibid: 14 /Art. 4.4) Financial assistance and technology transfer by developed countries are essential to enable developing countries to cope with global warming and adapt to its effects. A system of grants and loans has been set up through the Convention and is managed by the Global Environment Facility (GEF).

Currently, there are 195 Parties to the UNFCCC, (194 states and the European Union) (UNFCCC [a] s.a.). They meet annually at the Conference of the Parties (COP), the supreme body of the Convention established to review the implementation of the Convention and any related legal instruments that the COP may adopt by a Protocol. Arrangements for sessions of the COP and assistance to the Parties are made by the Secretariat (United Nations 1992: 19f).

2.3 Kyoto Protocol

The Protocol was developed under the UNFCCC and adopted at the third session of the Conference of the Parties (COP 3) in Kyoto, Japan, on 11 December 1997.
Article 3 of the protocol formulates the objective as follows (United Nations 1998: 3):

1. The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

2. Each Party included in Annex I shall, by 2005, have made demonstrable progress in achieving its commitments under this Protocol.

Parties that have ratified the Kyoto Protocol have committed to cut not only carbon dioxide (CO2) emissions, but also other GHG emissions, as stated in Annex A being Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF6) (ibid: 19).

With regard to developing country Parties, the Protocol states in Article 3.14 that:

> Each Party included in Annex I shall strive to implement the commitments mentioned in paragraph 1 above in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties [...]. Among the issues to be considered shall be the establishment of funding, insurance and transfer of technology. (United Nations 1998: 5)

The Kyoto Protocol entered into force on 16 February 2005 and the reason for the time span between the terms of agreement being settled and the protocol being engaged was due to Article 25 (1)

> This Protocol shall enter into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55 per cent of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession. (United Nations 1998 : 18)

Parties with commitments under the Kyoto Protocol to limit or reduce their GHG emissions „[...] must meet their targets primarily through national measures". (UNFCCC [e] s.a.) As a supplement to domestic actions, the Kyoto Protocol introduced three market based mechanisms, thereby creating what is now known as the ‚carbon market', a key tool for reducing emissions worldwide (ibid). The Kyoto mechanisms are Emissions Trading (ET), Clean Development Mechanism (CDM) and Joint Implementation (JI), whereas JI and CDM are the two project-based mechanisms which feed the carbon market (ibid).

If Parties continue with emissions above their targets, they are required to engage in emissions trading, i.e. buying ‚credits' from other committed Parties who are able to exceed their reduction targets in order to offset. In addition, the Kyoto mechanisms „[...] stimulate sustainable development through technology transfer and investments from developed to developing countries, helping Parties with Kyoto commitments to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost-effective way and encourage the private sector and developing countries to contribute to emission reduction efforts". (ibid [b] s.a.). The Kyoto Protocol is the first legally binding treaty aimed at cutting emissions of the main GHG believed to contribute to global warming and Emissions Trading (ET) is a key tool for committed Parties (states) included in Annex I to meet their targets on GHG emissions as stated in Annex A. Currently, there are 192 Parties (*6*) to the Kyoto Protocol to the UNFCCC (191 States and the European Union) and the total percentage of Annex I Parties emissions is 63.7 per cent (ibid [b] s.a.)

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(6) AUSTRIA is an Annex I Party to the UNFCCC: Signature 29 Apr 1998; ratification 31 May 2002; entry into force 16 Feb 2005; percentage of emissions 0.4% (UNFCCC b s.a.). Quantified emission limitation or reduction commitment (percentage of base year or period) 92% (United Nations 1998:Annex B)

2.4 European Union (EU)

The European Union (EU) has been a driving force in international negotiations on climate change and was instrumental in the development of the UNFCCC and the Kyoto Protocol. The EU is a full Party to the UNFCCC (UNFCCC [a] s.a.) and a signatory of the Kyoto Protocol *(7)* (UNFCC [b] s.a.).

Article 4 of the Kyoto Protocol allows „[...] any Parties included in Annex I that have reached an agreement to fulfill their commitments under Article 3 jointly [...]“, to allocate its target among the Member States (United Nations 1998: 5). The EU has accepted a quantitative absolute reduction of 8 per cent of its GHG emissions during the period 2008-2012 compared with 1990 levels. This collective reduction commitment has been translated into a national emission reduction or limitation targets for each of the EU-15 Member States (EU members before 2004). The political agreement on that redistribution was reached at the environmental Council meeting on June 1998, and is referred to as the ‚Burden Sharing Agreement‘ (BSA) (EC Climate Action [a] s.a.). The burden of reaching this target is unequally distributed amongst Member States, taking into account national conditions (relative wealth), including current GHG emissions, the opportunities for reducing them and the level of economic development. Targets range from a GHG emission reduction to 72 per cent of base year or period for Luxembourg (Austria to 87 per cent) to an increase to 127 per cent for Portugal. (Annex II to 2002/358/EC).

The EU-27 Members States do not have a common target under the Kyoto Protocol in the same way as the EU-15 Members States. Most Member States that have joined the EU since 2004 have reduction targets of 6 per cent or 8 per cent. The targets are legally binding under EU law (EC Climate Action [b] s.a.)

The EU, as a party to the UNFCCC, reports annually on GHG inventories within the area covered by its Member States, i.e. domestic emissions taking place within its territory, whereas the legal basis for compiling the EU inventory is Council Decision No 280/2004/EC concerning a mechanism for monitoring Community GHG emissions and for implementing the Kyoto Protocol (European Environment Agency 2012).

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(7) EU (signature: 13 Jun 1992; approval: 21 Dec 1993 AA entry into force: 21 Mar 1994) (UNFCCC a s.a.). (signature 29 Apr 1998; approval 31 May 2002 AA; entry into force 16 Feb 2005) (UNFCCC b s.a).

The EU has set itself targets for reducing its GHG emissions as part of the Europe 2020 growth strategy which was implemented through a package of binding legislations. The climate and energy package is a set of binding legislation which aims to ensure the ambitious climate and energy targets for 2020 set by EU leaders in March 2007 (enacted in 2009), when they committed Europe to become a highly energy efficient. These targets, known as the ‚20-20-20' targets, set three key objectives for 2020 (EC Climate Action [b] s.a.):

- a 20 per cent reduction in EU GHG emissions from 1990 levels;
- a rise of the share of EU energy consumption produced from renewable resources to 20 per cent
- a 20 per cent improvement in the EU's energy efficiency.

Moreover, if other major economies in the developed and developing worlds „[...] commit to undertake their fair share of a global emissions reduction effort", the EU is willing to increase its GHG emissions reduction to 30 per cent by 2020 (ibid).
The targets set by the EU are supported by the scientific view and projections of the IPCC, „[...] the leading international body for the assessment of climate change, which was established in 1988 by the United Nations Environmental Programme (UNEP) and the World Meteorological Organization (WMO)". (IPCC s.a.)

All Member States have committed to the Europe 2020 strategy but, due to different economic circumstances, each Member State translates the overall EU objectives into national targets. The National Reform Programme is a document which contains the country's policies and measures to sustain growth and jobs and to reach the Europe 2020 targets and is presented along with its Stability Convergence Programme, which sets out the country's budgetary plans for the coming three or four years (EC Europe 2020 s.a.).

The EU has made great progress to reduce GHG emissions accompanied by initiatives such as the European Climate Change Programme (ECCP) and the EU Emissions Trading System (ETS).
The EU Council of Environment Ministers asked the Commission „[...] to put forward a list of priority actions and policy measures and the Commission responded in June 2000 by launching the European Climate Change Programme (ECCP) with the goal to identify and

develop all the necessary elements of an EU strategy to implement the Kyoto Protocol.“ (EC Climate Action [c] s.a.). The first ECCP (2000-2004) involved all the relevant groups of stakeholders working together, including representatives from the Commission’s different departments, the Member States, industry and environmental groups and a second programme (ECCP II) was launched in October 2005 (ibid). The ECCP has led to the implementation of dozens of new policies and measures inter alia the EU Emissions Trading Scheme, which came into effect Jan 1, 2005 and has become the EU's key tool for reducing greenhouse gas emissions from industry most cost-effectively. (EC Climate Action [b] s.a.).

Developed countries account for 75 per cent of global GHG emissions (the EU accounts for 11 per cent) and due to their limited economic development, developing countries are least responsible for the accumulation of GHG in the atmosphere, and hence climate change. Projections made by the IPCC of the effects of climate change show „[...] that the Least Developed Countries (LDCs) and Small Island Developing States (SIDS) will be hit earliest and hardest and have the fewest resources to prepare for and adopt these alterations. Climate change is therefore likely to further delay the achievement of the Millennium Development Goals (MDGs) in many of these countries“. (EC 2007: 2)

The EU, concerned about the additional challenges developing countries are facing as a result of a global climate change, has launched a Global Climate Change Alliance (GCCA) with developing countries most vulnerable to climate change, in particular the LDCs and SIDS, in order to help prepare them for confronting this challenge. By focusing on these countries, the alliance will offer a structured dialogue and concrete cooperation on actions funded by the EU’s development policy to tackle the combined challenge of the fight against poverty and climate change (EC 2007: 2). The GCCA is to be seen strictly complementary to and supportive of the ongoing process within the UNFCCC and the Kyoto Protocol (ibid : 4).
One of five priority areas and related actions proposed in the GCCA is ‚reducing emissions from deforestation‘, whereas the objective is „[...] to decrease CO2 emissions from deforestation in developing countries by creating economic incentives for forest protection, while preserving livelihoods and ecosystems depending on forests“ (EC 2007: 5). „About 20 % of global CO2 emissions are caused by deforestation and, in LDCs, 62 % of total emissions originate in land-use change, primarily deforestation. The regions with the highest

deforestation rates in the world are Africa, Latin America and South-East Asia/Pacific“. (ibid : 5) caused by „[...] multiple economic, socio - political, demographic and environmental reasons such as logging, agricultural expansion, infrastructure development, use of biomass as main energy resource, but also policy and institutional failures, and cultural factors“. (ibid : 6)

According to the IPCC 4th Assessment Report which provides a regional analysis of the impacts to be expected from climate change, Africa is particularly vulnerable to this challenge and will be exposed to water stress, extreme weather events and food insecurity associated with drought and desertification (EC 2007: 3). As Africa is already enduring the impacts of climate change on many levels, the EU is increasingly mainstreaming adaptation and mitigation in partnerships with African countries, at national, regional and continental levels. The guiding principles for this collaboration are set out in the EU-Africa Strategic Partnership on Climate Change and Environment. Similar partnerships have also been set up with other regions (EC 2011: 2).
As a EU flagship initiative, the GCCA has allocated more than EUR 250 million to programs in over 40 countries and regions since its inception in 2007. Under the GCCA, the EU is working with 16 countries and regional organizations in Africa (ibid: 2).

Another priority of out of five of the GCCA is „[...] enhancing participation in the Clean Development Mechanism (CDM) with the objective to help developing countries to participate in and benefit from the global carbon market, through the Clean Development Mechanism“ (EC 2007: 6). „The CDM makes it possible for companies or countries to meet their emissions targets under the Kyoto Protocol by investing in emission reduction projects in developing countries which contribute to sustainable development“. (ibid: 6) CDM projects cover many sectors, including sustainable energy production and use, waste treatment, reforestation and biofuels (ibid).

The GCCA complements the EU climate programmes and innovative instruments, such as the regional investment facilities through which a considerable amount of concessional loans in support of climate investments, especially in the energy sector, is leveraged. (EC 2011: 2) The GCCA is also enhancing participation in the global carbon market and aims to promote a more equitable geographic distribution of the Clean Development Mechanism (CDM) by building the capacities of partner countries, particularly in the field of energy (EC 2007: 6).

The EU was first in recognizing that efforts made outside its borders can stimulate private sector action by using the ‚flexible mechanisms' of the Kyoto Protocol. The CDM has led to several thousand projects worldwide and the EU is by far the biggest buyer of emission reduction credits from third countries, and provides for continued financial flows and technology transfer to developing countries (EC 2011: 2). The latter will be analyzed and discussed in section 3.

2.5 Clean Development Mechanism (CDM)

As mentioned earlier, the Kyoto Protocol allows Annex B Parties to meet their commitments by three ‚'flexible mechanisms', i.e. Emission Trading (ET), Clean Development Mechanism (CDM), and Joint Implementation (JI) in order to reduce the economic cost of emissions reductions.

The Conference of the Parties (CoP) serving as the meeting of the Parties to the Kyoto Protocol decided on its first session, held at Montreal in December 2005

> [...] that the use of the mechanisms shall be supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments under Article 3, paragraph 1. (UNFCCC 2005a:4)

Emission Trading, the so called carbon market, is a key tool for reducing emissions worldwide; JI and CDM are the two project-based mechanisms for climate implemented in foreign countries, feeding the carbon market. Companies that commit themselves to these projects are compensated with emission certificates allowing emission reductions to be carried out where costs are lowest. „JI enables industrialized countries to carry out joint implementation projects with other developed countries, while the CDM involves investment in sustainable development projects that reduce emissions in developing countries". (UNFCCC [e] s.a.)

The CDM became fully operational after its modalities and procedures had been agreed on in Marrakech in 2001 and with the Kyoto Protocol entering into force in 2005. The first CDM project was registered in 2004.

In Europe, the EU Linking Directive allows all companies participating in ET to offset a proportion of their climate obligations by using certificates from CDM and JI projects (DEHST 2012: 9).

2.5.1 CDM objectives

The CDM was introduced under the Kyoto Protocol to the UNFCCC in 1997. Article 12 (2) and (3) of the Kyoto Protocol defines the CDM and its purpose as follows:

> Purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3 (United Nations 1998 : Art. 12 (2): 11).

> Under the clean development mechanism:
> (a) Parties not included in Annex I will benefit from project activities resulting in certified emission reductions; and
> (b) Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol (United Nations 1998 : Art. 12 (3): 11).

Participation in the CDM, including in activities mentioned above and in the acquisition of certified emission reductions, may involve private and /or public entities (ibid Art 12 (9): 13). The CDM support Annex I countries with an emission limitation and reduction commitment under the Kyoto Protocol to invest in projects which reduce GHG emission in non Annex I countries. A CDM projects can earn saleable ‚certified emission reduction' (CER) credits, each equivalent to „[...] one metric ton of carbon dioxide equivalent, calculated using global warming potentials". (UNFCCC 2005b : 7)

Parties that commit themselves to these project activities are compensated with emission certificates that may also be used in European Emissions Trading, allowing emission reductions to be carried out where costs are lowest, thus, the economic burden of meeting Kyoto targets can be reduced. While giving developed countries some flexibility in how they meet their emission reduction or limitation targets, it is also intended to stimulate sustainable development and emission reductions in developing countries.

A key prerequisite for CDM development is that a CDM project must provide emission reductions that are ‚additional' to what would otherwise have occurred. According to Article 12 (5) of the Kyoto Protocol, projects registered under the CDM must produce „[r]eal, measurable, and long-term benefits related to the mitigation of climate change; and [...] reductions in emissions that are additional to any that would occur in the absence of the certified project activity". (United Nations 1998: Art 12 (5): 12)

The target of the CDM is a real and transparent reduction in GHG emissions while contributing to sustainable development through technology transfer and investment. The

CDM enables companies or countries to invest in emission reduction projects in developing countries which „[...] leads to significant long-term investment, creates jobs and income, triggers transfer of technology and supports developing countries to adopt to low carbon development“. (EC 2007: 6)

In order „[...] to comply with the overall framework for CDM project development, the project type applied must be eligible under the framework of the Kyoto Protocol“. (SETatWORK s.a.) Eligible as CDM are all projects that reduce GHG emissions, „[...] while at the same time complying with the host country sustainable development criteria and the ‚additional' requirements as stated under the Kyoto Protocol“. (ibid) Eligible for CDM are projects with a potential of GHG emissions reduction in one of the following sectors: energy industries (renewable/ non-renewable sources), energy distribution, energy demand, manufacturing and chemical industries, construction, transport, mining/ mining production, metal production, fugitive emissions from fuel (solid, oil and gas), fugitive emissions from production and consumption of halogenated hydrocarbons and sulphur hexafluoride, use of solvents and waste management (handling and disposal), land-use, land-use change and forestry, agriculture (UNFCCC 2012a: 10ff).

Forestation, reforestation and agriculture do not qualify within the EU, and nuclear projects are excluded worldwide“ (DEHSt 2010 : 10) .

2.5.2 CDM modalities and procedures (CDM institutions and project cycle)

The regulatory framework for using CDM's consists of laws and procedures at the international level of the UNFCCC, at the EU level, and the national level.

The CDM is subject to the authority and guidance of the ‚Conference of the Parties (COP) serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP) ' and is supervised by an Executive Board of the CDM. CDM projects must qualify through a rigorous and public registration and issuance process involving other key institutions such as the Designated National Authority (DNA) and the Designated Operational Entity (DOE).

The Conference of the Parties (COP) serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP) has authority over and provide guidance to the CDM (UNFCCC 2005b : 7). Its functions in relation to the CDM are set out in 3/CMP.1, Annex, paragraphs

2-4, including the authority over and making rules for the CDM, providing „[...] guidance to the Executive Board (EB) by taking decisions on the recommendations made by the EB on its rules of procedure [...]“ and on the designation of operational entities that are provisionally accredited by the EB. It shall further review annual reports made by the EB, „[...] the regional and subregional distribution of designated operational entities (DoE) and take appropriate decisions to promote accreditation of such entities from developing country Parties. It shall review „[...] the regional and subregional distribution of CDM project activities with a view to identifying systematic or systemic barriers to their equitable distribution and take appropriate decisions, based, inter alia, on a report by the Executive Board“ (UNFCCC 2005b: 8) and it shall assist in arranging funding of CDM project activities, as necessary. (ibid)

The Executive Board (EB) supervises the CDM, under the authority and guidance of the COP/MOP, and is fully accountable to the COP/MOP. The full list of the functions of the EB, its composition and rules of procedures is set out in 3/CMP.1, Annex, paragraphs 5-8 (UNFCCC 2005b: 8). The EB comprises 10 members from Parties to the Kyoto Protocol, elected by the COP/MOP for a period of two years and being eligible to serve a maximum of two consecutive terms. The composition of the EB shall be „[...] one member from each of the five United Nations regional groups (Africa, Asia, Western Europe and others, Eastern Europe, Latin America and Caribbean), two other members from the Parties included in Annex I, two other members from the Parties not included in Annex I, and one representative of the small island developing States“. (CDM Rulebook [a] s.a.: 65) The EB elects its own Chair and Vice-Chair, with one being a member from an Annex I Party and the other being from a Party not included in Annex I. The positions of Chair and Vice-Chair alternate annually between a member from an Annex I Party and a member from a Party not included in Annex I. The EB is required to meet at least three times each year and the results of meetings are made public, in accordance with the principle of transparency. EB meetings are generally open to all Parties, UNFCCC accredited observers and stakeholders. Observers of meetings may make presentations on matters under consideration. „At least two thirds of EB members, representing a majority of members from both Annex I and non-Annex I Parties, must be present to constitute a quorum“. (ibid) „The modalities and procedures permit the EB to establish committees, panels and working groups to assist it in carrying out its functions“. (ibid). Any reports produced by the panel will be made publicly available (CDM Rulebook [a] s.a.: 65). The UNFCCC Secretariat is mandated to support the EB (ibid: 11).

Countries wishing to participate in the CDM have to set up a Designated National Authority (DNA) for the CDM (UNFCCC 2005b: 12). As the key entity in non-Annex 1 countries involved with CDM, the DNA is the body granted responsibility by a Party to authorize and approve participation in CDM projects. DNA is „[...] responsible for ensuring that the host country maintains control over the CDM project activities undertaken in its country. The DNA has the responsibility of ensuring that CDM activities meet the sustainable development objectives determined by the host country[...]“ (SETatWork s.a.) and to issue letters of approval to project participants in CDM projects, confirming that the project activity is implemented voluntarily and contributes to sustainable development in the host country (CDM Rulebook [c] s.a.: 64). The registration of a CDM project can only take place if the host country has ratified the Kyoto Protocol and approved the project and if the project has been validated by a Designated Operational Entity (DOE) accredited by the CDM Executive Board. The DOE is an independent private company or a consultant accredited by the EB to function as external controller of the CDM project activities in order to verify whether the project meets the CDM requirements. Registration of a CDM project is not subject to the availability of a letter of approval from an investor country unless emission reduction certificates are to be transferred to a developed country after they are issued (CDM Rulebook [c] s.a.: 62). In order to determine the amount of Certified Emission Reductions (CERs) generated by a project in a host country, the CDM requires application of a baseline and monitoring methodology. Depending on the scale of the project, methodologies are classified into four categories, i.e. methodologies for large scale, small scale CDM project activities, for large scale and afforestation and for small scale reforestation (A/R) CDM project activities (UNFCCC 2012: 10).

A CDM project requires a certain procedure with multiple steps, from the project design to its final registration by the EB and, later on, the issuance of emission reduction certificates. In more detail the procedure can be broken down into five stages (ECR s.a.):

Stage 1: Project Development (PIN and PDD)

Stage 2: Host Country Project Approval

Stage 3: Project Validation and Registration

Stage 4: Project Implementation and Monitoring

Stage 5: Verification, Certification and Issuance of CERs

The CDM project cycle has two phases, i.e. the project design phase (stages 1 - 3) and the project operation phase (stages 4 and 5).

In the project design phase, the first target is to receive national approval by the host country DNA. In stage 1, the project idea (Project Identification Note - PIN) will be incorporated in a Project Design Document (PDD) by the Project Developer (PD). The PDD creates the basis for the validation and registration process under the UN. It is „[...] a standard format describing how the activity intends to fulfill the pre-requisites for registration as a CDM project. It consists of a general description of the project, its proposed baseline methodology, a timeline and crediting period, a monitoring methodology, calculation of GHG emissions by source and stakeholders comments“. (SETatWORK s.a.) „Stakeholders means the public, including individuals, groups or communities affected, or likely to be affected, by the proposed clean development mechanism project activity.“ (UNFCCC 2005b: 7) The „[...] PDD contains all relevant information regarding the project activity, including a description of the proposed emission reduction activity, a justification of the additionality requirement [...]“ (SETatWORK s.a.) and a monitoring plan to explain how the emission reductions will be monitored (UNFCCC 2005b: 23f).

In stage 2, the project developer forwards the PDD to the Designated National Authority (DNA) of the host country which „[...] must issue statements on the PDD indicating that the government of the host country participates voluntarily in the proposed activity and that the project assists the host country in achieving sustainable development“. (SETatWORK s.a.) A letter of approval will be issued by the DNA (CDM Rulebook [b] s.a.:64)

In stage 3, the validation and registration of the CDM project takes place. The validation is a process involving an independent evaluation of the project activity by an external auditor selected by project participants. The Designated Operational Entity (DOE) is „[...] an independent private company or a consultant accredited by the EB to function as external controller of the CDM project activities“. (SETatWORK s.a.) The DOE reviews the PDD in order to verify whether the project meets the CDM requirements. The main task of the DOE in this regard is to confirm that a given project activity is additional (UNFCCC 2005b: 15f). „A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity“. (UNFCCC 2005b: 16)

„Once a project activity has been validated by the DOE, a validation report is forwarded to the Executive Board (EB) for registration as a CDM project“. (SETatWORK s.a.) The registration of a project, the last step of the project design phase, will be final within eight weeks after the date of receipt of the request for registration by the EB unless at least three members of the EB request a review of the project activity. If a review is requested, the EB decides at its next meeting whether to perform the review or allow the project to proceed. In case the EB determines as the outcome of a review that a project does not comply with CDM rules, it may require alterations to the project or turn it down in its entirety. Registration is the prerequisite for the verification, certification and issuance of CERs related to that project activity (ibid: 16).

Once the project is operational (project operational phase), the emissions occurring from the activity must be monitored (stage 4) which is done according to the monitoring plan submitted and approved in the PDD. The information on emission reductions must be included in a monitoring report estimating the amount of CERs generated and submitted by the project participants to a DOE different to that involved in the validation process who carries out verification (UNFCCC 2005b: 17).

The last stage includes the Verification, Certification and Issuance of CERs. „Verification is the periodic independent review and ex post determination by the DOE of the monitored reductions in anthropogenic emissions by sources of GHG that have occurred as a result of a registered CDM project activity during the verification period“. (ibid: 18) Based on the monitoring report submitted, the DOE must ensure in an independent review „[...] that the CERs have been generated according to the guidelines and conditions agreed upon during the validation of the project“[...] (SETatWORK s.a.) and produces a verification report to the project participants, the Parties involved and the EB and makes the report publicly available (UNFCCC 2005b: 19).

Based on its verification report, the DOE „[...] certify in writing that, during a specified time period, the project activity achieved the verified amount of reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the CDM project activity“ (UNFCCC 2005b: 19). The DOE informs „[...] the project participants, Parties involved and the EB of its certification decision in writing immediately upon completion of the certification process and makes the certification report publicly available“. (ibid: 19) Certification of the CERs generated by the activity is made by the same DOE that

verifies the project. The Certification report is „[...] a written assurance from the DOE that the project achieved the level of emission reductions and these reductions are as requested real, measurable and additional“. (ibid: 19) The report constitutes „[...] a request to the EB for the issuance of CERs [...]“(ibid: 19) by instructing the CDM registry to issue the CERs. The issuance shall be considered final, „[...] unless a Party involved in the project activity or at least three members of the EB request a review of the proposed issuance of CERs [...]“ within fifteen days (ibid: 19).

A levy of 2 per cent on CERs issued is transferred to the UNFCCC Adaption Fund which is designed to support the least developed countries in adapting to the effects of climate change (UNFCCC [c] s.a.).

2.6 Carbon market

Emissions trading is one of the several alternative political measures based on an old concept of environmental protection in which the use of natural resources should be reflected in monetary terms in order to internalize external effects and to improve and resolve these external effects. The signatories to the Kyoto Protocol have chosen a cap-and-trade system as an alternative to carbon taxes. Emissions trading, according to the Kyoto Protocol, refers to trading between states, whereas the EU Emissions Trading Scheme (EU ETS), established through binding legislation (Directive 2003/87/EC) and launched at the start of 2005, is the world's first international company-level 'cap and trade' system of allowances for emitting carbon dioxide (CO2) and other greenhouse gases.

2.6.1 Concept of emissions trading

Emissions trading is based on an old concept of environmental protection in which the use of natural resources should be reflected in monetary terms. External costs of environmental impacts on society and environment are not accounted for by producers and consumers, i.e. are not included (internalized) in market prices and include damages to the natural and built environment, such as effects of global warming.

From a climate protection perspective, the emission of GHG which are the cause of global temperature rise, the so called ‚greenhouse effect', is a use of natural resources as defined above. To internalize external effects and to improve and resolve these external effects,

several alternative political measures, including environmental subsidy, environmental tax and emissions trading systems can be implemented.
A key concept in the economics of climate change is the ‚carbon price', i.e. the price attached to emissions of carbon dioxide (CO2).
On the one hand, a carbon price is the ‚social cost of carbon', measuring the cost of CO2 emissions which is the present value of additional economic damages now and in the future caused by an additional ton of CO2 emissions. From an economic point of view, emissions are an "externality," whereas the emitter is imposing these costs on the society today and in the future without paying the costs of these emissions. On the other hand, where emissions are limited, a ‚carbon price' represents the market price or penalty that would be paid by those who generate the CO2 emissions.
The carbon price might be imposed via a ‚carbon tax' or a ‚cap-and-trade' system (Nordhaus 2008: 11f).

