Forecasting CER supply up to 2020

Findings from the IGES CDM Project Database

Paper 4 in a series on Analytic Support for Target-based Negotiations

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Executive Summary

Currently, protracted CDM procedures and tightened rules have cast a shadow on CER supply not only within the 1st commitment period of the Kyoto Protocol but also after it, especially up to 2020. According to the current pipeline as reflected in the IGES CDM Project Database as of 1 April 2010, approximately 6.0 billion tons of Certified Emission Reductions (CERs) will be generated between 2013 and 2020 in accordance with original estimations given in the Project Design Documents (PDDs) from all projects in pipeline. Additionally, we estimate 10.8 billion tons will be generated from projects to be newly entered into the pipeline until 2020. However, current CDM procedural risks such as delay of validation, high dropout in the middle of the validation process, delay of registration with rejection risks by the CDM EB, operational risks after registration and issuance success risks have to be considered due to their significant influence on supplying CERs not only for the first commitment period but also after 2012. Due to those risks in the CDM process, we estimate that this figure may finally end up almost being halved (8.76 billion tons).

We have also analyzed several hypothetical scenarios that may be in place before or after an international agreement is concluded. Scenario that no renewal of crediting period and registration after 2012 is allowed for major host countries namely Brazil, China, India, Mexico and South Korea significantly influence on the future supply (only 21% of initial estimation with original PDDs and simple projection). In comparison, currently dominant CERs from HFC projects will not necessarily continue to be the major portion of a future supply between 2013 and 2020 due to low numbers expected to come into the pipeline compared with other types of projects.

Forecasted CER Supply between 2013 and 2020

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Original PDDs</th>
<th>Adjustment</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Estimation</td>
<td>5,999</td>
<td>3,232</td>
<td>2,733</td>
<td>1,705</td>
<td>3,190</td>
</tr>
<tr>
<td></td>
<td>10,813</td>
<td>8,054</td>
<td>8,054</td>
<td>8,054</td>
<td>8,054</td>
</tr>
</tbody>
</table>

[Note] Unit: million t-CO$_2$e

Scenario 1: Renewal of crediting period and registration after 2012 is disallowed for HFC type projects
Scenario 2: Renewal of crediting period and registration after 2012 is disallowed for projects in five countries (Brazil, China, India, Mexico, and South Korea)
Scenario 3: Renewal of crediting period and registration after 2012 is disallowed for projects in steel and cement sector
1. The CDM has grown, but much concern remains over CDM procedures

Since the first registration of the CDM project activity in 2004, the CDM market has grown rapidly, with over 2,000 projects now registered at the CDM Executive Board (CDM EB) under the United Nations Framework Convention on Climate Change (UNFCCC) as of 1 April 2010. After the stable increase between 2006 and 2008, the largest increase in terms of registration at the EB occurred in 2009, largely due to a dramatic increase in Chinese CDM projects. In 2009, 57 projects were registered on average every month, half of which were from China. There are still more than 2,500 projects in the pipeline, which may further expand the CDM market throughout the world.

Conversely, much debate and criticism surrounds the unequal regional distribution of CDM project activities, especially the limited participation from Africa, Small Island and Development States, and Least Developed Countries (LDCs). For example, CDM projects hosted by LDCs which are registered at the CDM EB made up only 0.7% in numerical terms and only 0.3% in total expected emission reductions up to 2012. However, little progress has been made in terms of registration, which means that African countries are still under-represented in the market. Overall, taking into consideration the current pipeline, in which 40% of the projects in the validation process are based in China and 28% in India, it is safe to say that this unequal distribution of CDM project activities may be continued for a while.

Chart 1-1: Number of registrations by region

Total expected emission reductions up to 2012 from 2,120 projects already registered at the CDM EB amounts to 1.8 billion tons of CO2 equivalent, while only 22% of credits (0.4 billion) out of this from 683 projects has been issued so far. Currently, 23 million tons are issued every quarter on average, but issued CERs last year amounted to only 123 million tons in total, which is slightly lower than that of 2008 (138 million tons). If this trend continues, only 894 million tons (49%) may have been issued from currently registered projects by the end of 2012, according to the simple regression analysis performed on the issued CERs.

