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German Projects and Initiatives

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Foreword

Mitigating climate change poses an unprecedented challenge for the international community. If the United Nations Framework Convention on Climate Change (UNFCCC) target of limiting global warming to two degree Celsius is to be met, cooperation within the international community must take on a new quality at all levels and our economic system must see radical change.

Having made the largest contribution to global climate change in the past, industrialised countries must leave existing emission paths to effect timely reductions in global greenhouse gas emissions that are efficient, effective and can be sustained. Also, with rising emissions in developing countries and emerging economies, these too must intensify efforts to combat climate change.

The Clean Development Mechanism (CDM) and Joint Implementation (JI) – the two project-based mechanisms established under the Kyoto Protocol – provide an international framework to enable collaborative climate change effort. They allow industrialised countries to use emission reductions achieved, for example, with CDM projects in developing countries to meet part of their Kyoto Protocol commitment targets. With more than 7,000 CDM projects having been registered since 2005, valuable experience has been gained in planning and implementing climate change activity worldwide.

Despite all of this, the global carbon market currently faces many and diverse challenges. Emission reductions achieved in the European Union (EU) have notably led to a dramatic drop in demand for CDM and JI-generated

emission certificates – a situation that could directly impact climate change projects initiated under the mechanisms. The disappearance of a large share of revenue from certificate sales puts projects at risk, making their future uncertain. This gives rise to the question of how the crisis affects different project types and how the climate change impact of those projects can best be made crisisproof.

Looking to the future, another issue to be addressed is how experience gained with the CDM and JI can be used to take account of the altered conditions in the international climate change agreement to be negotiated by 2015. While the CDM reform process is still underway and important reform measures have yet to be implemented, the Parties to the UNFCCC decided at the climate conference in Durban to create a new market mechanism (NMM). The mechanism's detailed structure has yet to be decided, as has its relationship with both existing and emerging climate change mechanisms, but it is clear that compared with the CDM and JI, the NMM will be greater in scope and will cover broader segments of the economy. Because achieved emission reductions are no longer to be exclusively used to meet industrialised countries' Kyoto Protocol targets, a net climate change mitigation effect will ensue.

Despite the NMM's huge differences when compared with existing projectbased mechanisms, the CDM and JI can deliver key methodologies and models for use in designing future market mechanisms and thus avoid reinventing the wheel. Also, infrastructures created under the CDM and JI can be used as a basis for a phased transition towards the new market mechanisms of tomorrow.

Against this backdrop, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports a wide range of related ac-tivities. The associated research work provides a scientific basis for the debate on the structure of the international carbon market under a new climate change agreement. It also highlights options to allow continuation of projects already implemented under the CDM and JI. The key findings of this work are set out in this brochure, which I trust you will find an interesting and informative read.

Berthold Goeke

Ministerial Director

Deputy Director General 'Climate Policy'
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Carbon market on a tightrope of hope and fear

The international carbon market currently balances on a tightrope of hope and fear. Hope, because market-based climate change instruments are still being discussed as a key component of a future climate change agreement. This is due not least to the valuable experience gained in the application of the models, methodologies and processes used with the two project-based mechanisms, the Clean Development Mechanism (CDM) and Joint Implementation (JI). This treasure chest of knowledge should not get lost, but be kept and used. After all, CDM and JI activities have allowed a wide range of methodologies designed to calculate and verify emission reductions to be tried, tested and improved. Also, over the years, carbon market players have accrued vast expertise in the development and use of market-based instruments. This applies as much to the United Nations (UN) and national governments and agencies as it does to the research community and private industry.

It is clear, however, that in all likelihood, the models and methodologies used under the CDM and JI will not be readily transferrable 'one to one' to new market-based climate change instruments. Such instruments will probably be subject to different demands:

- Future instruments will go beyond the purely project-based approach. Tools and ways must thus be found or created to enable broader segments of host country industries to be included.
- In addition, future instruments themselves will be required to contribute directly to the climate change effort to assist achievement of the two-degree target. Up to now, the CDM has been a zero sum game – the certified reductions achieved in developing countries enable additional emissions in the industrialised countries that use the certificates generated as a result.

What carbon market players must fear, however, is the outcome of the current market crisis. On the one hand, Europe's financial and economic crisis resulted in a huge gap between expected and actual demand for emission reduction certificates. On the other, the CDM and JI have produced extremely successful projects which in turn have generated a large number of certificates. The resulting massive over-supply of certificates has seen prices plummet.

In turn, this situation threatens the future of projects already registered. What will happen to them when the certification period expires? Will the reduction activity be stopped? Which projects are directly affected and are at risk of being stopped right now?

The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) funds a range of research projects that tackle issues in this fraught arena, with the portfolio covering both of the scenarios outlined above.

Two of the projects focus on the immediate impact should the international carbon market collapse and develop options to support the climate change activities most at risk:

- *Concepts and Country Specific Strategies for the Carbon Market Post 2012*
- *Options for Continuing GHG Abatement from CDM and JI Industrial Gas Projects*

Four further projects look at the further development of the market-based approach based on experienced gained with the CDM:

- *Standardised Baselines and Their Implications for a National Measurement, Reporting and Verification (MRV) System in Least Developed Countries (LDCs)*
- *Opportunities for a Stepwise Transition from CDM Towards Future Market Mechanisms and Emissions Trading and the Respective Capacity Building Needs*
- *Options to Utilise CDM Design Features for Future Market Mechanisms*
- *Developing Sectoral Mechanisms in the Transition Period Towards a New Climate Treaty*

Despite their differing research focus, these projects have a common goal: securing the expected climate change mitigation effects despite the unexpected difficulties seen on the carbon market.

Continuation or Collapse: CDM projects and their fate should the carbon market fail

The Clean Development Mechanism serves as a market mechanism to include the private sector in the financing of global emission reduction efforts. It provides monetary incentives for the implementation of climate change activities that foster sustainable development. The first CDM project was registered in November 2004. Since then, the CDM has developed both quantitatively and qualitatively: more than 7,000 projects have been registered in more than 80 countries to date.

