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**Benoît Leguet,**

*Mission Climat of the Caisse des  
Dépôts<sup>1</sup>*

**Ghada Elabed,**

*University of California at Davis*

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## A REFORMED CDM TO INCREASE SUPPLY:

# Room for action

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### Abstract

3,700 CDM projects are in progress in developing countries estimated to reduce emissions by a potential 2.7 billion tons of CO<sub>2</sub> until 2012. However, the success of the CDM has put the system under strain: the estimated supply by 2012 could be as low as 1.8 billion tons of CO<sub>2</sub>. To enhance the capacity of the mechanism to increase emissions reduction efforts in developing countries, in particular in the energy and agricultural sectors which will eventually play a large role in abatement, we recommend the development of simplified and objective additionality tests, top-down methodologies and the reform of the validation and verification procedure.

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### Introduction

While the success of the Clean Development Mechanism (CDM) has been praised by many observers, the mechanism faces today a number of challenges: increasing delays, difficulty in finding auditors to certify projects, and a great number of uncertainties for project developers (Schneider 2007, Sterk 2008, Wara & Victor 2008). These challenges are the price of success: 3,700 CDM projects are in progress in developing nations. These projects could potentially abate emissions by 2.7 GteqCO<sub>2</sub> by 2012. The number of CDM projects is growing and is putting the mechanism to the test.

Based on analysis of risks and delays in the CER generation process, we propose certain procedural modifications within the existing institutional and methodological frameworks to enable the CDM to realize the sizeable emission

reductions necessary to combat climate change and to quench the thirst for Certified Emission Reduction (CER) credits stemming from the Annex B countries and the European Union Emission Trading Scheme (EU ETS).

In the first section of the article, we examine the principal characteristics of the projects currently in the CDM pipeline. We then examine in detail the implications of delays and bottlenecks in the process of generating CERs. The pre-2012 supply we evaluate at 1.8 billion CERs compared to the 2.7 billion tons of CO<sub>2</sub> potentially abated by the mechanism by 2012. This assessment hints at various ways to reform and improve the CDM from 2013 onwards: standardized methods of proving additionality; top-down methodologies and a reformed validation and verification process. Ensuring the success of the CDM in the post-2012 world is not only about lowering the cost of compliance for Annex I countries and involving today's non-Annex I countries. It is also about setting a standard for project-based mechanisms that could help build an ambitious international climate regime for tomorrow.

## *Potential supply of CERs through 2012*

### **A large potential, few countries, few technologies**

According to the information available in the UNEP-RISOE CDM/JI Pipeline,<sup>1</sup> over 1,100 projects have already been registered by the United Nations that could yield 1.3 GtCO<sub>2</sub> of abatement by 2012.

1 Source: UNEP-RISOE CDM/JI Pipeline, August 2008 (unless specified). The data does not take into account new projects that will enter the pipeline between today and 2012.

Abatement through the CDM is focused on a relatively small number of technologies, often involving non-CO<sub>2</sub> greenhouse gases with potent global warming potentials and potentially low abatement costs. While more than a hundred methodologies have been approved by the CDM Executive Board (CDM EB), 10 methodologies alone are expected to generate 80% of the potential CERs before 2012. Incineration of HFCs and N<sub>2</sub>O should yield more than a quarter of all emission reductions in the CDM by 2012; capture and destruction of methane should account for roughly a quarter of the abatement. Nevertheless, more diversified technologies to avoid emissions of CO<sub>2</sub> are also present: renewable energy projects (one methodology covers at least eight sub-types of technologies) should account for one third, and energy efficiency for one tenth, of the emission reductions until 2012.

By mid-2008, 70 countries had submitted at least one CDM project to the UNFCCC Secretariat. By 2012, roughly 80% of the potential CERs generated by projects currently in development should be generated in the Asia-Pacific region, and one fifth in Latin America. Around half of the abatement should take place in China, 15% in India and 7% in Brazil. Five countries alone – China, India, Brazil, South Korea and Mexico – should account for more than 80% of the abatement from CDM projects by 2012, which indicates that a limited number of countries will actually participate actively in the CDM.