The signatories to the Kyoto Protocol have chosen, as an alternative to carbon taxes, a cap-and-trade system which became a standard design for global warming policies today and the idea is very simple. On a global scale, it does not matter where GHG emissions are generated, as long as they are collectively reduced and emissions are treated as a market commodity. Under the Kyoto Protocol, total emissions are limited by governmental regulations (the cap) and emissions permits are allocated to firms and other entities or are auctioned. Those who own the permits are allowed to sell them to others (the trade) (Nordhaus 2008: 12).

Emitters of carbon dioxide (CO2) must be in possession of the relevant allowances and, in case they do not possess a sufficient number of allowances, they can either reduce their emissions by using climate-friendly technology or acquire additional allowances. As the total number of available allowances remains limited, the additional purchase of allowances is only possible if a reduction of CO2 output has been achieved elsewhere (DEHSt [a] s.a.).

Trading emissions permits is an important innovation in environmental policy and its advantage is that some emitters can reduce emissions more economically than others.
If an emitter has extremely high costs of reducing emissions (abatement costs), it is more efficient for that emitter to purchase permits from emitters whose emissions reductions can be made more inexpensively (Nordhaus 2008: 13).

2.6.2 Emissions trading between states and companies

As set out in the UNFCCC and the Kyoto Protocol, international trade with emission certificates provides an essential instrument for industrial countries to meet their commitments. Based on the idea of a flexible ‚cap and trade' scheme, emissions trading according to the Kyoto Protocol refers to trading between states and stipulates that each developed country is assigned a defined quantity of certificates that entitle it to emit a defined quantity of GHG. One certificate, so called ‚Assigned Amount Units' (AAUs), is equal to one metric ton of carbon dioxide equivalent.
In case the emissions exceed the country limit, governments have a choice either to take action in their own country, i.e. setting incentives for technological innovation to reduce emissions to cap level, or to buy additional certificates from other industrial countries. If a country does not use entirely its emission budget, the surplus certificates can be sold, resulting in an inter-state market for emission certificates. Emissions trading between states exists since 2008 with 39 states participating that have committed themselves under the Kyoto Protocol to limiting their emissions (DEHSt [b] s.a.).

Beyond that, the Kyoto Protocol gives states the opportunity to collectively meet their commitments, which the European Union has done (ibid).
As its most important instrument to meet emissions reduction obligations, the EU introduced the European emissions trading scheme (ETS) between companies which is also based on a ‚cap and trade' scheme and certificates in the ETS are known as ‚EU Allowances (EUA)' ((DEHSt [b] s.a.).
The EU Emissions Trading Directive (Directive 2003/87/EC) laid its legislative foundations in 2003 and, since its introduction on 01.01.2005, emissions trading of carbon dioxide (CO2) at company level has been the main instrument of the EU to meet the emissions reduction targets agreed upon in the Kyoto Protocol. With the beginning of emission trading between states in 2008, the European Emissions Trading Scheme (ETS) is integrated into international emissions trading (DEHSt 2010: 4).

Further emission certificates can be earned by participating in the project-based mechanisms such as JI and CDM. The EU Linking Directive (2004/101/EC) linked JI and CDM as further instruments to EU emissions trading which become available to companies in EU Member

States as additional ways of obtaining emission allowances abroad to meet their annual surrender obligations (DEHSt [b] s.a.).
The CDM is the first crediting scheme for GHG established at UN level and the Certified Emission Reductions (CER‘s) have been established as the first internationally accepted currency for carbon at the carbon markets whereas one CER is equal to one metric ton of CO2 equivalent.

2.6.3 Principles of EU Emissions Trading Scheme (EU ETS) and its legal framework

As mentioned earlier, the overall EU target to reduce combined emissions of GHG by 8 per cent from 1990 levels over the first commitment period from 2008-2012 has been translated into differentiated emission reduction or limitation targets for each Member State under the so called ‚Burden Sharing Agreement‘ (BSA) by Council Decision 2002/358/EC of 25 April 2002. In order to promote reductions of GHG emissions in a cost-effective and economically efficient manner, the EU Emissions Trading Directive (Directive 2003/87/EC) established a scheme for GHG emission allowance trading within the Community. All Member States are full participants in the EU emissions trading scheme (ETS) which is based on the following principles: It is a ‚cap-and-trade‘ system with mandatory participation in the sectors covered and contains a strong compliance framework. „It is accepting credits from emission-saving projects carried out under the Kyoto Protocol’s CDM and JI and is also open to establishing formal links with compatible mandatory cap-and-trade systems in third countries that have ratified the Kyoto Protocol“. (EC 2009: 7)

The common trading of EUAs is central to the ETS, whereas one allowance gives the right for the emission of one ton of CO2 and the limit or ‚cap‘ on the number of allowances allocated creates the scarcity needed for a trading market to emerge.

In the first trading period (2005-2007), a total of 2298,5 million tons per year of CO2 allowances was allocated to Member States and, in the second trading period (2008-2012), 2086,5 million tons. (European Commission 2009: 14). Based on verified emissions data for 2005 collected as a result of the EU ETS monitoring, reporting and verification requirements, the Commission has taken a strict approach to ‚National Allocation Plans‘ (NAPs) for 2008-2012 to help ensure that Member States meet their Kyoto targets. The total number of

allowances for the second phase has been cut to 6.5 per cent below the level of 2005 emissions. (ibid: 16)

Member States are requested to draw up NAPs for each trading period and to allocate to each ‚installation' in the scheme allowances to emit a certain level of CO2 per year. These decisions on the allocations are made public (ibid: 9). The NAPs have to be based on objective and transparent criteria as stated in Annex III of Directive 2003/87/EC and the EU has issued specific guidance on their application for the first trading period (2005-2007: COM (2003) 830 of 7 January. 2004) and second trading period (2008-2012: COM (2005) 703 final of 22 December 2005). NAPs are assessed by the Commission on the basis of these rules and, once approved, the total quantity of allowances cannot be altered neither the number of allowances given to each installation once a Member State has finalized its allocation (ibid: 15ff).

Companies having difficulty in remaining within their emissions limit (covered by allowances) can either take measures to reduce their emissions, such as investing in more efficient technology or using a less carbon-intensive energy source, or buy extra allowances and /or CDM/JI credits on the market. A combination of these options is also possible, depending whichever is cheapest, ensuring that the emissions are reduced in the most cost effective way. Companies keeping their emissions below their allocated allowances can sell them in the market at a price which is determined by present supply and demand. Trade in the market can be made directly between companies and other participants or through one of the several organized exchanges in Europe, or via intermediaries (ibid: 21).

The ETS focused initially on CO2 from big emitters (Annex I). During the first trading period from 2005 to 2007, the ETS covered only CO2 emissions from large emitters in the power and heat generation industry and in selected energy-intensive industrial sectors. In the second trading period (2008 - 2012), the participation is mandatory for businesses in the following sectors: Energy activities (combustion installations, mineral oil refineries, coke ovens), production and processing of ferrous metals (iron and steel plants), mineral industry (cement, glass, lime, bricks, ceramics) and other activities such as industrial plants for the production of pulp and paper. Threshold values based on production capacity or output determine which plants in these sectors are included in the scheme (DEHSt 2010: 6).

It is the responsibility of the Member States to ensure that laws are complied with as stated in the EU Directive 2003/87/EC)

> Member States should ensure that the operators of certain specified activities hold a greenhouse gas emissions permit and that they monitor and report their emissions of greenhouse gases specified in relation to those activities. Member States should lay down rules on penalties applicable to infringements of this Directive and ensure that they are implemented. Those penalties must be effective, proportionate and dissuasive (2003/87/EC: (11), (12)).

The European Union provides a legal framework, which is implemented by the Member States through national legislation *(8)*. Each installation in the ETS *(9)* must have a ‚permit' from its competent authority for emitting all six GHG controlled by the Kyoto Protocol which will only be granted in case the operator is capable of monitoring and reporting the plant's emission. A permit sets out the emission monitoring and reporting requirements for an installation. The European Commission has issued a set of monitoring and reporting guidelines (Commission Decision 2007/589/EC) which have to be followed. Reports have to be checked by an independent verifier on the basis of criteria set out in the ETS legislation and made public (European Commission 2009: 20).

ETS incorporates a robust framework of measures to ensure compliance. Installations (emitters) must surrender allowances equivalent to their verified CO2 emissions of that year which are cancelled therefore cannot be used again. Emitters with allowances left over can sell them in the market or save them for their future use. Emitters not having enough allowances to cover their emissions in the previous year are penalized, made public by their names and have to pay a dissuasive fine for each excess ton of CO2 emitted which is EUR 100 per ton. Furthermore, some member states have laid down additional sanctions at national level for any infringements of the ETS rules (European Commission 2009: 19).

The market is EU-wide but is linked to emission reduction opportunities world wide by accepting credits from projects carried out under the Kyoto Protocol such as CDM and JI. The inclusion of CDM, JI and linking with compatible schemes in third countries is regulated by the EU „Linking Directive" (Directive 2004/101/EC).

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(8) The ‚Emissionszertifikategesetz (EZG)' is the statute for the implementation of the EC Emissions Trading Directive in Austria. Sections 11-13 EZG define the parameters for the preparation of the National Allocation Plan and the legal acts based thereon, as well as the criteria for the allocation of allowances in the 2008-2012 period (NAP:48).
(9) Some 11,000 installations in the EU are included (2010), accounting for almost 50 per cent of the EU's total CO2 emissions and about 40% of its overall greenhouse gas emissions. (European Commission 2009: 13)

As stated below, it allows all companies participating in emissions trading to offset a proportion of their climate obligations using certificates from CDM (CERs) and JI (ERUs) projects *(10)* whereas certificates generated from nuclear facilities are excluded.

> The use of CERs and ERUs by operators from 2008 may be allowed up to a percentage of the allocation to each installation, to be specified by each Member State in its national allocation plan. The use will take place through the issue and immediate surrender of one allowance in exchange for one CER or ERU. An allowance issued in exchange for a CER or ERU will correspond to that CER or ERU (Directive 2004/101/EC: (5): L338/18f).
>
> Member States are to refrain from using CERs and ERUs generated from nuclear facilities to meet their commitments pursuant to Article 3(1) of the Kyoto Protocol and pursuant to Decision 2002/358/ EC“ (Directive 2004/101/EC: (8): L338/19).

The ETS is the world's first trading system to recognize most of these credits as equivalent to emission allowances (1 EUA = 1 CER (CDM) = 1 ERU (JI)) and allow them to be traded within the system. The ETS is also open to establish formal links with compatible mandatory cap-and-trade systems in third countries that have ratified the Kyoto Protocol.

In 2013, the system will be revised and a single EU wide cap on emission allowances will replace the current system of 27 national caps implemented through national allocation plans (NAPs). Auctioning will become the basic principle in place of the current system whereby the vast majority of allowances is given away for free by governments. Auctioning will create a stronger incentive for businesses to take early action to reduce emissions, complies better with the 'polluter pays' principle and will increase the efficiency, transparency and simplicity of the EU ETS (European Commission 2009: 17). The penalty, currently EUR 100 per ton, will rise in line with the annual rate of inflation in the Eurozone, i.e. the group of EU countries using the euro as their currency (ibid: 19).

2.7 CDM outcome of the period: 2005 - 2012

The CDM as a flexible mechanism under the Kyoto Protocol has two objectives: It shall help developing countries in achieving sustainable development and assist developed countries in reducing the costs of meeting their emission reduction targets.

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(10) In Austria the use of CERs and ERUs is allowed up to 10% of the allocation to each installation (NAP Austria 2007 : 4) The purchase of JI/CDM certificates allows for an additional 9 million emission reduction units p.a. (that is 45 million certificates over the whole period 2008-2012) (ibid : 10).

Under the CDM, emission reduction projects are undertaken in developing countries, with often lower GHG abatement costs than in developed countries. For each ton of CO2 equivalent that is reduced as a result of a CDM project, a certified emission reduction unit (CER) is issued and can be used by developed countries for the fulfillment of their commitments.
Since its operational implementation in 2005, the CDM presents an impressive record.

2.7.1 CDM in numbers

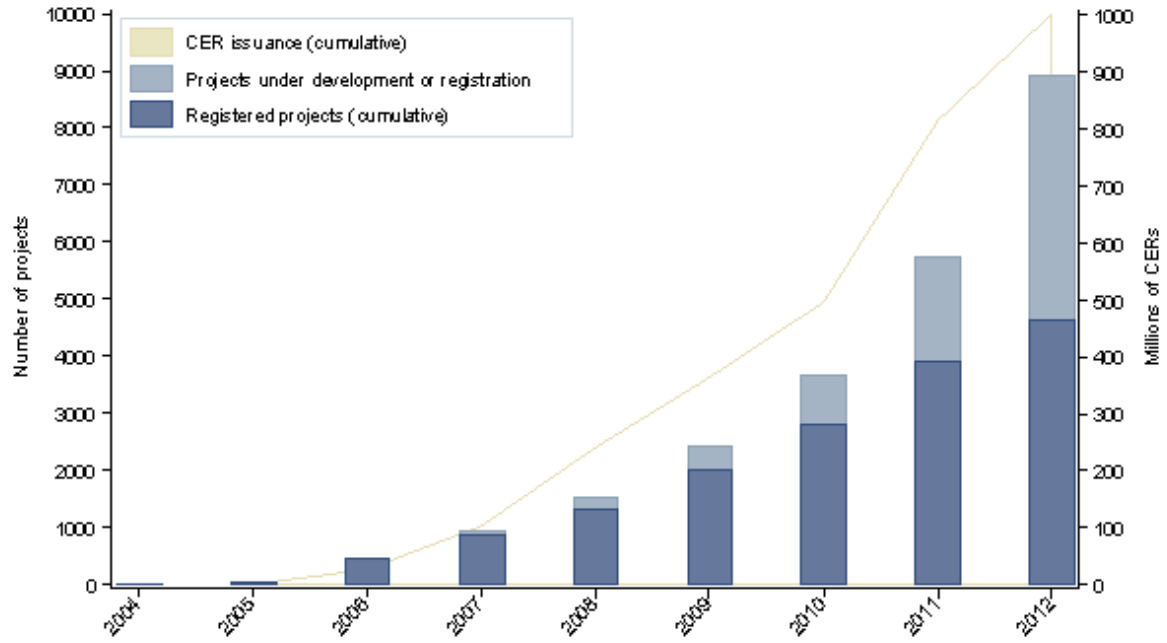
The status of CDM projects in various project cycles as of December 2012 shows a total of 3,521 projects at validation, 336 projects in process of registration and 5,194 projects registered, resulting in a total of 9,051 CDM projects in the pipeline excluding projects rejected (228), withdrawn (57), given a negative validation by DOEs (231) and 1,350 projects where DOEs terminated the validation (UNEP Risoe [a] s.a.).

As can be seen from Figure 1 below, not only the number of projects in the pipeline rose considerably in the last years, likewise the number of Certified Emission Reductions (CERs) increased remarkably. Many existing CDM projects were able to get their CERs issued. From the total of 5,194 projects registered, 1,896 CDM projects have got CERs issued. (UNEP Risoe [a] s.a.) As of December 1st, the number of CERs issued passed the significant milestone of 1 billion i.e. 1.094.212 CERs (UNEP Risoe [b] s.a.).

Along this development, the CDM has attracted, in less than 10 years, more than USD 215 billion in investment in registered CDM projects in 81 countries worldwide (UNFCCC 2012 e: 1).

The number of project activities submitted for registration saw a surge in new projects in 2012 which had been anticipated ahead of rules coming into effect in the European Union (EU) in 2013 i.e. unless the projects were already registered in 2012, the use of CERs from projects other than those hosted in least developed countries (LDCs) or other countries with bilateral agreements with the EU are excluded (UNFCCC 2012b: 5).

Figure 1: Projects registered and under development and certified emission reductions issued 2004–2012



Source: (UNFCCC 2012b : 4) http://unfccc.int/resource/docs/2012/cmp8/eng/03p01.pdf

2.7.2 Sectoral and regional distribution

In terms of sectoral distribution of the current project pipeline as of 1st December 2012, renewable energy projects represent the most important project sector, accounting for 69 per cent of all CDM activities. Among these, wind (29 per cent) and hydro power projects (26 per cent) as well as biomass energy generation activities (10 per cent) constitute the largest fraction, while the share of solar projects lies at around 4,2 per cent. Another project sector with a large share of the pipeline is CH4, i.e. methane avoidance (8 per cent), landfill gas activities (5 per cent), coal bed/mine methane (1,3 per cent) and cement (0,4 per cent), accounting for 16 per cent of total CDM number.

Around 10,2 per cent of all CDM activities are directed towards achieving emission reductions through exploiting energy efficiency (EE) potentials. The largest share of these activities (6,7 per cent) is being implemented in the field of EE own generation (5 per cent), EE supply power plants (1,4 per cent) and energy distribution (0,3 per cent) while the demand side (3,5 per cent) is made up by EE industry (1,8 per cent), households (1,3 per cent) and EE service (0,4 per cent). Particularly in developing countries where technologies are often out

dated and inefficient, energy efficiency measures host large potentials for emission reductions.

Table 1: CDM pipeline*) by sector as of December 2012):

Sector	CDM number	%	CERs (000)	%	CERs issued (000)	%
Renewables	6263	69,0	859184	34,4	235091	21,5
CH4 reduction/cement/coalmine/bed	1428	16,0	481478	19,3	80043	7,3
Supply side EE	625	6,9	218809	8,8	51461	4,7
Demand side EE	320	3,5	20098	0,8	2238	0,2
Fuel switch	152	1,7	155870	6,2	38865	3,6
HFC, PFC, SF & N2O	149	1,6	735476	29,3	680872	62,2
afforestation & reforestation	72	0,8	21851	0,9	4998	0,5
transport	42	0,5	6560	0,3	644	0,0
Total	**9051**	**100,0**	**2499326**	**100**	**1094212**	**100,0**

*) including registered and projects that are at least at the validation stage
Source: UNEP Risoe: CDM/JI Pipeline Analysis and Database: CDM projects by type

The goal of CDM projects is to support sustainable development in the host countries. Countries which do not have a quantified emission limitation and reduction obligation in Annex B of the Kyoto Protocol (so-called Non-Annex I countries) can qualify as host countries for CDM projects. The number of qualified countries will be reduced from 2013 onwards, with the new rule that only credits from Least Developed Countries (LDCs) are allowed for use in the EU ETS.

In terms of regional distribution of the current project pipeline as of 1st December 2012, the Asia & Pacific region has by far the largest share (81,2 per cent) of CDM projects in the pipeline, followed by Latin America with 13,6 per cent. Asia & Pacific and Latin America host around 95 per cent of the CDM projects.

Table 2: CDM pipeline*) by host region as of December 2012

Region	CDM number	%	CERS (000)	%
Asia & Pacific	7346	81,2	1985346	79,4
Latin America	1232	13,6	350693	14,1
Africa	268	3,0	96758	3,9
Middle East	104	1,1	33663	1,3
Europe & Central Asia	101	1,1	32866	1,3
Total	**9051**	**100,0**	**2499326**	**100,0**

*) including registered and projects that are at least at the validation stage
Source: UNEP Risoe: CDM/JI Pipeline Analysis and Database: CDM projects by host region

Africa now hosts 268 projects (these do not include the PoAs), accounting for only 3 per cent of the CDM pipeline.

„The difference between the number of projects hosted per country and their emission reductions potential is a result of different project types and technologies“. (Boyd et.al 2009: 823)

Considering that about 1 per cent of the projects in the pipeline are hosted by Least Developed Countries (LDCs) across continents, implies that countries in areas such as sub-Saharan Africa (SSA) with particularly low levels of socio - economic development, have not yet benefited accordingly.

3. Assessment and critical analysis of CDM design objectives

This section will provide an assessment and critical analysis of CDM project activities in respect of the claims as stated in Article 12 of the Kyoto Protocol,

> *[...] to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3". (United Nations 1998: 11)*

Particular emphasis will be paid to CDM's contribution to sustainable development in developing countries (non Annex I countries) on equal level to the achievement of cost-effective emission reductions by industrialized countries (Annex I countries).
The dual-objective reflects the compromise of the negotiations between Annex I countries looking for flexible cost effective options to meet their emission target in an economically efficient way and developing countries being preoccupied by mitigation policies which might affect their economic development. The CDM raised high expectations in developing countries for its potential to contribute to sustainable development triggered by foreign investments, technology transfer, and for its potential to alleviate poverty.

The purpose of this chapter is to analyze if the CDM is able to hold the promise of its dual-objective with reference to the first commitment period (2008 - 2012).

Most part of the literature is focused on CDM's contribution to emission reduction in a cost efficient way in Annex I countries, followed by evaluations on CDM's capacity to contribute to global emission reduction and to sustainable development in non Annex I countries. Research and public discussion has so far been focusing almost exclusively on the first objective.

This chapter begins with a short introduction of CDM's benefits for Annex I countries which usually includes an assessment of certificates as a political instrument for climate mitigation with respect to ecological effectiveness, economic efficiency and political enforceability but will be limited on basic statements with respect to economic efficiency.

The main focus of this chapter will be laid on CDM's contribution to sustainable development and its impact on development countries. Due to the lack of a general definition/ understanding on sustainable development and a set of indicators for measurement, this

section discusses the issues to define and assess sustainable development and aims to elaborate on how the CDM contributes to sustainable development by asking what criteria do host countries DNAs currently use to determine whether a CDM project contributes to its sustainable development. Against this background, a survey of key theoretical research on multiple perspectives will be given based on a literature review of CDM‘s contribution to sustainable development.

3.1 CDMs contribution to cost - effective climate change mitigation in Annex 1 countries

As stated in Article 12 of the Kyoto Protocol, one of the main purposes of CDM is to assist Annex I Parties in achieving their emission reduction targets by providing them with lower-cost opportunities for emission reductions to supplement their domestic actions. Finalizing the first commitment period (2008-2012) of the Kyoto Protocol, the following questions, i.e. how cost-effective the CDM has been and to what extent it has reduced the marginal costs of emission reductions for Annex I countries, will be discussed.

3.1.1 CDMs cost saving potential of the CDM

As mentioned earlier, Annex I Parties to the Kyoto Protocol have national emission limitation commitments for the period 2008–2012. To meet its national commitment, a country can implement policies and measures to reduce domestic emissions and/or purchase assigned amount units (AAUs), emission reduction units (ERUs) and certified emission reductions (CERs) from other countries.

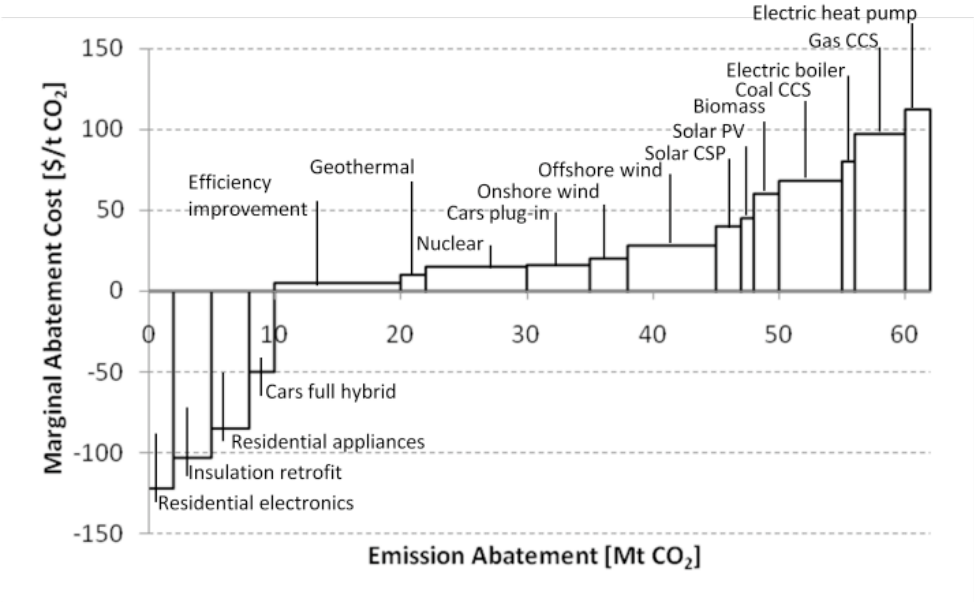
To identify the lowest-cost options for meeting its national commitment, the marginal abatement cost (MAC) will be considered, in particular a marginal abatement cost curve (MACC) which displays possible emission reduction measures in order of increasing marginal cost (USD/ tCO2e reduced), starting with the most cost-effective measure.

For each option, the curve shows the cost per metric ton CO2e reduced (abatement cost) on the vertical axis and the potential emission reduction, in metric ton CO2e per year (abatement potential), on the horizontal axis and each step on a MACC represents an emission reduction option. Typical options in a MACC include switching e.g. to clean energy, improving energy efficiency. Highly developed countries such as Japan have their curve closer to the vertical

axis, implying a more limited emission reduction potential and higher costs to meet a country‘s given emission reduction level (Spalding - Fecher et al. 2012: 21).
The total compliance cost is represented by the area under the curve and the marginal cost is the cost per metric ton CO2e reduced of the last option included (ibid).

Each country’s compliance cost depends both on its MAC curve and its commitment. Starting with the lowest-cost option and implementing all the emission reduction options needed to meet a country‘s national commitment, a country could minimize the cost of its emission reduction commitment domestically (ibid).

Figure 2: Expert based MAC curve



Source: Kesitzki 2011: 3

If the price of compliance units, such as AAUs, ERUs and CERs, is lower than the marginal cost of the last option, the total compliance cost can be reduced by purchasing such units and implementing fewer domestic reduction options. In other words, any options which have a higher marginal cost than the price of compliance units are not implemented and units equal to the reductions expected to be achieved by those options are purchased (ibid).

The concept of abatement curves has been applied since the early 1990s to illustrate the costs associated with carbon abatement and to serve as a decision making aid for environmental policy, however, the precision suggested by the curve is misleading (Kesitzky 2011: 2). A MACC reflects the marginal costs relative to a baseline and, in practice, the MACC changes

because of the projected baseline emissions change (due to macroeconomic conditions), the projected fuel prices change and the cost or performance of various options changes. Nevertheless, options can be grouped into cost ranges and options that need to be implemented to achieve the emission reduction target (Spalding - Fecher et al. 2012: 21).

With respect to CDM and generated CERs, the mechanism can help Annex I countries to reduce compliance costs in two ways.
On the one hand, the government can choose to purchase CERs to achieve domestic reductions instead of implementing policies which are more costly. On the other hand, where permitted by the national government, companies (installations) subject to a domestic policy can use CERs to comply with that policy. The government then uses those CERs to offset the higher domestic emissions. The use of CERs by installations in the EU ETS for compliance accounted for almost half of the CERs issued up to March 31, 2012 (ibid: 22).