Still, the global carbon market faces difficult times. At the end of the first Kyoto Protocol commitment period, the lack of any holistic international climate change agreement with ambitious reduction targets had a negative impact on demand for carbon credits. In addition, the European Union (EU) decided that after 2012, only certificates generated from CDM projects conducted in least developed countries (LDCs) could be used in the EU Emissions Trading Scheme (EU ETS). Because the EU ETS constitutes the largest segment of the international carbon market, it plays a key role when it comes to demand for certificates and thus for the future of the CDM in mid-income countries. These include the fast-growth emerging economies such as China, Brazil and India, in which the vast majority of CDM projects are registered. However, the over-supply of certificates is so great that, at the time of writing (May 2014), no adequate price signals can emerge – not even for certificates generated from projects conducted in LDCs.

Project aim

Not all projects initiated under the CDM survive through to registration. Some fail in the early stages, while others are unable to meet the financial, political or regulatory demands due to a lack of start-up funding or government backing from the host country, or because of the quirks of a complex CDM instrument which has often been subject to change.

Then again, the future of many registered projects also remains uncertain. Some are unable to cover their operating costs, and others lack the funds needed for verification or monitoring. Many projects have thus been put on hold or, despite the significant investment already made, have been cancelled altogether in deference to the difficult outlook on the carbon market.

Thus, the aim of this research project is to assess what happens to CDM projects that have either failed to enter the CDM process or have left it when their life-cycle expired. The research findings will be used to document the impact should the carbon market collapse. In particular, they should highlight whether and to what extent the collapse will allow completion of registered projects. Rather than looking at individual cases, the analysis will be used to draw statistically significant conclusions for the CDM as a whole.

In a second phase, an analysis will be conducted to determine the extent to which such stranded projects can be continued using alternative instruments, meaning without the carbon market. It can be assumed that the situation regarding certain projects, and the opportunities to continue them, will vary depending on the country group and the type of technology being used. Ultimately, the aim is to highlight available options and make recommendations to allow continued international carbon market cooperation.

Methodology

The project's methodology differs on several points from existing CDM pipeline analyses:

1. The study focuses solely on the phase after registration.

2. The study uses a repeated survey of selected projects in order to document relevant trends over a prolonged period of time.

3. Data collection is done by means of stratified sampling of selected projects, whereby the project developers are personally contacted and interviewed. Publicly

available project data (such as project documentation and databases) are also analysed.

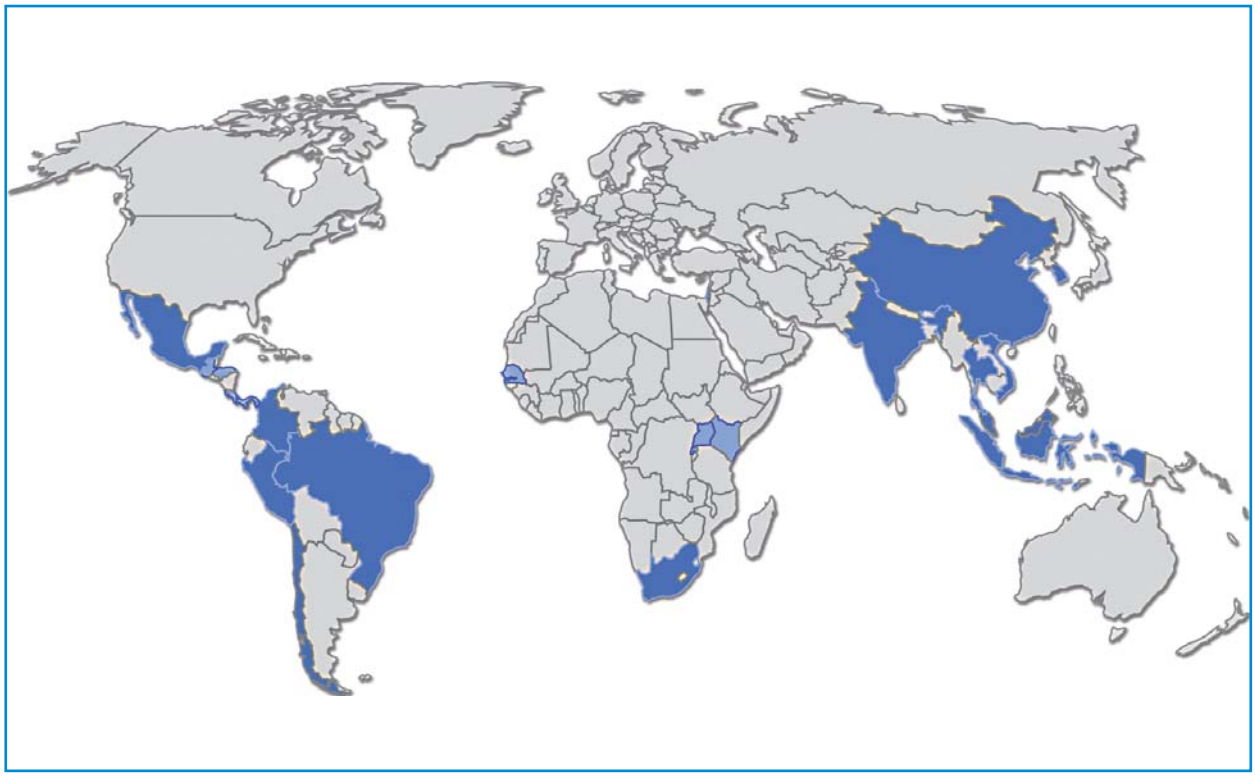
The first two points arise directly from the project's research question. The stratified sampling process is necessary to serve the high expectations placed on the data to be collected. The aim is to be able to draw substantiated conclusions on CDM projects in their entirety. But to do so, it is important that the data be statistically significant. This is the only way to quantify any remaining uncertainties. Conducting a study of the overall situation for more than 7,000 registered CDM projects is entirely unfeasible. Although the stratified sampling process allows only selected projects to be assessed, it still provides statistically significant findings.