According to the World Bank, China was responsible for three fourths of all CDM transactions in 2007. The success of CDM in China is largely due to the country's size and attractiveness, and to the early start it took by developing, among others, several large projects based on incineration of industrial gases. On the opposite end of the spectrum lies Sub-Saharan

Africa, with only 2.7% of the potential credits until 2012. The bulk of the Sub-Saharan projects are hosted by only four countries: Nigeria, South Africa, Ivory Coast, and Kenya.

**The two faces of CDM: Large-scale and small-scale projects.<sup>2</sup>**

The previous paragraphs might lead the reader to conclude that the typical CDM project is a large-scale non-CO2 industrial gas destruction project in China. This conclusion is partially correct. Because large-scale projects involve low abatement costs and generate significant amounts of CERs, project developers are willing to spend money on the lengthy CDM process, which involves developing a methodology and Project Design Document (PDD), hiring auditors to validate the PDD, paying the registration fee, abating emissions, measuring emission

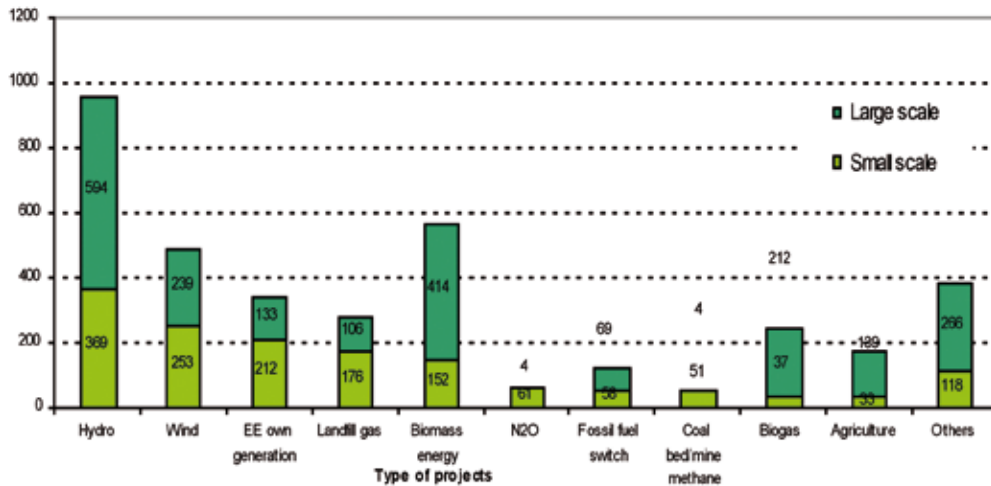
reductions, and again hiring auditors to verify the emission reductions. As a result, large-scale projects have historically been among the first projects to emerge.

However, more than 1,600 small-scale projects – which generate less than 60 000 CERs per year – are also being developed (see Figure 1). These types of projects represent 45% of all projects under development and could yield 245 million CERs by 2012. Small-scale projects enjoy some flexibility in the registration process that reduce transaction costs: a simplified PDD development process, simplified modalities for monitoring emission reductions, a reduced registration fee, and bundling of similar projects to reduce the share of fixed costs.

Fenhann (2008) points out two elements - among others - that could explain the popularity of small-scale projects. First, while large-scale methodologies must be proposed by project developers and approved by the CDM EB in a

<sup>2</sup> This section is partially based on Joergen Fenhann's (UNEP Risoe) article: Carbon Finance, 19 May 2008: « Why are there so many small-scale projects? »

Figure 1 – Breakdown of large- and small-scale projects by type



Source: UNEP RISOE CDM/JI Pipeline Analysis and Database, 1 August, 2008.

bottom-up process, small-scale methodologies are approved in a top-down process. This triggered the emergence of small-scale projects in

*The number of CDM projects is growing and is putting the mechanism to the test.*

sectors for which small-scale methodologies - but no large-scale methodologies - had been approved. This was in particular the case for the 594 hydroelectric projects and 414 biomass projects, which together could yield 161 million CERs by 2012.