As mentioned earlier, installations in the EU ETS must submit each year valid compliance units i.e. European Union Allowances (EUAs), CERs or ERUs equal to their actual emission level in the previous year. EUAs so far distributed each year, mostly through free allocation to participating installations equal to the annual emissions cap and CERs, can be freely traded. CERs have a lower market price than EUAs but both are equivalent for compliance. Using CERs reduces compliance costs and also the demand for EUAs which may also lower their market price. As a result of the use of CERs and the EUA-CER price spread, the estimated compliance cost saving to EU ETS installations for the period 2008–2011 as of April 30 of the subsequent year and calculated with total saving over the four years is almost EUR 1.2 billion (USD 1.5 billion) (ibid: 22).

In summary, the CDM has reduced compliance costs for installations in the EU ETS and Japan by at least USD 3.6 billion for the period from 2008 to 2011, whereas the savings could be much larger, depending on the impact of CER use on the price of EUAs. For the commitment period 2008–2012, the compliance cost savings for these installations are estimated to be at least USD 2.3 billion and the use of CERs by Annex I government to meet their national emission limitation commitments will yield an additional USD 1.3 billion in savings (ibid: 24).

3.1.2 CDMs mitigation cost effectiveness

Considering CDM‘s mitigation cost effectiveness, the focus is on the project mitigation cost. As mentioned earlier, the project design documents (PDDs) mostly include an investment analysis providing sufficient information to calculate the projected cost per tCO2e emissions reduced which may differ substantially by project type.

> „The project mitigation cost is the present value of all capital and operating costs over the life of the project less the present value of any revenue from sources other than the sale of CERs (e.g. for electricity generated), divided by the anticipated emission reductions over the life of the project. Thus, the project mitigation cost is measured in cost per tCO2e reduced. [The project mitigation cost includes all operating costs and all revenue other than the sale of CERs over the life of the project].“ (Spalding - Fecher et al. 2012: 24) *(11)*

Thus the project mitigation costs are sensitive to the discount rate and to the project crediting period (fixed or renewable) used.

In order to be cost effective, the total cost of a CDM activity after including the transaction costs, needs to be lower than the price of CERs. Considering the mitigation cost of a CDM activity as a measure of a project’s net costs, a negative cost means the CDM activity is profitable without revenue from the sale of CERs.

The project mitigation costs and the costs of similar emission reduction options as mentioned earlier in MAC curves are not directly comparable.

A MAC curve applies to a country, reflecting a specific baseline scenario such as the fuel prices and technology performance (lifetime, etc.) and typically uses a social discount rate. On the contrary, the project mitigation cost estimates are based on projects in different countries that probably have different baselines, a limited crediting period and use private discount rates. Furthermore, being a relatively accurate measure of the project’s costs over its lifetime, it may not represent the true abatement cost. When calculating the marginal abatement cost, cost included in the baseline scenario should be subtracted from the project mitigation cost as it is the case for most CDM renewable energy projects which defer investment in fossil-fired generation, so the marginal abatement cost is the mitigation cost for the CDM project less the cost of the fossil-fired capacity avoided (ibid: 26).

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(11) not included are transaction costs, such as fees to designated operational entities (DOEs) for validation and verification, host-country levies or designated national authority (DNA) charges, the administrative cost levy of the EB, the share of proceeds for the Adaptation Fund and costs associated with the sale of CERs. (Spalding - Fecher 2012: 26)

3.2 CDMs contribution to sustainable development (SD) in non Annex 1 countries

The first objective of the CDM, as mentioned in Article 12 of the Kyoto Protocol, is to assist Parties not included in Annex I in achieving sustainable development and this objective is given the same level of importance as assisting Annex I Parties to meet their emission reduction targets in a cost-effective way. The Kyoto Protocol does not define sustainable development nor refer to a set of indicators to measure CDM‘s contribution to sustainable development.

Since the registration of the first CDM project, the CDM has been criticized for not generating sufficient sustainable development benefits.
The Executive Board (EB) of the clean development mechanism to the Conference of the Parties (CoP) states in his annual report that „[...] there is a need to do more to make visible the sustainable development co-benefits of CDM projects“ and „[...] to ensure that the CDM makes an impact on sustainable development, it is crucial that DNAs set related criteria and ensure that they are met in the projects they approve“. (UNFCCC 2012b: 7)

Assessing CDM‘s impact on sustainable development needs a clear understanding what is meant by ‘sustainable development‘ and what are the ‚related criteria‘ to be set by the DNAs; is there a common understanding or do they differ among countries ? Finally, if and how should the DNAs monitor the related criteria of a CDM project and make sure that they are met by evaluating the outcome ?

Based on issues to define and assess sustainable development, this section aims to elaborate on how the CDM contributes to sustainable development by asking what criteria do host countries DNAs currently use to determine whether a CDM project contributes to its sustainable development.
Technology transfer, an opportunity to channel clean technologies to developing countries, is not clearly defined as well and its co-benefit to sustainable development has also been criticized.
Against this background, a survey of key theoretical research on multiple perspectives will be given based on a literature review of CDM‘s contribution to sustainable development and technology transfer.

3.2.1 Issues to define and assess sustainable development

As mentioned earlier, the Kyoto Protocol does not define ‚sustainable development'. To define sustainable development, reference is often made to the Brundtland Report (Our Common Future) which defined sustainable development as development that „[...] meets the needs of the present without compromising the ability of future generations to meet their own needs". (United Nations 1987: 14 [3.27])

There have been numerous attempts to find more operationally useful definitions and indicators of sustainable development. Although there are many different approaches to define sustainable development (for an overview see Sutter 2003 and Singh et al., 2009) and no universally accepted definition exists so far, it is widely agreed that sustainable development comprises three mutually reinforcing ‚dimensions', i.e. economic development, social development, and environmental protection (Sutter 2003; Olsen, 2007; and Alexeew, et al., 2010). This fact is shared by both the academia (scientific studies) and the practitioners (DNAs), however, no universally accepted approach or methodology exists when it comes to practical and concrete assessments of a CDM's impact on sustainable development (Olsen 2007).

Since the adoption of the Kyoto Protocol, there has been some guidance on Article 12 concerning the determination of sustainable development in CDM projects. The Marrakech Accords underline that „[...] it is the host Party's prerogative to confirm whether a clean development project activity assists it in achieving sustainable development [...]" (UNFCCC, 2002 Decision 17/CP.7: 20) meaning the competence is given to the Designated National Authorities (DNAs) of host countries to define their own ‚indicators' and relevant assessment procedures to evaluate project documentation. Due to the fact that the DNA decides on sustainable development indicators on the basis of their national development priorities, there is a wide variation in the way and detail in which these indicators are defined. However, this pragmatic approach to define sustainable development leads to several issues. On the one hand, different stakeholders prioritize different aspects of sustainable development and, due to unequal power relation among stakeholders, the ones with strong resources are able to define the terms in their favor, i.e. for the carbon trade. There is a tendency of competition among non-Annex I countries to attract CDM investments and to create an incentive to set low

sustainability standards, an issue discussed as ‚race to the bottom' (Sutter 2003; Olsen 2007) On the other hand, the absence of any monitoring and verification requirements for CDM projects whether the potential benefits are actually achieved may lead to very optimistic articulated sustainable development benefits in the PDDs.

Originally, the CDM had no explicit technology transfer requirements in the Kyoto Protocol however were included later in the 2001 Marrakech Accords. It is an opportunity to channel clean technologies to developing countries which constitutes an important co-benefit to sustainable development as it helps to improve local living conditions by reducing GHG emissions. No universally accepted definition of ‚technology transfer' exists so far. The term ‚technology transfer' is defined by the IPPC

> „[...] as a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research/education institutions". (IPCC 2000 a: 3)

An important aspect of technology transfer is the transfer of knowledge and not the sale of goods only.

> „It comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose it and adapt it to local conditions and integrate it with indigenous technologies". (IPCC 2000 a: 3)

The new technology must be accompanied by transfer of sufficient knowledge in order to install, operate and maintain the equipment and will focus on meeting the technology needs of the projects.

Technology requirements, including the technology transfer, are specified by host countries as a requirement for project approval. Almost all countries identify technological sustainability as a key criteria for CDM projects to attain sustainable development goals, however, the degree of detail in which these criteria is expressed differs from country to country.
Some „[...] DNAs provide generic guidelines on a project's technological benefits (indirect indicators like technology transfer or implication of technology transfer to the country)", while others „[...] ask for very specific and detailed information as well". (TERI 2012: 70) The impact of CDM projects on 'technological sustainability'/'technological self-reliance'/'technological up-gradation' is either considered by DNAs as one of the sustainable development criteria/indicators or as part of some sustainable development criteria/indicator which is in most cases the economic benefit (ibid: 70).

In cases [...] where technology transfer might be included under the sustainable development criteria by a host country, the project proponents might try to exaggerate the technology transfer component of a project to increase the chance to getting the project cleared by the DNA“ (Das 2011: 29) who is often not in a position to verify the claims made by project developers and investors. Besides, „[...] host country DNAs may have reasons to adopt a rather lenient approach in approving CDM projects, thereby failing to utilize whatever potential the CDM may be having as a vehicle for technology transfer“. (ibid)

No general guidance exists ‚how‘ the DNAs should assess the sustainable development impact of CDM projects and other aspects of sustainable development such as the technology transfer.
The procedures for granting the Letter of Approval (LoA) differ greatly among countries, whereas the representation from key ministries in the approval process is common to provide support to the DNA in its decision making on the compliance of the project, with the sustainable development priorities of the country and the designated sustainable development indicators being used as a reference (Spalding - Fecher et al. 2012: 33).

Contrary to the control of CO2e emission reduction activities, sustainable development benefits and other aspects of sustainable development such as the technology transfer are not included in the monitoring requirements of the CDM which makes the ‚real‘ impact (positive and negative) of CDM projects on sustainable development not known (measurable) or reported and, in some cases, the impact might be ignored. „Sustainable development is not included in the assessment of DOEs during verification and it is not a requirement at the international or national level that sustainable development benefits are actually realized (ibid: 34).

The issue of monitoring sustainable development is subject of controversial discussion while some stakeholders mention that a monitoring system should be in place to measure the sustainable development benefits of a project. Others question the usefulness by arguing that a more rigorous system might be counterproductive and have a negative impact on the market and incorporating sustainable development criteria into the verification process would increase transaction costs, already one of the most important barriers to the CDM. (Spalding-

Fecher et al. 2012: 35). Finally, it is up to the DNAs enhancing the dialogue among each other, to share ideas on best practices, sustainable development criteria and other key issues.

In order to support the objective of the CDM to assist in achieving sustainable development, the Gold Standard (GS) was developed in 2003 by an international expert panel on the initiative of the World Wide Fund for Nature (WWF). The GS consists of criteria that go beyond the official CDM modalities. GS projects

> „[...] must adhere to a stringent and transparent set of criteria developed by the Secretariat, overseen by an independent Technical Advisory Committee and verified by UN accredited independent auditors. The certification process uniquely requires the involvement of local stakeholders and NGOs (The Gold Standard Foundation s.a., s.p)

The aim of the GS is the establishment of a ‚premium product' on the CDM market under the assumption that buyers will be willing to pay a higher price for certified high-quality projects which financially reward not only the emission reductions but also the sustainability benefits of a project (Sterk et al. 2009: 34).

A key aspect of the GS is that the developer of a GS project is required to submit a sustainability monitoring plan in addition to the sustainable development assessment in the PDD. This plan is the basis to verify whether the CDM project has indeed contributed to sustainable development as anticipated in the PDD and may cause the project developer to consider the impacts of the project carefully and to keep the PDD analysis brief to minimize the monitoring requirements (Kirkmen et al. 2012: 24).

3.2.2 Sustainable development criteria - SD contribution

In order to determine ‚how' a CDM project makes its contribution to sustainable development, a list of criteria/indicators is required against which a project is assessed and showing the ‚nature of its contribution' (nature of benefits). Several studies have been made to analyze what criteria/indicator host countries DNA do currently use to determine whether a CDM project contributes to its sustainable development and to use the findings as a best practice of indicators suitable for CDM assessment.

A recent study by the Energy and Resources Institute (TERI 2012) prepared for the UNFCCC with a sample of 30 countries based on three main data sources, i.e. a compilation of questionnaire responses from DNAs, DNAs website and literature, shows that most of the

DNAs mention to have an operational definition of sustainable development in their country and define their sustainable development criteria under the social, economic and environmental dimensions. The degree of detail in which DNAs explain their sustainable development criteria differs. The range is from a general listing of criteria/indicators under the three dimensions, to listing of criteria and a set of indicators under each, to listing of indicators under criteria with scoring of each indicator. Technological benefits of CDM projects are either incorporated into the economic benefits or are a separate category (TERI 2012: 20). Almost all countries state technological sustainability as a key criteria for CDM projects to attain sustainable development goals, however, the emphasis of DNAs on what constitutes technological sustainability and the degree of detail in which the criteria is expressed also differs from nation to nation (TERI 2012: 22f).

The most frequently sustainable development criteria in each of the three dimensions used by DNAs to assess the benefits of CDM projects are: (Spalding - Fecher et al. 2012: 33; TERI 2012: 24ff).

economic benefits =>	**number of total 30 (TERI)**
- Additional investment generated	10
- Employment generation	25
- Income generation	11
- Contribution to sustainability of balance of payments	10
- Clean energy development	10
technological benefits	
- Contribution towards improvement of technologies	15
- Technological sustainability	11
- Technology transfer	6

In order to assess the economic benefits, DNAs investigate local and national benefits. „While the major focus of DNAs is local and regional benefits, some countries also give consideration to the impact of project activity on the macro-economic sustainability of the country“. (TERI 2012: 21)

„Most DNAs expect CDM projects to contribute towards strengthening the local economy of the region by generating additional income for the local communities [...]“ (ibid :21) and by

bringing in additional investment. DNAs give particular attention on the projects' contribution towards generation of employment; almost all have this criterion for their assessment of sustainable development benefits (TERI 2012: 20f / Spalding-Fecher et al. 2012: 32). Many DNAs also assess within the economic dimension the impact of the project on the promotion of clean energy in the country (generation from renewable sources of energy, substitution of energy sources with greater positive environmental impact, impact on the decrease in the cost of energy and on the access of energy to the people) (TERI 2012: 21).

Technological benefits are defined by DNAs by using three criteria i.e. contribution towards improvement of technologies, technological sustainability and implications of the technology transfer on the host country, whereas almost all countries state technological sustainability as a key criteria for CDM projects to attain sustainable development goals. „[...] the host countries expect that the CDM projects should not only use good technologies but also assist in the overall goal of technological self-reliance of the country". (TERI 2012: 22)

environmental benefits =>	**number of total 30 (TERI)**
- GHG emission reduction	16
- Impact on environment general and change in practices	14
- Impact on environment specific	20
on air, water and land resources	18
on conservation/promotion of biodiversity	18
on solid waste generation or disposal	10
- Contribution to resource sustainability	16

DNAs in the sample classified the environmental benefits of CDM projects broadly into the following criteria: GHG emission reduction, impact on the environment and resources and contribution to sustainability of resources, whereas „[...] most DNAs rely on the environmental laws and standards set by national, provincial and local governments in deciding whether the project is contributing positively to the local environment". (ibid: 27) The most frequently used criteria in the environmental dimension is the impact of the project on the local environment and resources. While some DNAs give criterion of ‚impact on environment', most of them elaborate the impacts further on the air, water and land environment, and on biodiversity.

Special impetus is given by several DNAs to solid waste generation or disposal (TERI 2012: 27; Spalding - Fecher et al. 2012: 32).

social benefits =>	number of total 30 (TERI)
- Quality of life of local communities	25
- Effective public/community participation in project design planning and implementation	12
- Capacity/skill/knowledge development	12
- Consistency with/contribution to national, provincial and local development and sectoral priorities	14

The impact on the quality of life of the local community is the most frequently used criterion to assess social benefits and specific indicators that would justify the improvement by the project include: „assisting in poverty reduction through employment generation (9), ensuring no adverse effects on health (13), engaging in developmental activities to support society (10), enhancing access to public services (7) and promoting local industry (2).“ (ibid: 28) The impact on human health and engaging in developmental activities appear most frequently. Developmental activities highlighted by DNAs include infrastructure creation, provision of healthcare, educational facilities and civic amenities. Most DNAs require effective community participation throughout the project cycle and give impetus to the ability of the project to generate technical skills and knowledge in the local community. The consistency of the project with national, provincial, local development and sectoral objectives is the second most important used criterion (TERI 2012: 28; Spalding - Fecher et al. 2012: 32).

Another study (Kirkmen et al. 2012) recently published by the UNFCCC assesses the claims made by project participants in the project design documents (PDDs) submitted for registration. A set of 10 indicators, derived from the statements made in the PDDs for registered CDM projects were used to tabulate the sustainable development claims in the PDDs of 3,864 projects registered and undergoing registration as of June 2012 (Kirkmen et al. 2012: 16). PDDs with no statement to the project's contribution to sustainable development (32) and with no specific sustainable development statements (8) were not included in the analysis. All projects were reviewed by a single analyst assessing the statements from various sections of the PDDs, whereas most information was taken from section A.2 of the PDDs.

Claims of reduction in GHG emissions which is a prerequisite for a CDM project, were not part of the sustainable development indicators as well as general statements to host countries promotion of sustainable development but not directly related to the project.

The table below shows sustainable development dimensions and indicators for CDM projects (Kirkmen et al. 2012: 15) and the number of sustainable development claims by indicator.

Table 3: Number of sustainable development claims by indicator

Dimension	Indicator	number of claims	% of total
Economy:	- Stimulation of the local economy including job creation and poverty alleviation	1112	
	- Development and diffusion of technology	446	
	- Improvement to infrastructure	147	
Total:		**1705**	**44%**
Environment:	- Reduction of pollution	837	
	- Promotion of reliable and renewable energy	738	
	- Preservation of natural resources	311	
Total:		**1886**	**49%**
Social:	- Improvement of health and safety	120	
	- Engagement of local population	96	
	- Promotion of education	10	
	- Empowerment of women, care of children and the frail	5	
Total:		**231**	**6%**

Most frequently claimed are stimulation to the local economy including job creation and poverty alleviation (29 per cent of the projects), reduction of pollution (22 per cent of projects), and promotion of reliable and renewable energy (19 per cent of the projects) (Kirkmen et al. 2012: 16). Claims of environmental benefits (49 per cent of projects) are slightly higher than economic benefits (44 per cent of projects) and both far exceed those of social benefits (6 per cent of projects) (Kirkmen et al. 2012: 17).

There seems to be some consistency of findings from TERI and Kirkman. Both are recent studies of sustainable development criteria but based on different sources of information. TERI is based on a sample of 30 countries using three main data sources, i.e. survey DNA questionnaire, DNAs website and literature while Kirkman tabulates the sustainable

development claims in the PDDs of 3,864 projects registered and undergoing registration according to a set of 10 indicators derived from PDDs.

In respect to the claims/benefits in both studies, the DNAs give particular attention on the projects' contribution to the local economy, i.e. ‚generation of employment' respectively ‚stimulation of the local economy including job creation and poverty alleviation'. In TERI, this economic indicator ranks equal with ‚quality of life of local communities', an indicator stated in the social dimension (25 out of 30), whereas in Kirkmans' study it is followed by ‚reduction of pollution' and ‚promotion of reliable and renewable energy', both indicators from the environmental dimension. Looking into more detail what is meant by ‚quality of life of local communities', which is the most frequently used criterion to assess social benefits in TERIs study, the sub indicator is, inter alia ‚assisting in poverty reduction through employment generation (9 out of 30). If we deduct this sub indicator from the social dimension, for a better comparison, the second most important indicators in TERI changed to the environmental dimension, i.e. ‚impact on environment' and ‚contribution to resource sustainability'.

However, the findings in respect to the distribution of claims among the three dimensions are different. In contrast to the study of Kirkmen, the social dimension in TERI is not far behind the economic and environmental dimensions.

An earlier study by Olsen and Fenhann (2006), which is based on sampled 296 PDDs coded out of 744 total as of May 2006, found that in 68 per cent of all projects ‚employment generation' is the most likely impact of an average CDM project to sustainable development, followed by economic growth and improved air quality, whereas „[...] the distribution of SD benefits among the three dimensions is fairly even with most benefits in the social dimension, followed by economic and environmental dimensions." (Olsen and Fenhann 2006: 3ff)

The distribution of claimed benefits among the three dimensions is not directly comparable. Olsen and Fenhann categorized employment as a social benefit, whereas in the recent studies it is categorized as an economic benefit.

Table 4: Comparison of findings - most frequently used sustainable development criteria

TERI (2012)	Kirkman (2012)	Olsen and Fenhann (2006)
- **employment generation** - **quality of life of local communities**	- **stimulation of the local economy including job creation and poverty alleviation**	- **employment generation**
- **Impact on environment (specific)**	- **reduction of pollution**	- **economic growth**
- **contribution to resource sustainability**	- **promotion of reliable and renewable energy**	- **improved air quality**

Dimensions: economic, environmental, social

As can be seen from the table above, economic indicators are the most frequently sustainable development criteria used, with a specific focus on job creation/employment, followed by environmental indicators in recent years.

Further findings in Kirkmans‘ also show trends in sustainable development contributions, The economic indicators have remained relatively constant over time but ‚stimulation of the local economy, including job creation and poverty alleviation‘, has fluctuated slightly from a low of 26 per cent in 2006 to a high of 31 per cent in 2011 of all claims (Kirkman et al. 2012: 19). The other claims also saw some fluctuation over time, whereas ‚reduction of pollution‘ has increased from 15 per cent in 2005 to 24 per cent in 2012 and social claims have fallen from 11 per cent to 6 per cent over the same time span. These trends may be due to shifting patterns of sustainable development claims over time or changes in the project mix each year e.g. biomass projects were prominent at the beginning of CDM but have declined since 2007, whereas wind and hydro projects have increased exponentially since 2011 (Kirkman et al. 2012: 20).

Contributions to sustainable development as stated in the PDD are expectations at the time the project is being validated and may be different to the actual contributions. In order to assess the relative reliability of these claims, a follow up survey was conducted (Kirkman et al.

2012) by the UNFCCC to compare the claims made in the PDD with the actual outcome. Project participants, after having their projects been registered in 2011, were asked to assess each project‘s contribution to sustainable development and the survey responses from 332 projects were compared with the indicators compiled from the PDDs. Only nine of the 332 projects or 3 per cent of projects show a 100 per cent match of the indicators from the PDDs and the survey responses, whereas 27 projects or 8 per cent of projects have 0 per cent match between survey and PDD indicators. 100 projects or 30 per cent of the projects show a match of 50 per cent between survey and PDD indicators and 197 projects or 60 per cent of projects have at least half of the indicators matched (Kirkmen et al. 2012: 21).

Considering that two thirds of projects have similar sustainable development claims indicates that some claims made in the PDDs are reasonable representations of the sustainable development contributions expected by project participants in addition to the mitigation of GHG emissions. Deviations may be due to differences in interpretation of the applicable indicator or changes of the sustainable development contributions as stated in the PDDs (Kirkman et al. 2012: 22).

The absence of any monitoring and verification requirements for CDM projects whether the potential benefits are actually achieved may bear the risk to rely on very optimistic articulated sustainable development benefits when analyzing on the basis of PDDs only.

3.2.3 Research overview on CDMs contribution to sustainable development

There is a growing body of literature on CDM‘s contribution to sustainable development mostly published by researchers and academicians as peer-reviewed papers. The number of opinion articles from policy/think tank organizations is also significant. This section summarizes the review of scientific studies assessing the sustainable development performance of CDM projects.

CDM‘s contribution to and impact on sustainable development has been subject of extensive research and commentary in the academic literature with a broad variety of approaches and aspects. Some studies compare across Project Design Documents (PDDs) and /or have country, regional, sectoral or technology focus and many are showcases of ‘positive’ or ‘negative’ case studies. Other studies cover widespread criticism such as the potential trade off between the two objectives of the CDM, the correlation between CDM‘s impact on

sustainable development and additionality of projects. Others cover the ongoing debate on international guidelines for assessing the sustainability of CDM projects and how to promote more equitable distribution of CDM projects.

There are two ways of assessment on a project-by-project basis, i.e. ‚how' and ‚how much' a CDM project contributes to sustainable development (UNFCCC 2011: 2).
In order to determine ‚how' a CDM project makes its contribution to sustainable development, a list of indicators is required against which a project is assessed and showing the ‚nature of its contribution' (nature of benefits). This approach was first used by Olsen and Fenhann (2006). They developed a new methodology for the assessment of CDM's sustainable development contributions which is based on qualitative text analysis of sampled 296 PDDs coded out of 744 total as of May 2006. Their results describe how CDM projects on an aggregated level contribute to sustainable development. Due to the qualitative nature of the methodology, there is no basis to conclude ‚how much' the CDM contributes to sustainable development (Olsen and Fenhann 2006: 3).
The determination ‚how much' a CDM project makes its contribution to sustainable development requires, in addition to a list of indicators, a quantitative and qualitative measure for each indicator, to score the project and weights allowing the scores for the different indicators to be aggregated into an overall measure of the ‚extent of the contribution' (nature and quantity of benefits) to sustainable development (Kirkman et al. 2012: 13). Only two studies used this approach, i.e. Sutter and Parreno (2007) and Alexeew et al. (2010).

The methodologies employed to analyze/assess the sustainability impacts of CDM projects comprise textual/keyword analysis of information given in PDDs, Multi-Criteria Assessment and Multi-Attributive Assessment of information given in the PDDs, follow up survey of project participants, site visits for verification of PDDs, Multi-Attributive Assessment of information received from stakeholder consultations/surveys, interviews with international experts and project developers and literature review. The Multi-Attributive Assessment Methodology (MATA-CDM) developed by Sutter (2003) is the most elaborated approach.
The analysis of CDM's contribution to sustainable development has been mostly based upon Project Design Documents (PDDs) and samples chosen from the pool, which is a sensitive

issue as Sutter noted „[...] the selection of case studies and the chosen assessment methodology in general considerably influence the results of such studies“ (Sutter 2003: 64).
Apart from some individual case studies, most analyses remain ex ante analyses on sustainable development potential benefits. This is mainly due to the absence of monitoring and verification requirements in respect to sustainable development delivering ‚real and measured‘ impacts. The PDDs deliver the best coverage of all CDM projects at the design stage and it is required in section A.2 of the template to describe in maximum one page the project activity in terms of its purpose and contribution to sustainable development. The PDD is used by all host countries to screen sustainable development before issuing the Letter of Approval (LoA). In addition, the access to this information is easy as all the PDDs in the project pipeline can be downloaded on the UNFCCC website free of charge.
In order to validate the claims made in the PDDs, a few studies have followed the analysis of PDDs with questionnaire survey among the relevant stakeholders and site visits for selected projects. Some research based on the PDDs are accomplished (followed) by literature review (Alexeew et al. 2010) and by interviews with international experts and project developers (Castro and Michaelowa 2008). One recent PDD research as mentioned earlier by the UNFCCC (Kirkman et al 2012) is accomplished by a follow up survey of project participants.

Initially, research findings on how the CDM contributes to sustainable development have been primarily on a project-by-project basis, however, since 2005, studies of the CDM‘s contribution to sustainable development at aggregated levels (existing CDM portfolio) have been added to the literature. Analyses are based on the fast growing CDM portfolio in terms of types of projects, the volume of CERs generated and geographic distribution.