In the first instance, a group of countries is selected. The challenge here is to take in countries with a large number of projects while achieving a balanced regional distribution and taking account of the differing social, cultural and economic conditions.

In addition to relevant countries, the selection was limited in respect of project types. Large-scale hydropower projects with over 20 MW rated output were not taken into account because it can be assumed that, due to the huge investment they involve, they will be continued without funding from the CDM. Afforestation and reforestation projects were also excluded because these have never been recognised under the EU ETS, meaning that they cannot be affected to any great extent by the trends seen in that emissions trading arena.

The sampling method used allowed the selection to be reduced to 1,311 projects, with the developers being

List of countries and regions included in the analysis	
Brazil	Central America Region
Chile	Costa Rica
China	Guatemala
Columbia	Honduras
India	Panama
Indonesia	
Israel	Sub-Saharan Africa Region
Malaysia	Kenya
Mexico	Rwanda
Peru	Senegal
South Africa	Uganda
South Korea	
Thailand	
Vietnam	



Overview of countries and regions included in the analysis

contacted to enable initial data collection. This was done, among other things, by using a detailed online survey containing 30 questions. The questions cover current information on five key aspects:

- Implementation and operational status of the projects
- Use of certificate purchase agreements and the certified emission reduction (CER) marketing approach
- Strategies to verify and issue certificates
- New obstacles and those already overcome
- Availability of international and national support in addition to the CDM

Status of activity

The representative group was selected using the stratified sampling approach, and contact was made with those involved in the first of the 1,311 projects. The survey questions were presented to a test group of developers of some 100 projects in order to obtain feedback on the manageability of the questionnaire. This test phase also gave an indication of the scope and quality of the expected feedback, which was then used to enhance and finalise the questionnaire.

The online survey was launched for the selected CDM projects at the beginning of March 2014. To ensure the broadest possible reach, the research team is currently actively seeking contact with those responsible for the projects in question. Initial survey results are expected in May 2014. These will be processed in a database and will serve as the basis for the detailed analysis: what are the conditions under which projects are stopped? Which factors foster project continuation despite the collapse of the carbon market? How much influence do existing or planned national policy instruments, such as Nationally Appropriate Mitigation Actions (NAMAs) or renewable energy promotion schemes, actually have?

In a final phase, country-specific recommendations are drawn up on how to deal with stranded projects. How can these be secured or even revived using existing or yet-to-be developed policy instruments?

Further information

This research project is conducted on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) as part of the Environmental Research Plan and is implemented via a consortium comprising Ecofys and TÜV Süd. To learn more about the project see:

www.ecofys.com/en/project/evaluating-the-state-of cdm-projects/

Project life-cycle
2013–2015

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Industrial gas projects under the CDM and JI: A future despite the crisis?

Industrial gas projects were among the first to be conducted under the CDM. The most important gases are trifluoromethane (fluoroform or HFC-23), and nitrous oxide (N_2O). HFC-23 is a byproduct that occurs in the production of chlorodifluoromethane (HFC-22) which is used as a cooling agent and as a basis for the production of other chemicals, especially PTFE – better known as Teflon. N_2O is also an industrial byproduct which largely occurs in the creation of adipic acid and nitric acid. Both are highly potent greenhouse gases (GHGs). N_2O is some 300 times stronger than CO_2, while HFC-23 is as much as 14,800 as damaging to the climate as CO_2. HFC-22 also contributes to the depletion of the ozone layer.

Given this extremely strong effect on the climate, project developers found industrial gas projects particularly attractive and highly lucrative in the early days of the CDM. In some cases, the revenue accrued from the sale of certificates was so high that it provided 'perverse incentives'. In the meantime, some facilities have increased production of HFC-22 solely to generate more income from its subsequent destruction.

In response to massive criticism, the methodologies used to calculate emission reductions were adapted to prevent such extreme distortion. Nonetheless, industrial gas projects are still frowned upon due to the high profits they generate when compared with their relatively low contribution to sustainable development. The EU banned the use of certificates generated from industrial gas projects at the start of the third EU ETS trading period. What goes uncontested, however, is that such projects effect reductions in emissions which are extremely harmful to the climate, and achieving those reductions is relatively low in cost. Thus, given their important contribution to reducing greenhouse gases, premature stoppage of industrial gas projects could hinder global climate change efforts. If the greenhouse gas reductions achieved with industrial gas projects were to be offset by reductions in other emissions, it would send the costs of climate change mitigation through the roof. This is why the development both of measures to identify endangered CDM projects and of appropriate support strategies is of key importance.

Project aim

As opposed to many other types of CDM projects, reducing industrial gas emissions involves ongoing costs. Also, the reduction activity generates no revenue other than that from the sale of emission certificates. If this revenue falls away due to the collapse of the carbon market, the reduction activities could be stopped and the ensuing damage to the climate would be huge. BMUB thus finances the project on *Options for Continuing GHG Abatement from CDM and JI Industrial Gas Projects*, which focuses on the following research questions:

- Which project types are at risk of their reduction activities being stopped in the face of low certificate prices?
- How high are the (ongoing) mitigation costs in the identified projects? In other words, what certificate price threatens stoppage of the activity?
- What emission quantities are expected from the identified projects? What other reduction options exist beyond the CDM and JI?
- By what means can the reduction activities be maintained and which of those means best serve long-term prevention of industrial gas emissions?

Methodologies and status of activities

In a first step, the most important CDM and JI project types were assessed to see if the low prices for CDM emission certificates and JI emission certificates (ERUs, Emission Reduction Units) posed a direct threat to their continuation. This was done using a sequential decision-making approach, with the main focus being placed on whether the reduction activity is mandatory, whether other sources of income exist alongside revenue from certificate sales, and whether those income sources are enough to cover the costs of the reduction activity.