The generation of credits is also disproportionate, with almost half of issued credits generated by China, which has a greater than 80% share of the Asian countries. If we include the pipeline, expected emission reductions come to 3.6 billion tons up to 2012 as a whole. However, CER supply up to 2012 in particular is affected by the current CDM procedure, which this paper will address. Specifically, discussed are key factors revealed based on findings extrapolated from the IGES CDM Project Database, and how these factors may influence the volume of expected CER supply up to 2012, as well as from 2013 and 2020.
Chart 1-2: Issuance of CERs by quarter

(Chart not shown here)

(Unit: million t-CO\textsubscript{2}e)

(Source: IGES CDM Project Database, as of 1 April 2010)

2. Methodologies on analysis

Our analysis in this paper was carried out based on information obtained from the IGES CDM Project Database as of 1 April 2010, which contains publicly available information provided through the UNFCCC web-site for each individual project activity at each stage in the CDM procedures (see the table below). The assumptions and projections in this paper are based on information of each individual project activity and status as of 1 April 2010.

Table 2-1: Summary of CDM project activities used for this paper

<table>
<thead>
<tr>
<th>Status</th>
<th>Projects</th>
<th>Total ERs by 2012 (1000 t-CO\textsubscript{2}e)</th>
<th>Total ERs 2013-2020 (1000 t-CO\textsubscript{2}e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under validation</td>
<td>3,186</td>
<td>1,431,836</td>
<td>2,685,259</td>
</tr>
<tr>
<td>Under completeness check and requesting registration</td>
<td>601</td>
<td>280,919</td>
<td>641,912</td>
</tr>
<tr>
<td>Withdrawn and rejected at the CDM EB</td>
<td>199</td>
<td>111,505</td>
<td>128,666</td>
</tr>
<tr>
<td>Registered</td>
<td>2,120</td>
<td>1,812,091</td>
<td>2,542,741</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,106</strong></td>
<td><strong>3,636,351</strong></td>
<td><strong>5,998,578</strong></td>
</tr>
</tbody>
</table>

Note: Information and data were derived from PDDs

(Source: UNFCCC, 2010)

In this paper, we provide analysis on how the current CDM process will affect future CER supply compared with that originally planned in the PDDs based on statistics from the database, as well as projections on CDM projects coming into the pipeline from April 2010 to the end of 2020 based on simple regression analysis. Our assumption is made particular on each CDM project procedure, such as validation, requesting registration and issuance stage including the dropout rate at the validation stage, rejection rate at the requesting registration stage, and dropout rate at the implementation stage (detailed explanation will be given in the following section).

As our estimation of the future CERs supply, we simply deducted total amount of CERs that may be lost during each stage of the CDM project procedure from the original amount stated in the PDDs plus projected amount from upcoming projects.
3. Key factors to be considered in forecasting CERs supply

CDM has its unique project cycle and project proponents and, together with the contracted Designated Operational Entity (DOE), must go through step-by-step procedure with necessary documentation and coordination with the UNFCCC secretariat as well as the CDM EB in order to receive CER issuance. After entering into the pipeline, CDM projects follow a set order, normally starting with validation, then requesting registration, registration, monitoring, verification & certification, and finally issuance of CERs. Project proponents estimate emission reductions (CERs) from the beginning such as from first submissions up to opening up for stakeholders’ comments in the validation process with the expected start date of crediting period. In fact, the crediting period written in the initial PDD is normally delayed due to the above CDM procedures so that initial emission reductions up to the end of 2012 must be deducted depending on how long projects have to adjust to their crediting period. To make matters worse, projects sometimes must stop procedures due to a failure of required actions or documentation, or other factors. Therefore, this paper addresses the most influential risks on CDM procedures to the forecast summarised below and adjusts the original amount of CERs written in the PDDs into a more realistic CERs estimation depending on which CDM procedure each project dealt with.