The following studies are a selection from different aspects, some being focused on the question if the CDM is delivering the requested twin objective as stated in Article 12 of the Kyoto Protocol on equal ranking while others are focused on CDM‘s potential/extent to contribute to sustainable development in general and by project type. Others question whether the CDM contributes to technology transfer which is often seen as a specific aspect of sustainable development. To complete the picture, studies focused on the ongoing debate on international guidelines for assessing sustainability of CDM projects (Gold Standard) and how to promote more equitable distribution of CDM projects will be addressed.

3.2.4 Main findings of the research on CDMs contribution to sustainable development

Several experts questioned whether the CDM is able to fulfill both objectives. One of the first studies was made by Sutter 2003 and is based on a MATA-CDM of information received from stakeholder consultants/surveys from six case studies in South Africa, India and Uruguay. Sutter concluded „[...] a clear trade off between the two objectives of the CDM – cost efficient emission reductions and contribution to sustainable development". (Sutter 2003: 72) Competition among non-Annex I parties in attracting CDM investments may lead to a ‚race to the bottom' in terms of sustainable development standards and to the unequal support of the objective of cost efficient emission reductions. „Due to international competition, nationally set standards can lead to a ‚race to the bottom,' thereby weakening the sustainability objective [...]" (Sutter 2003: 65) and in combination with the current absence of international sustainability standards „[...] it is likely to cause a trade-off in favor of the cost-efficiency objective". (Sutter 2003: 65) As both parties have no direct incentives to implement strict sustainability criteria, Sutter states „[...] it is essential that Designated Operational Entities (DOE), as well as independent observers such as NGOs or academia, critically observe the ongoing activities under the label of CDM." (Sutter 2003: 72)

The conclusion of a trade off between the two objectives of the CDM in favor of cost-efficient emission reductions was later on shared by many researchers.

Olsen (2007) made an review of 19 studies focusing on sustainable development aspects of CDM as of 2005, whereas none of the 19 studies assessed have been registered CDM projects. The review revealed an emerging consensus in the literature that the CDM produces „[...] a trade-off between the two goals of the mechanism in favor of producing low-cost emission reductions at the expense of achieving sustainable development benefits". (Olsen 2007: 67) Left to market forces, the CDM does not significantly contribute to sustainable development (ibid)

Sutter and Parreno (2007) assessed the first 16 registered CDM projects as of August 2005 by using information given in the PDDs and by applying MATA-CDM for assessing their sustainable development contribution. The 16 projects cover seven project types, i.e. hydro (6), landfill gas (3), biomass (2) HFC-23 destruction (2) and energy efficiency households (1) fossil fuel switch (1) and wind (1) in nine host countries. To get an overall score for each

project on its contribution to sustainable development, each project was scored on equally weighted criteria, i.e. ‚employment generation', ‚distribution of returns from the sale of CERs' and ‚improved local air quality'. The additionality of each project was measured by the impact of the revenues from the sale of the CERs on the project's profitability.
Sutter and Parenno found no project with the coexistence of a large contribution to sustainable development and high additionality. They concluded a trade off between the two objectives of the CDM and the projects assessed does not deliver its claims to promote sustainable development. In particular, Hydrofluorocarbons (HFC) and landfill gas projects were highly additional with emission reduction of 95 per cent but made a small contribution to sustainable development. They concluded that the first CDM projects missed their target „[...] there are currently no UNFCCC registered CDM projects that are likely to fulfill the Kyoto Protocol's twofold objective of simultaneously delivering greenhouse gas (GHG) emission reduction and contributing to sustainable development". (Sutter and Parreno 2007: 75)

Alexeew et al. (2010) assessed the contribution to sustainable development and the additionality of 40 registered projects (a sample of 379 projects registered by December 2008) in India by using a multi-criteria analysis to assess the projects' sustainable development benefits, a methodology similar to that of Sutter and Parreno. He found that the values for each dimension of sustainability differ significantly across project types. Projects in the sector wind, hydro and biomass provide a higher number of sustainable development benefits, whereas energy efficiency and HFC-23 projects made no contribution (Alexeew et al. 2010: 12 [245]). In consistence with Suttner and Parreno, he concluded that none of the projects achieved a large contribution to sustainable development and high additionality. (Alexeew et al. 2010: 11 [244]). Considering the relationship between the projects' additionality and sustainability contribution „[...] a trade-off between these two CDM goals is established, revealing a potential inherent conflict in how the current mechanism works". (Alexeew et al. 2010: 233)

Apart from the issue whether the CDM is able to fulfill both objectives, several studies have focused on CDM's contribution to sustainable development and almost all arrive at a similar conclusion that the CDM does not sufficiently fulfill its objective of assisting host countries in achieving sustainable development. Olsen and Fenham (2008) concluded that the contribution

of the CDM to sustainable development is not significant, Nussbaumer (2008) states that CDM‘s capacity in assisting host countries in their effort to promote sustainable development is minimal and Boyd et al. (2009) concluded that the CDM in its current form has negligible sustainable development benefits.

Boyd et al. (2009) reviewed „[...] a random sample of 10 cases that capture specifically (a) a diversity of CDM project types that include biomass, waste heat recovery, hydroelectricity, fuel switch, land fill, construction and biogas and (b) regions“. (Boyd et al. 2009: 823) The case studies taken were from India, Brazil, South Africa and China. The evaluation was made subjectively „[...] according to qualitative measures of direct and indirect benefits based on sustainable development criteria such as employment, health and environmental benefits (ibid: 823). The „[...] insight into sustainable development benefits at the project level was conducted by reviewing relevant PDDs for evidence of sustainable development benefits“. (ibid). Boyd et al concluded: „All of the cases appear to make significant emission reductions while falling short in delivering direct local benefits“. (ibid: 824)

Almost all CDM projects claim in their PDD multiple sustainable development benefits, but the mix of benefits claimed and the extent of benefits varies considerably by project type. The contribution to sustainable development by project type has been subject of various research and many argue that it depends on the nature of the project, especially the type of technology. There is a general understanding on projects which have little or no impact on sustainable development.

Olsen and Fenhann (2006) made a ranking of project types based on the proxy measure of the maximum possible sustainable development contribution of project types.
They concluded that HFC generates 1,8 benefits and N2O average of one benefit per project projects, both having the least sustainable development benefits. However, such projects have other benefits, including a tax raised (in China 65 per cent for HFC and 30 per cent on N2O) for sustainable development purposes which may, to some extent, compensate for the low number of sustainable development benefits from the CDM project itself. A study made by Watson and Farnkhauser (2009) underlines this result and concluded that end of pipe projects such as HFC, PFC, and N2O reduction were found to contribute less to sustainable

development benefits than renewable energy or forestry projects which have a greater capacity (Watson and Frankhauser 2009: 17).

Renewable energy projects often considered with the highest contribution are replaced by cements projects at the top of the ranking. „CH4 reduction projects including agriculture, landfill gas, coal bed/mine, fugitive and cement projects have the highest average number of SD benefits with 3,4 benefits per project“ (Olsen and Fenhann 2006: 11) and have a high environmental profile such as cement projects, contributing with 82 per cent of all the projects to better air quality and conservation. CH4 projects are „[...] closely followed by renewable energy projects including biomass, hydro, wind, biogas, biothermal, solar and tidal projects with an average of 3,2 benefits per projects“. (ibid) In particular, “[...] hydro and wind projects contribute with many SD benefits that are mainly socio-economic such as employment, welfare, growth and access to energy“. (ibid) Energy efficiency projects generally have few sustainable development benefits with 2 benefits per project (ibid).

While some project types have limited sustainable development benefits (by numbers), they have outstanding contributions to a single benefit. For example, „[...] energy efficiency projects in the industry sector have also few SD benefits but a high contribution to improved air quality from 60 % of all projects“. (Olsen and Fenhann 2006: 12) The same with biomass projects contributing relatively few sustainable development benefits but having a high number of ‚other benefits‘ from 26 per cent of all projects (Olsen and Fenhann 2006: 12).

Analysis of sustainable development benefits of small scale versus large scale CDM projects shows that „[...] small scale projects in average deliver a slightly higher number of SD benefits (3,2) with a higher socio-economic profile than large scale projects (2,9)“ (ibid: 13), whereas the latter tend to deliver more air, water, health and other benefits (ibid: 13).

Watson and Frankhauser (2009) also concluded that „[c]ontrary to common belief, small-scale projects do not appear to provide higher co-benefits than large-scale projects“ and both large and small-scale projects have similar co-benefits (Watson and Frankhauser 2009: 18).

A recent study also analyzed the sustainable development claims made in PDDs by project type (Kirkman et al. 2012) and found that most project types claim almost all sustainable development indicators (economic, environmental and social) but similar sustainable development contributions are claimed by similar projects. In other words, the mix of benefits

claimed and the extent of benefits varies considerably by project type (Kirkman et al. 2012: 18).

In most project types, the economic and environmental dimensions are dominant except for PFC and SF6, N2O, energy efficiency service, and landfill gas project where the social dimension is dominant due to statements about benefits for health and safety and for N2O projects engagement of local population. In contrast, cement, CO2 usage and tidal projects, have no social claims at all (Kirkman et al 2012: 18).

Project types with a dominance of claims in economic dimension are: HFCs, CO2 usage, N2O, cement, PFCs, SF6, afforestation/reforestation, wind, landfill gas. The most economic sustainable development contributions (> 90 per cent) are reported from HFC (HFC-23 destruction) projects, with the highest level of ‚stimulation of the local economy, including job creation and poverty alleviation' (> 55 per cent), the indicator claimed more often than any other indicator for all project types except energy efficiency industry, fossil fuel switch, methane avoidance and N2O (Kirkman et al. 2012: 18).

Project types with a dominance of claims in the environmental dimension are: Biomass energy, coal bed/ mine methane, energy efficiency households, industry, service, supply side and own generation, energy distribution, fossil fuel switch, fugitive, geothermal, hydro, solar, and transport (ibid).

In the social dimension, improvement of health and safety seems to be reported more often for coal bed/mine methane, energy efficiency own generation and landfill gas projects, owing in part to safer working conditions due to lower risk of explosions from methane leakage. The PFCs and SF6 project type claims improvement of health and safety more often, but there are only a few projects of this type (ibid).

The question whether the CDM contributes to technology transfer has led to extensive research from the very beginning of the CDM. An in depth discussion of technology transfer in the context of climate change mitigation has been published by the Intergovernmental Panel of Climate Change (IPCC) in the year 2000.

Technology transfer studies are mostly limited to the analysis/evaluation of project documents, mainly PDDs, without checking whether the statements in the documents are true. Key findings from the literature on technology transfer are not strictly comparable. Different definitions of technology transfer have been used in these studies; the format of the PDD and

reporting requirements for technology transfer have changed over time as earlier there was no requirement of project proponents to provide the technology description (TERI 2012: 71).

Dechezleprêtre et al. (2007) made an assessment of 644 CDM projects registered up to May 1st, 2007 and statistics describing technology transfers through the CDM show the following picture: Concerning the nature of technology transfer involved in the CDM projects, „[...] 279 projects out of 644 involve technology transfer, representing 43 % of projects and 84 % of the expected annual CO2 emissions reductions. Projects with transfer are thus larger-scale on average than those without“. (Dechezleprêtre et al. 2007: 7) Transfers of technology limited to the import of equipment are much less frequent (9 per cent) than the transfer of knowledge alone (15 per cent). The „[...] transfer of both equipment and knowledge is observed in 19 % of the projects [...]“ which „[...] illustrates the key role of technical skills in the diffusion of carbon mitigation technologies“. (Dechezleprêtre et al. 2007: 8)

In respect to transfer by type of technology „[...] the number of projects and the likelihood of transfer vary greatly across types of technology. All projects aiming at the destruction of HFC-23 entail a transfer [...]“ and „[...] projects avoiding the emission of nitrous oxide (N2O) in the chemicals industry and recovering methane (CH4) in landfills and farms also exhibit a very high transfer rate“. (ibid: 9). Conversely, technology transfers are limited in power generation using hydro power or biomass due to use of very common local technology (Dechezleprêtre et al. 2007: 9).

Among factors which „[...] drive the technology transfer positively is the size of the project which is in line with the expectation that larger projects are better able to exploit economies of scale in technology transfer“. (Dechezleprêtre et al. 2007: 17) Another factor is the origin of project developer. The likelihood of technology transfer is higher for projects operated by subsidiaries of companies from industrialized countries confirming the conjecture that pre-existing capital links strongly promote the import of a new technology, while for unilateral projects it is lower. Finally, the probability of technology transfer (equipment) decreases with the number of projects using the same type of technology in the country (ibid: 17).

In an accompanying paper, Dechezleprêtre et al. (2009) tried to explain inter-country differences by using the same data and econometric model and he concluded that projects in Mexico, China and Brazil involved significantly more technology transfer than projects in India. While in Mexico and Brazil foreign companies are strongly involved, in India and

China investment opportunities generated by fast growing economies seem to be more relevant in facilitating international technology transfers through the CDM. The lower rate of international transfer (12 per cent) in India may be due to a better capability to diffuse domestic technologies (Dechezleprêtre et al. 2009: 1).

The findings of Dechezleprêtre et al. are confirmed by a recent UNFCCC study (Kirkman et al. 2012) based on claims made in the PDDs of 3,949 CDM projects registered and undergoing registration up to June 2012. The study shows that 67 per cent of projects claim a transfer of technology, which on average is more common for larger projects with the exception of afforestation/reforestation, energy distribution, solar and hydro projects. The rate of technology transfer is the lowest for hydro and cement projects, being mature technologies widely available in developing countries (Kirkman et al. 2012: 29).

The core finding of another study (Das 2011) undertaking „[...] an empirical exploration of the extent to which the CDM is contributing to technology transfer and the nature of that technology transfer [...]“ (Das 2011: 2) is that the contribution of the CDM to technology transfer can, at best, be regarded as minimal (ibid: 2). The study based on information on the first 1000 registered projects downloaded in a chronological manner from the UNFCCC web portal as of March 2008 „[...] presents an operational definition of technology transfer in the context of the CDM and applies this definition to a data set of the first 1000 registered CDM projects“. (ibid: 2) Using PDDs as main source, only 265 involve technology transfer of different types. Among these, in 259 projects technological learning and capability building are restricted only to the level of operation and maintenance of an imported technology (Type III TT), whereas in only 6 projects the „[...] host country entity is either found to develop a technology in collaboration with some foreign entity or the host country entity is involved in in-house technological efforts towards adapting or improving upon an imported technology (Type I or II,).“ (DAS 2011: 28). Kirkman et al. made a comparison of technology transfer in projects across different countries and found that CDM host country characteristics, such as population, GDP per capita, foreign direct investment, renewable share of electricity generation and knowledge stock, significantly impact the rate of technology transfer via the CDM (Kirkman et al. 2012).

Under the current CDM procedure, a monetary value is only given for GHG emission reductions, and not for the contribution of CDM projects to sustainable development. As

mentioned earlier, the Gold Standard (GS), could help in giving a value to the objective of the CDM to assist in achieving sustainable development.

A limited number of studies is focused on the ongoing debate on international guidelines for assessing sustainability of CDM projects. Sterk et al. (2009) elaborated the suitability of the GS for CDM as a whole in order to enhance its sustainable development component, whereas others Nussbaumer (2009) made a comparison of GS labeled projects with non-labeled projects of a similar type with respect to impacts on socio-economic development and environment conservation.

Sterk et al. (2009), analyzed the actual implementation of the GS in 5 CDM projects which covers not only ex ante project design but also an assessment of the actual impact of the GS during project implementation to determine both the GS' practicability and the implementation of its sustainability requirements in GS projects (Sterk et al. 2009: 34f). In a second step, 10 conventional CDM projects were analyzed with respect to their additionality and their contribution to sustainable development to find further best practice examples outside of labeling schemes and to determine to what extent the GS criteria can also be applied to project types that are not covered by the GS. (Sterk et al. 2009: 39).

Nussbaumer **(**2009) used multi-criteria analysis and information from PDDs to compare, inter alia, the sustainable development contribution of GS (labelled projects) and regular CDM (non-labelled) projects of a similar type. He applied 12 sustainable development criteria consisting of four each for the social, economic and environmental dimensions to 39 registered CDM projects (as of April 2008) in 10 categories located in 12 countries. He found the sustainable development profiles of GS to be comparable with similar regular projects but with different performances in respect to the criteria set. GS projects performed better with respect to the social criteria, whereas regular CDM projects better on economic criteria. He concluded that in terms of sustainable development benefits, „[...] labelled projects do not drastically outperform non-labeled ones". (Nussbaumer 2009: 99)

3.3 Resume

The dual aim of the CDM can be seen both as a source of synergy which was originally intended by the Kyoto Protocol and as a source of conflict of interests. It reflects the

compromise and also the implicit assumption that synergy and win-win opportunities will constitute the basis for success of the CDM.

The CDM raised expectations in developing countries for delivering sustainable development benefits including technology transfer and contribution to poverty alleviation but, when it comes to practical and concrete assessment of CDM‘s impact on sustainable development, „[...] there is no single, (authoritative) and universally accepted approach or methodology applicable to any CDM project regardless of project type or location“. (Huang and Barker 2009: 4)

The initial assumption of the synergy and win-win relationship between the dual aims of CDM does not hold. While the CDM has reduced compliance costs for installations in Annex I countries so far there has been widespread criticism of the CDM contribution to sustainable development from the very beginning.

Some have argued that there is a trade off between the two objectives of the mechanism in favor of producing low-cost emission reductions at the expense of achieving sustainable development (Sutter 2003, Sutter and Parreño, 2007; Olsen and Fenhann 2008 and Alexeew et al, 2010). The key factor of CDM‘s inability to achieve the sustainability objective is the existence of the trade off between the carbon benefits which are valued in the carbon market and non carbon benefits such as sustainable development which are not monetized in the carbon market (Olsen and Fenhann, J. 2006 and 2008). To address this issue, an international standard of measuring and monitoring of CDM‘s contribution to sustainable development was proposed by several researchers in addition to the national definition (Sutter and Pareno 2005, Cosbey 2006, Olsen and Fenhann 2008).

Others argue that the contribution to sustainable development depends very much on the project type, whereas renewable energy projects have a higher contribution to sustainable development than HFC projects. Analysis based on project type revealed that the HFC and NO2 projects yield the fewest sustainable development benefits but they have a significant market share in the CDM pipeline for CERs issued with a relatively small number of projects. Buyers prefer HFC and NO2 projects because of their low cost emission reduction perspective which underlines CDM‘s capacity to produce the lowest cost emission reduction by leaving the sustainability claim subordinated. There is a general consensus that end-of-pipe adjustments have meagre sustainable development benefits (Schneider 2007) while greater

capacity to contribute to sustainable development is found in renewables, CH4 reduction and cement and energy efficiency supply sectors.

Contributions to sustainable development as stated in the PDD are expectations at the time the project is being validated and may be different to the actual contributions. The absence of any monitoring and verification requirements for CDM projects whether the potential benefits are actually achieved may bear the risk to rely on very optimistic articulated sustainable development benefits when analyzing on the basis of PDDs only.

Studies analyzing the most prominent benefits claimed in the PDDs reveal an uniform picture. Stimulation of the local economy through employment generation followed by environmental benefits such as reduction of pollution and promotion of renewable energy and access are the most claimed benefits. While the economic indicators have remained relatively constant over time, the other claims saw some fluctuation over time, whereas reduction of pollution has increased from 15 per cent in 2005 to 24 per cent in 2012 and social claims have fallen from 11 per cent to 6 per cent over the same time span.

Other studies focusing on CDM‘s ‚potential‘ to contribute to sustainable development based on PDD analysis found it ‚not significantly‘ by Olsen and Fenham (2008), ‚minimal‘ by Nussbaumer (2008) and Boyd (2009) concluded that the CDM in its current form has negligible sustainable development benefits.

Due to the lack of requirements for monitoring, reporting and verifying sustainable development impacts throughout the lifetime of a CDM project and the insufficiency of objective and ‚real‘ data from CDM projects, an assessment of the actual sustainable development impacts with a degree of certainty is not possible and does not allow a definite conclusion on the sustainable development impacts of the CDM.

With respect to technology transfer, findings based on claims made in the PDDs (Dechezleprêtre et al. 2009; Kirkman et al. 2012) show that 67 per cent of projects claim a transfer of technology which on average is more common for larger projects with the exception of afforestation/reforestation, energy distribution, solar and hydro projects. The rate of technology transfer is the lowest for hydro and cement projects, being mature technologies widely available in developing countries (Kirkman et al. 2012: 29).

The core finding of another study (Das 2011) is that the contribution of the CDM to technology transfer can, at best, be regarded as minimal (Das 2011: 2).
There is no doubt that the CDM facilitates technology transfer to host countries, however, the frequency of technology transfer of a given type in a host country declines over time as local expertise related to the relevant technologies grows implying CDM project activities help develop this expertise. The frequency of technology transfer differs significantly by project type and by host country.

Analyzing the CDM‘s current portfolio, one can see, on the one hand, a considerable amount of CERs generated by HFC and N2O projects which foster only meagre sustainable development benefits in the host country and, on the other hand, a strong geographical inequality in the distribution of CDM projects in favor of the emerging economies such as China, India and Brazil. Africa as a continent and, in particular, the least developed countries stay far behind, implying that the countries most in need of sustainable development have so far hardly benefitted from CDM.

4. Performance of CDM in Africa

By numbers, the CDM has been very successful in its first commitment period, however, the regional distribution of CDM projects has been highly unbalanced in the past. From the total of 9,051 projects in the CDM pipeline as of Dec. 2012, 79 per cent are located in emerging markets such as China, India, Brazil and Mexico. In terms of regional distribution of the current project pipeline as of 1st December 2012, the Asia & Pacific region has by far the largest share (81,2 per cent) of CDM projects in the pipeline followed by Latin America with 13,6 per cent. Asia & Pacific and Latin America host around 95 per cent of CDM projects in the pipeline. Only 3 per cent of all projects in the pipeline are hosted by countries on the African continent.

Unsurprisingly, Africa‘s Least Developed Countries (LDCs) remain even more neglected than the continent as a whole, implying that the countries most in need of sustainable development have so far hardly benefitted from CDM which has led to concern about the regional distribution of CDM projects and to barriers of CDM development in less developed countries. Barriers can be related either specifically to the CDM process or not related exclusively to the CDM such as the political and economic stability of a particular country, access to financial funds as well as a country’s regulatory framework.

African LDCs have significantly lower potentials for climate mitigation than emerging economies such as China, India and Brazil but recent research (Arens et al. 2011) has revealed considerable CDM potential in 11 selected African LDCs, accompanied by another study (Burian et al. 2011) analyzing barriers and obstacles for CDM projects in African LDCs.

The purpose of this chapter is to undertake a review and analysis of the current status of CDM in Africa, whereas CDM related and non related barriers will be discussed with a particular focus on sub-Saharan Africa and its LDCs.

This chapter begins with a general view on the actual CDM performance in Africa vis a vis other regions, discusses the issue of CDM‘s regional imbalances and presents a range of initiatives and activities which has been established so far at the international level to tackle this issue. This will be followed by an overview of the project pipeline (2005-2012) in respect to African countries and, in particular, the African LDCs displaying the performance of CDM

projects and PoAs by number and regional distribution within Africa and is based on available data/statistics provided by UNEP RISOE and UNFCCC.

With respect to CDM related and non related barriers for project development, general assumptions on process related barriers, technical barriers, structural and institutional barriers made in the relevant literature will be analyzed on African countries. Finally, assumption/ findings made on African countries will be discussed on its present CDM project pipeline.

4.1 Issue of regional equitable distribution of CDM projects

As can be seen from the figure below, the regional distribution of CDM projects is highly unbalanced. In terms of regional distribution of the CDM project pipeline as of 1st December 2012, the Asia & Pacific region has by far the largest share (81 per cent) of CDM projects in the pipeline, followed by Latin America with 13,6 per cent. Asia & Pacific and Latin America host around 95 per cent of the CDM projects and only 3 per cent of CDM projects in the pipeline or 2 per cent of all CDM projects registered are located in Africa.

Table 5: CDM pipeline*) by host region as of December 2012

Region	CDM	% of total
Asia & Pacific	7346	81,2
Latin America	1232	13,6
Africa	268	3,0
Europe & Central Asia	101	1,1
Middle East	104	1,1
Total	**9051**	**100,0**

*) including registered and projects that are at least at the validation stage
Source: UNEP Risoe: CDM/JI Pipeline Analysis and Database: CDM projects by host region)

The African continent consists of 54 states of which 34 are rated as Least Developed Countries (LDCs), representing 70 per cent of total (49) LDCs worldwide (UN-OHRLLS s.a.). LDCs are countries suffering from severe structural handicaps to growth and the

identification of LDCs is currently based on three criteria: gross national income (GNI) per capita, human assets and economic vulnerability to external shocks (ibid).

CO2 emissions of African LDCs amount to 8,4 per cent or 91,9 Co2 Mt in 2011 of total African emissions (ECJRC and EDGAR s.a.) which do not substantially contribute to climate change, but they are negatively effected by it due to environmental degradation and the depletion of the productive capacities. Their economies rely heavily on climate-sensitive sectors such as agriculture, fisheries, forestry, and other natural resources and impacts from climate change are particularly high for the poor living in environments that are exposed to droughts, floods and other extreme weather events. Climate change will also threaten coastal areas, where a large percentage of the population of African LDCs lives (22 of 34 LDCs in Africa are not land locked).
The reliance of African LDCs on local ecological resources and their limited financial, institutional and human resources leaves LDCs most vulnerable and least able to adapt to the impacts of climate change. Considering the low CDM activities in Africa and the fact that 34 of 54 states on the African continent are rated as LDCs implies that the countries most in need of sustainable development have so far not benefitted from the CDM.

The Kyoto Protocol does not refer to the regional distribution of CDM project activities but it has long been a concern of the Conference of the Parties (CoP) serving as the meeting of the Parties to the Kyoto Protocol. At CMP.2 in Nairobi 2006, the issue was raised by the Secretary General of the United Nations Kofi Annan who initiated the so called Nairobi Framework (NF) whose main objective is „[...] to improve the level of participation in the CDM and enhance the regional distribution of CDM project activities (UNFCCC 2012c: 4) and „[...] helping developing countries, especially those in sub-Saharan Africa, to improve their level of participation in the clean development mechanism (CDM)“. (ibid: 3)

Many experts have reflected on the inequitable distribution on CDM projects and various initiatives and activities, both under and outside the Kyoto Protocol, have been established with the aim of increasing the number of CDM projects in this region. At the international level, frameworks and work programs have been established, e.g. the NF (2007) and the Programs of Activities (PoA).

The PoA allows to aggregate program activities under one umbrella to better cope with African and LCDs realities of typically small per unit emissions. By simplifying methodologies and procedures, the CDM Executive Board intended to lower entry barriers and lower transaction and administrative costs per project in LCDs dominated by small and micro scaled projects. Another central piece of this work is the process of standardizing baselines (SBL). Using SBLs, baselines for CDM and PoAs will not need to be developed on a case-by-case basis which is perceived as long, difficult and costly. Moreover, PoAs should promote technologies with significant co-benefits to local communities, helping people to gain access to a range of benefits such as energy efficient cookstoves and lighting, solar energy and even clean drinking water. The PoA was introduced in 2007 and the first PoA was registered in 2009.

