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CDM Market Support Study

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Date: 10 May 2013

Project number: MARDE13204

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The elaboration of the CDM Market Support Study was financed by the KfW-managed “PoA Support Centre”, which contributes to the expanded use and implementation of the PoA approach and which has been initiated and funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Summary

This report presents the results of the **CDM Market Support Study** - conducted by Ecofys in cooperation with Climatekos – the objectives of which are to identify opportunities and solutions for the implementation of CDM projects and the continued use of the CDM framework in situations with low CER prices. Furthermore, guidance is provided which can be used as a toolbox for CDM project developer and parties interested in supporting the CDM. In this respect, the study takes three different perspectives, whose combined results need to be considered to provide support to the CDM in an efficient and effective manner:

A. **Price vulnerability**:
   Which CDM project types are least sensitive to low CER prices?

B. **Financial instruments**:
   Which financial instruments could be used, at least to some degree, to support the CDM or CDM projects?

C. **Policy measures**:
   Which policy measures or price stabilisation measures could be used to support the CER market and/or the CDM in general?

In the first part we identify trends that indicate the required support and respective CER price levels that are needed to create sufficient incentives for the market to continue with the CDM. One project category, covering some energy efficiency, methane reduction and renewable energy project types, is identified as a promising target for support activities due to its feasibility in relatively low CER price bands and its sensitivity to changes in CER prices. The results, however, also show that these trends do not provide information that is detailed enough to allow for the exact determination of the required support on the level of individual projects.

For this purpose the second part identifies a reversed auction as most efficient which requires project developers in a competitive situation to indicate the required CER price level. This part also assesses a broad range of financial instruments that could be applied to provide additional support for the CDM. The assessment looks at efficiency and flexibility of instruments, but also considers the potential to involve the private sector. Promising results can be expected e.g. from “conditional subsidies” or “guaranteed floor prices” while also instruments such as “securitisation” or “bonds issuance” show advantages.

The third part additionally identifies measures that could be promoted on political levels to support the CDM. These measures range from “demand windows in existing ETS” and the “activation of new and/or voluntary demand” to “purchase activities by (public) institutions” and “results-based financing” approaches. In assessing the individual strengths and limitations of the measures the study identifies no measure that qualifies as “silver bullet” assuming that funds to support the CDM are limited. Due to the urgency to support the CDM, measures that have short implementation timelines are however recommended for immediate action to avoid that capacity and resources developed for the CDM permanently leave the market with negative effects for the future implementation of market mechanism and the involvement of the private sector.

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List of Abbreviations

CDM	Clean Development Mechanism
CER	Certified Emission Reduction
DOE	Designated Operational Entity
EB	CDM Executive Board
ERPA	Emission reduction purchase agreement
EUA	EU allowance
EU ETS	EU Emissions Trading System
FVA	Framework for various approaches
GCF	Green Climate Fund
GFP	Guaranteed floor price
GHG	Greenhouse Gas
JI	Joint Implementation
LDC	Least Developed Country
MRV	Monitoring, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Actions
NMM	New market-based Mechanism
ODA	Official Development Assistance
OECD DAC	Development Assistance Committee of the OECD
PDD	Project design document
PoA	Programme of Activities
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

This report presents the results of the CDM Market Support Study tendered by the KfW operated PoA Support Centre Germany which is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The study was conducted by Ecofys in cooperation with Climatekos.

Background

The CDM has, in the past, faced a stable demand for the supplied carbon credits and has achieved enormous success around the world in stimulating greenhouse gas (GHG) reductions in developing countries that would not have occurred otherwise. In addition, the CDM has been responsible for raising awareness of climate change and the possibilities of carbon markets and led to a wide range of skills and knowledge available in developing countries.

In this way the CDM played an important role in transferring the CO_2 price signal to even the most rural parts of the world. Moreover, the CDM mobilised significant financing for mitigation activities in developing countries. In its impact research study the high level panel on the CDM Policy Dialogue estimated that the CDM initiated total investments in CDM projects of about US$[1] 215 billion by June 2012 (Spalding-Fecher et al. 2012), while the direct financing provided through the purchase of Certified Emissions Reductions (CERs) is likely to be at least an order of magnitude lower.

However, the CDM is currently under strain since it relies on a price for CER that is sufficient to cover the abatement costs and transaction costs of a project. The CER price is dependent on the demand signal from industrialised nations, which mainly comes from installations with compliance obligations under the EU ETS as well as the commitments of individual countries within the context of the UNFCCC framework. However, these two demand sources decreased due to the economic recession and the slow progress in the international negotiations on a comprehensive future climate change agreement with ambitious emission reduction targets.

In addition, methodological and administrative improvements and a steep learning curve for the mechanism's participants accelerated the speed of the CDM to develop projects and to issue CERs, leading to an increase in supply. When matched with the decrease in demand both now and in the near future, CER prices have reduced enormously. Since 2011, CER prices have fallen from more than € 12 to price levels below € 1 at the end of 2012. In particular, current prices below € 1 are not sufficient to cover transaction costs for new projects and challenge even the initiation of issuance activities of existing projects.

The unbalanced supply and demand situation and the general high level of uncertainty might lead to a period of relative inactivity with the risk that structures and expertise established by the CDM get lost. Even if the CDM is discontinued on a larger scale, this expertise might be valuable for the operation of a future New Market-based Mechanism (NMM) or any other mitigation scheme with rigid

[1] When using $ we refer to US$ throughout the report.

monitoring of emission reductions, even though such mechanism may not be intend to be a continuation of the CDM. It is therefore time to consider potential solutions to these challenges and risks. A balanced CDM continuation or piloting activities towards new mechanisms could act as a stepping stone to pick up the existing skill base and selected approaches of the CDM.

In the situation, with lacking price signals stimulating the desired market activity, the role and the importance of dedicated CDM investors considerably changes. In recent years the investors have been mainly private players using the markets for compliance. In the current situation the role of public investors, who are driven by the aim to keep the markets, the framework and a minimum level of activity, is becoming more important. These strategic buyers look for projects or initiatives that comply with their own quality objectives and are worth, from their point of view, supporting. This creates a new market where projects and investors aim to match without primarily following a price signal.

Objectives

With this background in mind, the objective of this study is to support project developers and policy makers, interested in the initiation of mitigation activities, in identifying project opportunities which are less vulnerable against low CER prices and which have opportunities to receive financial or market support to be feasible in lower CER price ranges. Institutions which are aiming to keep the CDM framework alive, are supported in their decision making on how to achieve the greatest impact with the available funds.

In particular, the study aims to provide guidance on the identification of available financial instruments and broader policy measures that could be applied to complement support from CDM for project-based mitigation activities. The study does not solely focus on the current price level of below € 1 but moreover prepares for situations with slight CER price recoveries. Since individual CDM developers and CDM supporters follow their own agenda of preferences and objectives, the study aims to provide general guidance which could be understood as a toolbox of opportunities. Promising single measures or relevant combinations are, however, highlighted.

In this respect, the study takes three different perspectives:

A. Price vulnerability:
   Which CDM project types are least sensitive to low CER prices?

B. Financial instruments:
   Which financial instruments could be used, at least to some degree, to support the CDM or CDM projects?

C. Policy measures:
   Which policy measures or price stabilisation measures could be used to support the CER market and/or the CDM in general?

The research conducted in view of these three perspectives match with the three parts of the study report where individual approaches are presented.

Approach

The first part of the study, assessing price vulnerabilities, develops the methodological foundation for recommendations in the following sections. The following sections on financial instruments and policy measures are independently developed while suitable solutions to overcome market barriers might be represented by a combination of these measures and instruments. This in addition might have different implications for CDM activities in different CER price scenarios.

In particular, the first part (**chapter 2**) of the study develops a categorisation of projects according to specific characteristics which influence their price vulnerability (e.g. abatement and transaction costs, additional revenue streams, scalability, etc.). The aim is to assess the project feasibility and identify project development opportunities for various project types in different low CER price scenarios. For all of these scenarios different assumptions for a moderate price recovery are made. The results of this characterisation shall enable stakeholders to identify project types that are feasible in different low price ranges or become feasible based on specific amount of support by policy measures and/or financial instruments.

In **chapter 3,** the study identifies and assesses financing instruments that can be activated and used alongside carbon finance (CDM) to enable the continued development and implementation of climate change mitigation projects in developing countries. For this aim desk-based research is supplemented by interviews with key public and private experts. Identified potential financing instruments for cost and/or risk reduction are assessed against their potential level of achievement. The assessment is supported by the development of evaluation criteria and applied in an evaluation matrix to prioritise the financing instruments and make recommendations. A specific focus is on approaches that represent a mixture of public and private finance. Finally, the CDM requirement to ensure non-diversion of Official Development Aid (ODA) diversion is brought into context and discussed.

Chapter 4 identifies and assesses, mostly, political measures for market and price stabilisation and to address the supply-demand mismatch. Most promising general approaches included in this assessment are e.g. the introduction of quota or demand windows in demand markets, diverse purchase activities by governments or funds and the creation of new additional demand. Measures that mainly focus on CER supply limitations such as the ban of further project types, the reduction of crediting periods and e.g. discounts are not taken into consideration. Furthermore, increasing the ambition levels of reduction commitments of Parties is seen as essential but not as a direct option for stakeholders supporting the CDM. The particular approach for this part follows an expert involvement to derive a list of promising measures which are further assessed against a set of criteria. Recommendations are developed taking into account the results from the previous chapters.

The following chapters 2-4 of the report are structured as described above while chapter 5 includes overall conclusions and a summary of the most important recommendations for further action.

2 Analysis of abatement and transaction costs in different project types

To implement new CDM projects, or maintain existing ones, companies incur both costs for the abatement of GHG emissions and transaction costs for the CDM process. In order for projects to be viable, the CER revenues should cover both of these costs. This chapter investigates abatement and transaction costs and estimates ranges of CER prices that are needed to ensure the viability of various CDM project types. It also identifies and discusses other factors that impact the sensitivity of a project to CER prices. It concludes by defining project categories with regard to their viability in a low CER price scenario and identifying CDM projects which are viable and can be implemented with relatively low CER prices. The results of this chapter provide a basis for the design of financial instruments and policy measures discussed in chapters 3 and 4.

2.1 Costs in the CDM cycle

Abatement and transaction costs are incurred at various stages of a CDM project, depending on the status of the underlying asset (planning, construction, operation) and of the CDM process (planning, elaboration of the project design document (PDD), validation, registration, monitoring and verification, issuance). Figure 1 below is a schematic illustration of possible distribution of costs throughout the CDM cycle.

For this analysis, projects are categorised into “new” and “initiated”, which reflect different degrees of maturity along the CDM and investment cycles, as shown in Figure 1:

- New CDM projects: projects which have not been built yet and which have not started the CDM process. All abatement and transaction costs are yet to be incurred. CER prices are expected to cover the abatement costs and the transaction costs until the end of the project for the project to be viable to an investor.
- Initiated CDM projects: projects which are already under development (CDM process and construction under way) and projects which are implemented (registered and operating, additionality checked and approved). For such projects some costs have already been incurred. CER prices are expected to cover the gap between future costs (e.g. remaining capital investment, operation and maintenance costs, ongoing investment costs,[2] remaining upfront transaction costs, ongoing transaction costs) and non-CDM revenues (e.g. sale of electricity). A specific analysis at the project level is needed to identify the gap between costs and revenues.

[2] Projects that are scalable incur ongoing investment costs, e.g. projects that involve the distribution of household appliances over a certain period of time.

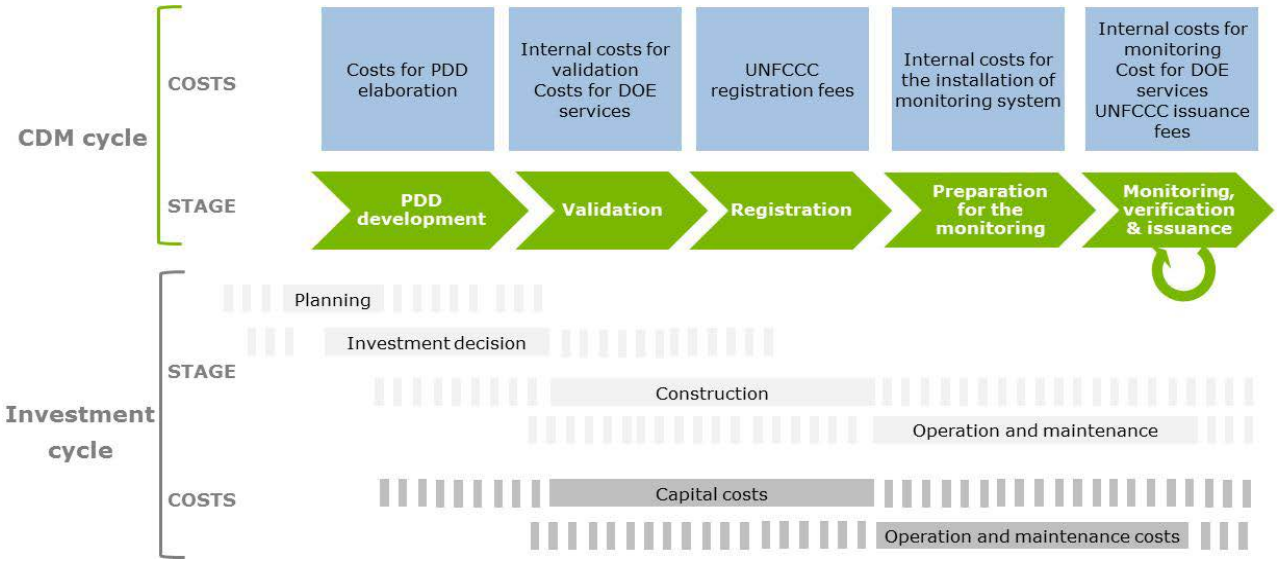

Figure 1: Abatement and transaction costs in the CDM cycle

2.2 Abatement costs

New CDM projects

The abatement cost of a new CDM project represents the average cost of reducing one tonne of CO_2 equivalent (tCO_2e) for a project over its lifetime. It is calculated as the present value of the CDM project costs (all capital and operation and maintenance costs) minus the CDM project revenues other than the sales of CERs over the life of the project, divided by the anticipated emission reductions over the life of the project. The abatement costs include costs to build and operate the CDM project and revenues from the operation of the CDM project, i.e. costs and revenues linked to the greenhouse gas reducing activity. Examples of costs and revenues included and excluded from the calculation of abatement costs are shown in Table 1.

Table 1: Examples of components of abatement costs

CDM projects	Included in abatement costs	Excluded from abatement costs
New wind farm	Construction, operation and maintenance costs; Revenues from the sale of electricity	
Methane capture in a wastewater treatment	Installation, operation and maintenance costs of the methane capture equipment	Operation and maintenance costs of the existing wastewater treatment plant
Nitrous oxide abatement	Installation, operation and maintenance costs of the nitrous oxide abatement equipment	Operation and maintenance costs and revenues from the factory where the nitrous oxide abatement equipment is installed

An investment analysis is included in the PDD of around three quarters of the registered projects.[3] These PDDs contain financial data that can be used to calculate total abatement costs. In this study recent reports[4] that calculated abatement costs for CDM projects based on data presented in PDDs were reviewed and compared. The results of this analysis are given in Table 2, which shows the abatement costs for different types of CDM projects where data is available.[5] The types were defined based on the classification suggested by the United Nations Environment Programme (UNEP) Risoe Centre CDM pipeline, which was used by the majority of the studies reviewed.

Table 2: Abatement costs of new CDM projects

Around \$ 0 / tCO_2	\$0 – \$5 / tCO_2	\$5 – \$10 / tCO_2	>\$ 10 / tCO_2
Coal mine/bed methane	Biomass energy	Cement	**EE industry**
Energy efficiency (EE) own generation	EE households*	**EE supply side**	Methane (domestic biogas)*
Geothermal	EE service	Methane (composting)*	Solar (PV)
Nitrous oxide (N_2O)	Fugitive emissions	**Wind**	Solar (thermal)
Perfluorocarbon (PFC)	**Hydro**		Tidal
Sulphur hexafluoride (SF6)	Landfill gas		**Transport**
	Methane avoidance (general)		
	Solar (cooking)*		
	Solar (heating)*		

Notes:

- Abatement costs were calculated using data from PDDs and are based on Castro 2012; Spalding-Fecher et al. 2012; UNFCCC 2011, 2012a; Rahman et al. 2012
- * highlights projects for which the cost given in the table is based on one study only.
- Project types highlighted in bold exhibit a significant standard deviation.
- The project types are listed in alphabetical order and not in order of costs.
- The limitations of the findings presented in Table 2 are discussed in the text below.

For most projects the abatement cost is below \$10/tCO_2e, with an average around \$2 - \$5/tCO_2e. However, costs vary significantly between project categories. They range from very high costs for, e.g. solar projects (above \$ 200/tCO_2e for solar PV and thermal), to costs around zero, e.g. for

[3] Spalding-Fecher et al. 2012.
[4] Castro 2012; Spalding-Fecher et al. 2012; UNFCCC 2011, 2012a; Rahman et al. 2012
[5] A MAC curve applies to a country and reflects national circumstances that are different from the assumptions used in PDDs, around e.g. baseline scenario, technology performance, project lifetime, and discount rate. As such CDM project abatement costs differ from the costs of similar emission reduction options in MAC curves and MAC curves are not used in this analysis.

industrial gases.[6] While some project types exhibit relatively low abatement costs over their lifetime, the upfront capital costs they incur can be significant. This is especially important for CDM projects that do not generate revenues other than from the sale of the CERs, where upfront investments for the mitigation activity are made only for the purpose of the CDM. For example, catalysts in N_2O destruction projects or methane capture and flaring equipment in methane avoidance projects will be repaid through the sale of the CERs only. In these cases, it is important that the CER revenues pay back these investments in a period that is acceptable to the investor.

The abatement costs presented in Table 2 are indicative and should be treated with caution. General trends emerged across the studies. Methane and industrial gas projects (HFC, N_2O, PFC, SF_6) tend to be cheaper than other technologies, mostly due to the high global warming potential of the GHG they are abating. A significant variability in the costs of projects within a given type is generally observed. This is shown in Table 2, where the project types that exhibit a significant standard deviation are highlighted. The difference between the minimum and maximum cost can be large. For example, for wind projects costs can go from negative costs to \$ 440/tCO_2e, for solar projects from \$ 1 to \$ 460/tCO_2e, for methane avoidance from negative costs to \$ 192/tCO_2e (UNFCCC 2012a)[7] and for landfill gas projects from negative to around \$ 30/tCO_2e (Spalding-Fecher et al. 2012).

This variability is due to the underlying projects as well as the data used:

Underlying projects:

- *Different technologies are included within a given project type*. For example, the hydropower type covers projects such as the construction of a small run-of-river power station but also the retrofit of an existing large dam based power plant. This variability is reflected in the standard deviation, which is important for hydro, wind and fossil fuel switch projects.
- *Different countries are included within a given project type*, ranging from fast developing economies like China to Least Developed Countries, where investment conditions differ.

Data:

- *The data used in the PDDs is not consistent.* Although the CDM Executive Board (EB) developed a stringent tool for the demonstration of additionality, the quality and type of the investment data used in the PDDs varies between PDDs.
- *The underlying sample of CDM projects is heterogeneous.* Some project types are more represented than others in the CDM pipeline. Table 3 below shows the share of the different types of CDM projects and programmes of activities (PoAs) in the pipeline. Cost estimates for

[6] Some costs were found to be negative, suggesting that projects are profitable without CER revenues. Negative costs can be due to several factors, for example to the method for calculating the abatement costs that might use assumptions different from the PDD and/or to other barriers the project is facing. Abatement costs were calculated based on projects that were successfully registered and the projects are hence assumed to be additional.
[7] For a renewable crediting period.

project types where the sample is high, like wind and hydro power projects, are more robust than projects of underrepresented types, like transport.