The results of the analysis show that most project types are not directly at risk. However, the industrial gas projects described above have high risk potential. Also, projects de-

Industrial gas abatement projects harbour huge climate change mitigation potential at relatively low cost. Lack of demand for emission certificates places them at risk.

signed to reduce methane emissions from coal mines and landfills, as well as emissions of sulphur hexafluoride (SF6) – say, from transformer stations in the energy sector – are highly at risk. A medium risk exists for some projects involving energy efficiency in homes, the use of alternative fuels in electricity generation, and methane reduction in wastewater management.

In a second step, the industrial gas projects were assessed for their potential in reducing emissions and generating emission certificates. This was done using model calculations for the period 2013 to 2030. The model uses data from existing CDM and JI projects, together with information from existing literature and partly from interviews.

Around half of the calculated emission reductions could be achieved with HFC-23 projects. About one third of the potential lies in N_2O emissions from adipic acid production, and the rest in N_2O from nitric acid production. Based on these calculations, total emission reductions amounting to 7.5 gigatonnes of carbon dioxide equivalent (CO_2e) could be achieved for the entire period. The annual reduction potential of about 0.4 gigatonnes CO_2e is equivalent to annual emissions in Spain. This could supply between three and five percent of the necessary and pledged emission reductions required to limit global warming to two degree Celsius. For 2020, the United Nations Environment Programme (UNEP) estimates this difference at between eight and 12 gigatonnes CO_2e per year.

The certificate generation potential deviates significantly from this amount. CDM and JI certificates have been issued for only 1.6 gigatonnes CO_2e. The reason is that under these mechanisms, not all facilities are approved for projects and the project life-cycles under the CDM are also limited. And depending on the methodology used, not all emission reductions are certified.

To calculate the reduction costs, three scenarios were developed which differ in terms of their underlying cost

structures and the average facility size and efficiency. The costs of reducing HFC-23 and N_2O emissions in adipic acid production are very low. In the middle scenario, which is designed as the base scenario and assumes a typical installation size, the overall costs of emission reduction (including investment costs) are estimated at €0.23 (HFC-23) and €0.29 (N_2O from adipic acid) per tonne CO_2e. The short-term marginal abatement costs even lie below €0.10. Those for N_2O reduction in nitric acid production are higher in principle and vary significantly. This is due to the greater number of installations, which in some cases differ vastly from one another in terms of size and efficiency. Nonetheless, the short-term marginal abatement costs for these installations are estimated at below €1.

Options to continue reduction activities

Finally, the study outlines five possible options to allow industrial gas reduction activities to continue when certificate prices hit an extreme low:

- Introduction of national regulatory measures
- Inclusion in emissions trading schemes
- Use of certificates domestically
- International or bilateral agreements on certificate purchase
- Direct international or bilateral financing of reduction activities

These options are evaluated using a range of criteria: are incentives provided for cost-efficient emission reduction? Are 'perverse incentives' avoided? Can the emissions of an entire sector be addressed or are the options limited to specific projects? What transaction costs can be expected? Which institutional and administrative capacities are needed? Do the measures provide ongoing or time-limited incentives?

Recommendations to save industrial gas projects

The research work has been largely completed and the findings of the study are available in a first draft.

The authors are strongly in favour of a long-term solution that addresses emissions from new facilities, either by means of regulation or inclusion in national emissions trading schemes. The industrialised countries could, in addition, provide short-term support in the continuation and, where appropriate, expansion of projects to reduce industrial gas emissions. For HFC-23 and adipic acid projects, perverse incentives must be avoided and the reductions financed relative to the reduction costs. This could be done by creating a fund, or by either buying or setting aside certificates relative to the reduction costs.

Because HFC-23 is a byproduct in the production of a chemical substance which harms the ozone layer, one promising approach would be to use the Multilateral Fund for the Implementation of the *Montreal Protocol on Substances that Deplete the Ozone Layer*. However, the authors recommend that for verification of reductions in N_2O emissions from nitric acid production, the institutions and methodologies of the CDM be used.

Further Information

This research project is financed by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and is conducted by Öko-Institut e.V.

Project life-cycle
2013–2014

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Standardised Baselines: Opportunities and usability for developing countries

The Kyoto Protocol assigns two goals to the CDM: promoting sustainable development in developing countries and supporting industrialised countries in achieving their emission reduction targets. The first of these has, however, received short shrift, especially in least developed countries. Distribution of CDM projects clearly shows that the mechanism has been particularly successful in emerging economies – especially China. By way of contrast, only 1.05 percent of projects have been conducted in LDCs.

One key investment barrier in these countries involves the high transaction costs incurred with each project. In many cases, the emission reduction potential in LDCs can only be exploited via numerous small-scale activities. This results in the costs for development, validation and verification (which could also simply be termed 'MRV costs') per project being spread across a small number of certificates. The cost contributions that need to be generated are thus high. These barriers to implementing CDM projects in LDCs are countered by the clear benefits arising from the sale of emission certificates generated by those projects. Compared with CERs from projects conducted in states which do not belong to the group of least developed countries, CERs generated in LDCs will still be used under the EU ETS even if the projects were registered after 2012. Also, projects conducted in LDCs often have great sustainability effects, which is why their certificates are sought after, both by buyers on the voluntary carbon market and in public carbon credit purchase programmes.

Standardised baselines are one way to reduce the transaction costs involved with these projects. With conventional CDM activities, a business-as-usual scenario must be developed for each project. The scenario describes how the emissions would develop if the project had not been implemented. Emission reductions are then calculated against this scenario. Also, for each project, proof must be provided that it could not be implemented without the revenue from certificate sales, meaning that it is truly additional. It must thus be shown that either the project is less financially attractive than less climate-friendly alternatives or that barriers exist which have hindered project implementation.

With standardised baselines it is now possible to verify both analyses at national level (or even internationally) and thus to dramatically reduce the requirements for individual projects. The additionality check has been subject to much criticism in the past because the proof that a project could not be implemented without the CDM is purely hypothetical. Thanks to their advanced information when compared to the verification panel, project developers have greater scope to argue their case when proving additionality, and there is a risk that their judgement could be purely subjective.