As outlined below, the PoA pipeline now contains 387 PoAs, of which 269 are at validation, 33 have requested registration, and 85 are registered as of Dec. 1st 2012. Like the CDM pipeline, the region Asia & Pacific is leading with 193 PoAs which is 50 per cent of PoAs in the pipeline but followed by Africa with 30 per cent compared to only 3 per cent of ‚standard' CDM projects in Africa.

Table 6: PoA pipeline*) by host region as of December 2012

Region	Validation	Reg.requ.	Registered	Total	%
Asia & Pacific	133	17	43	193	50
Latin Amerika	42	5	19	66	17
Africa	83	11	22	116	30
Europe&Central Asia	3	0	0	3	1
Middle East	8	0	1	9	2
Total	**269**	**33**	**85**	**387**	**100**
LDCs	31	2	9	42	11

*) including registered and projects that are at least at the validation stage
Source: UNEP Risoe: CDM/JI Pipeline Analysis and Database: PoA pipeline

Compared with the figures of the ‚standard' CDM pipeline, Africa ranks second in the PoA pipeline which might indicate that the intention to promote LDCs to get access to CDM activity proved to be successful but, as discussed later in more detail, this is not implicitly the

case. The share of all LDCs in the PoA pipeline is 11 per cent, whereas African LDCs account for meagre 7,8 per cent.

Table 7: CDM activity pipeline by host region as of December 2012

Region	CDM	PoA	%CDM	%PoA
Asia &Pacific	7346	193	81	50
Latin America	1232	66	14	17
Africa	268	116	3	30
Europe&Central Asia	101	3	1	1
Middle East	104	9	1	2
Total	**9051**	**387**	**100**	**100**

Source: Own elaboration on the basis of UNEP Risoe: CDM/JI Pipeline Analysis and Database: PoA pipeline

Despite various efforts, the inequitable distribution of registered CDM projects among regions has not changed over the years. In 2007, a total of 2,022 projects were in the CDM pipeline, whereas Asia & Pacific accounted for nearly 70 per cent, followed by Latin America with 27 per cent. In the following years, the Asia & Pacific region increased its share to 81 per cent while Latin America‘s share decreased to 14 per cent. Africa and the remaining regions continue to represent a low fraction of the current project pipeline (Arens et al. 2007: 4f). As of May 2007, only 41 CDM projects were hosted by African countries, representing a 2 per cent share of African projects in the pipeline compared to 3 per cent as of December 2012.

Figure 3: CDM pipeline by region 2007

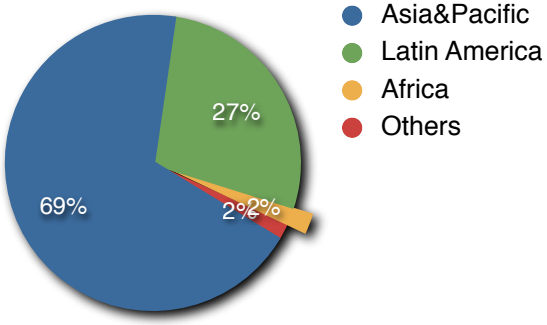
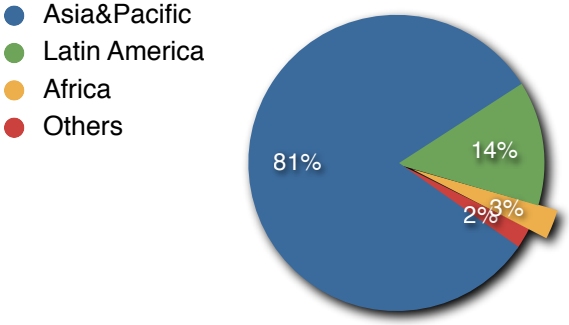


Figure 4: CDM pipeline by region 2012



Source: Own elaboration on the basis of UNEP Risoe [c] s.a.: CDM/JI Pipeline Analysis and Database: CDM projects by host region

A similar tendency can be observed with regard to registered CDM projects. From a total of 690 registered CDM projects as of May 2007, nearly 60 per cent of CDM projects are hosted in Asia & Pacific, followed by Latin America with 38 per cent. Only 3 per cent of the registered CDM projects (20 projects) are hosted in Africa, whereas half of them in South Africa.

Within the period 2007 - 2012, the Asia & Pacific region has increased its share of registered CDM projects quite substantially by hosting 85 per cent of all registered projects as of Dec. 2012. This increase is mainly due to the emerging countries such as China and India, both leading by project numbers in the regions as well as worldwide.

Figure 5: CDM registered by region 2007

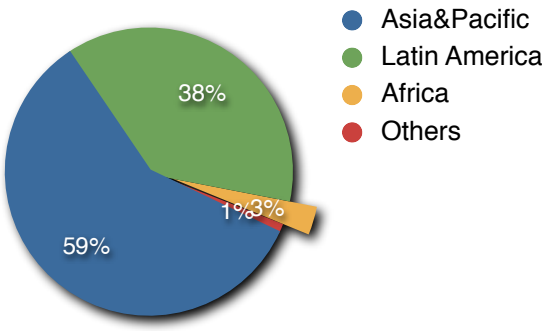
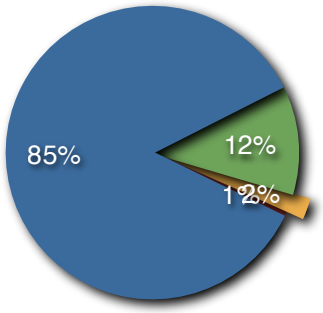


Figure 6: CDM registered by region 2012

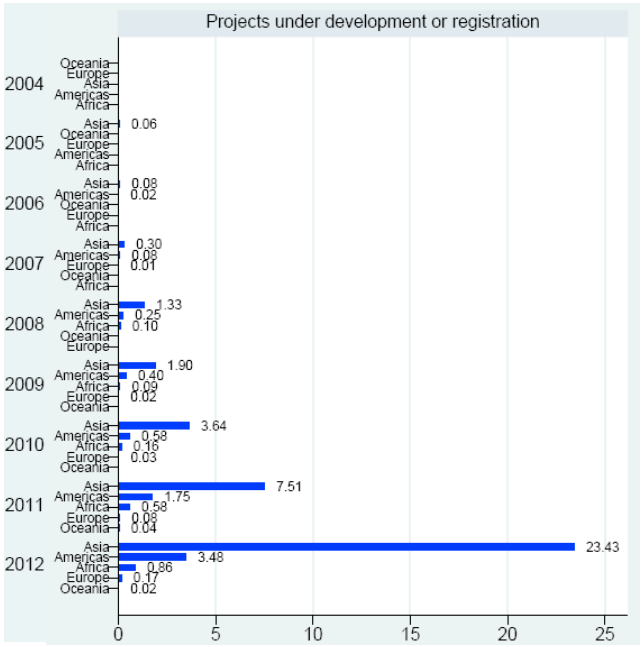


Source: Own elaboration on the basis of UNEP Risoe [c] s.a.: CDM/JI Pipeline Analysis and Database: CDM projects by host region

The substantial increase of Asia & Pacific in registered CDM projects has led Latin America to decrease its share from 38 per cent to 12 percent. In contrast to CDM projects in the pipeline, Africa saw a decrease of its share of registered CDM projects from 3 per cent in 2007 to 2 per cent in 2012.

With the approach of the end of the first commitment period of the Kyoto Protocol by Dec 2012, the numbers of requests for registration have been increasing steadily with a surge in new projects in 2012 which is most likely due to changes in the rules applicable to the European Union Emissions Trading System (EU ETS) from 2013 onwards. New rules in the EU, intended to create a competitive advantage for LDCs, exclude the use of CERs for compliance in the EU ETS from projects other than those hosted in LDCs or other countries with bilateral agreements with the EU, unless the projects were already registered in 2012 (UNFCCC 2012b: 5).

Figure 7: Projects registered by region 2004 -2012



Source: UNFCCC 2012b: 5

The UNCCCF is constantly working on efforts to increase regional distribution of CDM projects, e.g. signing partnership agreements to establish regional collaboration centers. Recently, agreements have been signed by the UNFCCC and regional development banks. One in Kampala, Uganda with East African Development Bank (EADB) which is expected to „[...] enhance capacity-building and provide hands-on support to governments, non-governmental organizations and businesses interested in developing CDM projects in more than 20 countries in the region. Among the countries that can seek support from the new office are Kenya, Uganda, Tanzania, Rwanda, Burundi, Angola, Botswana, Comoros, Egypt“ (UNFCCC 2013: 1). The other regional collaboration centre is in Lomé, Togo and the agreement has been signed with Banque Ouest Africaine de Développement (BOAD) which provides assistance in the development of CDM projects in Francophone Africa (ibid). Both agreements are designed to help Africa increase its attractiveness and potential for CDM.

Another effort is the CDM Bazaar which was launched in response to a mandate from the CDM Executive Board by the UNFCCC secretariat and the UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC). It is a web-based facility which serves as a platform for exchange of information on CDM project opportunities with the main goal to support the enhancement of regional distribution of CDM projects worldwide (CDM Bazaar s.a.).

4.2 Status quo (statistics) on CDM activities in Africa (2005-2012)

The African continent is home to 54 sovereign states (excluding dependent territories) and has a high political, economic and geographical diversity. The designation ‚sub-Saharan Africa' (SSA) is commonly used to indicate all of Africa except northern Africa (Algeria, Egypt, Libya, Morocco, Tunisia), with the Sudan included in SSA (UNSD s.a.). According to this geographical distinction, no LDC is located in northern Africa and only 15 states from total 49 states located in SSA are not rated as LDC. When analyzing Africa's 34 LDCs, the geographical focus is on SSA.

Table 8: CDM activity pipeline hosted in Africa as of February 2013:

Africa	CDM	PoA	Total
Angola	0	1	1
Burkina Faso	0	1	1
Burundi	0	2	2
Chad	0	1	1
DRC	5	1	6
Egypt	27	4	31
Ethiopia	3	2	5
Gabon	0	1	1
Ghana	0	5	5
Ivory Coast	38	1	39
Kenya	32	17	49
Madagascar	3	1	4
Malawi	0	3	3
Mali	1	0	1
Morocco	19	3	22
Mauritius	3	0	3
Mozambique	1	0	1
Nigeria	17	4	21
Rwanda	0	4	4
Senegal	5	4	9
South Africa	85	48	133
Swaziland	1	0	1
Tanzania	6	4	10
Tunisia	8	3	11
Uganda	16	4	20
Zambia	4	2	6
Total	**274**	**116**	**390**

North Africa	CDM	PoA	Total
	54	10	64

SSA	CDM	PoA	Total
Angola	0	1	1
Burkina Faso	0	1	1
Burundi	0	2	2
Chad	0	1	1
DRC	5	1	6
Ethiopia	3	2	5
Gabon	0	1	1
Ghana	0	5	5
Ivory Coast	38	1	39
Kenya	32	17	49
Madagascar	3	1	4
Malawi	0	3	3
Mali	1	0	1
Mauritius	3	0	3
Mozambique	1	0	1
Nigeria	17	4	21
Rwanda	0	4	4
Senegal	5	4	9
South Africa	85	48	133
Swaziland	1	0	1
Tanzania	6	4	10
Uganda	16	4	20
Zambia	4	2	6
Total	**220**	**106**	**326**

LDCs	CDM	PoA	Total
Angola	0	1	1
Burkina Faso	0	1	1
Burundi	0	2	2
Chad	0	1	1
DRC	5	1	6
Ethiopia	3	2	5
Madagascar	3	1	4
Malawi	0	3	3
Mali	1	0	1
Mozambique	1	0	1
Rwanda	0	4	4
Senegal	5	4	9
Tanzania	6	4	10
Uganda	16	4	20
Zambia	4	2	6
Total	**44**	**30**	**74**

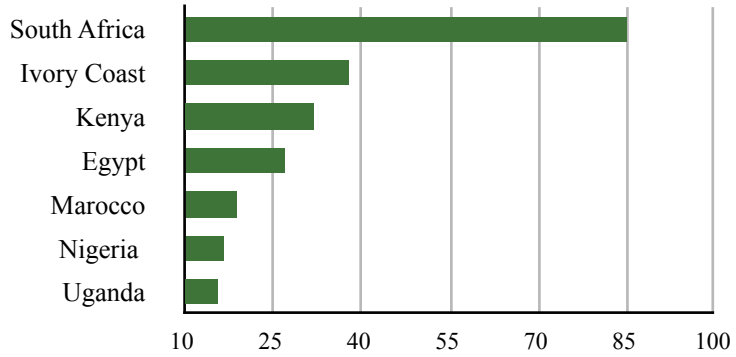
Source: Own elaboration on the basis of UNEP Risoe CDM/JI Pipeline Analysis and Database, Feb. 1st 2013

As of Feb 2013, there are 274 CDM projects in the pipeline hosted by 18 African countries. The bulk of CDM projects in the pipeline, i.e. 80 per cent, are hosted by countries located in SSA and 16 per cent of the total CDM project pipeline are hosted by LDCs.

The countries attracting the most CDM projects in SSA are South Africa, Ivory Coast and Kenya accounting for 70 per cent of CDM projects in the pipeline of that area. Within LDCs, Uganda is dominating the pipeline with 36 per cent of CDM projects in this category.

From the top countries hosting more than 10 CDM projects per country, in total 234 CDM projects or 85 per cent of all projects in Africa, only one country in this ranking is a LDC, this being Uganda.

Figure 8: Top down ranking > 10 CDM projects in the pipeline as of February 2013

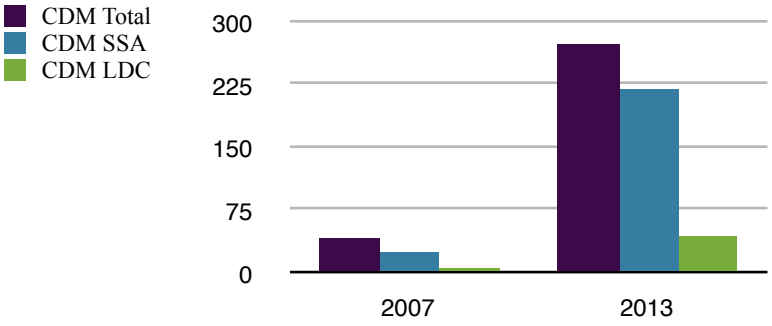


Source: Own elaboration on the basis of UNEP Risoe CDM/JI Pipeline Analysis and Database, February 1st 2013

The number of LDCs hosting CDM projects is very limited; only 9 countries of 34 LDCs in Africa are hosting in total 44 CDM projects which accounts for 16 per cent of all CDM projects in Africa.

Compared to 2007, the number of CDM projects in Africa has increased significantly from 41 CDM projects in the pipeline, hosted by 11 countries, to 274 CDM projects in Feb. 2013, hosted by 18 countries. The share of SSA in the project pipeline has increased from 27 CDM projects or 66 per cent of the total CDM pipeline in 2007 to 274 CDM projects or 80 per cent of the total African CDM pipeline in 2013, however, South Africa again has the main share.
In 2007, four LDCs, i.e. Uganda, Equatorial Guinea, Tanzania and Senegal in total hosted 5 CDM projects which accounts for 12 per cent of LDCs in the project pipeline compared to 16 per cent or 44 CDM projects in 2013. The increase of CDM projects in LDCs is relatively small as compared to the increase of the total African CDM pipeline as well as projects hosted in SSA.

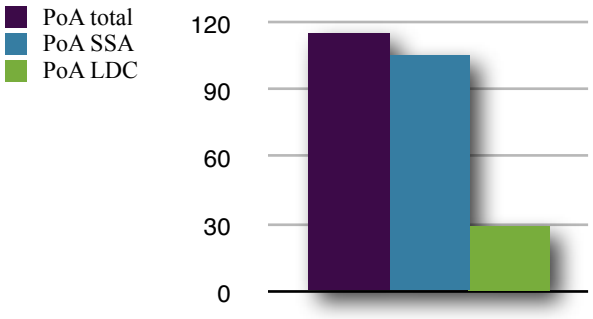
Figure 9: CDM project pipeline: breakdown by area 2007 and 2013



Source: Own elaboration on the basis of UNEP Risoe 2007 /Arens et al.2007: 8 and UNEP Risoe CDM/JI Pipeline Analysis and Database, February 1st 2013

With respect to PoAs under which many smaller projects can be registered to reduce transaction costs and to boost CDM project development for LDCs, the situation in Africa is as follows: As of Feb 2013, there are 116 PoAs in the pipeline, hosted by 22 African countries. The main share of PoAs in the pipeline, i.e. 91 per cent or 106 PoAs, are hosted by countries located in SSA and 26 per cent or 30 PoAs are hosted by LDCs.

Figure 10: PoA project pipeline by area as of February 2013



Source: Own elaboration on the basis of UNEP Risoe CDM/JI Pipeline Analysis and Database, February 1st 2013

Like standard CDM projects, the majority of PoAs is being developed in South Africa but the PoA pipeline is dominated by only two countries, i.e. South Africa and Kenya, both accounting for 56 per cent of total PoAs and the rest is balanced among 20 countries with 5 or less PoAs. As per the rules of the CDM, it is possible to include several countries into one PoA. Currently, there are 7 regional PoAs including parts or all of African countries such as the PoA ‚Improved Cook Stoves for East Africa' (ICSEA) which was registered by the CDM Executive Board in Dec. 2012 which is hosted by Uganda, Kenya, Burundi and Rwanda (Carbon Mechanism Review 2013: 22)

Considering the various efforts made since 2007 to enhance CDM projects in Africa and, particularly, in African LDCs, the numbers are far behind expectations. Even the PoAs did not result in a substantial rise in CDM activity, in particular for African LDCs. From the total of 34 LDCs in Africa, 13 LDCs are actually hosting a PoA, whereas 7 LDCs are also active in CDM development. The implementation of PoAs has enlarged the number of host countries by only 6 LDCs (Angola, Burkina Faso, Burundi, Chad, Malawi and Rwanda) and 2 non LDCs (Gabon and Ghana).

A number of research is dedicated on the CDM potential in Africa. By using a bottom up approach, Govinda et al. (2010) investigates the technical potential of reducing GHG emissions from the energy sector in SSA and finds that this region could develop 3,227 CDM projects, including 361 PoAs, which could reduce approximately 9.8 billion tons of GHG emissions. A recent study (Arens et al. 2011) has revealed considerable CDM potential in 11 selected African LDCs. It seems that the African continent and, in particular, the LCDs are facing specific barriers from the CDM as an instrument and from a set of other constraints.

4.3 Barriers (constraints) for CDM projects in Africa

An extended body of literature exists on potential barriers in general for CDM projects from the very beginning and, with the appearance of unequal distribution among regions, the focus was laid on Africa and, in particular, on SSA and its LDCs.

A number of recurring barriers have been identified and various approaches exist to categorize the different barriers for CDM projects. On a general level, barriers comprise structural and institutional issues such as investment climate and a functioning infrastructure also categorized as ‚national-level barriers'. With respect to CDM related barriers, the focus is on the CDM framework such as personnel, institutions and procedures for processing CDM project. Moreover, existing barriers on international-level such as constraints on project eligibility (e.g. on land use and forestry projects) as well as project-related issues, e.g. availability of underlying project finance, or other country related risks (national-level related barriers), may render the performance of the project uncertain.

CDM barrier analyses are, inter alia, published by international organizations such as OECD, World Bank and UNFCCC, the European Union, regional Development Banks, Ministries, Developing Agencies and NGOs.

4.3.1 CDM process related barriers

In order to assess barriers for developing CDM projects in Africa, in particular for African LDCs, the first step is to review whether a Designated National Authority (DNA) as well as modalities and procedures for approving projects are in place.

The existence of a DNA is a prerequisite for processing a CDM project. As mentioned earlier, countries wishing to participate in the CDM have to set up a DNA which is the key entity in non-Annex 1 countries to be involved with CDM. The DNA is the body granted responsibility to authorize and approve participation in CDM projects and for ensuring that the host country maintains control over the CDM project activities undertaken in its country. It is the DNA‘s responsibility to issue letters of approval to project participants in CDM projects, confirming that the project activity implemented is voluntary and contributes to sustainable development in the host country.

As of February 2013, from the total of 163 DNAs worldwide, 49 DNAs are located in Africa (30 per cent) and only 5 countries, i.e. Central African Republic, Congo, Seychelles, Somalia and the South Sudan, have no DNA so far. (UNFCCC [d] s.a.). All African countries, with only one exception due to the partition of the state (South Sudan), have ratified the Kyoto Protocol which is an increase compared to 2007 when 46 countries had ratified the Kyoto Protocol (UNFCCC [b] s.a.). In respect to DNAs, the number has increased from 33 DNAs operating in Africa in 2007 to 49 in 2013 (Arens et al. 2007:6).

Those countries in Africa not having a DNA are, with the exception of the Seychelles, countries affected by domestic unrest and civil war and three, i.e. Central African Republic, Somalia and the South Sudan are rated as LDCs.

From the total of 49 countries in Africa having a DNA, only 18 countries host one or more CDM projects in the pipeline and another 8 countries host no CDM but at least a PoA. From the total of 26 countries with a DNA (53 per cent) and hosting a CDM or PoA project, 14 are rated as LDC.

From the remaining 23 countries having a DNA but zero CDM activities so far, 17 countries (74 per cent) are rated LDC.

Table 9: DNA and CDM activities in Africa

No of countries	DNA Yes	DNA No	DNA CDM/PoA	total	DNA no CDM/PoA
Africa total 54	49	5	18 - 8	26	23
LDCs total 34	31	3	8 - 6	14	17

Source: Own elaboration on the basis of UNFCCC [d] (s.a) and UNEP Risoe CDM/JI Pipeline Analysis and Database

Despite the fact that almost all African LDCs are having a DNA in place, there are 17 LDCs left with zero CDM activities. Having a DNA in place not necessarily ends up in CDM projects, as can be seen in Africa.

Depending on human and financial capacities of the countries, the representation of DNAs vary considerably from country to country. DNAs are either being housed within an existing Ministry, or being a separate agency made up of representatives from a variety of Ministries often with a Secretariat involved, serviced by one or more formal advisory bodies, drawn from governmental and non-governmental sources (Cosby 2006: 30).

The non-existence of a DNA website might also be an explanation for the limited success of CDM activities. Arens et al. (2011) studied the potential of CDM in 11 selected LDCs in sub-Saharan Africa and „[...] they found that only 3 of the eleven countries studied have a DNA website and pointed out that absence of a DNA website can function as a barrier for investors and can be a sign that these DNAs do not actively promote the CDM within the host country“ (Arens et al. 2011: 12).

Ivory Coast has a functioning DNA web site of its National Environmental Agency (ANDE), with links to ministries, documents etc. Kenya also has a functioning web site (NEMA) giving a list of priority sectors for CDM projects in their host country. On the other hand, Uganda, hosting 16 CDM projects, has no DNA Website but a CDM promotion entity (Climate Change Unit) having a functioning web site. All three countries are among the leading CDM hosts.

The existence of a DNA Website and a separate CDM promotion entity has a pro-active role in CDM project development (Burian et al. 2011: 5). A separate independent promotion agency will be able to better focus on investor outreach than fulfilling multiple functions with potential conflicts of interest at the same time (Burian et al. 2011:19).

Table 10: DNA website and LDCs hosting a CDM project in the pipeline

country	DNA Website	CDM promotion entity	CDM in pipeline
Uganda	No	Yes	16
DRC	Yes	N/A	5
Zambia	Yes	Yes	4
Ethiopia	No	No	3
Madagascar	No	No	3
Mali	Yes	N/a	1
Mozambique	Yes	N/a	1

Source: Own elaboration on the basis of UNFCCC d (s.a) and UNEP Risoe CDM/JI Pipeline Analysis and Database

Moreover, the existence of a structured process for LoA approval, such as binding timelines for the LoA approval within a stipulated time frame, indicates that the host country is committed to a sound and efficient CDM implementation process (Burian et al. 2011: 18).

Besides the DNA as the basic formal institutional requirement for conducting a CDM activity, effective modalities and DNA procedures for approving a project must be in place as well as adequate human and financial resources. It might be possible that a country notifies a DNA to UNFCCC which in reality is not operational. An ultimate proof that the national CDM processes are operational is the existence of a registered project in that country (Burian et al. 2011: 18).

The large number of LDCs having a DNA but no CDM activity so far can be partly explained by their low awareness of CDM due to lack of information and appropriate knowledge on the CDM accompanied with no CDM specific experience and capacity for project preparation.

Many LDCs with a limited potential for attracting a CDM activity and limited financial resources balance the resource implication against the potential longer term benefits that CDM activities could provide (Cosbey 2006: 29) and it was also argued „[...] that in some of those countries the resources necessary to attract CDM investment might be more effectively directed toward other social priorities“. (Cosbey 2006: 30)

4.3.2 CDM potential related and technical implementation barriers

The abatement potential is another preliminary indicator to attract CDM projects. The CDM as a market based mechanism has proven successful in generating emission reduction projects with a total amount of 2,499 million expected CERs as of December 2012 (UNEP Risoe [a] s.a.)

One of the numerous constraints to the development of CDM in Africa is the relatively low emission level of African countries especially of LDCs. In 2011, estimates account Africa for only 3,3 per cent of the total emissions, with 33 per cent coming from South Africa, followed by Egypt with 19 per cent, Algeria 11 per cent and Nigeria 9 per cent.

With respect to CO2 emissions per capita, Africa has the lowest annual CO2 emissions per capita in the world.

Table 11: Emissions in Africa and CDM projects in pipeline

	2011 CO2 Mt	%	Tons CO2/ cap	2012 CDM
Algeria	117,4	11	3,3	0
Egypt	208,9	19	2,5	27
Lybia	60,2	6	9,3	0
Marocco	60,8	6	1,9	19
Tunisia	28,3	3	2,7	8
NA total	**475,6**			**54**
South Africa	360,0	33	7,2	85
Nigeria	96,3	9	0,6	17
Angola*	18,0	2	0,9	0
Sudan	13,1	1	0,3	0
Kenya	12,9	1	0,3	32
Ghana	9,0	1	0,4	0
Others	112,7			86
SSA total	**622,0**			**220**
Total Africa	**1098,2**		**1,1**	**274**
% total World	3,3			
LDCs	**91,9**			**44**
% total Africa	8,4			
Total World*	33376,3		4,9	

* without international transport

Source: own elaboration on the basis of: European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency. Emission Database for Global Atmospheric Research (EDGAR)(s.a.), release version 4.2.

The main reason for the low level of emission in many African countries is a lack of economic development and the fact that people do not have access to basic energy services. These low emission levels translate into low amounts of emission reduction potential (abatement potential), thus into a limited number of expected CERs which makes CDM projects not so attractive. Africa accounts for 3,3 per cent of total world emissions and 3,9 per cent of expected CERs resulting from its CDM project in the pipeline, representing a 3 per cent share of all projects in the CDM pipeline.