A second factor seems more decisive: the characteristics of the projects, and the political and technical environment in the host country. HFC, N<sub>2</sub>O and landfill gas projects are by nature large-scale. Some projects are also by nature small-scale, in particular in the renewable energy sector: wind, solar, hydro and biomass. In this context, the political and technical environment in the host country seems to play a major role. Of the 158 small-scale wind projects being developed in the world, 138 are hosted by India; 309 of the 504 small-scale hydro projects are hosted by China; and of the 328 small-scale biomass projects, 201 are Indian, 42 Brazilian and 23 Malaysian. Malaysia has also developed around 30 projects for composting oil palm residues. These elements seem to indicate that political will – and a favourable regulatory, technical and economic environment – can lead to the emergence of clusters of small-scale projects that can be at least partly financed through the CDM.

## *A closer look at the supply*

### **An assessment of the real supply by 2012**

#### **Having a project registered and credits generated is risky**

The principle behind the CDM is in theory extremely simple: any project that can be implemented thanks to the emerging carbon price and which generates an effective reduction of GHG emission of one ton of CO<sub>2</sub> may claim a CER. However, in practice it is unfortunately not that simple.

For the UNFCCC, the life of a CDM project begins the day the Project Design Document (PDD) is submitted to the public for comment. The PDD must then be approved by the host country, validated by a Designated Operational Entity (DOE) and registered by the CDM Executive Board (CDM EB). Once the project has been registered, it is eligible to generate CERs. Abated emissions must be monitored and verified by a DOE throughout the lifetime of the project. Once the emission reductions are verified, the CDM EB issues the corresponding CERs.

The discussion in previous sections assumed that all emission reductions set forth in PDDs will actually generate CERs. Unfortunately, this is not the case. Delays and bottlenecks in the process will trim the potential amount of CERs that will be available before 2012.

From the public UNFCCC data, we could not find any evidence of a PDD submitted for validation that was not approved by a host country. Along the registration process, it can thus be reasonably assumed that a host country will systematically approve all projects that have their PDD submitted to the UNFCCC: first, it is in the country's interest to approve a project, as long as it complies with the national sustainable

development strategy; second, since drafting a PDD is costly, it is likely that project developers engage in discussions with the host country's designated national authority while drafting the PDD. However, there were delays in approving projects varying from one week (Qatar) to 17 months (Uruguay).

All PDDs approved by the host country are not necessarily validated by the DOEs and approved by the CDM EB. Several projects have been rejected during this process. Even if a project is approved by the CDM EB, the potential to generate CERs mentioned in the PDD might not be achieved for technical reasons: for example, if the implementation of the project is delayed or if its operation is suboptimal. On the other hand, a project might generate more CERs than originally envisaged in the PDD.

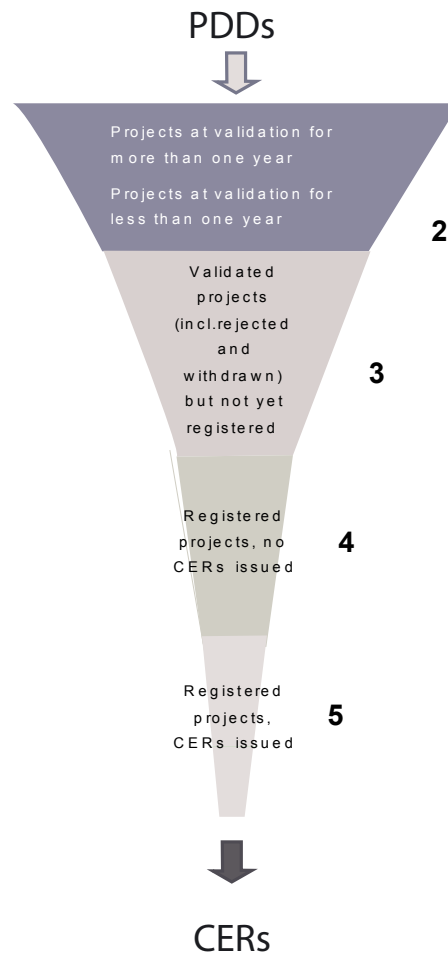
All these risks make the CER generation process resemble a funnel. See Figure 2. A great number of PDDs go into the funnel, but a much smaller number actually generate CERs as an end product. Delays due to bottlenecks, present in each step of the registration and issuance processes, lengthen the funnel and reduce the supply of CERs that will be available before 2012.