It is thus hoped that with the introduction of standardised processes which also take the sectoral rather than project approach, more objective criteria can be used to check additionality and determine the business-as-usual scenario.

In addition, standardised baselines provide a key foundation for the development of holistic climate change mechanisms that go beyond individual projects. Experience with standardised baselines at sectoral level could prove valuable in the development of nationally appropriate mitigation actions (NAMAs) and new market-based mechanisms.

BMUB and the German Federal Environment Agency (Umweltbundesamt, or UBA) have thus fostered the development of a framework for standardised baselines and, among other things, have made an important contribution to the debate with this research project.

Project aim

Over recent months and years, intensive work has been conducted on the instrument at international level and on the operating framework, yet only very little practical experience has been gained. Only four standardised baselines have been approved by the CDM Executive Board

With standardised baselines, the transaction costs for CDM projects could be significantly reduced – something of key importance for smaller-scale, decentralised climate change activities.

(EB) so far. A further five baseline proposals are currently in the validation phase, meaning drafts are available which have yet to be approved by the EB or which require improvement by the developers.

With the initiation of the project on *Standardised Baselines and Their Implications for a National Measurement, Reporting and Verification (MRV) System in Least Developed Countries (LDCs)*, UBA wants to support the further development of the regulatory framework for standardised baselines and their use and benefits for LDCs. The work involved will be conducted by a consortium comprising the Wuppertal Institute for Climate, Environment and Energy, and the GFA Consulting Group.

The research study focuses on two questions: how can standardised baselines take account of the particular challenges faced by LDCs? And how must the rules for standardised baselines be enhanced to ensure LDC potential is exploited to the full?

Methodologies and implementation

To address these questions, experience was gained via two different yet complementary methods and subsequently analysed. In a first step a case study was used to look at the extent to which standardised baselines allow the existing CDM methodology to be adapted to conditions in host countries. For example, a methodology for rural electrification (AMS I.L) was adapted to conditions in Ethiopia by allowing for greater inclusion of suppressed demand. AMS I.L was selected because this methodology already demonstrates a high degree of standardisation. The results of the adaptation were compared with standard emission calculations taken from AMS I.L. and then evaluated.

In a second step a guideline-supported expert survey was conducted targeting experts from different disciplines: representatives from the responsible authorities in host countries (Designated National Authorities, or DNAs) which have already submitted standardised baselines, advisers involved in the development of standardised baselines, representatives from Designated Operational

Suppressed demand

In very poor, mainly rural areas local per capita emissions are often extremely low. This poses a great barrier in the implementation of CDM projects in these regions because there is little if any scope for emission reduction. If the historical, extremely low emissions are compared with the project emissions, there is hardly any potential for CER generation. The low per capita emissions can, however, be explained in that basic human needs have not been met due to a lack of economic development. The demand to meet these needs is thus suppressed, hence the term 'suppressed demand'.

It can, however, be assumed that these basic needs will be met as economic development progresses, and that emissions will rise significantly as a result. Under the CDM it is possible to include these future emissions in the baseline calculation. Instead of considering only historical emissions data, suppressed demand sees an emissions level being used which would ensue if basic human needs such as for lighting and electricity supply were met. With this approach, CDM projects can generate emissions certificates and future emissions can be avoided.

Entities (DOEs), and scientists who have conducted research on the subject.

The interviews focused on five areas:

1. Development of a positive list and its use in CDM projects
2. The requirements of a system for quality assurance and quality control of data which must be collected or collated for a standardised baseline
3. Coordination of activities and interests of the various stakeholders involved in standardised baselines
4. Emissions from suppressed demand
5. Use of standardised baselines for new market mechanisms or NAMAs

Case study: Rural electrification in Ethiopia

The feasibility study showed that the creation of a standardised baseline for rural electrification which takes account of suppressed demand is not only technically possible, but – despite conservative assumptions – can also lead to higher baseline emissions. This increases the returns on CDM projects and Programmes of Activities (PoAs) in the form of CERs, which in turn increases the investment potential without affecting the environmental integrity of the CDM.

The underlying CDM methodology (AMS-I.L) provides a high degree of standardisation and allows suppressed demand to be taken into account as a key factor. When compared with the average figures available under the Global Environment Facility (GEF), significantly higher emission factors are achieved. This is made possible by considering national data (the emission factors of kerosene, electricity consumption, household size and lighting efficiency) and by greater inclusion of suppressed demand. In particular, consideration of suppressed demand takes in new potential for adaptation but relies on national data such as penetration factors for specific types of technology. Given the right carbon market prices, the development of standardised baselines can provide an additional and substantial contribution to financing rural electrification.

The study also showed that quality control of the basic data poses a key challenge. The UN regulations place huge barriers in the way of the responsible DNAs. Without support from industrialised countries, it would be doubtful whether the DNAs could foster the development of standardised baselines given the lack of funding and staff. This is especially the case with LDCs.

When it comes to synergies between standardised baselines and national measurement, reporting and verification systems, the situation is somewhat mixed. If standardised baselines are not developed to take account of suppressed demand or are not based on emission trends, the results cannot be directly applied to national MRV systems without restriction. In contrast, the development of standardised baselines could foster expanded staffing capacity and enhance local knowledge for

emissions data collection and aggregation. This leads to synergies especially when knowledge transfer is guaranteed from the development of standardised baselines through to conducting national greenhouse gas inventories.

Enhancing the instrument

Standardised baselines can be developed using existing CDM methodologies. The feasibility study tested this option for a standardised baseline for rural development. As an alternative, the UNFCCC Secretariat at the request of the CDM Executive Board developed a specific guideline for the creation of standardised baselines. The guideline centres round the performance penetration approach, in which the efficiency and performance of a technology is set in relation to its market penetration. The process is designed to identify climate-compatible (performance) technology with limited market penetration. It will also be used to identify a baseline technology which reflects the state of the art and whose emission factor can be used as a baseline. All technologies which perform better than the baseline technology are marked as candidates for a positive list. In other words, there is no longer a need for individual additionality checks at project level. Their use is automatically defined as additional if at sectoral level it can be shown that they are less economic than the baseline technology or if there are barriers that hinder their implementation.