- *The picture is incomplete.* Abatement costs can only be calculated for projects where the data is available. This de facto eliminates all projects where no such data is available, e.g. projects where additionality is determined through the analysis of barriers only (around 23% of the registered projects).[8] For such projects it is not possible to estimate the CER price that is needed to ensure financial viability.
- *The sample of projects analysed is different across studies.* Some studies only considered PDDs where a full set of data was available (UNFCCC 2011) while others used average as proxies for the projects for which such data was not available (Rahman et al. 2012), used secondary data for some project types (Castro 2012 for HFC-23 projects) or focused on specific countries (Castro 2012).
- *The studies used different methods for calculating abatement costs.* The studies made different assumptions with regards to, for example, the duration of the project, the discount of emission reductions (e.g. discounted in Castro 2012 but not in Rahman et al. 2012) and the financial discount rates (e.g. Castro 2012 used the median of the discount rates used in the projects within the sample while Spalding-Fecher et al. 2012 used the rate used in the PDD for each project).
- *The values presented are not comparable.* For example, in UNFCCC (2012a) and Castro (2012) the median cost is presented, in UNFCCC (2011) the average cost is given, and in Spalding-Fecher (2012) only the standard deviation is provided.

Considering the above, the different studies also present different results. For example in Rahman (2012) afforestation/reforestation were found to be the most expensive projects while UNFCCC (2011) did not estimate costs due to the lack of data. Another example is fossil fuel switch, for which in UNFCCC (2012a) costs were found to be very low, while in Castro (2012) a cost significantly above \$ 10/tCO_2e was estimated. In Table 2, only the project types where results were consistent were included, and the others, such as afforestation and reforestation and fossil fuel switch, were left out.

As highlighted above, the underlying sample of CDM projects is heterogeneous as project types are represented in different proportions in the CDM pipeline. Table 3 shows the share of various types of PoAs in the pipeline. For underrepresented types, the data available is limited and can be unrepresentative. Therefore, the next sections of the report focus on the types most represented in the pipeline, either in terms of number of registered projects/PoAs and/or in terms of number of CERs issued. The list of types further analysed in the report are indicated in Table 3 below.

[8] In Spalding-Fecher et al. 2012, Table 11

Table 3: Shares of different project and PoA types in the CDM pipeline

Types	Number of registered projects	Share	Number of kCERs issued[9]	Share	Number of registered PoAs	Share	Further analysed
Afforestation	8	0.1%	0	0.0%	0	0.0%	N
Agriculture	1	0.0%	0	0.0%	0	0.0%	N
Biomass energy	548	8.4%	30,104	2.5%	3	3.5%	Y
Cement	21	0.3%	2,746	0.2%	0	0.0%	N
CO_2 usage	3	0.0%	10	0.0%	0	0.0%	N
Coal bed/mine methane	70	1.1%	23,059	1.9%	0	0.0%	Y
Energy distribution	13	0.2%	781	0.1%	2	2.4%	N
EE households	64	1.0%	176	0.0%	16	18.8%	Y
EE industry	77	1.2%	2,097	0.2%	1	1.2%	N
EE own generation	279	4.3%	53,535	4.4%	0	0.0%	Y
EE service	10	0.2%	6	0.0%	3	3.5%	N
EE supply side	42	0.6%	2,041	0.2%	0	0.0%	N
Fossil fuel switch	83	1.3%	40,583	3.4%	0	0.0%	Y
Fugitive	29	0.4%	17,138	1.4%	0	0.0%	N
Geothermal	25	0.4%	5,708	0.5%	0	0.0%	N
HFCs	22	0.3%	482,794	40.0%	0	0.0%	N[10]
Hydro	1,834	28.0%	135,458	11.2%	12	14.1%	Y
Landfill gas	309	4.7%	38,208	3.2%	4	4.7%	Y
Methane avoidance	553	8.4%	13,910	1.2%	15	17.6%	Y
Mixed renewables	7	0.1%	16	0.0%	0	0.0%	N
N_2O	99	1.5%	243,344	20.1%	0	0.0%	Y
PFCs and SF_6	14	0.2%	2,875	0.2%	0	0.0%	N
Reforestation	36	0.5%	5,704	0.5%	0	0.0%	N
Solar	270	4.1%	217	0.0%	24	28.2%	Y
Tidal	1	0.0%	108	0.0%	0	0.0%	N
Transport	26	0.4%	872	0.1%	1	1.2%	N
Wind	2,112	32.2%	106,283	8.8%	4	4.7%	Y

Source: (UNEP Risoe, CDM and PoA pipelines, 1 March 2013)

Note: the project types analysed in the study represent 94.9% of the registered projects, 56.7% of the CERs issued by CDM projects, and 91.8% of the registered PoAs.

[9] This does not include CERs from PoAs.
[10] Excluded as only secondary data is available on costs – see Table 2.

Initiated CDM projects

The abatement costs given in Table 2 are applicable to new CDM projects. For initiated CDM projects, upfront capital costs were incurred and are considered as sunk costs. The decision to maintain the CDM project depends on future costs and revenues. In this case CER revenues are expected to cover the potential gap between costs and revenues. When this gap is not covered, the CDM project might be discontinued.

For projects that generate income other than CDM income, future revenues help reduce or close the gap, as revenues are often higher than operation and maintenance costs. Additional revenues therefore help mitigate the impact of changes in CER revenues on the project. Such revenues can include:

- Revenues from the sale of a (by-)product (e.g. electricity, heat, biogas)
- Cost savings (e.g. reduced internal costs for the purchase of fossil fuel or electricity from the grid, reduced purchase of fertilisers)

Table 4 below looks at the potential non-CDM revenues for the different project types identified in Table 3. Besides industrial gas projects and projects where methane is captured and flared without electricity generation, most projects are likely to include significant revenue stream in addition to CER revenues. This is the case for wind and hydropower projects, which represent around 60% of the registered CDM projects (see Table 3). In a low CER price scenario, many of these projects will continue to operate due to the additional revenue streams, which generally cover operation and maintenance costs. However, the CDM verification and issuance process, and in some cases CDM monitoring activities, might be delayed or stopped if the CDM transaction costs linked to these steps are higher than the potential CER revenues, i.e. if the cost of producing a CER is higher than its price. This is discussed in section 2.3.

Future costs can have a strong impact on projects that do *not* generate income other than CER revenues. In this case, the only source of revenues to cover the operation and maintenance costs is the CER revenues. Projects relying on CER revenues only include installations where methane is captured and flared without heat/electricity generation, and projects that abate emissions of industrial gas. An analysis of a sample of PDDs that used simple cost analysis showed that operation and maintenance costs amount on average to around € 0.5/tCO_2 for N_2O abatement projects and € 1.9/tCO_2 for landfill gas and coal mine / bed methane projects (Vivid Economics 2013). In the current price scenario, operation and maintenance costs of such projects are not covered by CER revenues. These figure do not include CDM transaction costs, which have to be added on top of that. In a low price scenario, such projects are likely to be discontinued and emission reductions likely not to be achieved.

The exact scale and nature of the ongoing costs and revenues are project specific and fluctuate over time, independently from the CER prices. For example, the amount of revenues coming from the sale of electricity is influenced by the feed-in tariff policy for the technology in the host country and cost savings are impacted by the price of the fuel that is saved. A project-specific analysis is needed to accurately determine the costs and revenues an initiated project is benefiting from, and to estimate the scale of the gap between costs and revenues, if any, that needs to be covered by CER revenues.

Table 4: Non-CDM revenue streams for initiated CDM projects

Type	Non-CDM revenue streams	Examples/comments
Biomass energy	Yes (Y)	Fuel cost savings, electricity/ heat
Coal mine/bed methane	No (N) (if capture and destruction only) Y (if electricity/heat generation included)	Electricity/heat *Operation and maintenance costs around € 1.9/tCO_2*
EE households	Y	Fuel cost savings
EE own generation	Y	Fuel cost savings, heat
Fossil fuel switch	Y (for greenfield projects, e.g. new natural gas plants) N (for switch in existing plants)	New plants: electricity Existing plants: fuel switch can result in cost savings when the alternative fuel is cheaper than the fuel replaced
Hydro	Y	Electricity
Industrial gases	N	*Operation and maintenance costs around € 0.5/tCO_2 for N_2O projects*
Landfill gas	N (if capture and destruction only) Y (if electricity/heat generation included)	Electricity/heat *Operation and maintenance costs around € 1.9/tCO_2*
Methane avoidance	N (if capture and destruction only) Y (if electricity/heat generation included, if manure used for fertilisation)	Electricity/heat, fertilisers
Solar	Y	Electricity/heat
Wind	Y	Electricity

Notes:

- "Electricity" refers to the sale of electricity to the grid or to a user as well as the avoided costs due to the generation of electricity for in-house use.
- Not all sources of revenues are available for all projects. For example, a waste gas project can increase the production of heat for its internal purposes only and generate cost savings, but it can also sell heat to other users.

2.3 Transaction costs

Transaction costs are another important cost component under the CDM. Transaction costs are extra costs imposed by the CDM. They are summarised in Figure 1 and include:

- Upfront fixed costs to develop the PDD, get it validated and registered, and to set-up the monitoring system, and
- Ongoing costs for the monitoring, verification and issuance of CERs.

Table 5: Transaction costs for new and initiated CDM projects

		New CDM projects (per project)						**Initiated CDM projects** (per verification event)					
	Average annual emission reductions ($ktCO_2e/y$)	PDD elaboration (k€)	Validation Internal costs (k€)	Validation DOE services (k€)	Registration UNFCCC fee (k€)	Installation monitoring system (k€)	**Total fixed upfront costs (k€)**	Monitoring internal costs (k€)	Verification DOE services (k€)	Issuance UNFCCC fee (k€)	**Total fixed verification costs (k€)**	**Verification costs per tCO_2e** (€/tCO_2e	**Total (€/tCO_2e** over the lifetime of the project)
Biomass energy	79	10 - 50	10 - 61	25 – 40	11	0 – 15	56 - 177	5 – 10	15 - 29	11	31 - 50	0.39 – 0.64	0.49 – 0.81
Coal mine/bed methane	510	10 - 50	10 - 61	35 – 70	78	0 – 15	133 - 274	5 – 10	20 – 30	78	103 - 118	0.20 – 0.23	0.21 – 0.26
EE households	26	6 - 15	8 - 16	25 – 40	3	0 – 15	44 – 169	3 – 10	15 - 30	3	21 - 43	0.41 – 0.84	0.58 – 1.33
EE own generation	197	6 - 50	8 - 61	25 – 35	30	0 – 7	69 - 103	3 – 10	15 – 27	30	48 - 67	0.24 – 0.34	0.26 – 0.38
Fossil fuel switch	491	6 - 15	10 - 61	30 – 35	75	3.5 - 15	119 – 145	3 – 10	20 – 25	75	98 - 110	0.20 – 0.22	0.21 – 0.24
Hydro large-scale	208	6 – 15	8 - 16	25 – 30	31	0 – 3.5	70 – 96	3 – 10	15	31	49 - 65	0.24 – 0.31	0.26 – 0.36
Hydro small-scale	29	6 – 15	8 - 16	20 – 29	3	0 – 3.5	37 – 67	3 – 10	15 – 23	3	21 - 36	0.37 – 0.63	0.51 – 0.90
Landfill gas	160	10 - 50	10 - 61	25 – 35	24	0 – 15	69 - 185	5 – 10	20 – 28	24	49 - 62	0.30 – 0.39	0.33 – 0.45
Methane avoidance	59	10 - 50	10 - 61	25 – 35	8	0 – 15	53 – 174	5 – 10	15 – 29	8	28 - 47	0.48 – 0.80	0.54 – 1.00
N_2O nitric acid	289	10 - 50	10 - 61	35	44	10 – 15	109 – 205	5 - 18	25	44	72 - 87	0.35 – 0.30	0.27 – 0.34
N_2O adipic acid	7,294	10 - 50	10 - 61	35	273	10 – 15	338 – 434	5 - 18	25	1,137	1,167 – 1,180	Around 0.16	Around 0.16
Wind large-scale	120	6 – 15	8 - 16	25 - 30	18	0 – 3.5	57 – 82	3 – 10	15 -22	18	36 – 50	0.30 – 0.41	0.33 – 0.49
Wind small-scale	15	6 – 15	8 - 16	25 – 28	1	0 – 3.5	40 – 64	3 – 10	15 – 21	1	19 – 32	0.64 – 1.08	0.92 – 1.58
Solar	30	6 - 15	8 - 16	20 – 27	4	0 – 7	38 – 69	3 – 10	10 - 21	4	17 - 35	0.28 – 0.58	0.41 – 0.91

Notes on Table 5:

- Data is for projects with renewable crediting periods. The costs are not discounted. The ongoing transaction costs are assumed constant throughout the crediting period. It is assumed that one verification is carried out per year for projects generating > 50,000 CERs/y and one every couple of years for projects generating < 50,000 CERs/y. For the calculation of the total transaction costs per tCO2 the average annual expected emissions reductions as per the UNEP Risoe CDM pipeline is used, and the cost for two renewals of the crediting period is included.
- The range of costs presented above shows average ranges for projects in a standard scenario. In complex scenarios and/or for complex projects transaction costs are likely to be higher. Refer to the text below and to Table 6 for more details.

For the purpose of this study, data on transaction costs was collected from a sample[11] of Designated Operational Entities (DOEs) and project developers for the types of CDM projects most represented in the CDM pipeline.[12] The results of the analysis are presented in Table 5 and Table 6 below. The two main types of registered CDM projects (wind and hydro) were broken down into small and large-scale projects[13] as the average expected emissions, which have an impact on the transaction costs per tCO_2e, are different. Projects in the N_2O type were further broken down into N_2O from the destruction of adipic acid, and N_2O from the destruction of nitric acid, given the difference in volumes.

Table 5 shows that transaction costs per tCO_2 can be relatively low over the project lifetime (from € 0.16/tCO_2e to € 1.58/tCO_2e). These results are consistent with other studies reporting on transactions costs.[14] Although CER prices are currently very low (around € 0.3)[15] they can still cover transaction costs for some projects. However, as shown in Table 5 fixed upfront costs can be high and affect new and initiated projects differently.

New CDM projects

For new projects, upfront fixed transaction costs can be a significant part of the investment and are largely independent from the size of the project and the expected CER volume. This is an issue for project developers who need the additional income from the CERs to make the project viable in the first place. For example, for a new methane avoidance project, the one-off upfront costs before registration are estimated at between € 53k and € 174k. With the current CER price at around € 0.3, up to around 550,000 CERs would be needed to recover these upfront costs alone.[16] This would represent just less than 10 years worth of emission reductions of an average sized methane avoidance project.[17] This picture dramatically improves with only a slight increase in the CER price: only up to 87,000 CERs would be needed at a price of € 2 per CER, which would be generated in less than two years.

[11] DOEs representing 37% of the registered CDM projects and project developers representing 14% of the registered CDM projects. Source: UNEP Risoe, CDM pipeline, 1 March 2013.
[12] Representing 94.9% of the registered projects, 56.7% of the CERs issued by CDM projects, and 91.8% of the registered PoAs. Source: UNEP Risoe, CDM and PoA pipelines, 1 March 2013.
[13] Respectively up to 15 MW and above 15 MW, as defined by the UNFCCC.
[14] Other studies found that overall transaction costs are generally below $ 1 per tCO_2e and around $ 0.4 on average. See Castro 2012; Spalding-Fecher et al. 2012; UNFCCC 2011; Rahman et al. 2012; Michaelowa 2012.
[15] € 0.30/CERs on 3 May March 2013. Source: Thomson Reuters Point Carbon, 3 May 2013, value for sCERs.
[16] Excluding the transaction costs for the verification and issuance of these CERs.
[17] Assuming an average annual CER generation equal to the average annual emissions reductions estimated in the PDD for methane avoidance projects using a renewable crediting period (59k).

These upfront costs are also a risky investment, as they can only be recovered through the issuance of CERs once the project is registered by the CDM Executive Board. Currently 23% of the projects submitted for validation are ultimately rejected, withdrawn, receive a negative validation opinion or have their validation terminated.[18]

Initiated CDM projects

For initiated projects, the fixed costs of monitoring, verification and issuance per tCO_2e are important in the decision to continue monitoring, verifying emission reductions and issuing CERs. When such costs are not recovered by CER prices, project developers might decide to stop these activities. For example, as shown in Table 5, for a wind project generating 120,000 CERs per year,[19] the monitoring, verification and issuance costs are estimated at around € 0.30 to 0.41/tCO_2e in case of an annual verification,[20] while CER prices are currently around € 0.30.[21,22] For an average EE household project, these costs can amount to up to € 0.84/tCO_2e in case of a biennial verification, or € 1.68/tCO_2e in case of an annual verification, well above the current CER prices. It should be noted that the values provided in Table 5 are under a standard scenario (see below) and are therefore likely to be conservative. For example, the above estimate of cost for an EE household project assumes average annual emission reductions of 26 $ktCO_2e$. For some cookstove projects, which fall into this type, the annual emission reductions can be significantly lower (e.g. around 3 $ktCO_2e$), which result in much higher costs per tCO_2e.

Table 5 shows that, as for abatement costs, there is a huge variability in transaction costs within a given project type. This is due to various reasons, including:

- Heterogeneity of projects within a type (as highlighted in the cookstove example above and as discussed in section 2.2)
- Variability of expert judgement
- Wide range of possible scenarios for a given project.

Table 6 illustrates the range of possible scenarios. In Table 5 a standard scenario was assumed, i.e. an approved methodology is used, there is data available to elaborate the PDD, the validation is in a country easily accessible, and there is no completeness check query during the registration and issuance processes. Table 5 also excludes any brokerage or legal fees and host countries' levies on carbon transactions. This suggests that in more complex situations, transaction fees are likely to be higher than indicated in Table 5.

Table 5 applies to CDM *projects*. For *PoAs,* the costs also depend on the actual number of CPAs included under the PoA, which cannot be predicted ex-ante. The more CPAs that are added, the lower the costs per CER are. However, low CER prices can significantly limit the number of new CPAs and impact the ability of PoAs to scale up (see section 2.5.2).

[18] Based on UNEP Risoe CDM pipeline, 1 March 2013. For three quarter of these projects, the validation was terminated by the project developer.
[19] Average annual emission reductions for large scale wind projects. Source: UNEP Risoe, CDM Pipeline, Mar 2013.
[20] € 5 to € 10k for the monitoring, € 15 to € 22k for the verification and € 14.4k for the share of proceeds.
[21] Source: Point Carbon, 3 May 2013 value for sCERs.
[22] The impact of non-CER revenues is not considered in this figure.

Table 6: Factors affecting transaction costs

	Low cost	High cost
PDD elaboration and validation *Internal costs*	Established methodology, applicable standardised baseline Available data (e.g. similar projects already implemented) PDD developed in-house or by a local consultant Elaboration of a single PDD	New methodology to be developed Complex methodology Lack of data (e.g. first projects in the country) PDD developed by an international consultant Elaboration of multiple PDDs (e.g PoAs: PoA Design Document, CPA-DD(s))
Validation *DOE costs*	Small scale Established methodology, applicable standardised baseline No completeness check query or request for review Easily accessible project location Validation of a single PDD	Large scale PoA Methodology with limited experience Completeness check query or request for review Remote project location Validation of multiple PDDs
Registration *UNFCCC fee*	Small projects (no registration fee for projects that are expected to generate a maximum of 15,000 tCO_2e/y) Projects in Least Developed Countries (LDCs) exempted	Large projects
Installation of the monitoring system *Internal costs*	Monitoring system embedded in the core business Few parameters to monitor	Monitoring system in addition to monitoring of core business Many parameters to monitor
Monitoring of emissions reductions *Internal costs*	Monitoring system embedded in the core business Few parameters to monitor	Monitoring system in addition to monitoring of core business Many parameters to monitor
Verification *DOE costs*	Established methodology Small projects Single installation to verify Few monitoring parameters to verify No completeness check query or request for review Low frequency of verification Easily accessible project location	Complex methodology Large projects Multiple installations to verify Many monitoring parameters to verify Completeness check query or request for review High frequency of verification Remote project location
Issuance *UNFCCC fee*	Small projects	Large projects

2.4 Total costs

Table 7 below combines the results from sections 2.2 and 2.3, presents the total costs (abatement and transaction) per project type and defines CER price bands. The table is applicable to new stand-alone CDM projects and presents the costs over the lifetime of the project. As mentioned in section 2.3, costs for PoAs depend on the actual number of CPAs included under the PoA and are likely to be higher for PoAs where there is a limited number of CPAs.