<table>
<thead>
<tr>
<th>Five risks on CDM procedures to be considered in this analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Protracted validation process</td>
</tr>
<tr>
<td>2) High dropout in the middle of validation</td>
</tr>
<tr>
<td>3) Protracted registration process with increased interruption by the CDM EB</td>
</tr>
<tr>
<td>4) Operational risk during implementation stage</td>
</tr>
<tr>
<td>5) Issuance success risk</td>
</tr>
</tbody>
</table>

1) Protracted validation process delays CDM registration, and leads to high dropout rate

According to the IGES CDM Project Database, the duration of the validation process—from the opening of public comments up to submission of the requesting registration to the UNFCCC secretariat—has almost doubled compared with that of three years ago (see the table below). Since projects currently in the pipeline are now prohibited from generating retroactive credits, except for afforestation and reforestation, delays in the validation process means delays in the registration and crediting period, which also downsizes the maximum CERs that can be generated compared with the initially planned amount in the PDDs, particularly up to 2012.

Based upon the trend of such increase in time by project type according to past records, around 0.86 billion tons of emission reductions may be deducted from the initial figure up to the end of 2012 originally planned in the PDDs among project activities in the current pipeline.

Chart 3-1: Duration of validation process from starting public comments to submission for registration

(Source: IGES CDM Project Database, as of 1 April 2010)
2) High dropout in the middle of validation

In addition, not all CDM project activities necessarily proceed to requesting registration to the CDM EB. We noted that several projects have shown no progress for far longer periods than the average duration, based on past records of types of project. If projects have received negative comments from DOEs within six months after the end of the comment or even had their contracts terminated with DOEs, such dead time is greatly lengthened.

Therefore, based on the statistics recorded regarding the duration of the validation process, as well as progress status in the pipeline, we estimate that 22% of projects on average will drop out during the validation process, even if submission of opening public comments had taken place (see the table below). Based on the probability for each project type, this results in 0.42 billion equivalent emission reduction credits being lost due to dropout projects in the current pipeline up to the end of 2012.

Chart 3-2: Dropout rate (%) during the validation process

[Note] Dropout rate is calculated by the past record categorized by each project type. The dropout rate is based on the sum of number of projects which are assumed to have been stopped due to reasons listed in the criteria below, divided by the total number of projects which have been put in place for opening public comments.

1. Projects where DOE contracts are terminated; the standard deviation from the mean value of days from starting public comments until requesting registration
2. Projects for which a DOE made negative comments; double the standard deviation from the mean value of days from starting public comments until requesting registration
3. Projects ongoing but not submitted; three times the standard deviation from the mean value of days from starting public comments until requesting registration

3) Protracted registration process with increased interruption by the CDM EB

According to the CDM procedures for registration, once the UNFCCC secretariat has confirmed the submission by the DOEs under the completeness checks, projects will be posted on public comments for a certain period. If there is no request for reviews by DNAs of the host countries or at least three members of the CDM EB, the project will be successfully registered.
However, if projects are requested for review they have to go through another process according to the procedures for review of registration, which obviously delays the registration for almost a half year. As seen from the table below, overall duration of requesting registration become continuously longer and currently projects undertaken review spend almost one year to get registered after submission of the requests.

Chart 3-3: Average duration from request until registration (days)

![Average duration from request until registration (days)](chart)

(Source: IGES CDM Project Database, as of 1 April 2010)

To compound matters, the ratio of automatic registrations has dropped to almost half, which stood at below 20% in 2006, and the probability of requests for reviews is increasing constantly. The probability of reviews being requested, or even worse, projects being rejected by the CDM EB differ according to project type. For example, waste gas/heat utilization and fuel switch type projects have a relatively high probability of request for reviews while that for biogas and N2O composition projects is low.