The expert interviews conducted as part of the research project have shown that the framework for standardised baselines does not yet meet the requirement for (almost) universal application. The interview partners stressed that the chosen approach does not meet the needs of all sectors – it is difficult to differentiate between the various technologies, especially where emissions can be reduced in various ways as part of a complex process, say in the cement sector. This differentiation is necessary because the performance-penetration approach does not provide for graduated emission factors. Also, criticism was expressed regarding the fact that the performance-penetration approach is based on the explicit assumption that market penetration of a technology has a negative correlation with its costs or with associated barriers. This assumption does not hold up in all cases.

Based on the information contained in the expert interviews, a set of *Recommendations on the Advancement of the CDM Standardised Baselines Framework* was drawn up. These have been published in the form of a discussion paper on the German Emissions Trading Authority (Deutsche Emissionshandelsstelle, DEHSt) website (see further information below). The key recommendations include:

- Alongside the performance-penetration approach, alternative approaches for the development of standardised baselines should be explored.
- Implicit assumptions such as those described earlier should be made explicit to the extent possible so as to improve guideline transparency and acceptance.
- Evaluation of financial additionality at sector and/or technology level is especially complex. It could allow better presentation of barriers at these levels. The UNFCCC Secretariat thus should make efforts to operationalise barrier analysis and develop associated guidelines.
- The required quality assurance and control systems are necessary, but pose a huge challenge – not least for LDCs. This is especially the case when data is either not available or when the data available is of poor quality. The QA/QC Guidelines must be enhanced to provide more clarity on how to deal with imperfect data.
- Depending on how a standardised baseline is selected, individual technologies could be either strategically promoted or excluded from promotion. The UNFCCC Secretariat should further identify the possible effects, develop guidelines for use by the DNAs, and offer advice via the UNFCCC Regional Collaboration Centres.
- To better consider suppressed demand in the development of standardised baselines, the UNFCCC Secretariat should liaise with other UN organisations such as the Food and Agriculture Organisation of the United Nations (FAO), the World Health Organisation (WHO) and the United Nations Development Programme (UNDP), and with other intergovernmental organisations to develop an index of research and data that can be used to define a minimum service level in order to identify sectors or services that have not yet been targeted.

Findings and impact

The work on both research questions addressed by the project has largely been concluded. The findings of the feasibility study will be implemented in a follow-on project: a standardised baseline for rural electrification projects will be developed in cooperation with the Ethiopian DNA. And in collaboration with carbon market experts in Ethiopia, a workshop was held in Addis Abeba which was attended by representatives from the Ethiopian Ministry of Environment and Forests, and from several other stakeholder institutions in the country.

It must be remembered that the development of standardised baselines can be well integrated into Ethiopia's national development policy. As a result, the World Bank afforded the Ethiopian Development Bank a loan in the amount of USD 40 million to fund a rural electrification programme. This programme contains activities which are planned as a Programme of Activities under the CDM and as such could use the yet-to-be developed standardised baselines. Talks between the Ethiopian Development Bank, the responsible ministries and the World Bank have already begun. The aim is to include the standardised baseline in a PoA for rural electrification. This is currently being developed by the World Bank's Carbon Initiative for Development (Ci-Dev), with the Ethiopian Development Bank acting as project manager. The findings of the research project will also be disseminated. For this purpose, the above-mentioned discussion paper was published and a copy was sent to all members of the CDM Executive Board. The key findings were presented at the 15th Global DNA Forum which was attended by some 80 DNA representatives. The research team was also involved in a UNFCCC Secretariat stakeholder dialogue on improving the standardised baseline framework.

Further Information

This research project was commissioned by the German Federal Environment Agency (UBA) as part of Germany's Environmental Research Plan. The work involved was conducted by a consortium comprising the Wuppertal Institute for Environment, Climate and Energy GmbH and GFA Consulting Group.
To learn more about the project see: www.wupperinst.org/en/projects/details/wi/p/s/pd/417/

The discussion paper on *Recommendations on the Advancement of the CDM Standardized Baselines Framework* is available at:
www.dehst.de/SharedDocs/Downloads/EN/JI-CDM/CDM_Discussion_Paper_Standardised_Baselines.pdf

Project life-cycle

2013–2014

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Build on experience, shape the transition: From the CDM to new market mechanisms

At the climate change conference in Cancún, Mexico, in 2010, the Parties to the UNFCCC agreed to limit global warming to two degree Celsius based on pre-industrial levels. With the rising emissions seen in emerging economies, climate change efforts in industrialised countries are no longer enough to achieve this target. Thus, in future, developing countries will be required to make a significant contribution to emission reductions.

A portion of that contribution should, according to the European Union and other Parties, be achieved through use of the carbon market mechanisms. Until now, the Clean Development Mechanism has been the only market-based mechanism that has led to significant emission reductions in many developing countries. The reductions achieved using the CDM do not, however, result in a net mitigation effect. Rather, they are used by industrialised countries to offset their emissions.

With the positive experience gained with the CDM in identifying and exploiting emission reduction potential in developing countries, and in light of the mechanism's ability to channel large-sum investments in clean technologies, the introduction of a New Market Mechanism (NMM) was agreed at the climate conference in Durban in December 2011. The NMM would serve the expansion of climate change efforts in developing countries and enable emission reductions in greater quantities than those achieved under the CDM. Climate change activities are no longer to be implemented at individual project level, but instead will cover broad segments of industry in host countries. Also, in contrast to the CDM, developing countries are to use the NMM to make their own net contributions to climate change mitigation.

The detailed structure of the NMM is still subject to heated debate as the UNFCCC climate change negotiations continue. That debate is shaped by the differing proposals put forward by the Parties. The negotiations are also influenced by additional discussion threads within the UNFCCC. These include the role that Nationally Appropriate Mitigation Actions (NAMAs) will play in a new climate change agreement and how they will be linked to the New Market Mechanism. Also of importance regarding the NMM structure are the CDM reforms that are currently underway and the fact that several developing countries, among them Mexico, Brazil, Chile and China, have announced their intention to set up national emissions trading schemes. Given the necessity to reach a watershed in global greenhouse gas emissions within this decade, these negotiations must be held in parallel and must take account of the various developments to allow timely decision-making.