CER price bands for initiated CDM projects are not presented as they depend on actual costs and revenues, for which quantitative data is lacking and which are project specific.

Table 7: Total costs of new CDM projects (stand-alone projects)

Type	**Abatement costs**[23] (€/tCO_2e) *Source: Table 2*	**Transaction costs** (€/tCO_2e) *Source: Table 5*	**Total costs** (€) *Sum abatement and transaction costs*	**CER price band** (€)
N_2O adipic acid	Around 0	Around 0.16	Around 0.2	**Around 0**
N_2O nitric acid	Around 0	0.27 – 0.34	Around 0.3	
Coal mine methane	Around 0	0.21 – 0.26	0.2 – 0.3	
EE own generation	Around 0	0.26 – 0.38	0.3 – 0.4	
Biomass energy	0 – 3.9	0.49 – 0.81	0.5 – 4.7	**0 - 5**
EE households	0 – 3.9	0.58 – 1.33	0.6 – 5.2	
Hydro large-scale	0 – 3.9	0.26 – 0.36	0.3 – 4.3	
Hydro small-scale	0 – 3.9	0.51 – 0.90	0.5 – 4.8	
Landfill gas	0 – 3.9	0.33 – 0.45	0.3 – 4.3	
Methane avoidance	0 – 3.9	0.54 – 1.00	0.5 – 4.9	
Wind large-scale	3.9 – 7.8	0.92 – 1.58	4.2 – 8.3	**5 – 10**
Wind small-scale	3.9 – 7.8	0.41 – 0.91	4.8 – 9.4	
Solar	>7.8	0.33 – 0.49	Above 8.1	**> 10**
Fossil fuel switch	Estimates vary[24]	0.21 – 0.24	Estimates vary	Estimates vary

2.5 Other factors affecting the sensitivity to CER prices

Some other factors not captured in the abatement and transaction costs discussed in the previous sections can affect the sensitivity of a project to CER prices. These include:

- CDM performance
- Scalability
- Financial situation of the project developer

[23] Table 2 presents the costs in US$. The values were converted into € for the purpose of comparison with transaction cost. Exchange rate: US$ 1 = € 0.78 (3 April 2013).
[24] See further explanation below Table 2.

2.5.1 CDM performance

In PDDs, the expected emission reductions are determined based on an approved methodology and on the expected performance of the underlying project and it is assumed that all emission reductions will be converted into CERs. However, an analysis of the CDM pipeline (see Table 8 below) shows that the CDM performance of projects (i.e. the ratio of the number of CERs expected in the PDDs to the number of actually issued CERs) is not 100% for all projects.

For some projects, such as industrial gas and renewable energy, the CDM performance is close to what is expected in the PDD. In contrast, for some others, such as methane avoidance and landfill gas projects, the performance is around half of what was expected in the PDD. This results in CER revenues lower than expected, and in comparatively higher transaction costs. This suggests that a CER price higher than the total costs (abatement and transaction costs) might be needed to ensure the project viability for projects that underperform (e.g. methane avoidance and landfill gas), and a lower price for projects that over perform (e.g. N_2O abatement).

Table 8: CDM performance

Type	CDM performance	Number of projects which have issued
Reforestation	171%	7
N2O	115%	52
HFCs	109%	19
Solar	99%	14
EE industry	86%	33
Fugitive	84%	11
Hydro	84%	665
Wind	83%	560
Geothermal	81%	8
Biomass energy	78%	201
EE own generation	78%	128
EE supply side	75%	13
PFCs and SF6	70%	7
EE service	63%	1
Coal mine/bed methane	62%	31
Fossil fuel switch	62%	49
EE households	57%	6
Methane avoidance	50%	167
Cement	49%	12
Landfill gas	49%	108
Tidal	46%	1
Transport	40%	6
CO_2 usage	31%	1
Afforestation	-	0
Agriculture	-	0

Source: (UNEP Risoe, 1 March 2013)

For new CDM projects, the average CDM performance can provide an insight into the risks for under or over delivery of a particular project type. However, the average value presented in Table 6 is for the overall pipeline, since the start of the CDM. A more detailed analysis would be needed to analyse

the evolution of the CDM performance since the start of the CDM and have a more accurate picture of the performance as of today. This study therefore does not quantify the impact of CDM performance on the transaction costs identified in section 2.3.

For initiated CDM projects, the actual performance of the project can be used to more precisely assess the transaction cost per tCO_2e.

2.5.2 Scalability

The CDM covers single-installation as well as multiple-installation projects. For projects that include one installation only (e.g. construction of a power plant, installation of an abatement equipment in a factory), the size of the project is decided at the time of the planning.

For multiple installation projects (e.g. installation of multiple solar water heaters, cookstoves, solar cookers, construction of several power plants as part of a bundle of projects or under a PoA, etc.), the size of the project is estimated at the time of planning. Its actual size generally depends on the actual costs and revenues of the project, including CER revenues, as CER revenues can be used to expand the project. For example:

- *CER revenues can be used to provide subsidies for the dissemination of low-emission appliances*: e.g. in a cookstove distribution project, CER revenues can be used to subsidise the price of the cookstove. If the CER price decreases, the amount of money available to subsidise the cookstoves will be reduced. That can be translated into a higher selling price to households and accordingly fewer households will be able to afford a cookstove. The scale of the project is reduced due to lower CER prices.
- *CER revenues are used to grow the business of the project developer and further expand the project*: e.g. in a solar water heater distribution project, the company providing the solar water heaters can use the CER revenues to not only subsidise solar water heaters but also to build an additional manufacturing facility, reach out to additional solar water heater manufacturers and expand their offer, etc. A reduction in CER prices limits the expansion of the company, which in turn limits the scale of the project.

This consideration affects both new and initiated projects. The issue of scalability is particularly relevant for PoAs, which are designed to increase in scale over time. However, standard CDM projects can also be affected by the issue of scalability (e.g. small-scale household energy efficiency projects). Table 9 assesses the scalability of CDM project types and gives examples of possible projects that are scalable. Scalable projects are sensitive to CER price fluctuations, both decrease and increase:

- *CER price decrease*: as mentioned above low CER prices are most likely to limit the expansion of scalable projects. For initiated projects, monitoring, verification and issuance activities might continue if CER prices are higher than the cost of producing CERs (see section 2.3); existing installations might continue operating if the additional revenue streams cover the operation and maintenance costs and, if applicable, new installations might be implemented if revenues cover ongoing investment costs (see section 2.2). However, the rate of new

installations might decrease or stop. This is especially the case for projects where ongoing investment costs are high (e.g. a few € per appliance in case of cookstove projects).

- *CER price increase*: for initiated projects, the project infrastructure is already in place (e.g. the project might be registered, the network for manufacturing and distribution of appliances might be in place in case of a cookstove project) and the upfront transaction costs have been incurred. If price increases to a level that can cover the operation and maintenance costs and, if applicable, the ongoing investment costs, the project might start expanding quickly after price recovery.

Table 9: Assessment of scalability

Type	Scalable	Description
Biomass energy	Y	Projects that involve several small-scale biomass units (e.g. small biomass power plants, small biomass boilers)
Coal mine/bed methane	N	Not prone to scalability unless several small sites are covered under a PoA
EE households	Y	Projects that involve appliances in several households (e.g. distribution of efficient lightbulbs, cookstoves)
EE own generation	N	EE own generation projects usually involve the installation of equipment to recover waste energy in one industrial facility
Fossil fuel switch	N	Fossil fuel switch projects usually involve a fuel switch in one facility
Hydro large-scale	N	Large-scale hydro projects usually involve the construction and operation of one power plant
Hydro small-scale	Y	Projects that involve several small-scale hydro power plants
Landfill gas	Y	Projects that involve several small-scale sites (e.g. composting in small landfills or communities, combustion of municipal solid waste in small sites)
Methane avoidance	Y	Projects that involve several small-scale methane avoidance units (e.g. domestic manure – household biogas units, wastewater treatment in small plants),
N_2O nitric acid	N	N_2O nitric acid project usually involve the installation of abatement equipment in one facility
N_2O adipic acid	N	N_2O adipic acid project usually involve the installation of abatement equipment in one facility
Solar	Y	Projects that involve small-scale solar units (e.g. solar water heaters, solar cookers, PVs in buildings, solar lamps)
Wind large-scale	N	Large-scale wind projects usually involve the construction and operation of one wind farm
Wind small-scale	Y	Projects that involve several small-scale wind farms

2.5.3 Situation of the project developer

Sections 2.2 to 2.5.2 have shown that the CER price that is required by a project to be or remain viable depends on the various characteristics of the projects, including costs. This price will also depend on the situation of the project developer, and more specifically, *inter alia*, on:

- *Its financial situation and the margin it requires*. Some project developers might be willing or able to incur losses due to low CER prices while others will want to ensure a certain margin on their investment.
- *Its core business.* Some projects, e.g. construction of renewable energy power plants, are integrated with the core business of the developers. Some other projects, e.g. the installation of a wastewater treatment in a palm oil mill, are not part of the core business. The decision-making process is likely to be influenced by the level of integration of the CDM in the core business of the developers.
- *Its ability to secure financing for the project independently from the prospect of generating CERs*. Low CERs will particularly impact new projects where financing is expected to be conditional to CER revenues (e.g. loans conditional to expected CERs, Emissions Reduction Purchase Agreement (ERPA) signature based on forward selling with buyers covering the transaction costs).
- *Its obligation to deliver CERs*, e.g. as per agreed in the ERPA. When project developers have to comply with obligations to deliver CERs they might have to do it at a loss.
- *The purpose of its participation in the CDM.* Investment in low-emission technologies can have non-financial advantages, such as benefits for the image of the company. Developers might be willing to incur limited losses to maintain this image.
- *Its perception of the project risks and its management of these risks.* Project developers will consider risks related to the climate policy, the CDM institutional framework and the investment climate both internationally and in the host country differently in their decision making projects.

The list of factors above is illustrative rather than exhaustive, and aims to highlight that several factors influence the CER price a project developer will consider as ensuring or maintaining the viability of a project. An assessment at the project level is needed to provide an accurate picture of the determinants for the assessment of CER prices needed by a project developer.

2.5.4 Assessment of the sensitivity to changes in CER prices

Table 10 below combines the results from sections 2.5.1 to 2.5.3 and 2.3 and assesses the sensitivity of CDM project types to changes in CER prices. A project is deemed sensitive to changes in CER prices if it is scalable and/or does not have revenues other than those which are CDM-related. The CDM performance is given but is not taken into account in the sensitivity assessment.

Table 10: Assessment of sensitivity to changes in CER prices

Type	Additional revenues	Scalability	CDM perfor-mance	Sensitivity	Comment
EE own generation	Y	N	78%	Low	
Fossil fuel switch	Y	N	62%		
Hydro large-scale	Y	N	84%		
Wind large-scale	Y	N	83%		
Coal mine methane	N / Y	N	62%	Conditional	High sensitivity to decrease in CER prices if no additional revenues
Biomass energy	Y	Y	78%	Conditional	High sensitivity to both increase and decrease in price for scalable projects
EE households	Y	Y	57%		
Hydro small-scale	Y	Y	84%		
Solar	Y	Y	99%		
Wind small-scale	Y	Y	83%		
Landfill gas	N / Y	Y	49%	Conditional	High sensitivity to both increase and decrease in price for scalable projects High sensitivity to decrease in prices if no additional revenues
Methane avoidance	N / Y	Y	50%	Conditional	
N_2O nitric acid	N	N	115%	High	
N_2O adipic acid	N	N	115%		

2.6 CER price ranges needed to ensure viability

Table 7 defines CER price bands that are needed to maintain viability of new CDM projects and Table 10 assesses the sensitivity to changes in CER prices of CDM projects. Three main categories of projects emerge from an assessment of these two tables. These categories are as follows and are represented in Table 11:

- **Category 1**: low CER price band (€ 0 – € 5/tCO_2), sensitivity likely to be low
- **Category 2**: medium – high CER price bands (€ 5 – € 10/tCO_2 and > € 10/tCO_2), low sensitivity
- **Category 3**: low CER price band (around € 0/tCO_2), high sensitivity

Category 1 and 3 projects can be implemented with relatively low CER prices, but Category 3 projects are sensitive to changes in CER prices. Category 2 projects can exhibit a low sensitivity to CER prices, but require a higher CER price to be viable. Category 1, which can be implemented with relatively low CER prices and can exhibit a low sensitivity to changes in CER prices, seems most promising for being supported by financial instruments and/or policy measures. Respective support opportunities will be discussed in the following chapters.

Table 11: Categories of CDM projects (price and sensitivity)

	CER price band (€) *Source: Table 7*	**Sensitivity** *Source: Table 10*	**Category**
EE own generation	Around 0	Low	Category 1
Coal mine methane		Conditional	
EE households	0 – 5		
Methane avoidance			
Hydro small-scale			
Biomass energy			
Landfill gas			
Hydro large-scale		Low	
Wind small-scale	5 – 10	Conditional	Category 2
Wind large-scale		Low	
Solar	> 10		
Fossil fuel switch	Estimates vary		
N_2O nitric acid	Around 0	High	Category 3
N_2O adipic acid			

However, these results are indicative and should be treated with caution. As highlighted in the sections above, there is a high variability in costs. Costs are dictated not only by the technology, size of project, geography, employed but also by the CDM process followed. Besides, factors other than costs impact the sensitivity of a project and its developer to fluctuations in CER prices (scalability, CDM performance, situation of the project developer). These factors are specific to each project and the study only provides indications for some generic cases. Finally, the status of the project in the development of the underlying asset and also in the CDM process has an impact on the CER price a developer will be able or willing to accept. As such, these results can inform the design of financial instruments and policy measures, but should not be solely relied upon. In order to have an accurate estimate of the CER price a project developer needs, a thorough investment analysis combined with an analysis of the other factors the project developer is considering in its decision making is needed.

Despite these limitations, the results of this chapter give a useful insight into the sensitivity of CDM projects to fluctuations in CER prices, which is an important element in the design of supporting instruments for CDM projects discussed in chapters 3 and 4.

It should be noted that some buyers will also consider non-monetary factors in the design of supporting instruments, such as technology used, region where the project is located and co-benefits of the project. For example, certain project types in Categories 1 and 3 such as N_2O or large hydro projects are viable in a low CER price, but they might not be favoured by buyers. Conversely some project types in Category 2 such as solar projects, and especially in LDCs, might be favoured by buyers despite the high CER price. This differentiation process is further discussed in section 4.2.5.

3 Identification and analysis of supporting instruments for CDM Projects

In this chapter we aim to explore how financing instruments could be designed and identified, so that they can be used alongside carbon finance, in particular CDM, to enable the development and implementation of climate change mitigation projects in developing countries at the most efficient use of financing. Such instruments take into account results from chapter 2 and seek to understand under what form, additional finance can be brought to projects to make CDM projects viable financially.

There are two stages at which finance can be provided to a CDM project:

- During the implementation of the project, including the installation, construction and operational phases, or
- On delivery of CERs.

The diagram below shows the various stages of a CDM project. It is envisaged in this study that financial instruments may be designed to bring financing from public and private sources during the "Construction Phase", when the risk capital is medium and is similar to traditional project finance. Such instruments would also be used during the "Operation Phase" when there is actual delivery of CERs. We do not envisage the "Planning Phase" as a target for additional financing as "seed financing" will not be covered by such instruments. Here seed financing would refer to finances brought upfront to provide initial funding to the project whether financers receive shareholding in return or not.

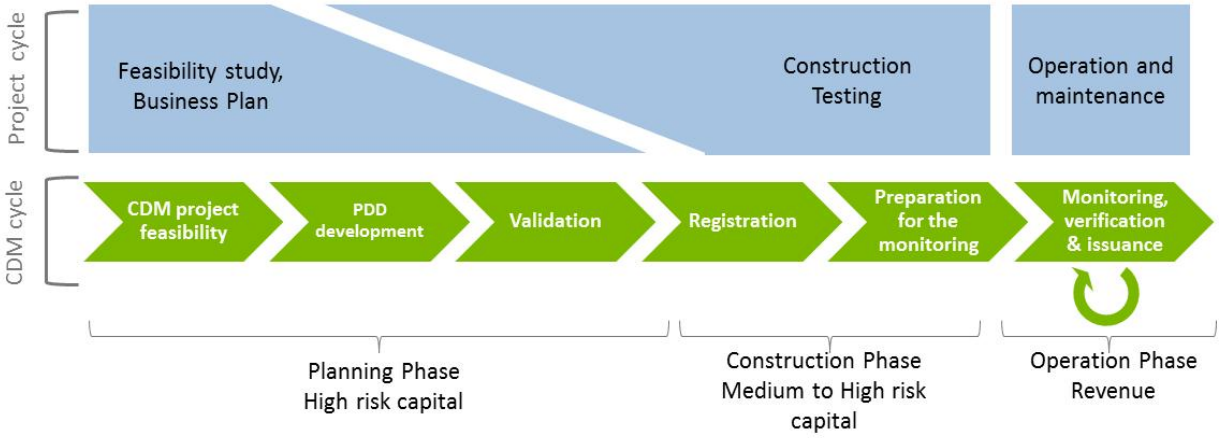

Figure 2: Financing phases in the CDM project cycle

The various instruments which are explored and discussed in this chapter are in the spirit of a “new and globally applicable” proposal. They are as follows:

Finance projects and CERs via:

Instruments directly supporting CDM projects

- Direct subsidies,
- Conditional and structured subsidies,
- Loans,
- Upfront payments,
- Guaranteed Floor Price for CERs.

Other, complementary instruments to support CDM project will be able to recoup part of the funding provided via above instruments. These include:

- Securitisation,
- Climate Bonds,
- Insurance.

The aim is to gather a range of instruments available to public and private entities and provide some understanding on how such instruments are best utilised and combined depending on the preferences and orientations of public and private funders.

3.1 Supporting instruments

3.1.1 Instruments directly supporting CDM projects

3.1.1.1 Direct subsidies

Description

The use of direct subsidies is the bluntest public intervention that can be made in the efforts to make CDM projects viable. This is typically a grant amount transferred to the carbon project developer and acts as artificially and directly allocating a price to the environmental externality of climate change as being a new form international CDM subsidy. This would nonetheless be one step beyond the type of subsidies that CDM has been receiving from bilateral and multilateral organisations through grants and loans to provide capacity building, promote concrete project development (e.g. PDDs) and implementation (e.g. monitoring plans). Such new set of subsidies would still be coming from bilateral and multilateral sources, however would be technology, geography specific.

Such direct financing may be allocated to CDM during the implementation stage of projects to the construction of infrastructure, purchase, installation or monitoring equipment. Alternatively it may be in the form of purchase of CER at a subsidised price.

Structured subsidies: Subsidies should be structured in such way to achieve the expected outcome in an efficient manner and not to generate negative outcomes or grant more money than envisaged.

The results in chapter 2 inform decisions on the project types to support with subsidies and on the level of subsidy necessary to reach an acceptable level of CER price. Geography and sustainable development criteria may be other axis of selection.

Pros and cons, limitations of subsidies

Although subsidies are the most straightforward way to transfer to public it is extremely important that such subsidies produce expected results and do not become incentives to the wrong types of projects or act as a disincentive to projects being efficient. For instance, subsidies may be granted to development projects such as small communities' local electricity projects: solar, wind or energy projects, cooking stove, biomass, energy efficiency, etc.