Table 12: CDM pipeline by host region and expected CERs as of December 2012:

Region	% of all CDM	CERs (000)	%
Asia & Pacific	81,2	1985346	79,4
Latin America	13,6	350693	14,0
Africa	3,0	96758	3,9
Europe & Central Asia	1,1	32866	1,3
Middle East	1,1	33663	1,3
Total	**100,0**	**2499326**	**100,0**

Source: UNEP Risoe [c] s.a.: CDM/JI Pipeline Analysis and Database: CDM projects by host region

Most SSA countries, with the exception of South Africa, have their traditional (rural) economies largely based on biomass and, therefore, very limited fossil fuel-related GHG emissions which translates into a disadvantage in terms of access to CDM projects that mitigate fossil fuel related emissions.

The current situation of CDM performance in Africa demonstrates the importance of abatement potential but this does not necessarily mean that a high abatement potential leads automatically to CDM activities. The majority of projects in Africa (57 per cent) is hosted in countries with higher emission levels such as South Africa, Egypt, Nigeria, Morocco and Tunisia. On the other hand, countries like Ivory Coast, Kenya and Uganda with low emission levels are hosting more than 30 per cent of the African CDM pipeline.

Table 13: Emissions of selected African countries & GNI per capita (2010)

	2000 CO2Mt	2011 C02Mt	Tons Co2/cap	GNI/cap in USD	2012 CDM	2012 PoA
South Africa	310,0	360,0	7,20	6100	85	48
Egypt	126,6	208,9	2,53	2340	27	4
Algeria	82,7	117,4	3,26	4460	0	0
Nigeria	89,8	96,3	0,59	1180	17	4
Lybia	48,5	60,2	9,32	12020	0	0
Morocco	35,3	60,8	1,88	2850	19	3
Tunisia	21,0	28,3	2,67	4070	8	3
Angola *	15,9	18,0	0,92	3960	0	1
Sudan *	5,4	13,1	0,29	1270	0	0
Kenya	9,7	12,9	0,31	780	32	17
Ivory Coast	6,8	7,0	0,35	1070	38	1
Uganda*	1,0	1,7	0,05	490	16	4

* rated LDC

Source: Own elaboration on the basis of:
European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency. Emission Database for Global Atmospheric Research (EDGAR) (s.a.), release version 4.2.; UNdata: GNI per capita (2010)

Although countries like Algeria, Libya, and the Sudan rank among the top emission countries in Africa, they have not yet hosted a CDM activity so far, indicating that other factors are limiting CDM investors appetite in those countries.

Many African LDCs are very low energy users with a limited mitigation potential. From the total Co2 emissions in Africa, LDCs contribute only 8,4 per cent (see table 11). The market-based nature of the CDM makes it difficult to increase the number of CDM projects in LDCs at market shares equivalent to other regions having a very high potential of emission reduction such as Asia and Latin America due to their emerging economies.

There is a positive correlation between countries‘ per capita income and per capita emission. The so called ‚IPAT‘ equation

$$\text{Impact (I)} = \text{Population (P)} \times \text{Affluence (A)} \times \text{Technology (T)}$$

presented by the IPCC illustrates how economic growth affects the environment, including GHG emissions (IPCC 2000 b: Chapter 3, Introduction s.p).

With respect to per capita emission, the top four emission leading countries in Africa (Libya, South Africa, Algeria and Tunisia) are classified by the World Bank as upper-middle-income economies with a GNI per capita between USD 4,036 to USD 12,475. Egypt, classified as lower-middle-income economy, is having a GNI per capita of USD 2,340.

Table 14: World Bank Income Classification

classification	USD GNI/cap	Africa	Total
low income	1.025 or less	27	36
lower middle income	1.026 - 4.035	16	54
upper middle income	4.036 - 12.475	10	54
high income	12476	1*	70

*Equatorial Guinea (GNI/cap USD 14680) but rated LDC
Source: Own elaboration on the basis of World Bank Data (s.a.)

Following the classification by the World Bank (World Bank data s.a.), 27 African countries or 50 per cent of all African countries are classified as low income economies, representing 75 per cent of all countries in this category, with a GNI per capita of less than USD 1,026.

Africa‘s LDCs are characterized by a high level of poverty and low levels of development. The majority of people in these countries do not have access to basic energy service for cooking and lighting due to the lack of electricity transmission and distribution infrastructure. In Africa more than 590 million people are living without electricity, whereas almost all are home in SSA. Africa ranks as the region with the least electrification rate (ER) of 41,8 per cent of the world, whereas the gap between North and SSA is quite large, with a range from 99 per cent in North Africa to 30,5 per cent in SSA (IEA 2011 s.a.), implying almost all LDCs have insufficient electricity transmission and distribution capacities.
Considering the ER in rural areas the situation is even worse with an ER of 14,2 per cent in SSA compared to 59,9 per cent in urban areas within that region (ibid).
As many CDM project types are intended for feeding renewable electricity into the grid, a country‘s low ER makes potential CDM projects unfeasible, regardless of the existence of favorable hydropower sites or agricultural and forest residues. Low ER can be a significant barrier for CDM projects in SSA (Burian 2011: 26)

Table 15: Regional aggregates of electricity access in 2009

	population without electricity in mio	Electrification rate (ER) %	Urban ER %	Rural ER %
Africa	**587**	**41,8**	**68,8**	**25,0**
North Africa	2	99,0	99,6	98,4
SSA	585	30,5	59,9	14,2
Developing Asia	**675**	**81,0**	**94,0**	**73,2**
China & East Asia	182	90,8	96,4	86,4
South Asia	493	68,5	89,5	59,9
Latin America	**31**	**93,2**	**98,8**	**73,6**
Middle East	**21**	**89,0**	**98,5**	**71,8**
Developing C.	**1314**	**74,7**	**90,6**	**63,2**
World	**1317**	**80,5**	**93,7**	**68,0**

* World includes OECD and Eastern Europe/Eurasia
Source: IEA, World Energy Outlook 2011 s.a.

Although there is a high demand for access to basic energy, this demand remains largely unmet, which leads to a situation commonly referred to as ‘suppressed demand’.

Suppressed demand expresses the fact that poor people tend to consume less basic services such as energy, water, goods than they would if they were less poor, or if the services to which they had access were cheaper or if there is no constraint on access or infrastructure. In case of suppressed demand, the level of energy service and associated emissions without the project are low to non-existent (Arens et al. 2012: 26).

However, the computation of CERs requires the establishment of a baseline which is the situation before the CDM project activity takes place. The determination of emissions reductions is, inter alia, the difference in emissions with and without the project which means that projects in the context of suppressed demand cannot claim any emission reduction. However, this recognition did not lead to immediate action but is now gaining recognition and acceptance. The CMP7 welcomed to adopt guidelines on suppressed demand and requested the EB to accelerate the implementation of the guidelines on suppressed demand in baselines and monitoring methodologies.

If suppressed demand is taken into account, the baseline used for a CDM project is not what people actually emit but instead reflects future increases in emissions if people were less poor or gain access to other technologies or energy sources and will improve the opportunity for low-income countries in Africa to participate in implementing CDM.

4.3.3 Barriers due to preferences or limitation of certain project types and sectors:

As discussed in the previous section, one of the critical matters about CDM and its benefit to sustainable development is that it focuses primarily on the emissions reduction potential of projects which leads CDM developers to concentrate on projects that generate large volumes of CERs to the neglect of much needed smaller scale projects in the areas of renewable energy and energy efficiency which is the case in Africa and putting the region at disadvantage. As of Dec. 2012, Africa hosted 100 small scale projects from its total pipeline of 268 CDM projects (UNEP Risoe [a] s.a).

Table 16: Africa‘s share in CDM pipeline and CERs expected by Type

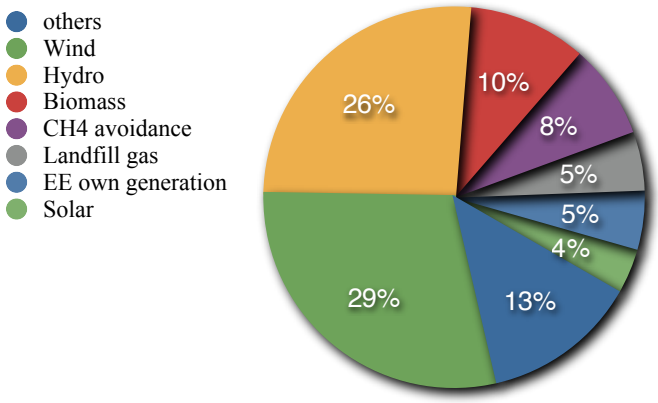
Type	Type Africa	% of Africa	% of total Type	total Type	% of total Type	CERs000	% of total CERS
Afforest&Reforest	24	8,8	33,3	72	0,8	21879	0,9
Agriculture	0	0,0	0,0	2	0,0	25	0,0
Biomass Energy	30	11,0	3,4	884	10,0	139642	6,0
Cement	3	1,2	7,5	40	0,4	24339	1,0
Co2 capture	0	0,0	0,0	3	0,0	155	0,0
Coal bed/mine methan	0	0,0	0,0	115	1,4	93559	4,0
Energy distribution	0	0,0	0,0	28	0,4	8409	0,0
Energy households	7	2,6	6,3	112	1,3	4255	0,2
Energy industry	16	5,8	10,0	160	1,8	12658	1,0
EE own generation	17	6,2	3,7	463	5,0	162564	7,0
EE service	1	0,4	2,4	41	0,2	815	0,0
EE supply side	4	1,5	3,1	128	1,4	38415	2,0
Fossil fuel switch	14	5,2	9,4	149	1,7	144334	6,0
Fugitive	8	2,9	12,3	65	0,7	75030	3,0
Geothermal	5	1,8	14,3	35	0,4	12956	1,0
HFCs	0	0,0	0,0	23	0,3	473654	20,0
Hydro	17	6,2	0,7	2317	26,0	376380	16,0
Landfill gas	36	13,1	8,3	432	5,0	182365	8,0
Methan avoidance	12	4,4	1,6	764	8,0	85662	4,0
Mixed renewable	0	0,0	0,0	10	0,2	116	0,0
N2O	15	5,5	13,8	109	1,3	250058	10,0
PFC and SF6	2	0,7	11,8	17	0,4	11455	0,5
Solar	20	7,3	5,1	390	4,3	4613	0,2
Tidal	0	0,0	0,0	1	0,0	474	0,0
Transport	1	0,4	2,5	40	0,0	6275	0,3
Wind	42	15,0	1,6	2616	29,0	289264	12,0
Total	**274**			**9016**		**2419351**	

Source: Own elaboration on the basis of UNEP Risoe: CDM/JI Pipeline Analysis and Database: CDM project distribution within host countries by region and type; CDM projects grouped in types . Africa Feb 2013; total World Dec 2012

The World total CDM pipeline is dominated by project types such as Wind (29 per cent), Hydro (26 per cent), Biomass energy (10 per cent) and Methane avoidance (8 per cent) which account for 73 per cent of the total CDM pipeline.

EE own generation, Landfill gas and Solar account for less, between 4 and 5 per cent, and all the remaining types have minor shares of the pipeline.

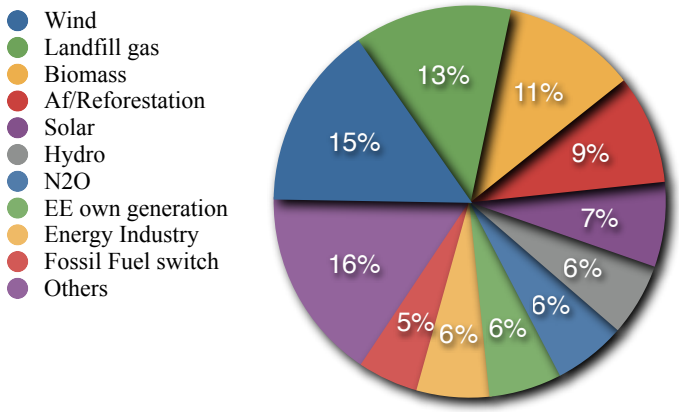
Figure 11: World total CDM pipeline by project types as of December 2012



Source: Own elaboration on the basis of UNEP Risoe: CDM/JI Pipeline Analysis and Database

The African CDM pipeline by project type looks different. With regard to project type, the African CDM pipeline is dominated by Wind (15 per cent), Landfill gas (13 per cent). Biomass Energy (11 per cent), Afforestation/Reforestation (9 per cent) and Solar (7 per cent).

Figure 12: African CDM pipeline by project type as of February 2013



Source: Own elaboration on the basis of UNEP Risoe: CDM/JI Pipeline Analysis and Database

However, considering Africa‘s share of the total CDM pipeline by project type, the picture is a completely different one. Afforestation/Reforestation projects in Africa account for 33,3 per cent of total CDM pipeline in this project type, followed by Geothermal (14,3 per cent), N2O (13,8 per cent) and Fugitive (12,3 per cent). The significant share in the forestry sector reflects Africa‘s potential in the Land Use, Land Use Change and Forestry (LULUCF) sector. Due to high exploration and development costs, Geothermal and N2O projects are typically developed by highly specialized international companies which have excellent access to international financing sources. As such, these projects are not subject to the financing constraints that prevail in Africa which will be discussed later on. Fugitive emission reduction projects are mainly in the oil and gas sector in which companies also have good access to finance (Arens et al. 2011: 10).
Other important types of projects dominating the African CDM pipeline such as Wind and Biomass Energy have a limited share in the total CDM pipeline in this project type. Wind accounts for only 1,6 per cent of worldwide Wind projects and Biomass Energy for only 3,4 per cent. Both sectors may be constrained to be realized in Africa by limited access of finance and low electrification rates (Arens et al. 2011: 10).

Considering Certified Emissions Reductions (CERs) broken down by project type, the most expected CERs are for HFCs, representing 20 per cent of total expected CERs, followed by Hydro (16 per cent), Wind (12 per cent) and N2O (10 per cent), representing almost two thirds of all expected CERs.
Due to the high global warming potential of hydrofluorocarbons (HFCs) and nitrous oxide (N2O), a mere 23 HFC and 109 N2O CDM projects account for 30 per cent of the expected CERs, compared to 2,616 Wind and 2,317 Hydro CDM projects, accounting for 28 per cent of the expected CERs.

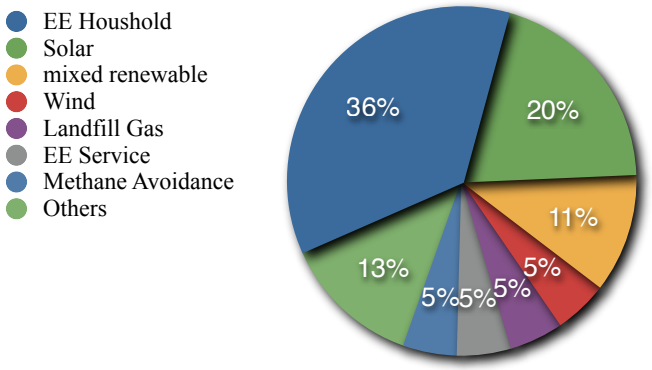
Africa has zero project of 23 HFCs projects world wide which is mainly due to the fact that the relevant industries are not located in Africa (Arens et al. 2011: 10). Hydro projects account for 6,2 per cent, Wind for 15 per cent and N2O for 5,5 per cent of the African project pipeline which might explain that expected CERs of African CDM projects (3,9 per cent) exceed their share in the total CDM pipeline (3 per cent).

Most SSA countries, with the exception of South Africa, have very limited fossil fuel-related GHG emissions, while their traditional (rural) economies are largely based on biomass which is a barrier in terms of access to a significant pipeline of CDM projects that mitigate fossil fuel related emissions. In many countries, potential for CDM projects are premised on GHG emission reductions from biomass usage, including waste management, energy efficiency measures at the level of households or small production facilities, and land use and forestry projects.

One of the several barriers that may inhibit the growth of CDM in Africa is the limitation on types of projects currently eligible for CDM. As most African economies are highly dependent on agriculture, the land use sector has the greatest potential for carbon finance. However, the eligibility of land-use, land-use change and forestry project activities (LULUCF) is currently limited to narrowly defined afforestation/reforestation activities (16/CMP.1, Annex, paragraph 13). Project activities involving switching from non-renewable to renewable biomass are currently not eligible for CDM approval (1/CMP.2, para 29 and 30). However, the COP/MOP requested that the EB make a recommendation at COP/MOP 3 simplified „[...] methodologies for calculating emission reductions for small-scale project activities that propose the switch from non renewable to renewable biomass". (CDM Rulebook [d] s.a.: 413)

With respect to the PoA pipeline by project type, the African pipeline is dominated by ‚Energy Efficiency Households' (36 per cent), i.e. lighting, stoves etc., followed by Solar (20 per cent) and mixed renewable (11 per cent), together accounting for 67 per cent of all PoAs hosted in Africa.

Figure 13: African PoA pipeline by project type as of February 2013



Source: Own elaboration on the basis of UNEP Risoe: CDM/JI Pipeline Analysis and Database

The total PoA pipeline is dominated by ‚Energy Households' (21 per cent), followed by ‚Solar' (19 per cent) and ‚Methane avoidance' (17 per cent).

Africa has a share of 51 per cent in Energy Households and 32 per cent in Solar of the total PoA pipeline by type. With the implementation of PoA, Africa could increase its activities in ‚Energy Households' with 42 projects in the PoA pipeline in comparison to CDM with 7 projects, demonstrating PoAs potential to abate barriers to rural development efforts. Africa's high share of ‚EE supply side' and ‚Afforestation & Reforestation' of the total PoA pipeline by type has a limited validity due to the very small amount of projects involved in these project types.

Table 17: Africa's share in PoA pipeline by Type as of February 2013

PoA	Africa	Total	Africa % of total
Afforest&Reforest	1	2	50
Agriculture	0	3	0
Biomass Energy	4	16	25
Cement	0	0	0
Co2 capture	0	0	0
Coal bed/mine methan	1	5	20
Energy distribution	1	4	25
Energy housholds	42	83	51
Energy industry	3	11	27
EE own generation	0	1	0
EE service	5	23	22
EE supply side	2	3	67
Fossil fuel switch	1	*5*	20
Fugitive	0	3	0
Geothermal	0	1	0
HFCs	0	0	0
Hydro	3	38	8
Landfill gas	5	18	28
Methan avoidance	5	67	7
Mixed renewable	13	*n.a**	*n.a*
N2O	0	0	0
PFC and SF6	0	0	0
Solar	23	72	32
Tidal	0	0	0
Transport	1	*6*	17
Wind	6	26	23
Total	116	387	30

Source: Own elaboration on the basis of UNEP Risoe CDM/JI Pipeline Analysis and Database, PoA pipeline overview, February 1st 2013.
n.a *: mixed renewables (Hybrids) i.e. Solar&Wind, Solar&Wind&Hydro, Solar&wind&others are not explicitly counted in the PoAs total pipeline

4.3.4 Non CDM related barriers (structural and institutional issues)

The inequitable distribution of CDM project activities among regions reflects the uneven state of economic development and the different attractiveness for investment (investment climate) of many developing countries.

The success of CDM project development is not only bound to the CDM potentials (abatement and technical); it also depends on a host country‘s overall framework for the development and finance of CDM projects. Besides the overall investment climate, political and economic stability of a particular country, its regulatory framework and the availability of funds are essential to attract CDM developers.

Many African countries are not in a position to comply with these requirements, particularly LDCs often face barriers such as a weak institutional framework and are additionally burdened with high level of corruption, resulting in difficult financing conditions for CDM projects. As it is with any Foreign Direct Investment (FDI), an enabling framework for CDM investments requires, first and foremost, political and macroeconomic stability, accompanied by a sound regulatory framework and efficient supporting institutions enforcing the relevant laws and regulations.

A ‚country rating‘ gives potential investors insight into the level of risk associated with investing in a particular country and to determine a representative country rating, credit rating agencies such as Moody‘s, S&P and Fitch evaluate the country's economic and political environment. Obtaining a good sovereign credit rating is usually essential for developing countries to attract foreign direct investment (FDI).

S&P defines five key factors that form the foundation of a sovereign credit analysis which include „[...] institutional effectiveness and political risks, economic structure and growth prospects, external liquidity and international investment position, fiscal performance and flexibility, as well as debt burden and monetary flexibility“. (S&P Feb 2012: 4) A country rated 'AAA' has the highest rating assigned by Standard & Poor's and an extremely strong capacity to meet its financial commitment, whereas „[...] BB, B, CCC, CC are regarded as having significant speculative characteristics. 'BB' indicates the least degree of speculation and 'C' the highest“. (S&P Feb 2012: 4). Due to the fact that CDM projects are long term investments, the following table outlines long term ratings from at least one of the three main rating agencies assigned to African countries.

Table 18: Credit ratings (long term) of African countries and CDM activities

	Moody's	S & P	Fitch	CDM	PoA
North Africa					
Egypt	B3-	B-	B	27	4
Morocco	Ba1	BBB-	BBB-	19	3
Tunisia	Ba1-	BB-	BB+	8	3
Sub-Sahara					
Angola *	Ba3	BB-	BB-	0	1
Benin *	NR	B	B	0	0
Botswana	A2	A	NR	0	0
Burkina Faso *	NR	B	NR	0	1
Cameron	NR	B	B	0	0
Cap Verde	NR	B+	B+	0	0
Gabon	NR	BB-	BB-	0	1
Ghana	B1	B	B+	0	5
Kenya	B1	B+	B+	32	17
Lesotho *	NR	NR	BB-	0	0
Mauritius	Baa1	NR	NR	3	0
Mozambique *	NR	B+	B	1	0
Namibia	Baa3	NR	BBB-	0	0
Nigeria	NR	BB-	BB-	17	4
Rwanda *	NR	B	B	0	4
Senegal *	B1	B+	NR	5	4
South Africa	Baa1	BBB	BBB-	85	48
Seychelles	NR	B	B	0	0
Uganda *	NR	B+	B	16	4
Zambia *	B1	B+	B+	4	2
Total				**217**	**101**

Source: Own elaboration on the basis of: Standard&Poors, Moody's and Fitch Ratings (Feb 2013)

As of February 2013, less than half of African countries (including 9 LDCs) have a long term rating assigned from at least one of the main rating agencies. Those rated countries (23) are hosting 318 CDM activities (217 CDM projects and 101 PoAs) of the project pipeline, which account for 80 per cent of CDM and 86 per cent of PoA of the African pipeline. South Africa, rated Baa1 by Moody's and BBB by S&P and Fitch, hosts the bulk of CDM activities of rated countries followed by Kenya (B1 and B+).

Table 19: Rating and CDM activities

Countries	with Rating	with Rating and CDM	CDM	PoA	Total
Africa total 54	23	16	217	101	318
LDCs total 34	9	7	26	16	42

Source: Own elaboration on the basis of S&P, Moody's and Fitch and UNEP Risoe CDM/JI Pipeline Analysis and Database and PoA pipeline overview, Feb. 1st 2013.

From total 34 African LDCs, only 9 countries have a rating assigned of which 7 countries are hosting 42 CDM activities (26 CDM projects and 16 PoAs) of the project pipeline, which accounts for 79 per cent of CDM and 50 per cent of PoA of the African pipeline.
Despite being rated, 7 countries or 30 per cent of all rated countries in Africa have no CDM activities at all, whereas 2 of them are the LDCs Benin and Lesotho.

From total 36 African countries with no rating, 12 countries are hosting 73 CDM activities accounting for 19 per cent of total CDM activities (21 per cent of total CDM and 14 per cent of total PoAs). Those countries are:

Algeria, Burundi* (1PoA), Central African Republic*, Chad* (2PoA), Comoros*, Congo (1PoA), DR Congo* (5CDM), Yvory Coast (38CDM/1PoA), Djibuti*, Equitorial Guinea*, Eritrea*, Ethiopia* (3CDM/2PoA), Gambia*, Guinea*, Guinea Bissau*, Liberia*, Lybia, Madagaskar* (3CDM/1PoA), Malawi* (3PoA), Mali* (1CDM), Mauritania*, Niger*, Sao Tome and Principe*, Sierra Leone*, Somalia*, Sudan*, Sudan South*, Swaziland (1CDM), Tanzania* (6 CDM/4PoA), Togo* (1PoA), Zimbabwe. (* rated LDC)

Table 20: No Rating and CDM activities

Countries	no Rating	no Rating but CDM	CDM	PoA	Total
Africa total 54	36	12	57	16	73
LDCs total 34	26	12	18	14	34

Source: Own elaboration on the basis of S&P, Moody‘s and Fitch and UNEP Risoe CDM/JI Pipeline Analysis and Database and PoA pipeline overview, Feb. 1st 2013.

From the total number of non rated African countries, the share of LDCs is high (72 per cent) but, nevertheless, these countries host 34 CDM activities or 9 per cent of total CDM activities which account for 7 per cent of total CDM (6 per cent of total CDM and 12 per cent of total PoAs) hosted by an African country.

Considering the prevailing ratings of African countries and particularly, for LDCs ranging from BB- to single B, CDM projects in LDCs will find it difficult to obtain foreign investment finance for initial projects, which could serve as the foundation for a CDM project activity. While most of the CDM projects in Africa are hosted by a rated country, no country rating, on the other hand, is not an obligatory exclusion from CDM activities as it is the case with Ivory Coast, hosting the second most CDM projects after South Africa. Even for LDCs

like DRC, Ethiopia, Madagascar, Tanzania and Mali, hosting 18 CDM projects no rating was not a barrier for a CDM activity.
OECD‘s country risk classifications (0-7), accounting for country‘s financial risk as well as political risk as of January 2013, show that all SSA countries, with the exception of Mauritius. Namibia, South Africa (rated 3) and Gabon, Ghana, Lesotho, Nigeria (rated: 5), are listed either in 6 or 7. (OECD s.a.)

Another key factor is the availability of financial funds and barriers affecting foreign direct investments.
An underlying assumption of the CDM is that GHG emissions could be reduced at lower cost in non-Annex I countries than in Annex I countries and Annex I countries could lower the cost of meeting their emissions reduction commitments by buying credits from CDM projects. It is also assumed that most CDM projects would involve Annex I investors to provide for capital, whether public or private, in return for the credits and every CDM project should theoretically be jointly implemented by both Annex 1 and Non-Annex 1 entities. In reality, foreign direct investment (FDI) in the CDM projects is almost non-existent as entities from Annex 1 countries generally prefer to purchase emission reduction units as an end-product of the projects, an approach referred to as ‚unilateral CDM‘.

Basically, there are different approaches to structure and finance a CDM project, i.e. bilateral, multilateral and unilateral model (Gervasoni 2006: 11f).
In a ‚bilateral‘ CDM model, one or more Annex I investors develop, finance and most probably implement the CDM project, whereas contract details are agreed directly between partners on a project by project basis. An emission reduction purchase agreement (ERPA) is most common, in which a project developer commits to implement an emission reduction project and the Annex I partners commit to buy credits generated by the project at a specified price. The bilateral approach resembles most the FDI approach, however, it can result in uneven geographically distribution of funds and projects.
The ‚multilateral‘ CDM model, often referred to as ‚portfolio‘ or ‚fund‘ approach, is based on a centralized fund used by different Annex I investors to finance CDM projects and implies a clear separation between the project development and the investors. This approach is considered as a valid approach for sharing the risks associated to project development.