Project aims

Against this backdrop, the question arises as to how synergies can be achieved between these various developments and trade-offs avoided. How must new market mechanisms be structured to allow utilisation of existing capacities and experience, and optimal integration into other mechanisms such as emissions trading schemes, NAMAs and the CDM? What CDM capacities could be used to implement climate change measures using a future market mechanism, and how should they be developed?

Another question that needs to be addressed is whether there are gaps in institutional and administrative capacities and how they can be closed. How can the current project-based approach used with the CDM be expanded to create a sectoral mechanism? These and other questions are the focus of three research projects conducted by Perspectives GmbH on behalf of the German Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the Federal Environmental Agency (UBA).

New market mechanisms are designed to broaden climate change efforts to take in entire sectors. Great climate change potential is seen in the energy sector, which still largely relies on the use of fossil fuels.

Methodology and status

Options to utilise CDM design features for future market mechanisms

The first of the three research projects looks at how existing components of the CDM can be used to implement climate change measures under new market mechanisms. In addressing this issue, the research team drew up an overview of existing and future market mechanisms, and pinpointed their differences and similarities. Particular focus was placed on their financing structures.

Based on this analysis, areas were identified in which synergies can be expected between experience gained with the CDM and new market mechanisms. The structure of the programmatic CDM provides an insight into how broad-based climate change efforts might look under a New Market Mechanism. In addition, experience gained in defining the baseline for CDM projects and Programmes of Activities (PoAs) could also be used for new market mechanisms. The newer standardised baseline models could prove especially useful (see also page 13). In a similar way, the application of various processes to prove additionality under the CDM could be used in the design of appropriate processes under new market mechanisms.

These and other components of the CDM were then tested for their use in hypothetical pilot projects for a New Market Mechanism. Here, specific sectors were selected in countries where implementation of pilot projects promises great potential for the use of the CDM components, namely the Tunisian wastewater management sector, the Ethiopian energy sector and the Peruvian waste management sector. Using these case studies, the research team showed how existing CDM methodologies can be used to calculate baseline emissions and monitor CDM projects within the framework of new market mechanisms, and highlighted where there is still a need for expansion.

The Tunisian study showed that the existing CDM methodologies cover all technologies used in the wastewater management sector. This allowed calculation of the climate change impact of the activities conducted under a New Market Mechanism. Direct use of the methodologies would, however, require detailed collection of data,

making for extremely high transaction costs. Thus, to exploit the climate change potential of Tunisia's wastewater management sector, it would make more sense to use some of the core components of the CDM methodology and draw on predefined standard figures where certain parameters are concerned.

The findings of the three case studies show the conditions under which components of existing CDM methodologies could be used efficiently and effectively with a New Market Mechanism, and where these standardised parameters would need to be supplemented.

Shaping the transition from CDM to new market mechanisms

In a second project, Perspectives GmbH develop transition scenarios for the switch from CDM to new market mechanisms and national emissions trading schemes, and test these for their usability. Taking account of the current status in the UNFCCC climate change negotiations, the research team looks at varying proposals for the design of new market mechanisms and highlights possible interactions with other climate change mechanisms such as national emissions trading schemes, NAMAs and existing/future activities conducted under the CDM.

These mechanisms pose a range of institutional and technical challenges for host countries: first and foremost, the institutional level requires the government to introduce suitable climate change instruments and to determine the conditions for implementation of climate change activities. The technical requirements largely call for the availability of high-quality data for emissions monitoring, and the ability to determine baseline emissions and accounting standards.

Given the differing requirements for the implementation of the different mechanisms, five categories were drawn up, setting out differing development paths which would allow for the transition from CDM to NMM and then pave the way for the introduction of national instruments such as emissions trading schemes (ETSs) and unilateral NAMAs.

0. **Countries with no CDM legacy**

   This category contains development paths for countries such as Turkey which have not been involved in the CDM so far and which will directly introduce market-based instruments.

1. **From CDM to NMM and ETS**

   This development path provides for the integration of CDM activities in potential ETS sectors under a sectoral market mechanism to allow the establishment of an emissions trading scheme in the longer term.

2. **Expanded CDM with net climate change mitigation effect (CDM+)**

   This development path sees the CDM expanded to take in entire sectors and used to achieve a net mitigation effect under a sectoral crediting mechanism.

3. **Continuation and further development of the CDM as an offsetting mechanism**

   This scenario contains two options: on the one hand, the continuation of the CDM with ongoing central importance for international offsetting, and on the other, its further development towards national offsetting in the form of a complementary instrument to national emissions trading schemes.

4. **Transformation of CDM activities into instruments under a NAMA**

   In this development path, CDM activities are initially integrated as instruments under a supported/credited NAMA with the aim of implementing these measures in the longer term without the need for financial support.

These five development paths vary in their ability to adequately tap emissions from specific sectors and emission sources. Development Path 1 is particularly well suited, for example, for sectors with a small number of large emission sources, such as the energy sector. In contrast, Development Path 2 can be used to exploit smaller, widely distributed emission sources, such as in the transport sector.

Because the development paths use different mechanisms, they pose a range of implementation challenges for host countries: in the case of Development Path 1, the establishment of an emissions trading scheme and participation in a sectoral market mechanism place many institutional and technical demands on host countries. By way of contrast, where a CDM portfolio exists, the continuation of CDM activities under Development Path 3 does not involve any significant infrastructural changes unless the activities are to be transferred to a national domestic offsetting scheme.

These development paths are currently being used to draw up country-specific strategies for transitioning from the CDM to new market mechanisms in ten countries. The strategies can be designed to meet local conditions.