Subsidies should stop once it has achieved the desired outcome and is not needed anymore (once carbon price are at higher level). However in practice, subsidies may continue longer than necessary.

Subsidies conditional to carbon price level

Subsidies could stop once carbon prices have reached a maximum level. This maximum carbon price level should however be defined at the inception of the subsidy. Such maximum level may differ per technology and depending on the geography.

Subsidies may become counterproductive

Subsidies become counterproductive if not well thought through at inception or when changes in market condition render them less appropriate. When an economic activity can have detrimental environmental consequences, subsidies often have bad impacts in the long run at a large scale.

In our case subsidies could lead to development of carbon projects beyond the point where they make sense for the size of the local community. For instance, this may be the case for development of means of electricity production, i.e. solar panels, run off river dams, beyond the necessity of the local community.

Box A: Subsidies for food production leading to counterproductive results in the long term

This is for instance the case for subsidies for food production (fertiliser, irrigation,...) which are made with no consideration of long term environmental issue and sustainable production. In the long run, this boosts production for a period of time but means a sharp slow in production in the longer run when soils have become poor or irrigation water is not available anymore due to exhaustion of water tables. Subsidies to fisheries which end up in overfishing are other striking examples.

Involvement of the private sector

Involvement of private finance is desirable as it reduces public involvement and makes financing mechanisms more efficient. However private sector will mostly be involved when projects are profitable or when there is high reward in a high risk situation. Nonetheless, within the current environment, there are still private players, for example Standard Bank who continues to invest and develop PoAs over Africa as part of its business strategy in the African continent. Nonetheless these are isolated cases.

There is a range of possibilities to combine public and private contributions. In this chapter, for each type of financial instruments, we explore how a private investor can be brought into the picture.

Subsidies are pure grants hence may seem unlikely to attract any private funding. However large corporations may consider taking part in such subsidies when projects are extremely “green” or “social”, and make a tangible difference to local communities. They may request the subsidy to be structured as a program to be used for image promotion. Philanthropists and wealthy individuals may also finance projects for similar reasons. When this is the case, it is less likely to be combined with public funding.

3.1.1.2 Loans

Description

Finance can be brought to emission reduction projects via the provision of loans. However such loans have to have attractive conditions for the borrower. So called “soft loans” also known as "soft financing" or "concessional funding" seem to be best suited.

Soft loans are loans that have lenient terms, and/or lenient interest rates. Repayment can be over such extended grace periods in which only interest or service charges are due. Repayments may also enjoy interest holidays. Soft loans typically offer longer grace periods (during which a late payment will not result in default or cancellation) or longer amortisation schedules (in some cases up to 50 years). Soft loans are loans with no fixed date/amount repayment terms, but rather based on ability to pay. They are much more similar to interest accruing accounts payable, or a promise to pay back when a financial trigger is reached[25].

Such loan financing can be done during the implementation stage of the project via lending funds at favourable conditions to the construction of the infrastructure, to purchase, install or monitor equipment. Such loans become more financially feasible if the carbon project has additional revenue streams but carbon, especially if the other sources of income (heat, power, biogas) are important in the viability of the project.

Funds would be made available to project developers at a favourable rate and principal would be paid back on the occurrence of a predetermined trigger event, possibly directly linked to a level of carbon price.

[25] For more information we refer to: www.naturalfinance.net/2010/08/introducing-soft-loans-new-corporate.html

A good illustration of such types of loans are the German Financial Cooperation (FC) development loan, which include reduced-interest loans as well as composite and mixed financing to lend funds to states or implementing agencies in developing countries backed by a state guarantee. This is currently suitable to provide local financial institutions with greater scope for their own lending operations especially to supply credits to small and medium-sized enterprises and support of infrastructure projects in developing countries.

Box B: Example of soft loans

Soft loans have been by development banks such as KFW to bring finance to SMEs within their own country. Also, soft loans are not uncommon between countries. Among many other examples, in 2007, Chinese president Hu Jin Tao promised up to $ 5 billion to African nations' of unconditional aid and soft loans.

Pros and cons, limitations of loans

The soft loan is obviously a very risky vehicle from the investor as there is little certainty over paying back the principal. Such a loan may include an option of shareholding on the project if no repayment.

The provision of soft loans or concessional finance seems particularly appropriate for CDM projects. These types of finance have been widely used by the various multilateral and bilateral development banks in other circumstances than CDM. Multilateral and bilateral development financial institutions would have the experience of risks associated with such instruments in such underdeveloped countries.

Involvement of the private sector

Private sector is very unlikely to be lending money on the basis of an uncertain soft loan. Private institutions are more likely to lend to project developers under a conventional loan structure to finance the implementation phase of projects if these projects present regular income once they are operational (e.g. sale of heat, power, biogas). However loans may be given by private entities partially on the basis of CERs price return if such CERs have received solid guarantees by public entities. Debt can only come second to fundamentally sound cash flows revenue (heat, power, biogas or guaranteed CERs).

3.1.1.3 Upfront payments

Description

The ability to foresee/speculate and capitalise on the fact that carbon prices will increase in the future is extremely important for the viability of financial instruments issued today. The ability to speculate

on a future higher carbon price may act as an instrumental link between public finance and private finance for the carbon markets.

A new project developed today under the CDM may be used in different ETS if it complies with respective import restrictions. Therefore selected CERs may be tradable under a number of emission trading systems in the future. Project developers may speculate that these restrictions might drive CER prices up. They might also speculate that some CERs can be used in the voluntary market, where carbon prices could be higher under specific conditions (cf. chapter 4).

If the project developer needs income from future delivery such credits can be pre-financed in two ways:

- A buyer (a public or a fully private entity) prepays for a number of credits at a discounted price. This buyer takes a bold bet on a potential recovery of price for carbon;
- A public entity prepays for the credits at a subsidised price compared to current market price. Such an investor takes the risk that when credits become available, they may only be worth a fraction of what they have paid for.

Pros and cons, limitations of upfront payments

Payment of transaction costs and potentially other initial development costs through initial funding has been an instrument widely applied by private and public entities to help cash constrained project developers to get going and develop CDM projects. As mentioned in chapter 2 these can add up to substantial amounts. However in the current environment, literally no private investors would work with upfront payments until clear signals for an increase in the carbon price are there. In the immediate future only public entities may subsidise the purchase of CERs up front.

Involvement of the private sector

If the private sector was to consider upfront purchase, they would buy projects upfront today at such a low price that it would make no difference to the viability of projects. To artificially raise the level of upfront payment, a public entity could guarantee a floor price for the carbon on delivery.

3.1.1.4 Guaranteed floor price (GFP)

The implementation of a floor price may be used to support the price of CERs and may indirectly finance the implementation of projects, if it is used to borrow additional funds.

Description

Project developers could get the guarantee of a floor carbon price to help with price recognition of emission reduction efforts. This guaranteed floor price (GFP) could be free or come at a cost. This would provide the holder of such GFP the right to sell his carbon at a certain price within a certain time frame. The issuer of such GFP will guarantee to pay for the carbon at a certain price. Similar types of instrument establishing a floor price for carbon have also been described as “Emission Reduction Underwriting Mechanisms (ERUMs)” in Edwards (2011) and Pizer (2011). Also the paper from Gosh (2012) offers an interesting view on such instruments. Such instruments are similar in

many aspects to “put options” often purchased by carbon funds or carbon aggregator to edge their risk exposure to carbon prices fluctuations.

However, a few different alternatives and features for GFP are important:

1) Tradable GFP: the GFP may be made transferable by the issuer. The advantages of making the GFP transferable and therefore tradable will significantly increase the likelihood that such option will eventually be used. If the carbon project, whose developer owns the GFP, fails to be completed or to deliver CERs, the project developer has the option to sell the GFP to other project developers in need of such CER floor price. This is also more efficient as depending on the fluctuation of CERs the project developer has the flexibility to trade the GFP. Such tradability assumes that there exists a mechanism where seller and buyers of such GFP can meet to transact.

2) GFP sold to project developers: GFP could be allocated free of charge or sold. The price of such GFP could be decided such that it represents a small but not insignificant cost to the project developer however it should not discourage from purchasing such guarantee. For projects located in LCD, such a cost may act as a disincentive and may have to be financed by a loan. Alternatively it could be determined via an auction or a reverse auction process (explained in section 3.1.3 below). When the GFP is allocated for free, there is no risk involved for the project developer who may take up the GFP at an early stage of his project while there is a high risk for the project will not happen or for the sake of trading it. Therefore it may be preferable to sell such GFP at a cost; this will make the purchaser more responsible in his use of the GFP and will provide the public funder some remuneration. This may be seen as a compensation for the risk taken for the issuance of the guarantee and free some capital potentially used to issue additional GFP. An add-on to such GFP may be for the public entity selling the GFP to reimburse the project developer of the GFP price if he does not exercise or trade the GFP.

3) Determination of the price of the guaranteed floor: pricing such a guarantee is a difficult exercise. Two price signals need to be established, “What level of carbon floor price should it guarantee?” and “How much should the GFP be sold for?”

   The result from chapter 2 could give an indication of fair level for pricing of the GFP. Nonetheless as suggested in the final part of chapter 2 it is not practical to think that an appropriate price of CER can be assessed ex-ante at a project level. As presented in Pizer (2011), it would be more efficient to use a reverse auction. Through a reverse auction bidders (project developers, investors) each make an offer on the price at which they wish to see their carbon guaranteed (GFP). They do so transparently, for instance via a website and within a predefined time period. Each bidder competes against each other for the lowest guaranteed price that would create enough of an incentive to make their project viable. The reverse auction process is further explained in section 3.1.3 below. In the absence of a functioning market such auction would have to be widely advertised to gather enough interested contenders.

4) Ways to lighten the cost of guarantee for public entities:

   A number of carbon projects will produce by-products such as electricity, heat or biogas. The amount guaranteed as a floor price for CERs may be inversely dependent on the price of such by-products. If the selling price of such by-products increases; revenue from CERs would be less important as they become less relevant for the project developers, as shown in section 2.2. This may lower the cost of such guarantee significantly for the public entity funding the guarantee. Potentially no price may be guaranteed for CERs once prices of such by-products are above a certain thresholds. In such product, the levels of guaranteed CER prices would be determined and fixed at the time emission of such GFP depending on the price level of by-products.

5) Alternative – reduced GFP price:

   At the time of using the GFP, the project developer could keep the CERs and receive an amount of money equal to GFP minus the CER price at the time. This alternative is more cost effective for the issuer of the GFP and let the project developer the freedom to sell or speculate further on CERs.

Pros and cons, limitations of guaranteed floor price

As seen above, GFP presents numerous advantages:

1) It is less capital intensive for the public funding entity than other alternatives explained above.
2) There is less chance that the money devoted to such CERs is left unutilized.
3) The pricing of carbon on delivery is more efficient.
4) It is flexible for the project developer as it can be traded.
5) The project developer can use such guarantee to secure other types of financing such as loans.

However issuing such an option and ensuring they can be tradable even “over the counter” is somehow more complex than other financial instruments and may require using costly experts and lawyers in the field. Furthermore, such instruments are not used by project developers today and therefore they would need to be explained and promoted to project developers. This coupled with the additional complexity of this instrument may make it more reachable for large sophisticated project developers and less so for small players in poor countries. Also, such project developers will have be made aware of such instruments either as a result of a liquid market or through an awareness raising campaign.

Involvement of the private sector

GFP instruments as they are described above may be best structured at least partially by large private financial institutions such as investment banks. However the institution taking the counterparty risk or covering the guarantee of providing the CERs at a minimum price on delivery will be either a fully public institution or a mixture of private and public as a level of subsidizing would be necessary for the purchase price of the GFP.

This is somehow comparable to the work of the World Bank's Prototype Carbon Fund. It acted as a first mover and buyer in setting up prices whilst bringing private players on board when time was still a few years away from a liquid market. This may also be the case with regards to simple upfront payments and ERPA loans. The Bank has been a market facilitator and catalyst in general, stimulating market demand in the early days as well as doing the same for specific project categories.

The same format can be used as a guide for a mechanism to fulfil certain interim or bridging roles. In the current situation, the above mentioned instruments will help with giving the regulators some time to agree and decide on the necessary supply reduction measures and increased targets to create new, additional demand and trigger price increase.

3.1.2 Complementary instruments to support CDM projects

The instruments described below cannot be used on their own to support the price of carbon, they are complementary to direct instruments discussed above in 3.1.1. They can significantly reduce the strain of finance from public sources. These instruments bring upfront future cash flows which have been partially guaranteed by public funding entities. This may free some capital which can be reused otherwise.

3.1.2.1 Securitisation

Description

Projects which are not profitable, too risky or too small on their own to find finance may be bundled together to reduce the risk of each individual project, the technology used or simply increase the overall size. Such bundled projects are usually securitized and shares of such groups are sold to private or institutional investors (Climate Bonds Initiative 2013a; Climate Bonds Initiative 2013b).

Box C: Example of securitisation

For illustration, securitisation has long been an attractive corporate finance option for project finance, especially in capital intensive industries such as transportation (aviation, railroads and shipping), mining, oil and gas, pipelines and non-utility power generation. For example, after a project has been constructed and is performing satisfactorily, a special purpose entity ("SPE") could issue debt and equity securities and use the proceeds to purchase project loans from the original lender (Forrester 2001).

Such bundling requires a large project pipeline and could only efficiently be done for a large geographical area and provided by a sophisticated public financial organisation or subcontracted to an equivalent private organisation. Such securitisation could only be done by reputable organisations especially in light of the bad reputation securitisation has gained from the last global crisis which it has caused.

Securitisation can be applied to project loans. The holders of various loans sell the loan or group of loans to a special purpose entity which will obtain the funds to make such a purchase by issuing debt or equity securities to long-term institutional investors.

Pros and cons, limitations of securitisation

As demonstrated by the last global financial crisis, it may be difficult to estimate the risk of loss within securitisation of loans because of uncertainties as to the credit quality of the borrower.

Evaluating the quality or the credit quality of projects or loans for the securitisation here may depend on the technology, the geography, the size of project, accuracy of various project assumptions and the project developer himself. Over the years, due diligences processes for CDM projects have improved and make such evaluations more reliable.

However, soft loans with very uncertain pay back timing and duration are unlikely to interest private investors unless an additional level of guarantee is provided on minimum repayments amount and timing.

Involvement of the private sector

As previously described, private entities may only be interested to purchase shares of the securitisation of a pool of projects or a pool of project loans if they can expect a return from such pool in balance with the risk within the instrument. With current heavy uncertainties (demand-supply imbalance, political/regulatory) which bear on carbon price it is unlikely that private investors will foresee any turnaround of the carbon market in the near future. Therefore any involvement from the private sector would most probably be conditional to a strong level of support from a public financial entity. This support would be in the form of guarantee on the return of the securitisation.

3.1.2.2 Climate bonds (extended securitisation)

Description

Securitisation can be extended to a wider public of investors via climate bonds. The climate bond (or carbon bond) market is a specialised subset of green bonds dedicated to raise funds to invest in vehicle contributing to the adaptation or the mitigation to climate change.

The climate bond faces a challenge to do with the size of projects. To be considered as an investable bond by large pension funds and other financial institutions, bonds must:

- Be of a certain minimum size; typical private placement bonds would be $ 50 million while large institutional investors (pension funds and insurance companies are interested in larger bonds minimum of $ 200 million).

- Gather a good rating from international rating agencies, such as Moody's, Standard & Poors and Fitch. Poorly rated bonds will often have to offer a high rate (coupon) to be of interest to investors.

Finally institutional investors are traditionally conservative investors and therefore favour investments which they are familiar with.

Pros and cons, limitations of climate bonds

The following three aspects may be issues in our case:

- For a number of projects in the mitigation and adaptation space, getting to volume of even $ 50 million can be an issue as projects bundled under the same bond should be as consistent as possible with cash flow pattern to match bonds repayments. Because of such volume constrains, such bonds are more likely to be seen in the more developed and large developing countries.
- Rating can be even more of an issue unless a very large public entity guarantees the repayment of the bonds.
- Finally in the current uncertain environment of the CDM, packaging bonds around such projects may frighten conservative potential investors.

However, there is a possibility that such bonds could be introduced here in cooperation with very reputable public or semi-public bilateral or multilateral organisations. Repayments would be guaranteed by such large organisations and would invariably fetch the highest rating.

If projects are bundled within a bond in their entirety (for their entire revenue stream and not only for their CDM component) such bonds may be presented as conventional "projects bonds" with a carbon component, with carbon price being guaranteed at a minimum level by a large public development agency[26].

Once the issue of gathering enough consistent projects to be bundled together is overcome, such bonds could typically be sold to social responsible investments (SRI) entities of pension funds or insurance companies or directly to an SRI fund. For instance, a large insurer such as Allianz could potentially be interested in such bonds from an SRI point of view.

With such bonds, the amount of money paid by the public entity at the end of the day will be highly dependent on how the underlying projects behave. A somehow comparable bond is under implementation in India where the Clinton climate initiative has bundled a number of solar projects which are sold as a bond while the UK government would bring some guarantee of the bond's repayment.

[26] For more information we refer to the "Climate Bond Initiative" http://climatebonds.net

3.1.2.3 Insurance

Description

There is a number of risks which can be covered by insurance for carbon projects such as project implementation risk (e.g. fire, failure, machinery), regulatory (e.g. rejection of the project by the CDM Executive Board), political (e.g. expropriation), counterparty (e.g. insolvency). Insurance companies and brokerage firms have been involved in insurance related to carbon projects. Until recently this was the case of Munich Re, AIG-Chartis, Zurich, and two brokers, smaller players, Carbon Re and Parhelion.

Here the two possible areas to be covered by insurance are:

- All various risks which may result in a non-delivery of carbon credits, and
- The pure financial risk on price of CERs, i.e. if price goes below a certain level.

Non delivery risk

Even during the glorious days of the carbon markets, delivery risk insurance has met only a very limited success with project developers (Wells 2011). This is mainly due to the fact that carbon risks are not seen as a serious threat to the business of companies which have received abundant allowances (e.g. EU ETS) and which only see CDM/JI projects as “cherries on the cake”. Also large corporations with compliance obligation were often choosing to envisage purchasing more carbon credits than actually needed to mitigate the risk of non-delivery. Insurance companies mentioned above actually most often covered risks related to carbon when non-delivery risk is a side risk within a business interruption policy or within credit insurance (insurance against insolvency of project developers) or also within a political risk coverage.

Furthermore we understand that the credit crunch had changed the way ERPAs were structured. Instead of making upfront payments, carbon credit buyers, with some exceptions, have decided to pay for CERs only on delivery. The buyers’ risks associated with future delivery have therefore vanished and the need for insurance shifted back to the project developers i.e. the sellers, who are generally located in CDM/JI host countries. In the absence of forward purchases, sellers must initially self-fund their projects (which can be a major problem as shown in chapter 2) and rely on their standard Property Damage/Business Interruption insurance to cover their CDM/JI activities.

Considerably reducing the risk of implementation via an insurance cover would invariably reduce the overall cost of such projects to the developers and make them more willing to accept lower CER prices. Risks which would have to be covered on a case per case basis credit insurance (e.g. degradation of solar panels), technology risk, insolvency risk and political risk.

It could be envisaged that such insurance is paid for by public development agencies wanting to subsidise some CDM project developers, and therefore make projects financially more viable. This would lower implementation costs. However, for the majority of projects this would not bring them materially down where it would make a substantial difference.

Insurance over a minimum CER price level

At this stage no insurance offers coverage to make projects financially viable. This has been envisaged by some insurance companies in the carbon market field but has not materialised in any product, mostly due to the complexity of the coverage and the fact that it would directly compete with financial options which are offered otherwise. It is unlikely that such coverage is of interest to any insurance company in the current environment. The end result of such an insurance instrument would be similar to the GFP explained previously.