**Methodology used to assess the supply<sup>3</sup>**

To account for the risks faced by CDM projects and to estimate the real number of CERs that will be available, we evaluated the potential amount of CERs generated by a given project based on the data available in the PDD and in the UNEP/RISOE CDM Pipeline for each month in the period from January 1<sup>st</sup>, 2000 to April 30<sup>th</sup>, 2013<sup>4</sup> and applied four corrective factors:

3 For a full explanation of the methodology, see Elabed & Leguet (forthcoming).  
 4 The date of April 30<sup>th</sup>, 2013 was chosen as it corresponds to the end of the second commitment period of the EU ETS, today's main source of demand for CERs.

Figure 2 – From reducing emissions to generating CERs: associated risks and delays



Source : Mission Climat of the Caisse des Dépôts, 2008.

- A “pre-validation factor” which measures the probability for a project to be validated within a year. Historically, 85% of all validated projects were validated within a year, and projects that remained at the validation stage for over a year were unlikely to be ever validated.
- A “validation factor” which measures the probability for a project that began the

validation process less than a year before to be validated by the DOE.

- A “registration factor” which measures the probability for a project that has been validated by a DOE to be registered by the CDM EB.
- A “generation factor” which measures the probability for a project using the registered by the CDM EB to generate the amount of CERs mentioned in the PDD.

Three delays are also applied to the estimate, based on observed historical delays:

- The delay from the day the PDD is submitted for comments and the request for registration;
- The delay from registration request to registration;
- The delay between the date of the marginal emission reduction that generated a CER and the issuance of the corresponding CER.

Additionally, an estimate of the new projects entering the pipeline until 2012 is carried out by observing historical trends by country and by sector.

### The long and winding road to CERs

#### Bottlenecks increase delays

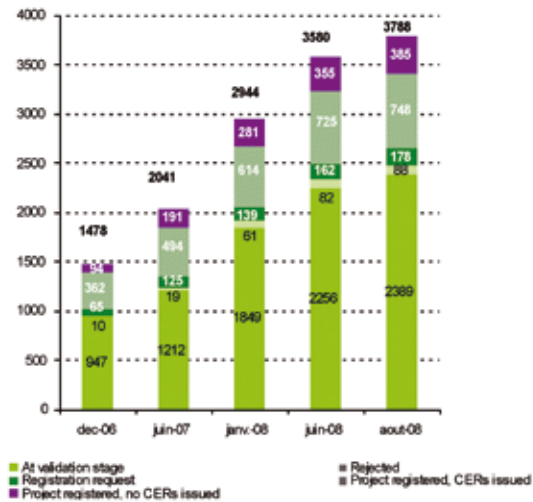
Some bottlenecks are apparent in the process. The first observed bottleneck is the delay in project approval by the host country. This delay seems to be increasing for several countries, in particular for China, as the number of projects applying for approval increases. The second bottleneck is the validation of the project by DOEs: the validation process takes anywhere between 58 and 520 days, depending on the country, with eight months on average. This may be explained by the fact that DOEs are understaffed. They are losing auditors to project

developers and CDM boutiques and it takes time to train qualified auditors. The third bottleneck is the CDM EB: the CDM EB issued CERs for the first time in October 2005. In 34 months, only 7% of the potential CERs up to 2012 have been issued. With less than five years to go, a potential 2.5 billion CERs have yet to be issued and it is uncertain whether the CDM EB can cope with the associated extra workload. This may indeed prove not to be the case, as new projects keep entering the pipeline every month, at an average rate of 120 new projects per month. In 18 months, the number of projects at the validation stage has multiplied by 2.5, and reached 2,255 projects in June 2008. During the same period, only 700 projects were registered (see Figure 3).