Chart 3-4: Ratio of automatically registered projects over past six years

<table>
<thead>
<tr>
<th>Year</th>
<th>Automatic Registered</th>
<th>Requested Reviews</th>
<th>Undertaken Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 (n=125)</td>
<td>34%</td>
<td>30%</td>
<td>21%</td>
</tr>
<tr>
<td>2009 (n=755)</td>
<td>50%</td>
<td>23%</td>
<td>17%</td>
</tr>
<tr>
<td>2008 (n=481)</td>
<td>49%</td>
<td>24%</td>
<td>16%</td>
</tr>
<tr>
<td>2007 (n=473)</td>
<td>67%</td>
<td>20%</td>
<td>3%</td>
</tr>
<tr>
<td>2006 (n=419)</td>
<td>86%</td>
<td>11%</td>
<td>1%</td>
</tr>
<tr>
<td>2005 (n=64)</td>
<td>89%</td>
<td>8%</td>
<td>3%</td>
</tr>
</tbody>
</table>

(Source: IGES CDM Project Database, as of 1 April 2010)

As a result, taking into consideration such results of probability rate by project type with increased duration by this review process, approximately 0.08 billion tons of CERs up to the end of 2012 may not be generated from projects in the current pipeline.
4) Operational risk during implementation stage

As stated in the previous section, only 683 out of 2,120 registered projects have moved to the issuance stage, and the remainder are still in the monitoring stage for corroboration of the amount of CERs to be generated in one issuance process, or have been otherwise delayed or not yet started. Based on the data recorded, we found that it took 447 days on average to receive the first actual CERs after registration.

However, as seen in the table below, duration for the issuance also becomes longer continuously. Projects received CERs for the first time by the end of the third quarter of 2007, and usually moved to the issuance stage within one year after registration. Meanwhile, projects which recently received CERs for the first time in the first quarter of 2010 take almost two years after registration.

Chart 3-6: Days until first issuance

(Chart 3-6: Days until first issuance)

(Source: IGES CDM Project Database, as of 1 April 2010)
CDM projects are always surrounded with high risks in their implementation due to the nature of the CDM itself. Since CDM project activity is additional if GHG emissions are reduced below that would have occurred in the absence of the registered CDM project activity, most projects should have been not implemented without CDM. Therefore, sometime registered status at the CDM EB does not still help projects implemented in case that project owners cannot afford to prior start projects by their own cost. As stated above, even within registered projects of a similar type, some still have not been processed up to first issuance despite far exceeding the average duration.

Taking into consideration such circumstances, and taking one standard deviation from the mean value of average days to the first issuance after registration as the threshold for non-operation of the project activity, this results in 408 registered projects not generating CERs due to non-operation in the current pipeline, which equates to a 0.294 billion ton loss of CERs up to the end of 2012 due to non-operational risks after registration in the current pipeline.

Chart 3-7: Non-operational rate after registration (%)

[Note] Excluding 1 afforestation and reforestation, 1 leak reduction, 1 material use, 3 PFC reduction, and 3 SF6 replacement projects

5) Issuance success risk

The emission reductions in the PDDs at the time of registration is simply an ex ante estimation based on methodologies formally approved by the CDM EB, based on an assumption made by the Feasibility Studies. Therefore, the actual activity level, including operational hours, may differ widely. In actuality, on average, only 83% of CERs originally planned in the PDDs have been issued due to overestimation on operational rates, noncompliance of the monitoring guidelines as per applied methodologies, etc. This CER issuance success rate also depends on project type; HFC23 reduction projects have a greater than 100% issuance success rate, while biogas and methane recovery projects are far below the average (50% for biogas and 39% for methane recovery).

Using the issuance success level as a criterion applied to registered projects that have not reached issuance yet, as well as projects in the current pipeline, 0.234 billion tons of CERs up to the end of 2012 may not be generated compared with the original amount in the PDDs.

Chart 3-8: CER issuance success rate (%)

[Note] Methane avoidance, other renewable energies, and transportation projects are excluded.
4. Actual number of CERs supplied up to 2012 may be less than half

**Projection of projects entering into the pipeline from April 2010 to the end of 2020**

We observed that 80 projects on average entered into the pipeline every month. If this trend simply continues to the end of 2020, over 25,000 projects may additionally enter and generate CERs between April 2010 and the end of 2020. Based on projection made by the simple regression analysis with an simple assumption that average CERs of each project type will equivalently generate with the 10-year fixed crediting period, additional CERs may be added by 0.32 billion up to the end of 2012 and 10.8 billion between 2013 and 2020.

However, taking into consideration CDM procedural risks as explained in the previous sections, additional amount may decline down to 0.13 billion for the end of 2012 and 5.53 billion for the period of 2013 to 2020.