3.1.2.4 Summary of supporting instruments

The diagram below summarises the financial movements of the various instruments. It shows the support to CERs prices determination, then the instrument which can directly provide funding to projects implementation stage and/or CERs. Subsequently it shows how these newly financed projects can transfer part of the financial burden to institutional or private investors. It also shows peripheral instruments such as the implication of insurance or corporate and private wealth, briefly mentioned above.

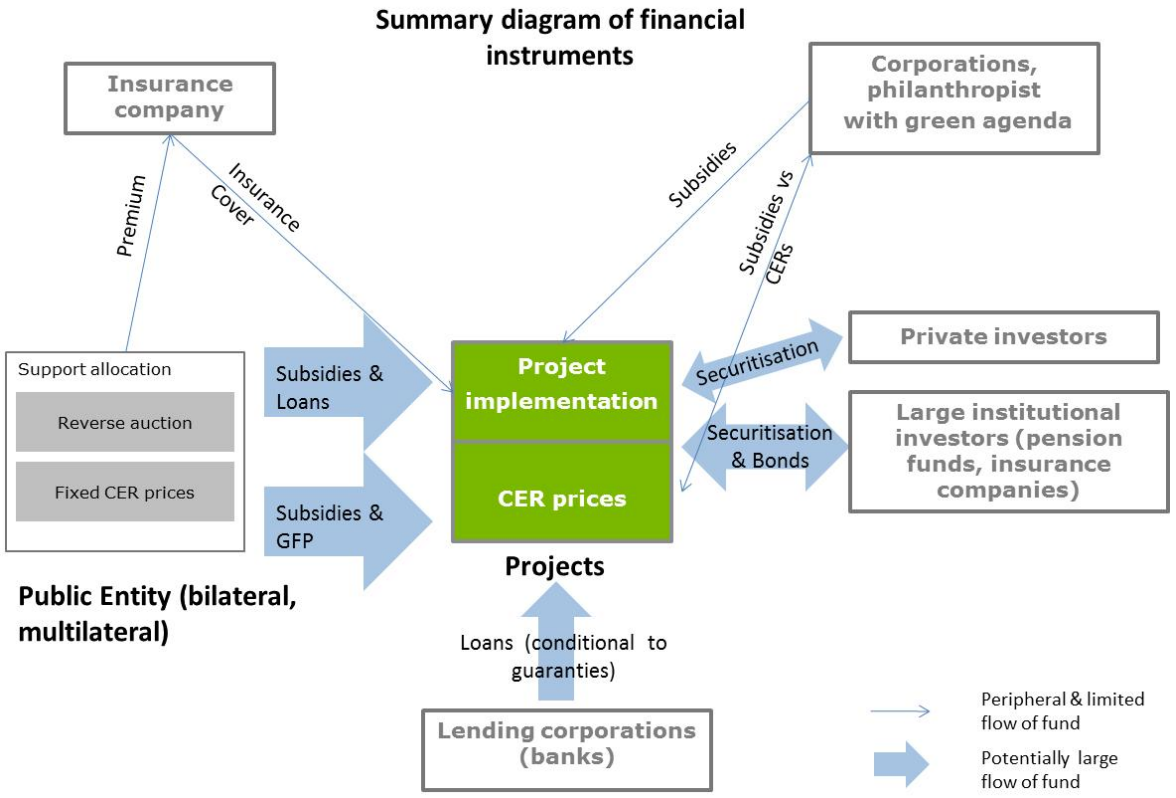

Figure 3: Interaction of supporting instruments for CDM Projects

3.1.3 Allocation of supporting instruments to CDM projects

For each instrument, there has to be a procedure to select projects which will be entitled to receive funds or benefits from the instrument. Public sources of money face limitation and cannot commit finance indefinitely to all CDM projects in existence and to come, even within specific technology, geography and sustainable development categories. Public funders might prefer to allocate funds in a fair and efficient way within the types of projects which they want to favour. While we will elaborate on potentially favoured project characteristics in section 4.2.5, the findings as presented in chapter 2 provide a clear indication of technologies and their viability in respect of cost of carbon. Such funders may want to concentrate mostly on technologies which are the least expensive to support while still being green and participating in local development, for instance, biomass energy, small hydro, solar cooking, solar heating, etc. The allocation is based on a global reach for the various instruments which however will need endorsement and cooperation from local governments where projects are implemented.

Allocating funding while considering specific technologies, geographies and sustainable development definitions may be done on the basis of:

- First come first serve basis,
- Tender process,
- Open or sealed “Reverse auction”.

First come first serve basis

Using conclusions from analysis such as the analysis done in chapter 2, public funders may make available on a “first come first serve basis” limited amount of funding to buy CERs at a maximum price informed by the analysis.

However the “first come first serve basis” is not efficient in the sense that it relies on the funder’s price analysis and does not let the market decide what is a best level of CER prices.

Tender process

In a tender process, public donors organise bids offering at a fixed CER price. Project developers participate in such bids and are selected on pre-defined criteria. Among many other types of auctions, it is particularly appropriate to mention the auction which is used as the default method of allocating allowances within the EU ETS. In 2013 over 40% of all allowances are to be auctioned, and the ETS legislation sets the goal of phasing out free allocation completely by 2027. Auctioning is the most transparent allocation method and puts into practice the principle that the polluter should pay[27].

Open or sealed “Reverse auction”

As described in Pizer (2011) a “reverse auction” is probably a more efficient way to decide on CER prices. Here, the funder openly auctions a limited amount of funding to buy a certain quantity of

[27] http://ec.europa.eu/clima/policies/ets/cap/auctioning/index_en.htm

CERs at a capped price within a certain timeframe and potential sellers of CERs bid for the right to sell a certain quantity of CERs at a certain price.

Such bids may be done openly for instance on a web platform and bidders are able to change the purchase price they propose, depending on what other bidders have done, before the auction closes. Alternatively the auction may be sealed; in such a case, bidders send their bid directly to the funder before a certain date without revealing the content of their bid to other bidders. Public funder will then select the winner on a price basis.

These ways of selecting projects that will receive finance and determine purchase carbon price level can be applied for the following instruments:

- Direct cash benefit in the form of subsidies,
- Conditional and structured subsidies
- Loans
- Upfront payments

However, they are particularly appropriate for the

- GFP (tradable or not).

Nonetheless, if the selection of projects is exclusively driven by CER price, such auctions may favour low additionality projects, where CERs are just “icing on the cake”.

Finally, the three allocations also differ in their dissemination of such an allocation. Although first come first served may not be efficient, it can operate even at very low market activity. However auctions and in particular reverse tendering requires a liquid market or at least an extensive awareness raising campaign for a large number of project developers to be aware of the auction.

3.1.4 Funds contributing to such investment products

A number of funds and facilities of multilateral (e.g. World Bank Funds Clean Technology Fund or funds from Multilateral Development Banks-Asian Development Bank, African Development Bank) or bilateral sources already in existence today include in their mandates the possibility to contribute to instruments such as described above. However these various funds and facilities would have differing preferences in their investment focus and therefore may use such financial instruments in different ways. Chapter 4 of this study will look in more detail at the role funds can have in dedicated support and purchase activities. Nonetheless, we explore funds with public-private partnerships more particularly below.

Funds with public and market based investments

A number of funds made of “public private partnership” already exist. This is for instance the case for the GEF (Global Environment Facility) earth fund public private partnership. Another good example of such a fund is the CP3 (Climate Public Private Partnership) initiated to act as a risk mitigation instrument to catalyse low carbon investments in developing countries. The CP3 is an initiative from the UK government with collaboration from International Finance Corporation (IFC) and Asian Development Bank (ADB). In such funds the public intervention is to make investments “leverage-

able" and provide technical assistance to improve the "invest-ability" of projects. Public funding helps technologies, projects and business to demonstrate the level of maturity and profitability to attract private involvement. Likewise the Global Climate Partnership Fund (GCPF) aims to enable a climate change friendly economic growth in developing countries. It seeks to attract private investments into the fund via selecting investment opportunities in climate change mitigation. The fund is an initiative from German Federal Ministry for the Environment and KfW.

The funds described above use public funds to improve the investment potential of small risk however profitable overall climate change and environmental projects or companies. Funds reassure private investors of the risk exposure and the size of investment commitments. In our case, to achieve such a result, public funding may have to first address the financial viability of such projects.

The instruments described in this report can be financed by public fund to improve the viability of projects. Such projects once they have been "rejuvenated" can then look for broader finance using Public Private Partnership funds such as the GEF earth fund, the GCPF or the CP3.

Also, the World Bank's Clean Technology Fund (CTF) and Strategic Climate Fund (SCF) and the Program for Scaling-Up Renewable Energy in Low Income Countries (SREP) use blending of public-private sources. Finally, the Green Climate Fund (GCF) may become an important mechanism and fund for supporting mitigation (and adaptation) action by using public funding to mobilise/leverage more private funding. It includes a provision to establish a private sector facility that enables it to, directly and indirectly, finance private sector mitigation and adaptation activities. For illustration the report of Gray and Tatrallyay (2012) shows how, within the mandate of the GCF, it can leverage private funds to dramatically increase investments in four mitigation sectors, namely renewable energy, energy efficiency, industrial gas and waste management.

Carbon funds

Carbon funds could also have a direct role from instruments described above, as they have a direct interest in a higher CER price. There are over 80 carbon funds under management globally, including private funds, government-run credit purchase vehicles or buyers' pools. Historically, most of these funds buy only the offset credits issued under the CDM, often from clean-energy projects like wind farms and hydro dams in developing countries.

Carbon funds would be players of choice to complement financial implication from multilateral and bilateral development financial institutions to buy credits with an embedded share of risk such as we have developed them here. A number of carbon funds, mostly public have been designed for post-2012 investments. This is the case of funds such as the World Bank Carbon Partnership Facility, the Post-2012 Carbon Fund from the European Investment Bank (EIB), together with KfW, CDC, ICO, and NIB) , the Nordic Environment Finance Corporation (NEFCO) Carbon Fund, as well as the ADB Future Carbon Fund, among others. However carbon funds are inevitably challenged by persistent low carbon prices and therefore may see their number and activity significantly reduced within the current carbon price environment.

3.2 Interactions with existing requirements

For the analysis of financing instruments that might be used alongside carbon finance it is important to also carefully assess how the financial support interacts with currently existing requirements. The CDM requires projects to ensure "additionality" and "non-diversion of Official Development Aid (ODA)" while for the use of climate finance sources potential double counting issues need to be considered.

Additionality

Via the additionality requirement, projects must prove that the CDM lifts barriers which would have prevented projects otherwise. Such barriers are usually financial barriers but can be of other forms such as technological barriers. In the context of financial additionality, also the impact from instruments as discussed in this section need to be considered for the additionality proof. Measures that lead to improved CER price levels influence the CER revenue expectations from projects while direct financial support needs to be considered similar to all other funding sources in the additionality considerations.

Here it is important that the income from carbon credits does not become irrelevant in financing the project. With very low CER prices the projects' additionality might become questionable especially if financial instruments are disconnected from the existence of CERs. It can therefore be important that financial instruments are designed to be conditional to the existence of CERs. If the financial instrument, for instance the subsidies are conditional to the CERs being generated then it can be demonstrated that the generation of CERs lift the barriers which was preventing the financial viability of the project, since these CERs will trigger the grant of subsidies.

Non diversion of ODA

In the Marrakech Accords the Parties to the Kyoto Protocol decided that *"public funding for clean development mechanism projects from Parties in Annex I is not to result in the diversion of official development assistance and is to be separate from and not counted towards the financial obligations of Parties included in Annex I"* (UNFCCC 2001). The interpretation of this decision led to different positions. Some Parties wanted no ODA involvement whatsoever whereas others tried to use ODA to generate CERs. Donors finally agreed at the OECD level on how to handle ODA used for CDM projects. The Development Assistance Committee (OECD 2004) endorsed the deduction of the equivalent value of CERs received in connection with ODA-financed CDM projects and that ODA funds should not be used to purchase CERs. Furthermore the value of CERs received against ODA should be reported. As part of the CDM procedures, letters from donors, and sometimes from host countries as well, are attached to the PDDs, stating that the money does not result in the diversion of ODA and is not counted towards their financial obligations. However, the original intention of the UNFCCC may have been less rigid and only limited to ensure that ODA is not taken away from other assistance to basic issues such as health or education in favour of climate change.

In practice the use of ODA for preparing projects for registration and the preparation of related documents and studies as well as capacity building measures around CDM project development is not controversial and generally accepted. In addition, experts from development finance institutions

interviewed in 2011 find that not using ODA to purchase CERs seems to be well-established international practice now (Monceau and Brohé 2011). Less clear are the practical implications of the abovementioned endorsed practice, including the use of ODA for the underlying project financing. A recent study by AEA, SEI, CEPS and CO2logic and related expert interviews conclude that "the treatment of ODA in the CDM is vague and that clearer guidance is required" (Monceau and Brohé 2011).

Although ODA seems not to be used to directly purchase CERs, concessional loans and grants are and have been used to facilitate the development of CDM projects through financing required documentation up to registration as well as to set up CDM infrastructures and establish local capacities, supporting the development of projects and the implementation and management of the CDM process. In addition, ODA is used in financing underlying project structures such as when CDM components piggyback on an existing development project structure.

Climate finance sources

In Copenhagen (2009) industrialised countries committed to provide $100 billion a year in new and additional climate finance from 2020 onwards. In addition, immediate 'fast-start' finance of up to $30 billion was promised. The concept of 'new and additional' climate finance is unclear at the moment nor does an internationally accepted definition exist. Also the actual supply of the finance is difficult in view of the worldwide economic and financial situation and Parties are rather reluctant as long as lack of clarity exists if funds will be counted as new and additional.

Climate finance is however identified as an important potential source of financing to support the CDM in the current situation. Larger funds for supporting financing instruments and policy measures, as discussed in chapter 4, might actually be generated in conjunction with climate finance. However, some stakeholders have identical concerns with potential double counting of climate finance and CDM support similar to the above discussed issue around using ODA for CDM project support.

Potential double counting of ODA and climate finance seems to be more problematic. Most EU member states, for example, deliver climate finance within ODA budgets and related channels, therefore many declare climate finance flows as ODA at the same time. Next to concerns about additionality of climate finance and double-counting, a recent survey among EU member states found that ODA is seen as an important element for climate finance commitments and their fulfilment; also with a view to effectiveness of climate finance in delivering tangible development benefits for recipients (Varma et al. 2011).

The use of climate finance for the support of the CDM framework with instruments and measures as discussed in this study seems however possible as long as climate finance is not used to purchase CERs which are again used for obligations of Parties under the Kyoto Protocol or other compliance purposes. This latter case would undoubtedly result in double counting since the same funds are used to claim progress on climate finance pledges as well as emission reduction targets. This exclusion however leaves many options open on how to use climate finance for CDM support. Climate finance that is provided for CDM capacity building or project initiation measures and also funds for providing indirect or direct financial support to CDM projects might still be new and additional. It might need to

be ensured that these funds would not have been provided without the Copenhagen climate finance pledge in 2009 and go beyond the levels that have already been provided to the CDM before.

On project level the additionality is affected in the same way as described for support stemming from other sources. Especially in very low CER price scenarios and as discussed above other sources of finance could be conditional to the generation CERs.

Also the direct purchase of CERs through climate finance sources should be acceptable as long as the CERs are immediately retired or cancelled. The climate finance sources spend to buy CERs lead to emission reductions that would not have occurred without the availability of these funds despite the availability of the CDM. The new 'baseline' situation for the CDM will be characterised by record low activity levels due to insufficient incentives for the private sector to invest in the CDM.

The combination of climate finance and the CDM seems moreover less problematic compared to the use of ODA sources. The CDM qualifies as an excellent tool to deliver on the objectives of climate finance whereas ODA objectives (e.g. health, education) are not the primary focus of CDM projects and would be achieved rather as side effect. Only in case the objectives of the financing are actually divers, a split of funding according to the purposes achieved seems reasonable.

The CDM should rather be seen as one of various tools that are required to actually and effectively spend the large amount of promised climate finance. In this respect it also should be considered that the direct financing provided by the CDM so far is by magnitudes smaller compared to the climate finance pledges made in Copenhagen. The CDM moreover is the tool that combines public and private finance and thus leverages public investments.

Unfortunately, the current lack of clarity on the accounting and reporting of climate finance hinders the supply of climate finance to support the CDM. Donor nations increasingly treat their climate finance obligations under the same logic as non-diversion of ODA. Some Parties even became more reluctant to issue letters confirming non-diversion of ODA to CDM projects as it previously was common practice. This is e.g. caused by the wording of the paragraph of the Marrakesh Accords, as cited above, which refers in an unspecified way to 'financial obligations of Parties included in Annex I'. One can argue that financial obligations include climate finance while this can also be questioned since climate finance was agreed in 2009 and the Marrakesh Accords already in 2001. The strict interpretation of the non-diversion clause is counterproductive since it leads to a disjunction between public funding and CDM and thus is crowding out private investments.

Real examples on how climate finance could be used to temporarily support the CDM are purchase activities without a full connection to the carbon markets and results-based financing or NAMAs which use CDM elements to e.g. ensure the GHG emission reduction quantification. These examples are further discussed in sections 4.2.3 and 4.2.4. Depending on the actually used financing sources, these approaches might apply the CDM framework completely or only partly. Also the immediate cancellation of CERs might only apply to parts of CERs according to the financing shares that stem from climate finance sources. If all CERs are foreseen to be immediately cancelled it might be more efficient to even waive the issuance procedure. Clarifications on transparent accounting rules for climate finance are however soon required to ensure the CDM is still available at the required scale when it shall be used as tool to spend climate financing sources.

3.3 Assessment of financial instruments

Each individual financial instrument analysed above has different features and will mean a different financial commitment for the financing entity. These commitments will depend mostly on:

- cost efficiency, including the level of potential private investments,
- flexibility,
- proven track record,
- potential level of achievement, and
- practicality of implementation.

An assessment and comparison of such factors will allow us to understand better which instrument may be preferable and why. This will therefore also lead us to understand what may be the best combination of instruments to achieve an optimum result in the most cost efficient way. To facilitate this we assessed and ranked each characteristic for each financial instrument and summarised the results in an evaluation table (cf. Table 12).

The various factors are analysed as follows:

- “cost efficiency” is looking at how efficiently funds are used to achieve the expected result. Would it be necessary to spend more money to achieve a similar result? This is directly dependent on the “level of potential private investments” which may be possible for particular financial instruments.
- “flexibility” is looking at how easily the financial instruments are to be put in place and also, how flexible they are in terms of being adaptable to situations.
- “proven track record” concentrates on how mature the instruments are and how often such instrument are used and in particular in the context of carbon projects or similar types of projects.
- “potential level of achievement” looks at the likelihood of such instruments to have expected results; this does not take into account how much it may cost or how long or efficiently it may produce the expected result but only the likelihood of achieving such results.
- Finally “practicality of implementation” looks at how easily such instruments are to be put in place, in consideration to the easiness to disseminate the awareness to such instruments (advertising for auction, liquidity of the market); also the required development level and investment environment of the host country and consideration to the set up cost that they may incur.

The evaluation of instruments may vary slightly depending on sectors, technologies or sustainability aspects of CDM projects. However this study does not get in such details to ease the understanding of the instruments.