#### Not every ton will become a cer...

Throughout the process of turning the potential abatement of one ton of CO<sub>2</sub> into a CER, the first hurdle is the “pre-validation factor,” which estimates the time necessary for the host country to approve the project. Upon applying this factor, we find that 25% of the Chinese projects (400 projects) and 20% of the Indian projects (roughly 300 projects) currently in the pipeline might never yield CERs. The second hurdle to overcome is the “validation factor”. Only two-thirds of the projects in development could be validated. The third hurdle is the “registration factor”. This factor measures the probability for a validated project to be directly registered, and seems to depend greatly on the sector or the methodology used. In particular, validated energy efficiency projects – about which the EB has expressed concern regarding additionality – account for more than half of the projects that are either rejected or reviewed by the CDM EB. The last hurdle to overcome is the actual generation of CERs. An emissions abatement project may under- or over-perform as compared to the provisions outlined in the PDD. While the

Figure 3 – Evolution of the CDM Pipeline (count: number of projects)



Source: UNEP/RISOE CDM Pipeline, 1 August, 2008.

average registered CDM project yields 94% of the emission reductions it intends to produce, this average hides differences among sectors. Industrial gas incineration projects achieve over 100% of their intended abatement and energy-related projects achieve between 60-80%, where as cement, steel, agriculture and transportation projects deliver only roughly 50% of the emission reductions planned in the PDD.

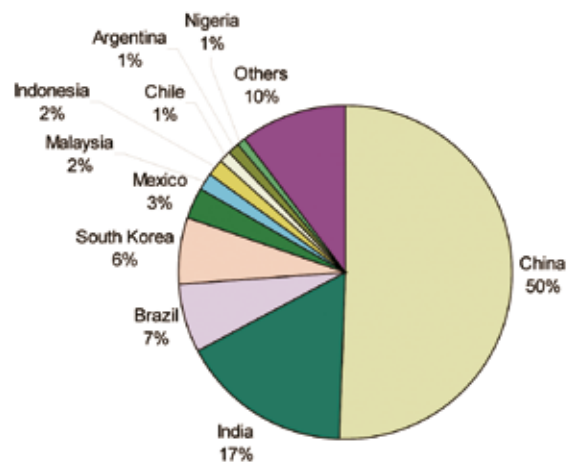
## Our assessment: 1.8 billion CERs

Data extracted from the UNEP/RISOE CDM Pipeline indicates a potential supply of 2.7 billion CERs by 2012. However, our estimate, taking into account the abovementioned bottlenecks and factors, is that only 1.8 billion CERs will effectively be generated by April 2013, this being

the end of the second compliance period of the EU ETS, the primary source of demand for CDM credits. This estimate does not fundamentally modify the balance of credits generated by country: China should still be the largest supplier of CERs, providing 50% of all CERs by April 2003; 75% of all CERs will be generated by only three countries (China, India, and Brazil), and 90% by only ten countries (see Figure 4)..

Around 1 billion CERs could be generated by only three methodologies: AM1 (incineration of HFC), ACM2 (grid-connected electricity generation from renewable sources) and AM21 (incineration of N<sub>2</sub>O); and 75% of the expected supply would come from only eleven methodologies. Energy projects such as renewable energies, fuel switch and energy efficiency on the production side should generate 45% of all CERs by 2012. On the whole, energy efficiency projects, either demand- or production-side, should represent 12% of all CERs. Incineration of HFCs, N<sub>2</sub>O and

Figure 4 – Breakdown of estimated supply of CDM projects by country (Total: 1.8 billion CERs)



Source: Mission Climat of the Caisse des Dépôts, based on UNEP/RISOE Pipeline data, 1 August, 2008

PFCs should yield roughly 40% of the CERs, while fugitive methane projects such as pipelines, coal mine methane and landfill gas should account for 10%.

## *Recommendations for the CDM*

Our analysis suggests that while the current CDM should result in significant emissions reductions of 1,8 Gt through April 2013, it will not realize its full potential of generating 2,7 Gt of reductions. The difficulties faced by the current mechanism should only marginally impact the development of non-CO<sub>2</sub> industrial gas reduction projects. On the other hand, they place at great risk the growth in projects in other sectors, among others energy production and agriculture. Projects in these other sectors will eventually make up the bulk of CDM projects, as the potential for HFC and N<sub>2</sub>O projects is dying out. If we seek to make the CDM an instrument that can help achieve significant emissions reductions in developing countries and serve as a key building block for the post-2012 international climate regime, we must improve its ability to perform.