**Table 4-1: Projection of new projects entering into the pipeline**

<table>
<thead>
<tr>
<th>Project type</th>
<th>Num. projects entered per month</th>
<th>Additional num. to be entered till the end of 2020</th>
<th>Total ERs by 2012 (thousand t-CO2e)</th>
<th>Total ERs 2013-2020 (thousand t-CO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afforestation and reforestation</td>
<td>0.71</td>
<td>258</td>
<td>1,873</td>
<td>90,891</td>
</tr>
<tr>
<td>Biogas</td>
<td>8.53</td>
<td>1,582</td>
<td>12,305</td>
<td>306,703</td>
</tr>
<tr>
<td>Biomass</td>
<td>11.38</td>
<td>2,334</td>
<td>24,894</td>
<td>643,972</td>
</tr>
<tr>
<td>Cement</td>
<td>0.99</td>
<td>123</td>
<td>2,856</td>
<td>72,783</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>4.32</td>
<td>1,344</td>
<td>17,513</td>
<td>518,934</td>
</tr>
<tr>
<td>Fuel switch</td>
<td>2.58</td>
<td>589</td>
<td>22,332</td>
<td>703,889</td>
</tr>
<tr>
<td>Hydro power</td>
<td>20.61</td>
<td>7,545</td>
<td>74,290</td>
<td>3,025,616</td>
</tr>
<tr>
<td>Methane avoidance</td>
<td>2.13</td>
<td>816</td>
<td>7,419</td>
<td>298,813</td>
</tr>
<tr>
<td>Methane recovery &amp; utilization</td>
<td>4.96</td>
<td>1,010</td>
<td>39,520</td>
<td>1,151,224</td>
</tr>
<tr>
<td>N2O decomposition</td>
<td>0.96</td>
<td>27</td>
<td>12,876</td>
<td>149,113</td>
</tr>
<tr>
<td>Other renewable energies</td>
<td>0.97</td>
<td>258</td>
<td>2,794</td>
<td>80,182</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.32</td>
<td>129</td>
<td>2,305</td>
<td>57,135</td>
</tr>
<tr>
<td>Waste gas/heat utilization</td>
<td>8.09</td>
<td>2,977</td>
<td>48,541</td>
<td>1,747,352</td>
</tr>
<tr>
<td>Wind power</td>
<td>12.74</td>
<td>6,304</td>
<td>46,804</td>
<td>1,965,985</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>79.29</strong></td>
<td><strong>25,296</strong></td>
<td><strong>316,322</strong></td>
<td><strong>10,812,592</strong></td>
</tr>
</tbody>
</table>

[Note] Biofuels, HFC, leak reduction, material use, PFC/SF6 are excluded due to low projection

**Chart 4-1: Forecasted CER supply up to the end of 2012 from projection only**

Unit: million t-CO2e
As a result, a total figure of 4.0 billion tons of CERs based on that originally planned in the PDDs from all CDM projects plus projected one, may end up being only around 1.8 billion tons (47%), due to risks involved at different developmental stages, as explained previously. As we approach the end of first commitment period, the protraction of the CDM process, especially before registration at the CDM EB, means that projects currently in the validation stage as well as projects entering into this stage may not be able to supply the anticipated amounts of CERs before the end of first commitment period (i.e., only 25% of those originally planned in the PDDs and projection).

Our analysis, which is based on the IGES CDM Project Database, reveals that the current prolonged CDM procedures, if they continue under current trends, will deal a fatal blow for CER supply, especially up to the end of 2012. Further, if CER supply between 2013 and 2020 is considered, based on the current data, risks involving dropout during the validation process, and requesting registration and issuance stage need to be reassessed. From the next section, we analyse CER supply after 2013 up to 2020 based on our assumptions made from the data on the IGES databases.