Table 12: **Assessment and comparison of financial instruments**

Assessment / Instruments	Cost efficiency	Flexibility	Proven track record	Potential level of achievement	Practicality of implementation	Overall result
Pure subsidies	(-) Inefficient if lack of focus	(-) little flexibility can't be modified	(++) Widely used	(0) Potential depends on how targeted	(+) Easy to set up	**(0)**
Conditional subsidies	(+) Efficient if well targeted	(0) little flexibility. Conditions can be modified	(++) Widely used	(+) Big potential if well designed conditions	(+) easy to set up	**(+)**
Soft loans	(0) Efficiency conditional on repayments	(++) very flexible for each situation	(+) Used in other situations	(+) Good potential	(+) common set up	**(+)**
Upfront payment	(-) Inefficient if limited reach	(+) flexible as adapt to situations	(0) limited use with difficult CER pricing	(0) Limited potential as low take up rate	(+) straight forward set up	**(0)**
Guaranteed Floor Price	(++) very efficient if well designed & understood	(++) very flexible especially if can be traded	(0) Specific use outside of carbon	(+) high potential	(0) Can be complex to set up	**(+)**
Securitisation	(+) efficient for successful issuance	(-) little flexibility implies similar projects	(0) limited use for such project size	(+) Good potential if well implemented	(0) Can be complex to set up	**(0)**
Bonds					(-) Complex for numerous small projects	**(0)**
Insurance	(-) can be expensive	(0) little flexibility if standard coverage	(+) Widely used outside carbon markets	(0) Potential only for part of project	(-) standard product doesn't exist	**(-)**

(indication of ranking of instruments is provided through (-) negative, (0) neutral, (+) positive, (++) strongly positive)

The overall analysis as presented in the table above is only a rough indication and assessment of the instruments described in previous sections. Since these instruments will serve different purposes and might be involved in the financing process at different stages, the ranking cannot conclude on one overall approach which fits every situation. The overall result is not a strict sum of + and – as these refer to item not on the same level but an indication of comparison between instruments. Such ranking of instruments is obviously subject to debate; however it is important to understand which instruments may achieve more than others.

This ranking shows that conditional subsidies, soft loans and GFP are to be favoured when compared to other instruments. Conditional subsidies appear as favoured instruments as they are able to directly address the financial gap in a straightforward manner. These instruments may be successful with project developers when compared with GFP as they are easier to understand. However such instruments may be more capital intensive for the funding entity as they lock in capital commitments from the public funders at the outset. Soft loans could also be useful instruments and attract some interest from project developers. However, in practice they may not be much less expensive than subsidies for the public funding entity.

Tradable GFP, despite an apparent complexity to set up and the somehow novelty of such instrument to the carbon world, offers multiple advantages. The flexibility of being tradable is important as the project developer can sell such GFP when he does not need such guarantee anymore. This instrument is probably the most efficient financial instrument to support the price of CERs. It utilizes the public entity fund only if CER prices remains below a certain level and it can be priced adequately depending on the types of projects, technology, geography that it targets.

Nonetheless, this mechanism is less attractive if there is no liquid carbon market as the success of such instrument would depend on wide advertising. Finally, GFP is exclusively for placing a floor under CER price and cannot participate directly in the financing of the overall project implementation, although the project developer who owns such GFP will find it easier to seek finance for his project.

As shown in the summary table, the other instruments are somehow less promising as they appear to be not practical in the current environment such as “upfront payment” or not well targeted such as subsidies. Also securitisation and bond hold a good potential however may be somehow difficult to implement in practice. Insurance is seen negatively as there is very little interest from the insurance providers to be involved in a significant way in CDM instruments at this stage.

The instruments would encounter different success depending on the state of the carbon market, whether the market is in total failure in transition phase or is still a generally functioning market. Instruments such as subsidies and loans could function even with a failed market. As expressed before however the success of GFP promoted via a reverse auction is closely dependent on a large number of project developers being aware of such instrument. This awareness is best achieved via a functioning market but could be replaced by wide advertising campaign.

3.3.1 Combinations of instruments

Complementary instruments

As discussed previously and shown in Figure 3, securitisations and bonds are difficult to use without other financial instruments placing a guarantee over the price of CERs to improve the financial viability of projects. They are best used as a second set of instruments complementing instruments such as subsidies, loans, or GFP. Such instruments allow project developers or institutions financing the project to bring forward future cash flows generated by projects. Through their use, a public development entity which initially supports the viability of the project could subsequently recover part of the funds spent on such support via securitisation or even issue of bonds to investors; large or small depending on the risk and specificities of projects bundled.

This would imply that a prerequisite to providing subsidies, loans or GFP, for public financial entities are to keep some rights over the possibility of getting access to the project in the future for a potential securitisation or bond issuance. The project developer would have an inherent incentive for this potential securitisation or bond issuance to occur since this would mean anticipated access to funds for him also. Such securitisation or bond issuance could be done by a public development entity or left to specialised private sector.

Instruments with different cost structures

Financial instruments such as subsidies, loans, upfront payments or GFP could be combined within the same projects so that the project developer reaches an adequate financing for his project. These instruments are of differing cost to the public entity and differing structures. A public entity may decide to offer subsidies only and exclusively to certain types or a limited number of projects which they want to favour, while it will offer some soft loans and GFP to some other projects.

3.3.2 Flexibility of financial instruments to fit public funders specificities

The range of instruments described previously must be seen by public financial entity as ways to support the CDM through the price of CERs while still keeping control on the types of projects they feel should remain financially viable through the use of carbon market. Different public financial entities or climate change funds may support different types of projects and in a different way; however this is the collective actions of these public financial entities and funds which would make possible an effective support of the CDM mechanism.

A public development entity may decide to devote certain pockets of funding to some specific technologies or geographies which are seen as priorities (cf. section 4.2.5). For instance these can be technologies particularly important for the development of local communities in places where the donor country has strong historical ties. The same public development entity then chooses to make available a second pocket of funding to sell tradable GFP instruments to projects which are more viable financially and less green. Likewise, a third pocket of money may be joined together between public financial entity and private partners to provide loans (conventional and flexible loans) for CDM project developers. The public financial entity would decide on rules and conditions around the

utilisation of such pockets of funding (e.g. the same project may be able to use funding from different pockets).

However, although it is important that public financial entities keep full flexibility to the extent that they decide which instruments they want to favour; there are decisive benefits in such public financial entities maintain enough communication and coordination to synchronise their actions for some of the instruments. In particular, success factors for securitisation and issuance of bonds is in the congruence of the level of financial guaranties and the cash flow pattern of supporting projects. Also tradable GFP will see their trading ability enhanced if such GFPs have similar structures. The informal over the counter market which may be built as a result will be more fluid if the project developers are able to understand easily how such instruments compare with each other. Finally public financial entities may coordinate their efforts when seeking an insurance cover for some projects. Insurance companies are more likely to come up with an appropriate cover at a fair price if there is a consistent demand for a number of projects.

3.4 Findings from this section

In the current situation it is necessary that a concerted action from public bilateral and multilateral organisations and private institutions is attempted to keep alive the CDM system and preserve as much as possible the capacity which has been built over the years.

What is suggested in this chapter is a “choose and pick” range of financial instruments available to public and private institutions to make decisive progress. This provides for a global approach across a wide range of technologies while leaving it up to the various Annex 1 countries and other public organisations to invest in project categories of their choice and at their own pace.

The most interesting features of the proposed systems of financial instruments include:

1. The proposed financial instruments are flexible as they can fully adapt to abatement prices of various types of projects technologies.
2. Within the same umbrella system of the “choose and pick” instruments; funding countries and public financial organisations can opt to favour certain projects types or certain geography to various degrees independently from other funders.
3. Also such instruments, can adapt to future variations of CER prices, it can easily and progressively be phased out as CER prices raise.
4. Efficient system; if designed as proposed, such instruments should be appropriate tools to finance efficiently specific projects depending on their needs.
5. Such system comprises the possibility of combining public and private funding to offer durable solution to the CDM.
6. Finally, such combination of instruments can be operational immediately as negotiations and active coordination between various public funders is not a prerequisite. Nonetheless, a minimum of concerted efforts would invariably enhance the final impact of such instruments, while an active coordination would certainly make a substantial difference.

4 Identification of policy based measures for market and price stabilisation

In this chapter we summarise the results of our theoretical study aiming to identify and assess mostly policy based measures which either address the supply-demand mismatch or offer general support to CDM projects or to the CDM framework due to their market or price stabilisation potential. Support for the CDM framework, in contrast to support for CDM projects, is considered in this chapter as measure that rather provides an environment for the application and further development of CDM methodologies, rules and even institutions than creating demand for actual CERs.

According to the approach of this part, as described in section 1, several policy based stabilisation measures are identified as promising approaches. These measures partly influence each other or could be implemented in parallel. Some might only apply to specific situations or have different impacts depending on the made assumptions. The consolidation of the longer list of measures led to fewer main approaches that cover a series of options which are variations of the main approach. These basically include:

- The introduction of **demand windows** in existing markets (section 4.2.1)
- The activation of **new demand sources** (section 4.2.2)
- **Purchase activities** by (public) institutions (section 4.2.3)

In addition, we discuss **results-based financing**, that do not directly allow the continuation of CDM projects but might offer opportunities to preserve the CDM framework and the readiness of market players for situations where sufficient price signals are back (section 4.2.4). In this respect we also consider implications from new mechanisms which are currently under development such as New market-based Mechanisms (NMM) and Nationally Appropriate Mitigation Actions (NAMA). Finally, we describe options for the differentiation of CDM activities which is a precondition for some of the presented approaches (section 4.2.5). This however does not represent a stand-alone measure for market or price stabilisation.

The structure of this chapter at first includes a brief review of proposals under discussion for policy based measures for price and market stabilisation in similar contexts (subchapter 4.1). This section is followed by the description and discussion of the main challenges for stabilisation measures and their alternative opportunities for implementation (subchapter 4.2). In subchapter 4.3 we finally compare and assess the discussed measures with the aim to provide an overview on the strengths and limitations of the measures and to derive recommendations for further action.

4.1 Existing proposals for price and market stabilisation

The current mismatch of demand and supply in the carbon markets put pressure on prices of allowances and offsets in various compliance systems. In addition to CERs also allowances in the EU ETS and offsets from JI projects saw lately drastic price declines. This prompted various players to propose plans for system adjustments.

On EU level some decisions have been made such as the ban of CERs from certain CDM technology types and the refusal to accept CERs from new CDM projects except they are located in LDCs. This has potential to support prices in the EU ETS but does not facilitate to maintain the CDM framework. Further structural adjustments to balance again supply and demand in the EU ETS are under consideration. Beside long term measures also a temporary set-aside of EU allowances (EUAs) as a short term measure was considered. However, in a first vote in April 2013, the European Parliament decided against a temporary set-aside. In its report on "The state of the European carbon market in 2012" the European Commission considered six options which are partly connected (European Commission 2009):

a) Increasing the EU reduction target to 30% in 2020; resulting in a reduction of the allowances in the EU ETS and in the sectors covered by the Effort Sharing Decision[28],
b) Permanent retiring of a number of EUAs in phase 3 of the EU ETS,
c) Revision of the annual linear reduction factor already during phase 3 of the EU ETS,
d) Extension of the scope of the EU ETS to other sectors which are less influenced by economic cycles,
e) Limited access or even exclusion of international credits, which include CERs, and
f) Discretionary price management mechanisms, such as a minimum floor price.

Apart from option e) all options could positively affect the demand for CERs since the supply of EUAs is reduced or potentially made more expensive as it could be the case in option f). However, there is currently no consensus around these options and their implementation is unlikely in the near future. Besides, considering the existing qualitative and quantitative limitations for the use of CERs in the EU ETS and the situation that the current CER supply is already able to cover the allowed CER import into the EU ETS, it is rather unlikely that this will actually increase CER price levels. An actual effect could be expected if import restrictions for CERs are lowered which is contradictory to the overall aim of the European Commission approach. Moreover, option e) in the list even considers to further ban CERs.

In 2012, the CDM Policy Dialogue, which was initiated by the CDM Executive Board to conduct an independent review of the mechanism and to ensure the CDM meets the challenges of the post-2012 period, formulated various recommendations for action. Beside recommendations for structural reform of the CDM framework also urgently required measures are proposed that address directly or indirectly actions for price and market stabilization. These include (CDM Policy Dialogue 2012):

[28] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 European Parliament 2009

- Increasing the mitigation ambition of Parties by strengthening the pledges,
- Ensure access for all countries, also those without mitigation targets under the Kyoto Protocol,
- Establishment of an institution to serve as a de facto reserve bank for CERs, charged with stabilizing the market,
- Only carefully expanding of the supply of CERs, once prices have recovered,
- Develop and test approaches to achieve a net mitigation impact, on both buyer and seller sides and
- Phase-out of projects with comparatively low marginal costs of abatement (e.g. industrial gas projects).

Furthermore the CDM Policy Dialogue made recommendations with linkages to climate finance commitments by Parties and with relevance for this study:

- Investigate the establishment of a new fund and/or enable existing or emerging funds to purchase and to cancel part of the current overhang of CERs. National governments could be invited to meet part of their commitments to international carbon finance through contributions to this fund. The CDM Executive Board could be authorized to use a portion of the financial reserves of the CDM to establish and commence the operations of this fund.
- Promote the use of CDM standards and methodologies in accounting for payments for verified results, so as to leverage the achievements, knowledge, and resources of the CDM to support the rapid implementation of the GCF.
- Apply the standards and methodologies developed under the CDM as a way to facilitate the implementation of mitigation activities supported by the Green Climate Fund.

The CDM Executive Board (EB), also in response to the CDM Policy Dialogue results, adopted at the EB71 meeting a “CDM two year business plan and management plan 2013 – 2014”, which could partly be read as a strategy to keep the CDM alive during a gap period and to ensure the mechanism is prepared for times when the market will be back (UNFCCC 2013). Furthermore, the EB in the following meeting (EB72) reached agreement on 22 recommendations for possible changes to the mechanism with a focus to make the CDM more efficient and effective. This prompted investors to conclude that the Executive Board falls short of actual ideas to rescue the CDM and has done little to address fears the scheme could collapse under the weight of the oversupply of credits (Point Carbon 2013a). This however might not correctly reflect the current mandate of the EB and the question whether the EB can only set or influence framework conditions or stimulate processes that may lead to relevant decisions and actions by others.

In addition to the above initiatives and activities further general analyses around price and market stabilisation measures were conducted. In this regard the recent study commissioned by the Nordic Working Group for Global Climate Negotiations (NOAK) discussed various measures that could be taken to boost demand for carbon credits in the absence of an ambitious global climate policy (Seppänen et al. 2013). Warnecke and Wartmann (2012) analysed price and market stabilisation measures in the context of domestic offsetting via JI or an Article 24a mechanism in EU sectors not covered by the EU ETS. Results from these studies were taken into account for the selection of promising measures in this study.

4.2 Main approaches for stabilisation measures

4.2.1 Introduction of demand windows in existing markets

Different options to increase demand for CERs in existing markets are addressed by several of the proposals mentioned in section 4.1. Unfortunately, most of the approaches are permanently or temporarily politically inhibited. Moreover, the increased acceptance of CERs in existing or emerging ETS worldwide is, besides the required political support on national level, complicated by the fact that some countries are not Parties to the Kyoto Protocol in the second commitment period. CERs accepted in the national trading schemes might not be counted towards future national commitments on international level. Still, we identified opportunities on how existing markets can support the safeguarding of the CDM framework during a gap period.

General description

The qualitative restrictions for the import of CERs into the EU ETS after 2012 contributed to a separation in eligible and non-eligible CERs. These two CER types are not in direct competition anymore and could develop two different price levels with advantages for eligible CERs. This basic idea, if further developed, could be used to drive prices for selected CERs to levels that are sufficient for the continuation of project development of the selected project types.

The introduction of demand windows in existing markets offers such an opportunity without the immediate need to increase the overall demand and without the need to decrease the quantitative import limitations for international offsets. Demand windows will be allocated to preferential CERs which stem from projects that comply with specified criteria. These criteria can be individually determined by the party running the respective trading system and can follow preferences reflecting which CDM project types are most valuable to be continued (relevant selection criteria are presented in section 4.2.5). The size of the demand windows needs to be aligned with the expected amount of CERs that could be delivered by the market in accordance with the specified criteria to ensure the desired price effect is achieved.

Demand windows can basically be implemented in all trading systems that allow the use of international offsets but also for the sectors covered by the Effort Sharing Decision in the EU. Figure 4 illustrates the functionality of demand windows in emission trading systems. Case (A) describes current budgets in most trading systems which allow surrendering international offsets in addition to system allowances for compliance. Case (B) reduces the allowed budget for “grey” offsets for the purpose to open a window for preferential CERs. “Grey” CERs are in this respect CERs which do not qualify as preferential CERs. This category does not imply that these CERs automatically stem from low quality projects.

Demand windows have the potential to preserve a certain level of CDM activity and might provide sufficient grounds for further developments of the CDM framework. CER selection criteria can also be chosen in a way that the CDM is further developed in areas where it positively influences the reputation of the CDM as a whole. However, in a scenario of generally over supplied markets, there is

a risk that such solutions create additional supply without providing the required additional demand on a continuous basis. If demand windows are created to bridge a gap to the next commitment period, or to allow for piloting of new offsetting mechanisms, market participants both on demand and supply side need the security that a stable market for their credits will be established in the long run, which can provide a solid basis for long term business decisions.

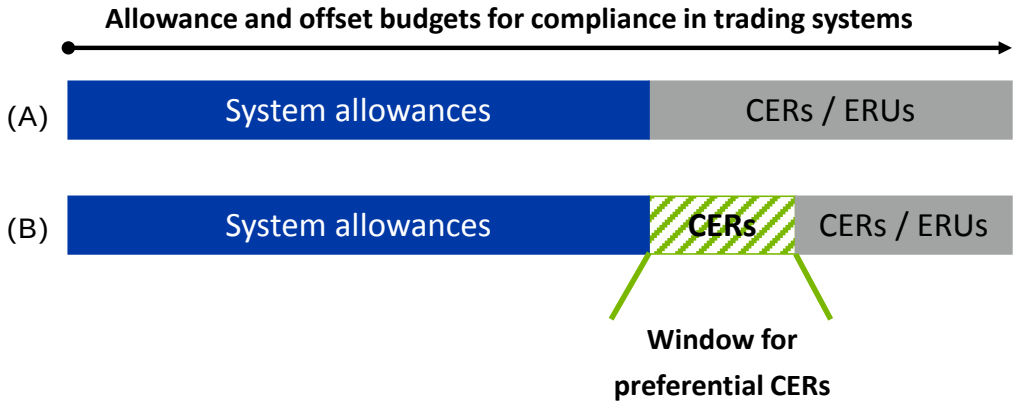

Figure 4: Schematic illustration of demand windows for preferential CERs in trading systems

Challenges

Besides the fact that this approach constitutes a solution for selected CDM activities only, it has some design features and potential shortcomings that need to be addressed during its implementation.

- Accurate alignment of the window size with the amount of CERs that potentially comply with the window criteria in one or several ETSs is required.
- The price level for preferential CERs will stay below the price level of the trading system allowances with a price difference large enough to cover for potentially increased transaction costs. Looking at the EU ETS as example this raises the question if EUA price levels are high enough to enable demand windows to support the CDM (cf. section 4.1).
- Demand windows for preferential CERs decreases the marketing opportunities for the remaining “grey” CERs. This effect relates to quantitative as well as qualitative aspects since the market will likely consider “grey” CERs as offsets with lower reputation.
- A political agreement on the window size and the selection criteria for preferential CERs seems to be difficult. Decisions on why projects are included and others are excluded might be difficult to justify or might appear arbitrary to the market.
- In addition, demand windows to be implemented in operating trading systems need to address how participants are treated that completely used their international offsets budgets already. They might have realised lower compliance costs compared to competitors. It is also likely that when this approach is actually considered participants will immediately try to surrender international offsets according to their remaining offsets volumes.

Alternative approaches

Modifications to this main approach are possible and include as an alternative the reduction of the budget of available system allowances instead of reducing the current offset budgets, while still keeping the total cap constant. A window for preferential CERs can also be opened if fewer allowances are auctioned or free allocation amounts are partly retained and retired. These options are however unlikely in the EU ETS with regards to the current political setting (cf. section 4.1).

The demand window, being a voluntary option, could be replaced by a mandatory quota for the use of preferential CERs. However, even less political support and legal barriers can be expected for this approach since quota would force all participants to purchase CERs with difficulties especially for small emitters.

Less critical in this respect is a combination with tradable offset quota between ETS participants. This is as well an option to involve all participants in the use of CERs, even if indirectly, but might create additional transaction costs. These costs need to be reflected in the price spread between general system allowances and preferential CERs and might decrease the possible price recovery effect of this measure.