Three main recommendations emerge from our observation of the bottlenecks, risks and delays observed during the CDM project approval and verification process that may be used to strengthen and enlarge the mechanism: (1) use simplified and objective additionality tests; (2) develop methodologies in a top-down process; and (3) improve the validation and verification process.

### **A. Use simplified and objective additionality tests**

Doubts have been raised by some observers as to the questionable additionality of some projects and the need to tighten criteria for proving additionality (see for example Michaelowa and Purohit, 2007; Schneider, 2007; Wara and Victor, 2008). These studies have focused on possible “false positive” projects i.e. possibly non-additional projects that do get registered. Surprisingly little material can be found on “false negative” projects i.e. possibly additional projects that do not get registered. This may be because these false negative projects are by definition never developed. There is unfortunately an inherent information asymmetry between the project developer and the DOEs, and efforts to tighten the criteria for proving additionality might actually have adverse effects, as they would increase costs, delays and risks, and possibly increase the number of false negatives.

On the contrary, additionality tests should be simplified and based on objective criteria, such as a positive list of technologies or technology standards, technology penetration rate and sectoral benchmarks, rather than on the existing tools. This would make it easier for the DOEs to validate projects, and easier for the CDM EB to assess the work of the DOEs. On the negative side, such lists, rates and benchmarks would require a significant amount of time to agree upon and could turn out to be very data-intensive. But in the longer term, the costs of the system would certainly decrease. At the same time, the number of false positives would, also, most likely increase. It should be borne in mind that two similar approaches can be used to decrease the amount of potentially non-additional CERs that enter the market. First, some approaches for discounting CERs generated by projects whose additionality is

not certain have been proposed (see for example Lambert, 2007). Second, potential windfall profits can be taxed away, and the proceeds used to fund climate-friendly projects such as projects that reduce emissions or climate change-related research. This is what the Chinese government appears to be doing with the sustainability tax it set up, whose proceeds feed the Chinese CDM Fund.

Simplified and objective additionality tests would gradually shift the debate from a project-by-project assessment to the assessment of programs or even policies. The real long-term benefit of a reformed CDM should in essence be to provide incentives for low-carbon investment by favouring the development of national policies and regulations. As we mentioned previously, the success of small-scale projects despite supposedly higher relative transaction costs indicates that political will, associated with a favourable regulatory, technical and economic environment, can lead to the emergence of clusters of emission-reducing projects. This is a good omen for programmatic CDM and could also provide a testing ground for policy-based CDM pilot projects based, for example, on biomass in India or small hydropower in China.

### **B. Develop methodologies through a top-down process**

Another reform that might be considered – and is hinted at by the success of small-scale projects – is developing methodologies using a top-down rather than a bottom-up framework. These types of methodologies, developed for a limited number of sectors, should include additionality tests based on objective criteria including, as previously mentioned, technology or technology standard, technology penetration rate and sectoral benchmarks (see for example

Sterk, 2008). Top-down methodologies could prove especially efficient for technologies that have a low penetration rate, such as CCS or energy efficiency projects. The challenge would obviously lie in agreeing on thresholds for the technology penetration rates, sectoral benchmarks, etc.

### **C. Improve the validation and verification process**

In the current CDM, the CDM EB is second-guessing the validation work carried out by the DOEs with the help of the experts of the Registration and Issuance Team. This process takes time and may partially explain the bottleneck observed in the registration process. Furthermore, review requests and rejections of validations based on the assessment of experts could undermine the process in the long run, since DOEs could then become very selective in

*Simplified and objective additionality tests would gradually shift the debate from a project-by-project assessment to the assessment of programs or even policies*

the projects they choose to validate. This could in turn deter project developers in some sectors for which the proof of additionality or other elements in the PDD are too subjective, in particular energy efficiency projects. The registration process pursued by the CDM EB should rather focus on ensuring that an adequate validation protocol has been followed. In this respect, the Validation and Verification Manual (VVM) currently being developed by the Board is a good starting point. Additionally, the experts of the Registration and

Issuance team could perform their review before that of the DOEs, since they have the sectoral and technical expertise that DOEs lack in certain cases. Hence, they can provide technical input to the DOEs for use in the validation process, rather than following the work of the DOEs and possibly contradicting their validation work. If this option is pursued, it would be necessary to pay the experts either by the DOEs or by an *ad hoc* fund.