Sectoral expansion of the CDM as an interim solution in the transition to future market mechanisms

The third research project provides the groundwork to expand the CDM and make it a sectoral CDM. The research team first analysed the debates on and trends in sectoral approaches in existing and future UNFCCC mechanisms. This included the evaluation of proposals submitted to the UNFCCC and a quantitative analysis of the CDM, PoA and NAMA pipeline. In addition, interviews were conducted with UNFCCC negotiators, representatives from the research community and carbon market players.

With the data obtained, the research team was able to trace the development of sectoral approaches in the CDM and estimate the potential for sectoral components in future market mechanisms.

With regard to the CDM, the project results show that some sectoral components, such as PoAs and standardised baselines, were separated from the theoretical debate and have since moved on into implementation. For a broader sectoral expansion of the CDM, the research team recommends pushing ahead with the reform of numerous CDM components, notably the further standardisation of baselines and processes to prove both additionality and measurement, reporting and verification. If these were to be combined with the programmatic approach, the CDM could be expanded in the direction of a sectoral mechanism.

Looking at the role of sectoral approaches in future mechanisms, the research team saw great potential in many models. There are, however, large differences between the various approaches: while some sectoral mechanisms, such as the UNFCCC's Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+), are about to be implemented, others are still in the planning stage, such as the International Civil Aviation Organization (ICAO) mechanism to regulate emissions in aviation. At the same time, some developing countries are going beyond the sectoral approach in that they are exploring the idea of introducing multi-sectoral emissions trading schemes at national level.

These diverse approaches and mechanisms point to a hybrid architecture in which centrally controlled mechanisms like the CDM and possibly a New Market Mechanism with decentralised activities can co-exist. If this evolves, the different approaches would need to be coordinated at international level to ensure the integrity of the entire system. This is where the Framework for Various Approaches (FVA) comes in – a framework with which to harmonise the different emissions and certification systems, and define the minimum standards being negotiated under the UNFCCC. To take account of the diverse sectoral approaches and the most recent trends, the research team recommends a review and revision of sectoral approach terminology:

- **Sector-oriented approaches:** These approaches refer to entire sectors or sub-sectors in which, for example, the use of a standardised baseline is mandatory. These approaches continue to be based on a crediting principle and can take in CDM-like projects, programmes and policy measures. Given their non-binding nature, they do not necessarily cover all emitters in a given country or sector.

- **Sectoral approaches:** These approaches broaden the scope of climate change activities by covering entire sectors or sub-sectors. Mandatory participation ensures coverage of the necessary sub-national, national and regional sources. A possible, early example of this type of approach could be the identification of emission-intense industries under the NMM.

- **Sector-specific approaches:** This third category refers to mechanisms which target emissions in a specific (sub) sector or from a specific technology (including cross-border emissions). Examples include REDD+ or a mechanism which targets the reduction of hydrofluorocarbon (HFCs) emissions. While these mechanisms can vary greatly in scope, they are seen to have great potential for the achievement of net emission reductions – but only if they go beyond the existing offsetting approach.

This revised terminology is designed to simplify the classification of existing and new mechanisms and models. The more detailed look at the similarities and the specific differences could serve to foster the debate on new market mechanisms and provide answers to the question of how to shape the transition from the CDM to future market mechanisms.

Outlook

The research projects are at different stages of completion. The findings of the project on the use of CDM design features for new market mechanisms and sectoral mechanisms are already available, while the research project on the transition from CDM to new market mechanisms is still a work in progress. In a second step, the five development paths will be applied to ten host countries – Chile, China, Indonesia, Kazakhstan, Columbia, Mexico, Peru, Thailand, Turkey and Vietnam – to test them in relation to the differing local conditions. In addition to the various national requirements, the research team will also take account of the proposals developed by the host countries for the introduction of market-based instruments. These will be used to develop country-specific strategies to allow best possible use of the CDM in the transition to new market mechanisms.

The findings of the research project have in some cases already been discussed with experts and the interested specialist public at various events. Additional events are planned. The research results will be used to foster the debate on new market mechanisms and the future of the CDM.

Further Information

The research project *Opportunities for a Stepwise Transition from CDM towards Future Market Mechanisms and Emissions Trading and the Respective Capacity Building Needs,* is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and is conducted by a consortium comprising Perspectives GmbH and adelphi consult.

The research projects *Options to Utilise CDM Design Features for Future Market Mechanisms and Developing Sectoral Mechanisms in the Transition Period towards a New Climate Treaty* are being conducted on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) as part of Germany's Environmental Research Plan. The research work involved in both projects is conducted by Perspectives GmbH.

Project life-cycles

Opportunities for a Stepwise Transition from CDM towards Future Market Mechanisms and Emissions Trading and the Respective Capacity Building Needs: 2013–2014

Options to Utilise CDM Design Features for Future Market Mechanisms: 2012-2013.

Developing Sectoral Mechanisms in the Transition Period towards a New Climate Treaty: 2013–2014

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Abbreviations and Acronyms

BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
Ci-Dev	Carbon Initiative for Development
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
DEHSt	German Emissions Trading Authority (Deutsche Emissionshandelsstelle)
DNAs	Designated National Authorities
DOEs	Designated Operational Entities
EB	Executive Board
ERUs	Emission Reduction Units
ETS	Emissions Trading Scheme
EU	European Union
EU ETS	EU Emissions Trading Scheme
FAO	Food and Agriculture Organisation of the United Nations
FVA	Framework for Various Approaches
GEF	Global Environment Facility
GHGs	Greenhouse Gases
HFCs	Hydrofluorocarbon
HFC-22	Chlorodifluoromethane
HFC-23	Trifluoromethane
ICAO	International Civil Aviation Organization
JI	Joint Implementation
LDCs	Least Developed Countries
MRV	Measurement, Reporting and Verification
NAMAs	Nationally Appropriate Mitigation Actions
NMM	New Market Mechanism
N_2O	Nitrous Oxide
PoAs	Programmes of Activities
PTFE	Teflon
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SF6	Sulphur Hexafluoride
UBA	German Federal Environment Agency (Umweltbundesamt)
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organisation

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