4.2.2 Activation of new demand sources

Besides generating sustainable price signals from existing markets the activation of new demand from new or currently underrepresented sources is considered as a further main approach. These markets are potentially by magnitudes smaller than existing demand sources but offer new opportunities and could also be implemented in addition to other options. It needs to be noted that we are not referring in this section to existing ETS in Annex-I or further developed countries or regions such as New Zealand, Australia, California and others. These ETSs are currently in different stages of accepting CERs and the provisions for offsetting are basically set already. We are rather focusing on new or innovative approaches which are less straightforward but theoretically possible and with potential to develop to considerable sizes.

4.2.2.1 New emission trading systems

General description

Regional emission trading systems which are under consideration or systems that are in an early stage of development are required to make certain basic decisions on the actual design of the ETS. One of the design elements is to decide on allowing offsetting as a component that offers additional flexibility and thus potential for reduced compliance costs for participants. A well designed link to an offset system can furthermore reduce the level of volatility in the ETS and might lower potential price peaks. For parties that are currently considering the implementation of an ETS, developing an independent domestic offsetting scheme might be a significant burden. The administration of an offsetting scheme that delivers credible, real and measurable offsets requires effort for the set-up of

rules and institutions and thus creates costs for the party running the scheme. The resources required for an own offset scheme could be saved when existing offsetting schemes are used such as the CDM. Various countries are currently looking into opportunities to use an ETS and have in addition considerable experience with the CDM as project host countries.[29] In these cases a further advantage of choosing the CDM as offsetting scheme is that the CDM is in this way actually used as continuous stepping stone to further carbon market developments. The CDM business which developed on national level in this way remains involved and can provide its capacity and resources. The CDM in these countries would develop into a kind of (domestic) offsetting scheme similar to the use of the JI in countries that are covered by the EU ETS.

Challenges

The main challenge for this approach is to actually reach a political consensus on the national level. Fears might exist that with the CDM link cheaper CERs are imported which even undermine the price level of the trading system similar to the situation in the EU ETS. In addition, especially less developed countries might aim to ensure that all mitigation activity investments resulting from the trading system are kept domestically.

These fears can be addressed if the use of CERs is limited to CERs stemming from domestic CDM projects. The ETS administrator might allow the use of domestically generated CERs and/or the use of internationally generated CERs only under consideration of strict criteria that ensure the imported volumes do not undermine the general price level. Although not accepting CERs, California is an example in this respect as their ETS only allows the import of international offsets when the supply of domestic offsets is insufficient. Once these new national ETS are in place, domestic CERs can however only be generated in sectors outside the ETS to avoid double counting. Depending on the sectors covered by the ETS this might even lead to a shift of CDM activities to sectors where more co-benefits for e.g. poorer communities can be expected.

A barrier for domestic CDM might also emerge at the international level since the CDM is defined as bilateral mechanism between developed and developing countries. The JI however, which is also domestically applied in various Western European countries, might serve as blueprint to overcome such barriers.

Alternative approaches

This approach again does not provide a solution for the whole CDM market but generates a regional niche in which the application of the CDM framework to potentially a variety of technologies is maintained. A pure domestic application of the CDM might also allow to further develop CDM methodologies to regional circumstances and might in this way offer new opportunities in the country which are currently not available. In case no consensus with international institutions can be reached in this point, the respective CERs could be earmarked as being for domestic use only.

[29] A transparent overview on trading schemes worldwide including those that are in a very early stage or just under consideration is provided by the interactive ETS Map on the website of the International Carbon Action Partnership (ICAP). For more information we refer to http://icapcarbonaction.com/index.php?option=com_wrapper&view=wrapper&Itemid=147

An example for the domestic continuation of the CDM is moreover the recent development in China on voluntary offsetting. The regional ETS pilot plans in China will allow the use of CCERs, so called Chinese Certified Emission Reductions. In June 2012, the Chinese government released general regulations while in early November 2012 the MRV guidelines for CCERs were issued by the NDRC which closely resemble the requirements for conventional CERs under the UNFCCC (GIZ 2012). Although the detailed rules for acceptance of CCERs in the ETS pilots are not fully defined yet, it can be expected that this domestic offset scheme offers a framework for the continuation of CDM projects in China.

4.2.2.2 Voluntary demand

General description

The creation of upscaled voluntary demand for CERs through policy based measures is seen as interesting option although its real potential is difficult to predict. The measures for this approach could follow two ways. On the one hand supporting interventions could create access to existing voluntary offset markets, in a potentially up-scaled manner, and on the other hand policy based measures could support or create new initiatives with voluntary demand for offsets and independent from the known voluntary market framework.

Up-scaled access to voluntary markets requires proactive marketing of the benefits of the voluntary use of CERs and should target rather sectors and big industries than individual buyers. For example industry sectors and associations that agreed on voluntary commitments with governments could support market instruments such as the CDM by taking the use of CERs as an option for their voluntary commitments into account. The recent consideration of the city of Sao Paulo to buy up to 16 million CERs to compensate for not reaching its goal to reduce its emissions by 30% below 2003 levels by 2012 shows that the large scale use of CERs for voluntary purposes is a realistic option if seriously promoted (Point Carbon 2013b).

New initiatives creating own voluntary demand can emerge outside the UNFCCC framework e.g. to address the insufficient ambition level of international reduction commitments. These initiatives can emerge on city or regional level or even target a global coverage. The creation and further development of such initiatives can considerably be supported by policy measures. An existing example is e.g. the “wedging the gap” initiative that aims to close the current gap between mitigation pledges on an international level and the reductions required to stabilise the climate at an acceptable level. Beside various other mitigation measures, the so called “wedges”, also the up-scaled use of voluntary offsets is considered (cf. e.g. Blok et al. 2012).

Challenges

One of the main challenges for the CDM with regards to voluntary demand is the different size of average transaction volumes. Compared to the volumes available in the CDM, voluntary buyers require rather small portions of offsets e.g. for Corporate Social Responsibility (CSR) purposes. Since large scale demand is required to ensure this option results in actual impact, individual small scale buyers are not sufficient as target group in this option. In addition, approaching large scale buyers

might overburden individual small sized projects and requires support from political levels. Technical support, e.g. by registries that match buyer and seller, could provide the grounds for professionally entering the voluntary markets by activating large scale demand.

Precondition for a voluntary demand expansion is of course a high reputation and respective acceptance of the targeted CERs. These reputation challenges result on one hand from general doubts in the credibility of offsets by some stakeholders and on the other hand from doubts if the CDM is able to provide high quality CERs in large scale amounts. A trade-off between quality and quantity expectations seems however required.

The CDM faces strong competition through the voluntary standards which are active since years and have built trust and reputation especially in aspects outside the questions addressed by CDM methodologies (e.g. sustainable development co-benefits). The decision by the CDM Executive Board in its 69th Meeting (Sept 2012) to pave the way for voluntary cancellation of certified emission reductions is an important precondition but will require further steps. This includes that a differentiation of projects is ensured according to the characteristics which are relevant for voluntary buyers since for non-experts CERs are currently rather seen as an anonymous group of undifferentiated “grey CERs” compared to various high quality voluntary project offsets. Starting points for this differentiation exercise delivers section 4.2.5 of this report.

Much of the reluctance of voluntary market participants to use CERs for off-setting also comes from negative press coverage of certain CDM aspects (e.g. around HFC credits or large hydro dam projects). This leads to a misperception that CERs are of lower quality than VERs, although basic VER standards are less rigid than the CDM. Increased information and marketing initiatives as well as open promotion of CDM by Government agencies could mitigate such misperceptions and increase the acceptance of CERs in the voluntary market. The adoption of a tool to allow highlighting and promotion of the sustainable development benefits of individual CDM projects during the EB70 meeting is another important step but falls short of the level of trust and transparency that is required to compete with high quality voluntary offsets. The tool is based on a voluntary approach without monitoring, reporting and independent verification components for sustainable development claims. Since some of the voluntary standards, e.g. the Gold Standard, integrated the mandatory review of these statements in the monitoring methodologies, at least a pragmatic verification approach is required if the CDM tool is to provide the same level of trust and transparency. Another approach, likely to be less costly than requiring an independent MRV of sustainable benefits, is to enable NGOs or locally affected stakeholders to comment in a non-anonymous way to the statements made on basis of the sustainability tool. This however might not be sufficient since it is very similar to the global stakeholder consultation carried out for CDM projects. During this consultation stakeholders are invited to comment on the PDDs, which contain various claims for co-benefits. However in only very limited number of cases stakeholders submit comments. Also buyers once they have decided to buy CERs from a project do not want to face the risks that their efforts are later on publicly questioned. If strict MRV seems too costly and public supervision insufficient, the differentiation and selection of projects could also be transferred to an independent third party such as funds operated by an international organisation (cf. section 3.1.4) or the host country DNAs. That

could provide buyers on the voluntary markets with enough certainty on the quality of the CERs generated.

Restrictions for eligible CDM projects with the aim to realistically manage supply and demand in this approach are not an option for a central mechanism administration. Existing CDM projects which comply with the rules can of course on their own attract voluntary buyers without control of any further institution. The market will however channel the amount of projects and eligible CERs on its own as long as the CDM ensures that reliable information on the characteristics of projects are transparently available to the market. The more transparent the information is and the stricter benchmark criteria are chosen the better can high reputation projects reach the prices they require. In this way an indirect option for the CDM administration to influence also the supply exists.

4.2.3 Purchase activities by (public) institutions

Market and price stabilisation can also be achieved by creating artificial CER demand when non-market sources are available to fund offset purchases. Public institutions have in the past focused on roles such as being a facilitator for project developers, CER buyers and national institutions. Public funds in this respect have additional functionalities including pooling of buyers, project selection or ensuring compliance of governmental buyers. In the current situation in which the private sector demand is insufficient to stimulate mitigation activities, the importance of the public sector increases. Public institutions creating demand could have a vital role for the survival of the current market structures if funds are spent for this purpose. This artificial demand can aim to keep a minimum level of market activity to ensure the framework and the capacities are maintained. While in this section we basically focus on policy based measures, a general assessment of financial instruments complementing the CDM and offering opportunities for public funders are described in chapter 3.

General description

Such purchase activities by public buyers are driven by the motivation to continue the CDM and have a variety of options to select the CERs. Purchase criteria can be chosen in different ways according to specific individual preferences or with the aim to maximise the positive impact for the overall CDM framework. Financial resources for purchase activities can come from different sources such as regular government budgets, tax revenues or innovative sources e.g. revenues from the sales of ETS allowances. Public money can also be blended with private money as long as incentives for the private sector exist (cf. chapter 3). This alternative financing approach might only temporarily be available and could serve as a bridge until regular market demand for CERs is back.

The criteria based purchase can be carried out directly by public institutions (e.g. purchase programmes) through acquisition of eligible projects. This can be complemented by approaches as described in section 3.1.3 e.g. tender processes and reversed auctioning for projects with similar criteria. This allows “to pick the best in each class” with lower resources on the side of the fund administration. By the use of fund structures being public-private partnerships as described in section 3.1.4 also the involvement of the private sector can be best ensured.

Strategic decisions on the project selection are more important the lower the resources of the purchase activity are. While individually supported funds might have a narrow selection approach, a pooling of resources might result in large funds with a broad impact and only a minor need for project selection. The “CDM Capacity Fund” being an initiative evolving from the CDM Policy Dialogue can serve as an examples in this respect.

Figure 5 describes how such a fund structure could operate. With the resources provided by donors the fund can acquire CERs from selected projects. As long as the price levels allow, the fund can resell these CERs to the markets and can, with the revenues from the sales, finance further purchase of CERs. A negative price difference between purchasing and reselling will however continuously reduce the means of the fund. If demand from the carbon markets does not exist, the fund can also try to attract individual public or private buyers to purchase CERs over market prices levels (direct marketing). Alternatively, the fund can accumulate the CERs for future purposes (e.g. when price signals are back from the carbon market) or just retire them (cancellation).

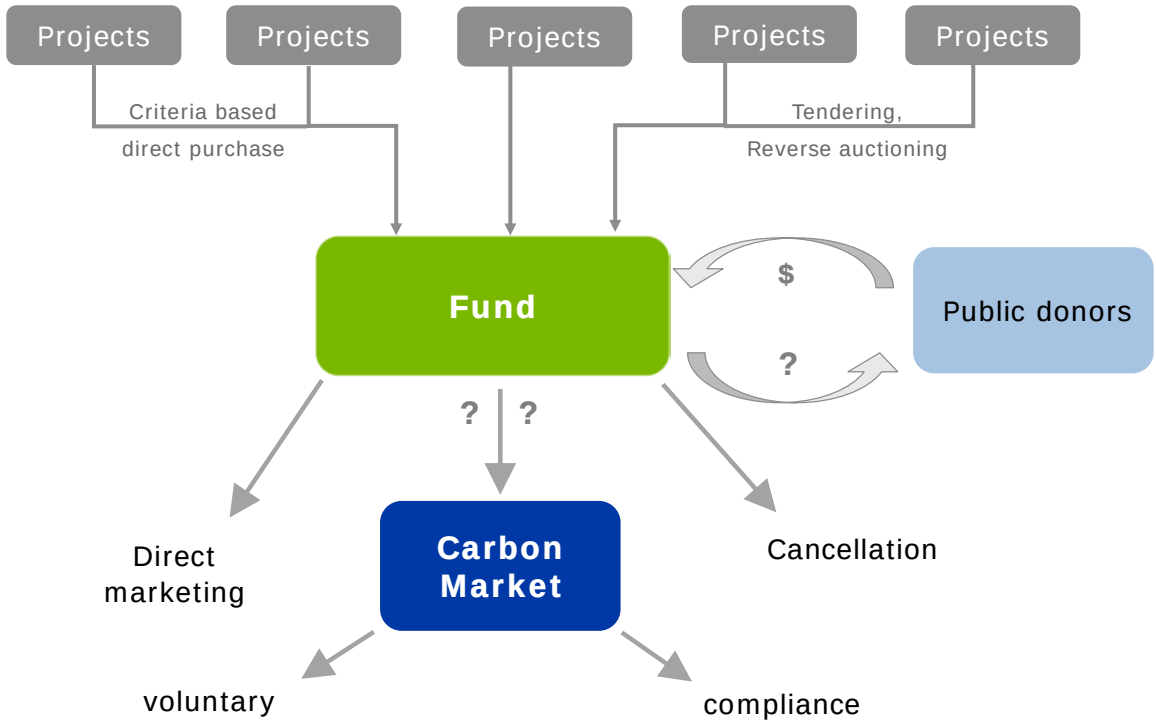

Figure 5: Potential fund structure for the support of CDM activities

Challenges

One of the main challenges of this approach is to create incentives for donors or buyers to provide financial resources for the fund. Limited incentives currently exist for private buyers apart from philanthropic motivations. Public donors, driven by the motivation to maintain the CDM framework, have limited resources due to e.g. the financial crisis, low EUA price levels and respective low revenues from alternative sources. In order to increase the available financial resources public donors might want to count purchase activities towards pledges that are made on the international level to provide climate finance (e.g. via the GCF). However, as addressed in section 3.2 funds spent for the purchase of CERs might result in double counting problems. Therefore it needs to be assured that CERs which are purchased directly or via a fund with climate finance sources are earmarked or retired. Alternatively this might only apply to parts of the generated CERs according to the share of financing provided by climate finance sources.

It also seems challenging for a global fund to combine efforts from different parties since CDM support preferences are potentially driven by national interests and might be difficult to be aligned. In case a global fund emerges, it will potentially need donor-specific windows to satisfy individual preferences. Nonetheless, alignment of selection approaches with currently existing or planned purchase activities (e.g. from UK) would create benefits for the overall impact of all initiatives.

4.2.4 Results-based financing

Results-based financing, also referred to as performance-based approach or payments for verified results (cf. section 4.1; CDM Policy Dialogue recommendation), does not directly create additional demand for CERs. Results-based financing does therefore not allow the direct continuation of CDM projects and has no market or price stabilisation impact in a conventional sense. It is however seen as important measure in the context of this study since it offers opportunities to preserve the CDM framework and the readiness of market players for situations where sufficient price signals are back. Moreover, results-based financing can provide a new environment for the application and further development of CDM methodologies with increased flexibility for testing innovative approaches. Similar to the previously discussed purchase activities, results-based financing requires the availability of (public) funds. It however does not require a distinct connection to the carbon markets now or in the near future.

The general concept behind results-based financing is applied to situations in which financial support is provided given that certain pre-defined outcomes are achieved. Finance is provided based on the achieved results that can include a variety of parameters and can in this way be structured much broader than the current CDM which is mainly focusing on quantities of GHG reduced. Parameters in the results-based financing approach can even be solely of qualitative nature and do not necessarily need to be quantitative. Examples where solely qualitative results are monitored include e.g. capacity building measures with indirect emission reduction potential. Results-based financing was initially applied in development cooperation and later also became a central part of the UNFCCC discussions

on Reducing Emissions on Deforestation and Degradation (REDD). Recently, it is also started being considered in the broader climate financing context, e.g. in relation to the implementation of NAMAs or the modalities of the GCF (cf. e.g. Jung et al. 2012, Schröder 2012).

Result-based financing might be interesting to CDM project activities as long as the quantification of GHG reductions plays a major role. Project activities using CDM methodologies to generate certified emission reductions might in a results-based financing approach get financing for the generated emission reduction below a predefined baseline. GHG quantification and maybe MRV approaches of the CDM can be used in this approach while it does not automatically have to result in actual issuance of tradable CERs. This approach when based on quantitative emission reductions below an agreed target is similar to sectoral approaches e.g. under a New market-based Mechanism (NMM). The difference is however that the financial support could come from other sources than the currently limited offset demand generated by e.g. emission trading schemes. In addition, the provided financing can be based on the results achieved on qualitative targets which can cover certain co-benefits or other areas as described in section 4.2.5. In the latter case similarities would also exist with regards to supported NAMAs although the additional component for GHG quantification based on CDM rules can be seen as unconventional.

As highlighted in the beginning of this section the results-based financing approach cannot directly address the supply and demand balance for CERs but could provide an incentive to maintain and further develop capacities, methodologies and MRV systems for carbon market mechanisms such as the CDM. In this way it could also motivate current participants to stay in the market and ensure that the resources built up by the CDM are not lost for future mechanisms. This new environment might also provide opportunities for piloting activities which test options for the transfer of the CDM knowledge to new market based approaches. Since CERs in this approach are either not issued or retired after issuance, more flexibility (e.g. in MRV) might be accepted. A results-based financing approach with a CDM component might in this way be able to also address open questions for the actual implementation of the NMM or NAMAs.

Although results-based financing does not directly address the supply and demand balance for CERs, it might still be an attractive measure to support the CDM. Especially purchasing programmes that aim to create demand for CERs which are then retired (cf. section 4.2.3) could benefit from the increased flexibility and potentially decreased transaction costs of this approach. Purchasing programmes and results-based financing approaches have considerable overlap or can even be merged when purchasing programmes do not aim to (re-)connect to the carbon markets.

A further incentive for countries to fund CDM related activities via this approach might come from different accounting of the funds towards their climate financing pledges. Since the actual issuance of CERs, which could be used for compliance, is not required in this approach no problematic double-counting issues of efforts are expected. This is moreover already addressed for the GCF which was launched in Durban. Paragraph 55 of the Annex to the Decision on Launching the Green Climate Fund explicitly considers results-based financing (UNFCCC 2012b):

"The Fund may employ results-based financing approaches, including, in particular for incentivizing mitigation actions, payment for verified results, where appropriate."