*Our three recommendations are to develop simplified and objective additionality tests, top-down methodologies and to reform the validation and verification procedure.*

In a very similar way, the verification process could be improved. The CDM EB may focus on checking that an adequate verification protocol has been followed. The goal of verification should not be to check the occurrence of every emission reduction claimed but rather to make sure that the risk of overestimating emission reductions is properly managed. Two initiatives of the CDM EB are promising in this respect and should be pursued: the previously mentioned Validation and Verification Manual and programmatic CDM, for which random sampling of the individual CDM Programme Activities is allowed for verification (UNFCCC, 2007). The voluntary market could also be a source of inspiration: the Voluntary Gold Standard has set up a system whereby a share of proceeds from every project goes to a fund managed by the Standard. The purpose of the fund is to pay the verifiers to randomly verify projects. Setting up a similar system for the CDM would, apart from reducing overall verification costs, address the concerns of some stakeholders that DOEs have a strong incentive to validate

any project because they are paid by the project developer and not by an independent body managed by the UN. It would also help address the looming bottleneck at the verification stage due to the lack of trained auditors.

In a nutshell, the CDM EB should rely more on the DOEs, which are supposed to work for and not against the EB. Governments have long understood that verifying income tax declarations is costly, hence they have taken a risk-based approach to spot tax evasion by using random sampling in the verification process. If CO<sub>2</sub> is to become the 21<sup>st</sup> century's currency, the same approach could be used to the benefit of the atmosphere.

## Outlooks

In eight years, the CDM has achieved a considerable task. First, in environmental terms, it should reduce emissions until 2012 by roughly 1.8 billion tons of CO<sub>2</sub>. More importantly, it has become today's standard for project-based mechanisms, which even critics of the mechanism admit (see for example Wara and Victor, 2008). However, the success of the CDM has put the system under strain. Multiple bottlenecks have appeared and must be remedied in order to enhance the CDM's capacity to increase emissions reduction efforts in developing countries. Our three recommendations are to develop simplified and objective additionality tests, top-down methodologies and to reform the validation and verification procedure. These recommendations seek to expand the scale of the CDM among others in the energy and agricultural sectors. Eventually these sectors will play a much larger abatement role than the "low hanging fruits" of non-CO<sub>2</sub> industrial gas abatement, which contributed to the early development of the CDM.

The road to Copenhagen and beyond is clear: the CDM crediting process should be streamlined and the mechanism should be enlarged. Expectations are high: some of the legislative proposals discussed in the US Congress include provisions for using international offsets. Equally, the European Commission's proposal for the post-2012 EU ETS – which is today by far the main source of demand for CERs - includes a provision for crediting projects that reduce emissions outside of the scheme. Such a provision could either supplement the CDM or replace it in case it fails to deliver. If the CDM succeeds in remaining the prevailing standard, it could help link the EU ETS with emerging carbon trading schemes in other nations, including a future American effort. Food for thought and room for action!

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**Benoît Leguet** is a Project Manager for Mission Climat, a research and analysis center on carbon economics at the Caisse des Dépôts in Paris, France. His research is currently focused on project-based mechanisms, investment in carbon assets, and carbon neutrality, and was a lead contributor to the CDM and JI guides published by the French government.

**Contact:** BENOIT.LEGUET@caissedesdepots.fr

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**Ghada Elabed** is a member of the Mission Climat team conducting research and analysis on project-based mechanisms linked to the Kyoto Protocol, mainly the Clean Development Mechanism. She is an agronomic engineer with a Masters degree in Environmental Economics.

**Contact:** Ghada.Elabed@caissedesdepots.fr

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