In an ‚unilateral' CDM model, Annex I parties are neither involved in financing nor in developing CDM projects and this model is considered as an appropriate approach for developing countries having difficulties to attract bilateral or multilateral projects due to the country risk premium for foreign investors but many potential host countries do not have sufficient resources and capacity to develop CDM projects without the assistance of Annex I partners.

CDM, originally intended as an instrument with a bilateral or multilateral approach where an Annex I party, i.e. an entity or fund, invest in a project in a Non Annex I country, did not materialize as expected. As of June 2012, about 90 per cent of the total number of CDM projects are domestically financed and, considering the project type, in particular renewable energy projects with the exception of geothermal projects, 80 to 100 per cent of CDM are domestically financed (Kirkman et al. 2012: 48). About 10 per cent of the total number of CDM projects involve some foreign finance which is overstated as all those projects also have some domestic finance (ibid).

Investments in CDM activities largely follow trends in FDI and a CDM project will only be developed if its revenues generated from the sale of CERs are financially attractive. The investment costs, respectively the abatement costs which play a significant role often constrain CDM project development in SSA as technologies for renewable projects are usually more capital intensive than fossil fuel alternatives.

Many African countries face barriers for CDM investments as they are not focused on by foreign investors due to their perception that investment in Africa, in particular in SSA, is risky and that the SSA region has few industries, small amounts of GHG emissions, and therefore limited opportunities to reduce these emissions and to generate CERs. Moreover, many countries have limited access to financial funds, whereas most of the LDCs rely on foreign support.

Another key factor for investors is a clear, stable and enabling legal framework which is difficult to deliver for many SSA countries due to their low level of economic development and, compared to the rest of the world, the investment climate in most SSA countries is less attractive.

The recent World Bank‘s report ‚Doing Business 2012‘ ranks most SSA countries on the ease of doing business at the bottom of the list of 183 countries (World Bank 2012: 6). A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operation of a local firm. Only two SSA countries, i.e. Mauritius, South Africa, are ranking within top 50 countries followed by Rwanda (LDC), Botswana, Ghana, Seychelles, Namibia and Zambia (LDC) ranking within top 100. Within the last ranking bracket, 23 out of 32 countries are located in SSA, whereas 18 countries are rated as LDC. But it is also reported that, over the past year, a record number of governments in Sub-Saharan Africa, representing 78 per cent of economies in the region, changed their economy’s regulatory environment to make it easier for domestic firms to start up and operate (ibid).

Table 21: SSA and LDCs ranking on the ease of doing business:

Ranking	1 - 50	51- 100	101 -150	151 - 185
# of SSA *	2	6	14	25
# of LDCs	0	2	10	20

Source: Own elaboration on the basis of World Bank 2012 s.a.: 6
*) only one Sudan is ranked and no Somalia

Among the aspects negatively affecting the investment climate are : (Ellis et al. 2007: 21f)
- FDI laws set up by a host country limiting CDM projects,
- property laws, restricting foreign ownership and
- tax regulations affecting the trade of CERs which has a negative effect on the financial performance and therefore the attractiveness of some projects and discouraging potential investors.

Some African countries suffer from civil unrest and war and others rate very badly with respect to corruption. The Corruption Perceptions Index by Transparency International, published on an annual basis, „[...] ranks countries based on how corrupt their public sector is perceived to be and the score indicates the perceived level of public sector corruption on a scale 0 - 100, whereas 0 means that a country is perceived as highly corrupt“.(Transparency International s.a.) A country‘s rank indicates its position relative to the other countries (174) included in the index.

Table 22: SSA and LDCs ranking on the Corruption Perception Index (2012)

Ranking	1 - 50	51- 100	101 -150	151 - 174
# of SSA *	4	14	21	9
# of LDCs	1	9	15	8

Source: Own elaboration on the basis of Transparency International s.a.

With respect to corruption, 4 countries of 49 SSA countries are ranked between rank 30 and 50, i.e. Botswana, Cap Verde, Mauritius and Rwanda (LDC), and 20 countries or 41 percent of all SSA countries are ranked within the first hundred countries, whereas 10 are LDCs. In general, LDCs are better ranked on corruption than the ranking on doing business.

Table 23: SSA and LDCs scoring on the Corruption Perception Index (2012)

Scoring	100 - 75	74 - 50	49 - 25	24 - 0
# of SSA *	0	5	34	9
# of LDCs	0	1	24	8

Source: Own elaboration on the basis of Transparency International s.a.

In general, a low scoring makes investment quite unlikely, however, considering the top countries in SSA hosting more than 10 CDM projects, the score is between 29 and 27, with the exception of South Africa scoring 43. In fact, one country, the Democratic Republic of Congo, has 5 CDM in the pipeline while scoring 21.

4.3.5 Summary of findings reflected on present CDM project pipeline

Based on the previous analysis of potential barriers which might negatively affect Africa to attract CDM projects and its general assumptions on Africa, the following analysis is taken on how they are reflected by the existing CDM and PoA project pipeline on a country specific basis.

Analyzing the present African CDM pipeline top down by number of CDM projects as of February 2013, South Africa complies with all assumptions made, fulfilling all criteria by ranking among top of all indicators, qualifying for 85 CDM projects in the pipeline. There is only one country in the CDM pipeline, i.e. Mauritius, ranking better, however, with a very

low amount of CO2 emissions, resulting in only 3 CDM projects in the pipeline. Both countries are among the best rated (Baa1) in Africa.

Table 24: Summary of indicators and CDM by country as of February 2013

	Corruption ranking	Corruption scoring	Doing business	Rating	GNI/cap	CO2/Mt	CDM
South Africa	69	43	39	Y	6100	360,0	85
Ivory Coast	130	29	177	N	1070	7,0	38
Kenya	139	27	121	Y	780	12,9	32
Egypt	118	32	109	Y	2340	208,9	27
Morocco	88	37	97	Y	2850	60,8	19
Nigeria	139	27	131	Y	1180	96,3	17
Uganda *	130	29	120	Y	490	1,7	16
Tunisia	75	41	50	Y	4070	28,3	8
Tanzania *	102	35	134	N	530	6,0	6
DRC *	160	21	181	N	180	3,5	5
Senegal *	94	36	166	Y	1050	6,9	5
Zambia *	88	37	94	Y	1070	2,7	4
Ethiopia *	113	33	127	N	380	7,2	3
Madagascar *	118	32	142	N	440	2,2	3
Mauritius	45	57	19	Y	7740	3,0	3
Mali *	105	34	151	N	600	0,7	1
Mozambique *	123	31	146	Y	440	3,7	1
Swaziland	88	37	123	N	2600	0,9	1
Total							**274**

Source: Own elaboration on the basis of Transparency International (2012); World Bank 2012; UNdata: GNI per capita (2010); European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency. Emission Database for Global Atmospheric Research (EDGAR), release version 4.2.; UNEP Risoe CDM/JI Pipeline Analysis and Database, February 1st 2013

Morocco and Tunisia also comply with all assumptions made, ranking among the five best of any of the categories; both countries are hosting 27 CDM projects in the pipeline. Swaziland, equal with Morocco concerning corruption, having the fifth highest GNI/cap but very small CO2 emissions, is qualifying for only one project. Egypt and Zambia comply with two indicators among the five best of any category, with 27 respectively 4 CDM projects in the pipeline.

Host countries complying with all or at least two indicators and ranking among the five best in any of the categories, i.e. South Africa, Morocco and Tunisia, represent 41 per cent and, including Mauritius, Egypt, Zambia and Zimbabwe (in total 147 CDM projects), represent 53,6 per cent of the CDM pipeline.

However, favorable indicators are not an absolute prerequisite to CDM development as can be seen on Ivory Coast and Kenya. Both countries, following South Africa by number of CDM projects, do not comply with any assumption. In particular, Ivory Coast, which has very unfavorable corruption and doing business indicators, no rating by any of the three rating agencies and modest CO2 emissions, is second best by CDM project numbers. Kenya‘s corruption indicators are even worse, however, doing business and CO2 emissions are better than Ivory Coast and the country is rated by all three rating agencies. Both countries represent 26 per cent of the CDM project pipeline, implying that other factor(s) are important in attracting CDM development. One factor might be a DNA web site; as mentioned earlier, both countries have a functioning web site of its DNA, whereas Ivory Coast is providing links to ministries, documents etc. and Kenya is giving a list of priority sectors for CDM projects in their host country.

Considering the performance of LDCs (*) in attracting CDM projects, Zambia is leading the top five ranking of LDCs, complying best with all assumptions made except CO2 emissions and, as mentioned earlier, is also within the top five of the overall ranking African countries. Tanzania, complying with all assumptions made, ranking among the five best LDCs of any of the categories - only the rating is missing - is qualifying for 6 CDM projects. Senegal is complying with all assumptions except doing business and Ethiopia with all except GNI/cap and no rating and both are qualifying for 8 CDM projects. Mali, complying with two assumptions made, is hosting one CDM project in the pipeline.

Uganda is the top ranking LDC by CDM project number, hosting 16 CDM projects, which is almost the number of all the aforesaid LDCs, i.e. Zambia, Tanzania, Senegal, Ethiopia and Mali together hosting 19 CDM projects in the pipeline. Uganda has a corruption ranking like Ivory Coast, has the least GNI/cap, very modest CO2 emissions but the second best doing business indicator of the top five LDCs. It is rated by two of the three rating agencies and has a separate CDM promotion entity but no DNA Website.

Again, one LDC is demonstrating that favorable indicators is not an absolute prerequisite for attracting CDM development. The Democratic Republic of Congo, hosting the same number of CDM projects like Senegal, having the least of the top five CO2 emissions and all the other indicators at the lowest, is hosting 5 CDM projects.

Analyzing the present African PoA pipeline top down by number of PoAs as of February 2013, the focus will be only on countries with no other CDM activity than PoAs,

Table 25: Summary of indicators and PoA by country as of February 2013

	Corruption ranking	Corruption scoring	Doing business	Rating	GNI/cap	CO2/Mt	PoA
South Africa	69	43	39	Y	6100	360,0	48
Kenya	139	27	121	Y	780	12,9	17
Ghana	64	45	64	Y	1240	9,0	5
Egypt	118	32	109	Y	2340	208,9	4
Nigeria	139	27	131	Y	1180	96,3	4
Rwanda *	50	53	52	Y	540	0,8	4
Senegal *	94	36	166	Y	1050	6,9	4
Tanzania *	102	35	134	N	530	6,0	4
Uganda *	130	29	120	Y	490	1,7	4
Malawi *	88	37	157	N	330	1,0	3
Morocco	88	37	97	Y	2850	60,8	3
Tunisia	75	41	50	Y	4070	28,3	3
Burundi *	165	19	159	N	160	2,2	2
Ethiopia *	113	33	127	N	380	7,2	2
Zambia *	88	37	94	Y	1070	2,7	2
Angola *	157	22	172	Y	3960	18,0	1
Burkina Faso *	83	38	153	Y	550	1,0	1
Chad *	165	19	184	N	600	0,2	1
DRC *	160	21	181	N	180	3,5	1
Gabon	102	35	170	Y	7760	6,5	1
Ivory Coast	130	29	177	N	1070	7,0	1
Madagascar *	118	32	142	N	440	2,2	1
Total							**116**

Source: *O*wn elaboration on the basis of Transparency International (2012); World Bank 2012; UNdata: GNI per capita (2010); European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency. Emission Database for Global Atmospheric Research (EDGAR), release version 4.2.; UNEP Risoe CDM/JI Pipeline Analysis and Database, February 1st 2013

Considering the countries in the PoA pipeline, the picture is rather mixed and, with the exception of Ghana, allowing no clear statement on the previous assumptions made. Ghana is complying best with all assumptions, ranking among the three best of any of the categories with top corruption, doing business indicators, adequate GNI/cap and CO2 emissions and is rated by all three rating agencies. Rwanda, Burkina Faso and Malawi have favorable corruption and doing business indicators, while their GNI/cap and Co2 emissions are rather small. Rwanda and Burkina Faso are rated; all three are qualified as LDCs and hosting in total 8 PoAs. Gabon, with average corruption and doing business indicators, the highest GNI/cap and adequate Co2 emissions, is hosting only 1 PoA. In contrast, Burundi and Chad, having in

all categories unfavorable indicators, no rating, qualified as LDCs, are hosting 3 PoAs. Despite very unfavorable corruption and doing business indicators, Angola could attract at least one PoA which might be supported by a high GNI/cap and Co2 emissions.

4.4 Resume:

The unequal distribution of CDM activities among world regions is driven by the fact that countries vary widely in terms of their GHG emissions, GHG-reduction potentials, cost of GHG reductions, investment climate/risk and policy towards the CDM. These indicators are also valid in respect to the African continent. Africa is a very diverse continent and the reasons why there are so few CDM projects differ from country to country (LDC and non LDC) and from region to region (North Africa and sub-Saharan Africa).

Africa makes up just 3 per cent of the total CDM pipeline as of Dec. 2012 (268 out of 9051 projects). The bulk of CDM projects in Africa are hosted in SSA (220) and the countries attracting the most CDM projects in this area are South Africa, Ivory Coast and Kenya, accounting for 70 per cent of CDM projects in the pipeline of that area. The number of African LDCs hosting CDM projects is very limited, only 9 countries of 34 LDCs in Africa are hosting in total 44 CDM projects which accounts for 16 per cent of all CDM projects in Africa.

The basic formal requirement for conducting CDM projects is fulfilled by almost all African countries, however, the pro-active role such as Website or a separate CDM promotion entity for project development varies among countries and depends very much on a country‘s financial resources and adequate human capacity.

Another factor driving the unequal distribution among world regions is the abatement potential which is another preliminary indicator to attract CDM projects. Africa‘s low level of industrialization and energy consumption is limiting its CDM potential. Africa is economically not as developed as other regions such as Asia which implies that Africa has less GHG emissions and hence less abatement potential.

African countries have a relatively low emission level of 3,3 per cent of the total world emissions and Africa has the lowest annual CO2 emissions per capita in the world. African LDCs account for 8,4 per cent of total African emissions.

The success of CDM project development is not only bound to the abatement potentials, on CDM related processes (DNA and procedures) and on existing national capacities. It also depends on the investment climate of a specific country and availability of financial resources. Countries suffering from civil unrest, war, high corruption or having no transparent and enabling legal framework in place, which is an important factor considering that CDM projects have long lifetime and crediting periods will find no foreign investor. Finally, the lack of access to financial funds by project developers to realize the CDM project is one of the main barriers as banks are often unfamiliar with the CDM, in addition to uncertain government support and limited awareness of the CDM.

The CDM is a market based mechanism and, as such, CDM projects tend to materialize where the abatement potential is high, which results in high volumes of CERs, and where investors find favorable macro-economic conditions.
Due to political and economic risks, limited abatement potential, financial resources and human capacity, high transaction costs, technical implementation barriers (electrification rate) of LDCs, the CDM has failed to reach many of its intended beneficiaries in the African LDCs. Barriers to CDM development can arise at different steps of the CDM project cycle and the relative importance of particular barriers varies between countries as well as over time. To enhance growth in a country's CDM activity, a combination of factors is needed including the presence of attractive CDM opportunities, a positive investment climate, and an enabling policy and legislative framework (in general, as well as CDM-specific). Barriers such as a country‘s regulatory framework can be easily changed by the national government but barriers such as political and economic instability, unfavorable overall investment climate and indicators like corruption index and risk ratings are difficult to overcome.
Africa has a large potential of renewable sources of energy (Arens et al. 2011: 16) through hydropower, geothermal energy, wind energy due to resources and solar energy, however, technologies for renewable projects are usually more capital intensive than fossil fuel alternatives, which constrains CDM project development in Africa additionally.

The unbalanced regional distribution of CDM project activities reflects the uneven state of economic development, the different attractiveness for investment of many SSA countries, in particular LDCs, and potential by sector/project type not in line with CDM developer preferences.

5. Conclusion

The basic principle of the CDM is that both Annex I and non Annex I countries benefit from participating in the mechanism, exploiting synergies between global carbon abatement goals and local sustainable development goals. From the perspective of non Annex I countries, the benefits should be generated both from the increased FDI flows and from the requirement that these investments should advance the sustainable development goals of the host country. The CDM raised high expectations in non Annex I countries for its potential to contribute to sustainable development triggered by foreign investments, technology transfer, and for its potential to alleviate poverty.

By numbers, the CDM has been very successful; with a tremendous growth to 9,051 projects as of Dec. 2012, the CDM has contributed to a global market for GHG emissions, the carbon market, and is providing low cost options to Annex I countries to meet their commitment obligations. But the initial assumption of a synergy and win-win relationship between the dual aims of CDM does not hold. The CDM has its limitations to effectively deliver on its sustainable development objective due primarily to the facts listed below.

The key factor of CDM‘s inability to achieve the sustainability objective is the existence of the trade off between the carbon benefits which are valued in the carbon market and non carbon benefits, such as sustainable development, which are not monetized in the carbon market. The lack of financial incentives for pursuing sustainable development benefits and the fact that these benefits have no financial value, as only GHG benefits result in monetary compensation through the generation of CERs, gives preference to projects with little or no sustainable benefits but high CER generation; due to their low cost abatement perspective and considerable amount of CERs generated, project types such as HFC, PFC, SF and N2O

underline CDM‘s capacity to produce the lowest cost emission reduction while leaving the sustainability claim subordinated.

Another key factor is the issue to define and assess sustainable development. Assessing CDM‘s impact on sustainable development needs a clear understanding of what is meant by ‘sustainable development‘ and what are the ‚related criteria‘ to be set by the DNAs.
Due to the fact that there is no clear definition of sustainable development, host countries define their own sustainability criteria and have little incentive to require strong criteria that could endanger investment. There is a tendency of competition among non-Annex I countries to attract CDM investments and to create an incentive to set low sustainability standards, an phenomenon identified as a ‚race to the bottom‘.
Moreover, sustainability requirements are undermined by the lack of stipulations for monitoring, reporting and verifying sustainable development impacts throughout the lifetime of a CDM project which may lead to very optimistic articulated sustainable development benefits in the PDDs. Contributions to sustainable development as stated in the PDD are expectations at the time the project is being validated and may be different to the actual contributions.
No general guidance exists on ‚how‘ the DNAs should assess the sustainable development impact of CDM projects and other aspects of sustainable development such as technology transfer. An assessment of the actual sustainable development impacts with a high degree of accuracy is not possible due to the insufficiency of objective and ‚real‘ data from CDM projects, thus not permitting a definite conclusion on the sustainable development impact(s) of the CDM.

The CDM was not able to uphold the promise of its dual-objective as stated in Art 12 of the Kyoto Protocol in its first commitment period. Aside from this, CDM‘s potential to contribute to sustainable development in non Annex I countries does not sufficiently meet the objective of assisting them in achieving sustainable development and depends on the nature of the project, especially the type of technology. Renewable energy projects have a higher contribution to sustainable development than end of pipe projects. While some project types have limited sustainable development benefits (by numbers), they have outstanding contributions to a single benefit/dimension, e.g. energy efficiency and biomass projects. An

improvement of at least one of the dimensions, i.e. economical, ecological and social, without having negative impacts on any of the others can be seen as a positive contribution to sustainable development.

Analyzing the CDM‘s current portfolio, one can see, on the one hand, a considerable amount of CERs generated by projects which foster only meagre sustainable development benefits in the host country and, on the other hand, a strong geographical inequality in the distribution of CDM projects in favor of emerging economies such as China, India and Brazil. Africa, as a continent, and particularly, its LDCs stay far behind, implying that the countries most in need of sustainable development have so far hardly benefitted from CDM.

Africa makes up just 3 per cent of the total CDM pipeline as of Dec. 2012. The bulk of CDM projects in Africa are hosted in sub Saharan Africa (SSA), whereas three countries, i.e. South Africa, Ivory Coast and Kenya, are attracting 70 per cent of CDM projects in the pipeline in this area. The number of African LDCs hosting CDM projects is very limited, totalling only 9 countries of 34 LDCs in Africa, which accounts for 16 per cent of all CDM projects in Africa.

The unequal distribution of CDM activities among world regions is driven by the fact that countries vary widely in terms of their GHG emissions, GHG-reduction potentials, cost of GHG reductions, investment climate/risk and policy towards the CDM. These indicators are also valid in respect to the African continent. The African continent has a high political, economic and geographical diversity and the reasons why there are so few CDM projects differ from country to country (LDC and non LDC) and from region to region (North Africa and sub-Saharan Africa).

The implementation of a DNA, the basic formal requirement for conducting CDM projects, is fulfilled by almost all African countries. However, Africa‘s low level of industrialization and energy consumption is limiting its CDM potential, respectively its abatement potential. African countries have a relatively low emission level of 3,3 per cent of the total world emissions and African LDCs account for 8,4 per cent of total African emissions.

The success of CDM project development is not only bound to the abatement potentials, to CDM related processes such as DNA and to existing national capacities. It also depends on

the investment climate of a specific country and availability of financial resources. Countries suffering from civil unrest, war, high corruption or having no transparent and enabling legal framework in place, find no foreign investor.
Africa has a large potential of renewable sources of energy through hydropower, geothermal, wind and solar energy. Technologies for renewable projects, however, are usually more capital intensive than fossil fuel alternatives, which constrains CDM project development in Africa additionally.

The CDM as a market based mechanism tends to materialize where the abatement potential is high, resulting in high volumes of CERs, and where investors find favorable macro-economic conditions. Due to political and economic risks, limited abatement potential, financial resources and human capacity, the CDM has failed to reach many of its intended beneficiaries in the African LDCs. The unequal regional distribution of CDM project activities reflects the uneven state of economic development, the different attractiveness for investment of many SSA countries, especially LDCs, and potential by sector/project type not in line with CDM developer preferences. These constraints are limiting CDM‘s capability to contribute to sustainable development in African LDCs.

Despite CDM‘s limitations regarding its sustainable development objectives and country specific barriers to attract CDM projects, it has, nevertheless considerably contributed to the awareness of climate change as an issue to key stakeholders in non Annex I countries.

6. References

Alexeew, Johannes, Bergset, Linda, Meyer, Kristin, Petersen, Juliane, Schneider, Lambert, Unger, Charlotte (2010). An analysis of the relationship between the additionality of CDM projects and their contribution to sustainable development. In: International Environmental Agreements: Politics, Law and Economics. Vol.10, Issue 3, pp 233–248.

Arens, Christof; Kiyar, Dagmar and Sterk, Wolfgang (2007): The Clean Development Mechanism in Africa - Potential and Limitation. JIKO Policy Paper 2/2007. Wuppertal Institute for Climate, Environment and Energy & GFA Envest, Wuppertal and Hamburg. Available at: www.jiko-bmu.de/files/basisinformationen/publikationen/application/pdf/policy_paper_cdm_eq_distri.pdf [accessed 4 January 2013].

Arens, Christof; Burian, Martin; W. Sterk, J. Schnurr, C. Beuermann, D. Blank, Z. Kapor, N. Kreibich, F. Mersmann, A. Burtscher and S. Schwan, (2011): The CDM Project Potential in Sub-Saharan Africa with Focus on Selected Least Developed Countries, Wuppertal Institute for Climate, Environment and Energy & GFA Envest, Wuppertal and Hamburg. Available at: http://www.jiko-bmu.de/files/basisinformationen/application/pdf/potentials_barrierefrei.pdf. [accessed 4 January 2013].

Arens, Christof; Wang-Helmreich, Hanna; Hodes, Glenn S and Burian, Martin (2011): Assessing Support Activities by International Donors for CDM Development in Sub- Saharan Africa with Focus on Selected Least Developed Countries, Wuppertal Institute for Climate, Environment and Energy & GFA Envest, Wuppertal & Hamburg. Available at: www.jiko-bmu.de/files/basisinformationen/publikationen/application/pdf/donor_activities_barrierefrei.pdf [accessed 4 January 2013].

Arens, Christof; Rammelt, Monika; Winter, Saskia; Sünnen, Rainer; Krey, Matthias; Vener, James; Blank, Daniel; Schnurr Joachim; Müller, Nicolas; Sabet, Nahla; Burian, Martin and Maviya, Johnson (2012): Mitigating Climate Change, Investing in Development. Fostering the CDM in Least Developed Countries. Wuppertal Institute for Climate, Environment and Energy & GFA Envest, Wuppertal & Hamburg. Available at: www.jiko-bmu.de/files/basisinformationen/application/pdf/climate_web_barrierefrei.pdf [accessed 4 January 2013].

Arens, Christof and Burian, Martin (2012): Integrating Africa's Least Developed Countries into the Global Carbon Market. Summary of key outcomes. Wuppertal Institute for Climate, Environment and Energy & GFA Envest, Wuppertal & Hamburg. Available at: www.jiko-bmu.de/files/basisiinformationen/parlamentarische_vorgaenge/application/force-download/cdm_african_ldcs.pdf [accessed 4 January 2013].

Arens, Christof (Editor-in-Chief); Forth, Thomas; Hermwille, Lukas; Kreibich, Nicolaus; Mersmann, Florian, Sterk, Wolfgang and Timon Wehnert (2013): The long road to 2015. In: Carbon Mechanism Review. Issue 1 2013. Wuppertal Institute for Climate, Environment and Energy. Wuppertal.

Burian, Martin; Arens, Christof; Sterk, Wolfgang and Wang-Helmreich, Hanna (2011): Integrating Africa's Least Developed Countries into the Global Carbon Market: Analyzing CDM Implementation Barriers, Wuppertal Institute for Climate, Environment and Energy & GFA Envest, Wuppertal & Hamburg. Available at: www.jiko-bmu.de/files/basisinformationen/application/pdf/barriers_barrierefrei.pdf [accessed 4 January 2013].

Boyd, Emily; Hultman, Nate; Roberts, J. Timmons; Corbera, Esteve; Cole, John; Bozmoski , Alex; Ebeling, Johannes; Tippman, Robert; Manna, Philip; Brown Katrina; Liverman, Diana M.(2009): Reforming the CDM for sustainable development: lessons learned and policy futures. Environmental Science & Policy 12 (7), pp 820 – 831.

Burian, Martin (2005): The Clean Development Mechanism, Sustainable Development and its Assessment. Hamburg, Institute of International Economics.

Carbon Market Watch (formerly CDM Watch) (s.a.). Available at: http://carbonmarketwatch.org/category/sustainable-development/ [accessed 28 March 2013].

Castro, Paula and Michaelowa, Axel (2008): Empirical analysis of the CDM. Climate Strategies Report. Cambridge, UK: Climate Strategies.

CDM Bazaar (s.a.): About the CDM Bazaar. Available at: www.cdmbazaar.net/about [accessed 4 April 2013].

CDM Policy Dialogue (2012): Evaluating the CDM in a changing world: The global economy and emissions since 1997 Paper prepared by Ingrid Burfurd Contribution to the research programme of the CDM Policy Dialogue July 2012.

CDM Rulebook (a) (s.a.): Bodies: Executive Board. Available at: www.cdmrulebook.org/65 [accessed 2 November 2012].

CDM Rulebook (b) (s.a.): Bodies: Designated National Authority. Available at: www.cdmrulebook.org/64 [accessed 2 November 2012].

CDM Rulebook (c) (s.a.): Bodies: Designated Operational Entity. Available at: www.cdmrulebook.org/62 [accessed 2 November 2012].

CDM Rulebook (d) (s.a.): Large Scale, Project eligibility, Available at: http://cdmrulebook.org/413) [accessed 2 November 2012].