Against this background also NAMAs could serve as purchase and retirement program for CERs with the objective to keep the CDM rules and infrastructure intact until either the market recovers or new mechanisms are available that have integrated the CDM rules. It needs however to be noted that a stringent application of CDM rules to a NAMA results in a high level of complexity as the CDM marks the highest level of accountability of emission reduction achievements. Such approach is mainly attractive for countries and donors which identify the GHG quantification in NAMAs as central focus, or which are also driven by the interest to support the CDM. Implementation of NAMAs with less stringent accounting rules makes the activities simpler, more flexible and results in lower transaction costs. If high accountability of emission reductions is desired, however, the utilisation of established components from the CDM can lower the administrative efforts and thus ensure a reasonable balance between credibility, transaction costs and capabilities in regions or for technology types. In this way the CDM could also develop from a market-based towards a more policy-based tool by providing components of its established regulatory basis for future mitigation instruments. Beside the use of its MRV framework also approaches that address e.g. “bottom of the pyramid” activities, standardisation or suppressed demand might contribute to future instruments based on results-based financing approaches.

4.2.5 Differentiation

Whenever support measures cannot address the CDM market as a whole, a differentiation of projects and their CERs is required to enable focussing of efforts to selected parts of the CDM. Differentiation is also mentioned as precondition for several of the above described market and price stabilisation measures such as the introduction of demand windows, preferential purchase activities and the activation of voluntary CER demand. Against this background it seems appropriate to describe differentiation opportunities in a dedicated section even if differentiation as such does not constitute an own measure in the context of this study.

Generally, CDM project or CER selection processes follow specific decisions on criteria which are relevant in the view of the particular decision maker. Since groups of buyers or policy makers have different starting points for their selection – they aim e.g. for the use of different measures and have varying preferences – it is impossible to provide at this stage final recommendations. We therefore provide a list of criteria that characterise projects and discuss potential options but leave the final decision to the actual decision makers. Relevant criteria to characterise and select CDM projects, in case the available funds for the CDM support are limited, include the following:

Impact

Project types that are viable at lower CER prices and in addition meet further criteria might constitute the core focus of the selection in cases where buyers with limited funds aim for a maximisation of the impact (cf. chapter 2).

Technology

The technologies or methodologies applied by different project types can be used as criterion for the selection. The selection of technologies might follow the understanding that specific technologies generally imply conformance with some further criteria or benefits as described in this section and thus leading to a generally higher integrity. The selection might alternatively be purely driven by political decisions. Objectives can e.g. include supporting the transfer of specific technologies with an economic benefit for the buyer or donor country. Existing cases of technology selection give a good insight in the types of technologies that are favoured by buyers. In this respect qualitative import restrictions imposed by the EU for the EU ETS are a good example. It can be assumed that technology types stigmatised by these restrictions will also not be considered by most buyers and supporters in the future.

Alternatively, CDM support might be limited but still broadly spread over a variety of project types instead of focusing on single preferential types. The rationale behind this approach is to ensure that the available capacity after a gap period and further developments are also broadly spread. In keeping continued activity on various methodologies a broad knowledge for the CDM and further mechanisms is maintained.

Region

The host country or region in which projects are implemented is an important criterion to characterize projects. Regional differentiation is moreover already applied by the import restrictions of the EU ETS which distinguish between CERs generated in LDC and non-LDC. Various definitions from different organisations exist that might additionally be considered as preferences. Examples are the World Bank and the Development Assistance Committee of the OECD (OECD DAC) which classify groups of countries with minor differences. While the World Bank focuses on income levels (e.g. low, lower or upper-middle-income economies)[30] the definitions provided by the OECD DAC include countries and territories eligible to receive official development assistance (ODA). The categorisation of the OECD DAC considers the income classification according to the World Bank and excludes G8 and EU members and countries with a firm accession date for entry into the EU[31]. LDCs are listed separately by the OECD DAC.

CDM supporters with limited funds can additionally have regional preferences which are not based on independent external classifications. This might be the case where bilateral cooperation agreements already exist or historical or economic reasons result in specific preferences. Regional proximity or a regional role model status of countries can motivate further preferences. Countries that qualify as a leader for a regional group might have the potential to successfully promote and multiply positive effects of supported activities in their region.

[30] For more information we refer to http://data.worldbank.org/about/country-classifications/country-and-lending-groups
[31] For more information we refer to http://www.oecd.org/dac/stats/daclistofodarecipients.htm

Co-benefits

Project-based mechanisms which solely focus on the reduction of GHG might overlook that GHG mitigation project activities can have negative effects for e.g. the local air, water or soil quality. Also, negative social impacts might occur as side effects of projects. On the other hand various project activities exist that lead to improvements in exactly these areas. Often stakeholders which are not directly involved in the project activity (e.g. local or rural communities and neighbourhoods) profit from the existence of co-benefits.

The CDM generally provides for the definition of relevant targets for the eligibility of projects already. CDM projects shall e.g. assist non-Annex I countries in achieving sustainable development by the transfer of low GHG emitting technologies. In addition, the CDM host country can also define eligibility criteria for projects taking place on its own territory. These criteria are relevant for the issuance of the "letter of approval" by the national authority. Voluntary offset standards often go beyond this requirement and define their own criteria for the avoidance of negative side effects or the generation of specific co-benefits. These criteria are considered for the approval of projects and are often also included in MRV provisions.

The list of potential environmental and social co-benefits is long while the identification of the co-benefits that will actually be used for the selection of projects depends on the specific preferences of the institution aiming to support the CDM in the current situation. Starting points can e.g. be the Millennium Development Goals[32] of the United Nations or the Gold Standard with its “Guidance on Sustainability Assessment” which is built around 12 indicators from the three areas environment, social development and economic and technological development (Ecofys et al. 2009). Warnecke and Wartmann (2012) proposed further quality criteria for projects based on the Agenda 21 items, resulting from the United Nations Conference on Environment and Development held in Rio in 1992 (UN DESA 1992). The Agenda 21 lists 28 dimensions relevant for sustainable development which are grouped into the three main areas (1) social and economic dimensions, (2) conservation and management of resources for development and (3) strengthening the role of major groups. Furthermore, the adoption of the CDM-tool to allow highlighting and promotion of the sustainable development benefits of individual CDM projects during the EB70 meeting provides a suitable starting point to develop project differentiation according to co-benefits. However, as already highlighted earlier it is important that the institutions supporting the CDM have confidence that the projects eligible with their selection criteria will withstand scrutiny. Co-benefit claims on a voluntary basis will likely not be sufficient in most cases.

Besides environmental and social aspects, co-benefits for the climate or for host countries are increasing in importance. The reform proposals for the JI from the JISC (JI Supervisory Committee) considered as an option for host countries to issue less emission reduction certificates than reduced emissions. The Conference of Parties (COP) decisions on the Framework for various approaches (FVA) and New market-based Mechanisms (NMM) include a reference that such mechanisms and frameworks shall achieve a net decrease and/or avoidance of GHG. Against this background and with

[32] For further information we refer to http://www.un.org/millenniumgoals/

a view on the competitiveness of the CDM towards new mechanisms CDM support might focus as well on co-benefits for the climate. In addition to setting e.g. fixed or profitability based discounts for the generation of net mitigation effects (cf. Warnecke, Wartmann 2012) e.g. purchase activities could learn from the Projects to Reduce Emissions (PRE) programme launched by the New Zealand's government in 2003 to support power generation projects that reduce GHG. The scheme was based on tenders and required applicants to state a "bid ratio", being the ratio of the number of units requested relative to the emission reductions delivered. The lower the bid ratio, the higher the ranking an eligible project received.

Project stage

A further important criterion for the support of selected projects is the stage of the project in the development cycle of the CDM. We distinguish in the following between three project stages to facilitate our considerations. Projects can be completely new projects, projects under development but not physically implemented and already operating projects.[33] The support of projects in all stages might have advantages for the CDM framework.

As completely new projects we consider projects that only exist as ideas but where no investment decisions are taken yet, neither for investments to develop them within the CDM project cycle (PDD development, validation, etc.) nor in actual implementation. CDM supporting institutions might be in favour for the support of new projects to ensure that their investment creates new and additional GHG mitigation. In addition the initiation of new project ideas offers opportunities for project proponents to provide the remaining market with tailor-made projects that address the selection criteria of the respective buyers already. This in turn would also assist buyers in identifying projects that fit their preferences. However, solely focussing on completely new projects puts project proponents that earlier entered the CDM at a disadvantage. Their trust in the carbon markets and carbon pricing in general might be damaged, leading to consequences for their future behaviour.

Projects under development are projects for which the CDM project development has started. Certain activities such as a feasibility study, PDD development, stakeholder consultations and validation might be started, completed or stuck due to the current situation. These projects can even be registered but not physically implemented. The support of projects in this stage could help clearly additional activities where the actual implementation and GHG mitigation can and will only be financed with a certain level of CER revenues. If ERPAs are not signed in the beginning and still valid, these potential good and advanced project activities will not be realised, leading to identified but unused emission reduction potentials.

Operating projects are considered as being registered and physically implemented. Projects might continuously operate or be temporarily or partly shut down due to the absence of the required CER revenues. In addition, many of the operating projects might have suspended their MRV and/or issuance activities since current CER price level do not cover the related transaction costs. For

[33] Please note that in chapter 2 we distinguish between new and initiated projects while for this section the category "initiated projects" is further distinguished in "projects under development" and "operating projects".

projects at this stage it seems rather complex to distinguish between projects that require additional support in the current situation and projects that are still feasible.

GHG mitigation activities that are actually discontinued and leading again to baseline emission levels due to the current situation are clearly worth being supported. The number of these projects is however difficult to estimate and might rather be small. Projects that have not yet refinanced their investments, or respective investments gaps that were supposed to be covered by the CDM, while no ERPAs exist (anymore) which provide a sound financial basis are also to be considered.

At this point it also needs to be considered if preferences exist for the nature of participants that will be supported. Groups of local stakeholders and investors, specialised CDM consultants and investors as well as multilateral companies might have a different vulnerability against investment failures. Especially the role of domestic investors should be carefully considered. At least for the renewable energy projects in the CDM it is known that the majority of the investment provided by the CDM has come from domestic sources (Spalding-Fecher et al. 2012). Some domestic investors which focus on electricity generation in general and not purely on types of renewable electricity do not consider the CDM and renewable energy as their core business. These investors do not have to continue with the generation of renewable electricity and their investments might be shifted from renewable energy back to fossil fuel based generation. Against this background we conclude that the decision on which existing projects should be considered for support in the current situation cannot be made without analysing the specific circumstances of projects (see also chapter 2).

4.3 Comparison of measures

All measures identified and discussed in this chapter provide a certain level of support to the CDM in the current situation and in situations with slight price increases and all have different strengths and limitations. The likelihood of the actual implementation of each measure mainly depends on its political feasibility which might be assessed differently depending on the individual perspective. For the support of the CDM urgent action is required and all approaches might be worth to be followed up. Measures might be implemented in parallel or in combinations while the actual decision on what approach will be pursued is based on the individual preferences and possibilities of decision makers.

The following comparison table (Table 13) aims in this respect to provide a basis for selection of the most feasible measures in the individual situation. The above described measures for price and market stabilisation are compared on basis of a set of practical implementation questions and further criteria addressing the expected impact. These include:

- Who finances the proposed measure? And what are its costs?
- What is the potential implementation timeframe, once the general measure is agreed?
- Who implements the measure and is the decision maker for setting the selection criteria, assuming that available funds for the measures are limited?
- What impact on the overall CER demand can be expected? Will new demand be created or just the targeting of existing demand changed?
- What are potential benefits for the CDM framework (e.g. measure creates an environment for the application and further development of CDM methodologies, rules or institutions)? Will the measure maintain the CDM as such? Will it offer room for further developments?

Since the actual suitability of the measures depends on individual perspectives and preferences we refrain from allocating a direct valuation to the criteria applied to each measure in Table 13. The table furthermore shows that effects of measures are significantly influenced by the approach actually applied within the stabilisation measure. Moreover, all measures have in common to be sensitive to the differentiation criteria selected for the definition of preferential projects or to the expected co-benefits from projects (cf. section 4.2.5). This as well influences the potential of the measures to have positive effects for the general reputation of the CDM. If supported projects are outstanding with regards to sustainability and co-benefits, this might have an impact on the overall future perception of the mechanism. For results-based financing this might however depend on the extent to which the CDM framework is applied. Activities with good reputation but with great distance to the current CDM framework might not be associated with the CDM in general.

Generally, it can be concluded that no measure qualifies as single “silver bullet” but the implementation of each approach has potential benefits for the CDM. The current situation, which is characterised by a high level of uncertainty for project developers on possible approaches to continue within the CDM environment, urgently requires stabilisation measures. Due to this urgency measures that can immediately be implemented (e.g. purchase activities) should be considered first while longer term support strategies should combine or consider all available measures.

Table 13: Comparison of measures for market and price stabilisation

	Introduction of new demand windows in existing markets	Activation of new demand sources		Purchase activities by (public) institutions	Results-based financing
		New emission trading systems	Voluntary markets		
Financing: sources & implications	existing trading systems, ETS participants have to bear slightly increased compliance costs	new trading systems and participants; ETS administration and participation might have lower costs	voluntary buyer initiatives; costs for voluntary compensation might decrease when CERs increase the traded voluntary market	mostly public donors; governments or governmental institutions	mostly public donors, but also climate finance sources via the GCF or directly from governments
Implementation timeline	rather medium than short term; agreement on criteria and procedures might be challenging	short, medium or long term; depends on the implementation planning of the trading scheme	short or medium term; immediately possible but large scale impact requires marketing efforts	Short term; if funds are available and agreements on selection criteria could be reached	short or medium term; individual donor might act immediately while climate financing sources require further international agreement on allocation and accounting rules
Decision maker for selection criteria	governments responsible for administration of existing ETS	governments responsible for administration of new ETS	individual voluntary buyers and initiatives	(public) donors	(public) donors and potentially the GCF
Impact on overall CER demand	no new CER demand since general quantitative limitations for CER use remain unchanged	new demand is created, amount depends on the size and design of new trading systems	new demand is created, amount depends on marketing efforts and voluntary buyer funds	new demand is created, amount depends on available funds and spending efficiency	might not result in actual CER demand
Supportive effects for the CDM framework	support for the further development of the CDM framework in areas that are subject to the agreed selection criteria	support opportunities are limited regionally and to non-ETS sectors	CDM framework support in project types and regions that are subject to voluntary buyer preferences	support opportunities according to the selection criteria of the funding institution; increased opportunities when CERs are retired	according to the agreed results for financing; increased flexibility to test new approaches since CDM rule application is voluntary

5 Conclusions

The aim of this CDM Market Support Study is to identify opportunities to support the continued implementation of CDM projects and the CDM market as a whole in situations with low CER prices. In this respect we follow a threefold perspective. We assess transaction and abatement costs and further factors which influence the sensitivity of project types against low CER prices. This analysis is followed by an identification of financial instruments that could complement project support provided by the CDM. Finally, we discuss and compare policy based measures for market and price stabilisation. We believe that the combined results of these three perspectives need to be considered to provide support to the CDM in an efficient and effective manner.

The results of chapter 2 show general trends for different project types with regards to their vulnerability to low CER prices. These trends indicate the required support and respective CER price levels that are needed to create sufficient incentives for the market to continue with the CDM. One project category is identified as a promising target for support activities due to its feasibility in relatively low CER price bands and its sensitivity to changes in CER prices. This category encompasses energy efficiency (own generation and households), methane reduction (landfill gas, methane avoidance, and coal mine/bed methane) and renewable energy projects (small and large-scale hydropower, and biomass) (cf. Table 11).

The results however also show that these trends do not provide information that is detailed enough to allow for the determination of the required support on the level of individual projects. Even if project characteristics are broadly similar (e.g. technology, geography) determining specific support levels should rather be based on project specific assessments or achieved by market instruments to be efficient. In addition some buyers might also consider non-monetary factors in the determination of the support level, such as technology used, region where the project is located and co-benefits of the project. In this case, they might be willing to offer a CER price that is higher than required to maintain the viability of CDM projects.

For the determination of support levels with market instruments chapter 3 identified a reversed auction as most efficient which requires project developers in a competitive situation to indicate the required CER price level. The success of such an auction is, nonetheless dependent on a large number of project developers to be aware of the auction.

Furthermore, chapter 3 identifies and assesses a broad range of financial instruments that could be applied to provide support for the CDM. These instruments allow public funders to quickly recreate a demand for a selected number of CDM projects. Beside efficiency and flexibility of instruments, we also consider the potential to involve the private sector in the application of the instruments. The assessment demonstrates that some financial instruments may achieve better results than others, such as “conditional subsidies” or “guaranteed floor price”. However this does not exclude other instruments such as “securitisation” or “bonds” issuance which can be complementary and extremely useful to free some capital from public institutions, and get the financial private sector involved.

In addition to the analysis of financial instruments, the results from chapter 4 identify various measures that could be promoted on political levels to support the CDM. These measures range from “demand windows in existing ETS” and the “activation of new and/or voluntary demand” to “purchase activities by (public) institutions” and “results-based financing” approaches. In assessing the individual strengths and limitations of the measures we identified no measure that qualifies as “silver bullet” assuming that funds to support the CDM are limited.

Due to the urgency to support the CDM, measures that have short implementation timelines are however recommended for immediate response measures. These are mainly “purchase activities by (public) institutions” and “results-based financing” approaches. While artificial demand by purchase activities mainly supports existing structures, result-based financing seems most promising when the main objective is to maintain and also transfer the knowledge base developed under the CDM to new mechanisms such as an NMM or NAMAs. This set-up of combining the CDM with other results-based financing approaches might also provide a favourable environment for new mechanisms to conduct pilot activities and test new approaches. Chapter 4 furthermore shows that in the longer run all measures offer supportive contributions although their implementation timelines, political barriers and scale of impact vary significantly.

A maximised impact of the targeted measures is preferred and could be reached by coordinated, concerted actions pooling the resources of all potentially supporting institutions. This however requires time and seems challenging on the short term. Individual preferences for the targeting of support (cf. section 4.2.5) and the selection of measures and instruments might result in coordination efforts that delay the effective implementation. A pooling of resources as medium term measure is nonetheless pursued by the CDM Capacity Fund being an initiative evolving from the CDM Policy Dialogue (cf. section 4.2.3). Also the Green Climate Fund pools resources which could result in important lessons learned. Climate finance can in addition be a direct source for large-scaled CDM support. This however requires clarification on the harmlessness of the combination of ODA and climate finance with CDM (cf. section 3.2).

Beside the scale and the timing of the support also the effective spending of the resources will contribute to the success of the CDM support. From the perspective of individual projects and with the knowledge of all project characteristics it might be easy to identify a specific combination of instruments and measures that result in the most effective support. However, in the current situation the decision makers on political levels or at institutions providing the funds will decide on the approach for the support and the allocation to specific projects according to their individual preferences.

The results of this study however support both sides. Project developers are prepared to reply to future buyer or donor preferences and institutions supporting the CDM are assisted to find the most effective combination of approaches. In this respect the conducted analyses and assessments that are summarised in this study provide a toolbox of opportunities from which the most appropriate combination can be chosen for CDM developers, buyers and other supporters. The study shows at several stages that limitations exist that require a project specific determination and do not allow to derive one general recommendation.

Finally, it needs to be highlighted that the combined results of the study identify supportive instruments and measures for the CDM in the current situation with insufficient CER demand. These opportunities should however be seen as temporary solutions which cannot replace the requirement for reactivated general demand in the medium or longer term. All identified measures are dependent on the willingness of institutions to support the CDM. The enthusiasm to support the CDM in its current form might however disappear when no large-scaled role for the CDM is expected in any future climate regime.

This moreover strengthens the need to pave the way, today, for the regulatory framework of the CDM to be maintained by transferring it to future mechanisms. This could also be understood as a chance to develop the CDM from a pure market-based instrument towards an integrated part within future market-based and also policy-based instruments by providing components to instruments such as the NMM, the FVA, NAMAs or results-based financing approaches. However, if none of the described supporting instruments, measures and other initiatives is applied to the current CDM, it seems unavoidable that participants leave the market and knowledge on market instruments is irreversibly lost. This will have enduring consequences for the setup of future market mechanisms and for future attempts to involve the private sector.

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