Cosbey, Aron; Murphy, Deborah, Drexhage, John and Balint, John (2006): Making Development work in the CDM - Phase II of the development dividend project. Winnipeg: International Institute for Sustainable Development. Available at: www.iisd.org/pdf/2007/making_dev_work_cdm.pdf [accessed 11 November 2012].

Das, Kasturi (2011): Technology Transfer under the Clean Development Mechanism: an empirical study of 1000 CDM projects. Working Paper 014, The Governance of Clean Development Working Paper Series. School of International Development, University of East Anglia UK www.uea.ac.uk/international-development/research/gcd/Das+2011 [accessed 21 November 2012].

Dechezlepretre, Antoine; Glachant, Matthieu and Meniere, Yann (2007): The Clean Development Mechanism and the international diffusion of technologies: An empirical study. Fondazione Eni Enrico Mattei. Nota di lavoro 105.2007. Available at: www.feem.it/userfiles/attach/Publication/NDL2007/NDL2007-105.pdf [accessed 4 December 2012].

Dechezlepretre, Antoine; Glachant, Matthieu and Meniere, Yann (2009): Technology transfer by CDM projects : A comparison of Brazil, China, India and Mexico. Energy Policy 37 (2009), pp 703-711.

Ellis, Jane and Kamel, Sami (2007): Overcoming the barriers to Clean Development Mechanism Projects. Organization for Economic Co-Operation and Development (OECD), International Energy Agency (IEA), UNEP RISOE Centre. France 2007 Available at: www.oecd.org/environment/cc/38684304.pdf [accessed 9 February 2013].

European Climate Registry (ECR) (s.a.): CDM. Clean Development Mechanism (CDM) Project Cycle Presentation. Available at: www.europeanclimateregistry.eu/cdm-presentation.php [accessed 4 December 2012].

European Commission (s.a.): Climate Action (a): Kyoto emissions targets: Joint fulfillment, „burden sharing“ and base years. Available at: http://ec.europa.eu/clima/policies/g-gas/kyoto/index_en.htm [accessed 13 November 2012].

European Commission (s.a.): Climate Action (b): What is the EU doing about climate change? Available at: http://ec.europa.eu/clima/policies/brief/eu/index_en.htm [accessed 13 November 2012].

European Commission (s.a.): Climate Action (c): European Climate Change Programme. Available at: http://ec.europa.eu/clima/policies/eccp/index_en.htm [accessed 13 November 2012].

European Commission (s.a.): Climate Action (d): Policies. The EU emissions trading system (EU ETS) Available at: http://ec.europa.eu/clima/policies/ets/index_en.htm [accessed 13 November 2012].

European Commission (s.a.): Europa 2020: Europe 2020 in Austria. Available at: http://ec.europa.eu/europe2020/europe-2020-in-your-country/osterreich/index_en.htm [accessed 13 November 2012].

European Commission (2002): 2002/358/EC: Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfillment of commitments thereunder. [Burden Sharing Agreement]. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002D0358:EN:HTML [accessed 13 November 2012].

European Commission (2002): 2002/358/EC: Annex II. Available at: http://ec.europa.eu/clima/policies/g-gas/docs/table_emm_limitation_en.pdf [accessed 13 November 2012].

European Commission (2003): Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. [Emissionshandelsrichtlinie] In: Official Journal of the European Union. L 275/32-25.10.2003). Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:275:0032:0032:EN:PDF [accessed 13 November 2012].

European Commission (2004): Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms. [EU Linking Directive]. In: Official Journal of the European Union. L 338/18 - 23; Strasbourg 13.11.2004. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:338:0018:0018:EN:PDF [accessed 13 November 2012].

European Commission (2007): Communication from the Commission to the Council and the European Parliament. Building a Global Climate Change Alliance between the European Union and poor developing countries most vulnerable to climate change. Brussels. Available at: www.gcca.eu/sites/default/files/GCCA/gcca_com2007540_en.pdf [accessed 4 September].

European Commission (2008): Commission Staff Working Document. Implementation Framework of the Global Climate Change Alliance. Brussels. Available at: www.gcca.eu/sites/default/files/GCCA/gcca_sec20082319_implementation_framework.pdf [accessed 13 November 2012].

European Commission (2009) [2006]: EU action against climate change. EU emissions trading an open scheme promoting global innovation. Belgium; Available at: http://ec.europa.eu/clima/publications/docs/ets_en.pdf [accessed 4 September 2012].

European Commission (2011): Supporting a climate for change. The EU and developing countries working together. Belgium. Availabale at: http://ec.europa.eu/clima/publications/docs/supporting_a_climate_for_change_en.pdf [accessed 13 November 2012].

European Commission Joint Research Centre, Emission Database for Global Atmospheric Research (EDGAR) (s.a.): CO2 time series 1990-2011 per region/country/per capita for word countries. Available at: http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts_pc1990-2011 and http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2011 [accessed 9 January 2013].

European Environment Agency (EEA) (2012): Annual European Union greenhouse gas inventory 1990–2010 and inventory report 2012. Submission to the UNFCCC Secretariat. EEA Technical report No 3/2012. Copenhagen. Available at: www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2012 [accessed 13 February 2013].

Federal Ministry of Agriculture, Forestry, Environment and Water Management (2007): National Allocation Plan for Austria pursuant to Sec. 11 of the Austrian Emission Allowances Trading Act

(EZG) for the period 2008-2012. In accordance with Art. 9 of Directive 2003/87/EC and the Decision of the European Commission from 2 April 2007. (NAP Austria).

Fitch Ratings (s.a.): Sector Sovereigns. Available at: www.fitchratings.com [accessed 11 March 2013].

Gervasoni, Giulia (2006): Assessing sustainability for CDM projects. A case study from Thailand. Theses University Lund, Sweden.

Govinda R. Timilsina; Gouvello de, Christophe; Thioye, Massamba and Dayo B. Felix (2010): Clean Development Mechanism Potential and Challenges in Sub-Saharan Africa. Mitigation and Adaption Strategies for Global Change, Springer, Vol.15(1), pp 93-111

Gouvello de, Christophe; Dayo, Felix B. and Thioye, Massamba (2008): Low-carbon Energy Projects for Development in Sub-Saharan Africa. Unveiling the Potential, Addressing the Barriers. World Bank, Washington, D.C.

Huang, Yongfu and Barker, Terry (2008): The Clean Development Mechanism and Sustainable Development: A Panel Data Analysis. Environmental Economy and Policy Research Discussion Paper Series. 4CMR, Department of Land Economy University of Cambridge, UK.

Huang, Y., J. He and F. Tarp, (2012): Is the Clean Development Mechanism Promoting Sustainable Development?, Working Paper No. 2012/72, United Nations University, World Institute for Development Economics Research (UNU-WIDER), Helsinki, Finland.

International Energy Agency (IEA) (s.a.): World Energy outlook 2011. Electricity Access today. available at: www.worldenergyoutlook.org/resources/energydevelopment/accesstoelectricity/ [accessed 17 March 2013].

IPCC (Intergovernmental Panel on Climate Change) (1990): First Assessment Report. Overview. Preface to the IPCC overview, pp 51 -62.

IPCC (2000a): Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers. A Special Report of the Intergovernmental Panel on Climate Change, Working Group III, IPCC, Geneva, Switzerland. Available at: www.ipcc.ch/pdf/special-reports/spm/srtt-en.pdf [accessed 12 February 2013].

IPCC (2000b): Emissions Scenarios. Nebojsa Nakicenovic and Rob Swart (Eds.). Cambridge University Press, UK. Available at: www.ipcc.ch/ipccreports/sres/emission/index.php?idp=0 [accessed 12 February 2013].

IPCC (s.a.): History. Available at: www.ipcc.ch/organization/organization_history.shtml#.UV02Pxwcorg [accessed 4 October 2012].

Kesicki, Fabian (2011): Marginal abatement cost curves for policy making – expert-based vs. model-derived curves. UCL Energy Institute University College London. Available at: www.homepages.ucl.ac.uk/~ucft347/Kesicki_MACC.pdf [accessed 13 November 2012].

Kirkman, Grant A.; Seres, Stephens; Haltes, Erik and Spalding-Fecher, Randall (2012): Benefits of the Clean Development Mechanism. Bonn, Germany: United Nations Framework Convention on Climate Change. Available at: http://cdm.unfccc.int/about/dev_ben/ABC_2012.pdf [accessed 6 February 2013].

Mersmann, Florian and Arens, Christof (2012): Integrating Africa's Least Developed Countries into the Global Carbon Market Standardized Baselines and LDCs – Concept, Issues, and Opportunities. Wuppertal Institute for Climate, Environment and Energy & GFA Envest. Wuppertal & Hamburg. Published by: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Division E II: Climate Protection, 11055 Berlin, Germany. Available at: www.jiko-bmu.de/files/basisinformationen/application/pdf/ldc_sbl_barrierefrei.pdf [accessed 12 February 2013].

Moody‘s (s.a.): Research & Ratings. Sovereign & Supranational. Available at: www.moodys.com [accessed 11 March 2013].

Nordhaus William (2008): A Question of Balance. Weighing the Options on Global Warming Policies. Yale University Press New Haven & London.

Nussbaumer, Patrick. (2009): On the contribution of labelled Certified Emission Reductions to sustainable development: A multi-criteria evaluation of CDM projects. Energy Policy 37, pp 91–101.

Olsen, Karen Holm (2007): The clean development mechanism’s contribution to sustainable development: a review of the literature. Climatic Change (2007) 84, pp 59–73.

Olsen, Karen Holm. and Fenhann, Jorgen (2006): Sustainable development benefits of clean development mechanism projects. CD4CDM Working Paper No.2 October 2006. UNEP RISO Centre. Available at: http://cd4cdm.org/Publications/SustainableDevelopmentBenefitsCDM.pdf [accessed 10 December 2012].

Olsen, Karen Holm and Fenhann, Jorgen (2008): Sustainable development benefits of clean development mechanism projects: A new methodology for sustainability assessment based on text analysis of the project design documents submitted for validation. Energy Policy, 36 (8), pp 2819 – 2830.

Organization for Economic Co-Operation and Development (OECD) (s.a.): Trade. Export credits. Country Risk Classifications as of January 2013. Available at: www.oecd.org/tad/xcred/crc.htm [accessed 14 March 2013].

Okubo, Y. and Michaelowa, A (2010): Effectiveness of subsidies for the Clean Development Mechanism: Past experiences with capacity building in Africa and LDCs. Climate and Development, 2(1), pp 30–49.

Perman, Roger; Ma, Yue; Common, Michael; David, Maddison and McGilvray, James (2011): Natural Resource and Environmental Economics. 4th edition, Pearson Education Ltd England.

Pfeifer, Gregor and Stiles, Geoff (s.a.): Carbon Finance in Africa. A policy paper for the African Partnership Forum. Available at: www.africapartnershipforum.org/meetingdocuments/41646964.pdf [accessed 7 March 2013].

Ruthner, Lena; Johnson, Mark; Chatterjee, Bipasha; Lazarus, Michael; Fujiwara, Noriko; Egenhofer, Christian; Monceau, Tanguy du and Brohe, Arnaud (2011): Study on the Integrity of the Clean Development Mechanism (CDM); carried out under contract for the European Commission DG Environment and Climate Action. Available at: http://ec.europa.eu/clima/policies/ets/linking/docs/final_report_en.pdf [accessed 12 February 2013].

Schmidt-Traub, G. (2011): Meeting Africa’s climate finance challenge. Carbon First, 3/2011, pp 5–7.

Schneider, Lambert (2007): Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement. Report prepared for WWF Berlin. Available at: www.oeko.de/oekodoc/622/2007-162-en.pdf [accessed 11 December 2012].

Seres, Stephens (2008): Analysis of Technology Transfer in CDM Projects. Prepared for the UNFCCC Registration & Issuance Unit CDM/SDM. Montreal, Canada.

Sustainable Energy Technology at Work (SETatWORK) (s.a.): CDM Project Development. Eligible CDM project types. Available at: www.setatwork.eu/cdm_projects.htm#project_types [accessed 8 August 2013]

Singh, Rajesh Kumar; Murty, H.R.; Gupta, S.K.; Dikshit, A.K. (2009): An overview of sustainability assessment methodologies. Ecological Indicators 9 (2009), pp 189-211.

Spalding-Fecher, Randall; Narayan Achanta, Amrita; Erickson, Peter; Haites, Erik; Lazarus, Michael; Pahuja, Neha; Pandey, Nimisha; Seres, Stephen and Tewari, Ritika (2012): Assessing the impact of the Clean Development Mechanism. Report commissioned by the high-level panel of the CDM Policy Dialogue. Final Report July 15, 2012. Luxembourg. Available at: www.cdmpolicydialogue.org/research/1030_impact.pdf [accessed 12 February 2013].

Standard & Poors (S&P) (2012): Standard & Poor's Ratings Definitions. In: Global Credit Portal. Ratings Direct. February 2, 2012 Available at: http://img.en25.com/Web/StandardandPoors/S_P_Ratings_Definitions.pdf [accessed 11 March 2013].

Sterk, Wolfgang et al. (2009): Further development of the project based mechanism in a post-2012 regime. Wuppertal: Wuppertal Insitute for Climate, Environment and Energy. Available at: /www.jiko-bmu.de/files/inc/application/x-download/cdm_post_2012_study_wi.pdf [accessed 2 February 2013].

Subbarao, Srikanth and Lloyd, Bob. (2011): Can the Clean Development Mechanism (CDM) deliver?. Energy Policy 39, pp 1600–1611.

Sutter, Christoph (2003): Sustainability check-up for CDM projects. How to assess the sustainability of international projects under the Kyoto Protocol, Zurich: Swiss Federal Institute of Technology Zurich.

Sutter, Christoph and Parreno, Juan Carlos, (2007): Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. In: Climatic Change, 84 No.1, pp 75-90.

The Energy and Resources Institute (TERI) (2012): Assessing the Impact of the Clean Development Mechanism on Sustainable Development and Technology Transfer. Final Report prepared for UNFCCC. New Delhi.

The Gold Standard Foundation (s.a.): The Gold Standard. Who we are. Available at: www.cdmgoldstandard.org/about-us/who-we-are [accessed 1 March 2013].

Transparency International (s.a.): Corruption Perceptions Index 2012. Available at: http://cpi.transparency.org/cpi2012/results/ [accessed 14 February 2013].

Umweltbundesamt. Deutsche Emissionshandelsstelle (DEHSt) (2010): Questions and Answers on Emissions Trading. The European Emissions Trading Scheme (EU ETS) in Germany. Berlin.

Umweltbundesamt. Deutsche Emissionshandelsstelle (DEHSt) (s.a.) a.: Emissions trading. The concept of emissions trading. Available at: www.dehst.de/EN/Emissions-Trading/emissions-trading_node.html [accessed 17 December 2012].

Umweltbundesamt. Deutsche Emissionshandelsstelle (DEHSt) (s.a.) b.: Emissions trading. Foundations of Emissions Trading. Available at: www.dehst.de/EN/Emissions-Trading/emissions-trading_node.html [accessed 17 December 2012].

United Nations (1987): Report of the World Commission on Environment and Development: Our Common Future. Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Cooperation: Environment [Brundtland Report] published as Annex to General Assembly document A42/427 Available at: http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf [accesses 4 November 2012].

United Nations (1992): United Nations Framework Convention on Climate Change. New York.

United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change. New York.

United Nations Climate Change (UNCC) (2012): CDM News Release. UNFCCC releases report on the benefits of the Kyoto Protocol's clean development mechanism. Bonn, 20 November 2012. Available at: http://cdm.unfccc.int/press/releases/2012_26.pdf [accessed 28 December 2012].

United Nations Data (UNdata) (s.a.): Statistics. GNI per capita. Available at: http://data.un.org/Data.aspx?d=SOWC&f=inID%3A94 [accessed 2 February 2013].

UNEP Risoe Centre (s.a.) a: UNEP Risoe CDM/JI Pipeline Analysis and Database, December 1st 2012. Available at: www.cdmpipeline.org [accessed 22 December 2012 and 10 March 2012].

UNEP Risoe Centre (s.a.) b: CDM projects by type. Available at: www.cdmpipeline.org/cdm-projects-type.htm [accessed 22 December 2012 and 10 March 2012].

UNEP Risoe Centre (s.a.) c: CDM by host region. Availabale at: www.cdmpipeline.org/cdm-projects-region.htm [accessed 22 December 2012 and 10 March 2012].

UNFCCC (United Nations Framework Convention on Climate Change) (2002): The Marakesh Accords. 17/CP.7. Modalities and procedures for a clean development mechanism, as defined in Article 12 of the Kyoto Protocol. New York Available at: http://unfccc.int/resource/docs/cop7/13a02.pdf [accessed 14 November 2012].

UNFCCC (2005): Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol on its first session, held at Montreal from 28 November to 10 December 2005. Available at: http://unfccc.int/resource/docs/2005/cmp1/eng/08a01.pdf [accessed December 2012].

UNFCCC (2005a): Decision 2/CMP.1. Principles, nature and scope of the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol.

UNFCCC (2005b): Decision 3/CMP.1. Modalities and procedures for a clean development mechanism as defined in Article 12 of the Kyoto Protocol. ANNEX Modalities and procedures for a clean development mechanism.

UNFCCC (2011): CDM Executive Board EB 65 Proposed Agenda - Annotations Annex 17: Report on sustainable development co-benefits and negative impacts of CDM project activities. (Version 01.0) Available at: www.kyomecha.org/document/CDM/EB65/eb65annotation/eb65_Annex17_Report_on_sustainable_development_co-benefits_and_negative_impacts_of_CDM_projects_activities.pdf [accessed 14 November 2012].

UNFCCC (2012a): Clean Development Mechanism. CDM Methodology Booklet. United Nations Climate Change Secretariat, Bonn 2012. Available at: http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf [accessed 14 November 2012].

UNFCCC (2012b): Annual Report of the Executive Board of the Clean Development Mechanism to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. Part I. Eighth session, Doha, 26 November to 7 December 2012. Item 7 of the provisional agenda Issues relating to the clean development mechanism. Available at: http://unfccc.int/resource/docs/2012/cmp8/eng/03p01.pdf [accessed 11 January 2013].

UNFCCC (2012c): Nairobi Framework Partnership. Work Programme 2012 Version 01. Nairobi Framework Partners and Cooperating Oraganizations Work Plan 2012. Available at: http://cdm.unfccc.int/Nairobi_Framework/nf_workprog2012.pdf [accessed 14 November 2012].

UNFCCC (2012d): CDM in Africa Finance and Support. Bonn, Germany. Available at: http://unfccc.int/resource/docs/publications/pub_cdm_africa_finance_2012.pdf [accessed 22 December 2012].

UNFCCC (2012e): CDM News Release. Bonn Nov. 20, 2012).

UNFCCC (2013): Press Release. Bonn Feb. 12, 2013.

UNFCCC (a) (s.a.): Status of ratification of the Convention. Available at: http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php [accessed 10 December 2012].
UNFCCC (b) (s.a.): Status of ratification of the Kyoto protocol. Available at: http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php [accessed 10 December 2012].

UNFCCC (c) (s.a.): About CDM. Available at: https://cdm.unfccc.int/about/index.html [accessed 10 December 2012].

UNFCCC (d) (s.a.): About CDM, Governance, National Authorities, Full list of DNAs. Available at: http://cdm.unfccc.int/DNA/bak/index.html [accessed 10 December 2012].

UNFCCC (e) (s.a.): The Mechanisms under the Kyoto Protocol: Emissions Trading, the Clean Development Mechanism and Joint Implementation. Background. Available at: http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php [accessed 8 August 2013]

United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States (UN-OHRLLS) (s.a.): Least Developed Countries. About LDCs. Available at: www.unohrlls.org/en/ldc/25/ [accessed 21 November 2012].

United Nations Statistics Division (UNSD) (s.a.): Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings. Available at: http://unstats.un.org/unsd/methods/m49/m49regin.htm [accessed 12 March 2012].

Watson, Charlene and Fankhauser, Samuel (2009): The Clean Development Mechanism: too flexible to produce sustainable development benefits? Working Paper No. 3, Centre for Climate Change Economics and Policy, London School of Economics and Political Science.

World Bank (2006): Submission to the CDM Executive Board on regional distribution of CDM project activities. Washington DC April 21, 2006. Available at: https://wbcarbonfinance.org/docs/CDM_Regional_Balance_EB_call_for_input.pdf [accessed 21 November 2012].

World Bank (2012): Doing Business 2012. Doing business in a more transparent world. Comparing regulations for domestic firms in 183 economies. Washington DC. Available at: www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB12-FullReport.pdf [accessed 12 March 2013].

World Bank (s.a.): Data. About. How we classify countries. Country and Lending Groups. Available at: http://data.worldbank.org/about/country-classifications/country-and-lending-groups [accessed 12 March 2013].

7. **Appendix**

7.1 Zusammenfassung

Die Auswirkungen des Klimawandels bekommen zwar alle Länder zu spüren, aber die Entwicklungsländer und hier im Besonderen die am wenigsten entwickelten Länder (LDCs) sind davon am härtesten betroffen da, sie aufgrund mangelnder finanzieller Mittel, geeigneter Technologien als auch wirksamer Institutionen nicht entsprechend auf die Folgen des Klimawandels reagieren können. Zunehmende Nahrungsmittelknappheit, Wassermangel, Ausbreitung von Krankheiten auf neue Gebiete, Schäden durch Überflutung und Zwangsmigration aufgrund von Verwüstung und Versteppung von Ackerland sowie ein Anstieg des Meeresspiegels zählen zu den wahrscheinlichsten Auswirkungen des Klimawandels auf die Entwicklungsländer.

Die Idee des „Clean Development Mechanism“ (CDM) bzw. „Mechanismus für umweltverträgliche Entwicklung“ wurde 1997 im Zuge des Kyoto Protokolls geschaffen und erst 2005 nach diversen Überlegungen im Bezug auf seine Umsetzung implementiert. Der CDM verknüpft die Verpflichtung der Industrieländer (Annex I Länder) zur Minderung von Treibhausgasemissionen mit dem Ziel der nachhaltigen Entwicklung in den Entwicklungs- und Schwellenländern (non Annex I Länder). Durch die im Rahmen von CDM - Projekten in non Annex I Länder getätigten Investitionen in den Klimaschutz sollen diese von den Technologie- und Finanztransfers aus Annex I Länder und einer Verbesserung der Infrastruktur profitieren, während die entsprechend der Menge der Emissionsminderung generierten Emissionzertifikate entweder von den Projektbetreibern selbst für die Erfüllung ihrer Emissionsauflagen verwendet oder über den Markt gehandelt werden können. Im Rahmen des EU-Emissionshandels können Unternehmen in Annex I Länder zur Erfüllung ihrer Emissionsauflagen u.a. Emissionszertifikate resultierend aus CDM-Projekten in non Annex I Länder erwerben und in einem vorgegebenen Umfang zur Deckung ihrer Emissionsauflagen heranziehen.

Seit der Implementierung des CDM im Jahr 2005 bis Dezember 2012 wurden insgesamt 9.051 Projekte beantragt und davon 5.194 Projekte bereits registriert. Zweifellos hat der CDM zur Bildung eines globalen Marktes für Emmisionen von Treibhausgasen beigetragen, der es den Annex I Ländern ermöglicht, kostengünstig ihre Emissionssziele zu erreichen. Die ursprüngliche Intention, dass auch die non Annex I Länder gleichermaßen vom Konzept des

CDM durch seinem Beitrag zur nachhaltigen Entwicklung profitieren, konnte nicht realisiert werden, was ist in erster Linie auf folgende Umstände zurückzuführen ist:

Es existiert ein „trade off“ zwischen den in Werten ausgedrückten Emissionen am Markt und den nicht in Werten ausgedrückten Beiträgen zur nachhaltigen Entwicklung. Der Umstand, dass Beiträge/Aufwendungen zur Emissionsreduktion durch die Generierung von Emissionszertifikaten und deren Verwertung entgeltlich kompensiert werden, führt zur Bevorzugung von Projekttypen mit einem hohen Zertifikatepotential wie z.B. HFC, PFC, SF und N2O, die jedoch einen geringen bis keinen Beitrag zur nachhaltigen Entwicklung liefern. Darüber hinaus sehen die Regelwerke keine allgemein gültige Definition von nachhaltiger Entwicklung und ihrer Bewertung vor.

Bei näherer Analyse bestehender CDM Projekte nach Länder und Regionen ist auffällig, dass die Schwellenländer, allen voran China, Indien und Brasilien überrepräsentiert, hingegen Länder südlich der Sahara nur marginal vertreten sind. Der Anteil Afrikas beläuft sich auf 3 Prozent der CDM Projekte weltweit, wobei nur in 9 von insgesamt 34 LDCs in Afrika ein CDM Projekt registriert wurde, was einem Anteil von nur 16 Prozent der CDM Projekte in Afrika entspricht. Die Gründe für die geringe Beteiligung in Afrika sind unterschiedlich, ebenso die Rahmenbedingungen für ein CDM Projekt in den einzelnen Ländern v.a. in den am wenigsten entwickelten Länder südlich der Sahara. Die bestehenden Treibhausgasemissionen bzw. das Reduktionspotenzial, das Investitionsklima, die Finanzierungsmittel und die politischen/institutionellen Rahmenbedingungen sind für ein CDM Engagement entscheidend. Der afrikanische Kontinent zeichnet sich durch eine hohe politische, wirtschaftliche und geografische Diversität aus und die Gründe für eine geringe CDM Beteiligung unterscheiden sich von Land zu Land (LDC und nicht LDC) und auch zwischen den Regionen nördlich und südlich der Sahara.

Der marktwirtschaftliche Ansatz des CDM zur Bekämpfung des Treibhauseffekts materialisiert sich dort, wo das Reduktionspotential und damit das zu generierende Zertifikatevolumen hoch ist und Investoren auf ein vorteilhaftes makro-ökonomisches Umfeld treffen. Aufgrund der wirtschaftlichen, politischen und instituionellen Risiken, des bescheidenen Reduktionspotenzials und finanzieller Ressourcen, hat der CDM sein Ziel zur nachhaltigen Entwicklung in Afrika v.a. in den LDCs südlich der Sahara beizutragen, bis dato nicht erreicht. Dessen ungeachtet hat der CDM wesentlich zur Bewusstseinsbildung bei den Entscheidungsträgern in non-Annex I Länder bezüglich des Klimawandels beigetragen.

7.2 Curriculum Vitae

Personal details:

Surname:	Grünbaum
First name:	Gabriele
Nationality:	Austria

Education:

2008 - 2013	University of Vienna: International Development
2008 - 2013	University of Natural Resources and Life Sciences, Vienna: Environment and Bio-Resources Management
2002 - 2003	Danube University Krems / Austria: Management Development Programm „Banking and Finance“
1988:	University of Economics and Business Administration, Vienna: Doctorate rer.soc.oec.
1983:	University of Economics and Business Administration, Vienna: Magister rer.soc.oec.

Professional experience:

1986 - 2008	UniCredit Group: Bank Austria, Vienna
1983 - 1985	Semperit Ges.m.b.H, Vienna,

Language skills:

German (native), English (fluent), Italian and French (basic)

Vienna, June 2013

Dr. Gabriele Grünbaum