Chart 4-2: Forecasted CER supply up to the end of 2012

![Chart 4-2: Forecasted CER supply up to the end of 2012](chart.png)
5. Forecasting CER supply from 2013 to 2020 taking into consideration procedural and operational risks

Expected emission reductions between 2013 and 2020 from all CDM projects, including new projects expected to enter into the pipeline, comes to 16.8 billion tons according to the original PDDs as well as our projection. Since 54% of projects apply for a renewed crediting period, this estimation is based upon annual emission reductions in the last year of the first crediting period continuing at the same level for the rest of the credit renewal period.

However, as described in the previous chapter, CDM procedural risks as well as operational risks at each developmental stage cast a shadow over the possibility of obtaining the full amount of CERs as originally planned, thus this estimation would need to be revalued at 8.76 billion tons, which is approximately 52% of the amount originally planned in the PDDs as well as initial projection on new projects expected to enter into the pipeline. In addition to these risks, CER supply especially after 2012 may suffer further fluctuations, largely depending on how the entire international agreement for the regime after the first commitment period of the Kyoto Protocol will be settled.

Chart 5-1: Forecasted CER supply between 2013 and 2020 including original PDDs and projection

This paper, therefore, addresses several possible scenarios which may entail further restrictions on CER supply between 2013 and 2020. These scenarios were considered based upon individual hypotheses relating to the ongoing international CDM negotiations, and are also premised upon the assumption that the CDM will be continued under the current framework. However, a new framework after 2012 may directly or indirectly influence any number of aspects of the current CDM.
FORECASTING CER SUPPLY UP TO 2020

Scenario 1: Denial of renewal of crediting period for HFC type projects

Currently, there are twenty HFC23 reduction projects registered at the CDM EB, and they dominate the current CDM market in terms of supply of CERs (52% of issued CERs is generated from this type of project) due to their high Global Warming Potential (GWP of HFC23 is 11,700 times larger than that of CO2). Hence it is highly unlikely that this type of project will be further increased in numbers during the first commitment period as well as subsequent periods, owing to long-lasting international discussion with regards to inclusion of new HCFC22 facility under this type of CDM.

Recently, there has been a submission to revise the methodology which most HFC type projects have been using for calculation of emission reductions. According to this submission, revision may have significant impact on downsizing the volume of CERs from this type of project due to a change of currently adopted assumptions, such as the HFC-23/HCFC-22 ratio. This revision also applies to already registered projects for subsequent crediting period (UNFCCC, 2010). The revision has not yet been adopted at the time of writing of this paper, but we consider this as a possible scenario and analysed its influence on the future supply of CERs especially after 2012.

Since it is difficult to estimate how much volume can be exactly deducted due to this revision at this moment, this paper hypothetically applied the most influential of the registered HFC23 projects which is no longer allowed to renew its crediting period. Currently, 14 out of 20 projects chose a 7-year crediting period, and none of these crediting periods have been renewed yet.

Taking into consideration such circumstances and applying the assumption that these projects will not be allowed to renew their crediting periods, the expected CER supply may be reduced from 8.76 billion to 8.25 billion tons, which is a 6% reduction from our initial analysis. Although HFC project generates a significant amount of CERs for one project and dominates the current CDM market, expected CER supply may be dependent more on other types of projects coming into the pipeline in the future rather than on those from already registered HFC projects.

Scenario 2: Denial of renewal of crediting period and registration after 2012 for projects in selected countries (e.g., China, India, Brazil, Mexico, and South Korea)

This is also controversial issue, but we would like to pursue hypothetical analysis on the limited participation of developing countries to the CDM after 2012. The Copenhagen Accord which was officially noted at the end of COP15 in Copenhagen last year stipulates that non-Annex I Parties will undertake nationally appropriate mitigation actions either by their own efforts or with international support (UNFCCC, 2009). Detailed mechanisms are still subject to ongoing international negotiation, but it is clear that CDM after 2012 will be influenced to some extent by decisions made by the international negotiation, especially regarding the issue of nationally appropriate mitigation actions. All countries hosting CDM projects may be eligible for this activity, but at the same time it is still not clear that how CDM after 2012 will be placed in parallel to the introduction of such activities. Although only the EU Energy and Climate Package announced by the EU in 2008 expressed that it will utilize CDM credits from LDCs after 2012, none of the Parties announced an explicit position on CDM after 2012 (EU, 2008).

Currently, China, India, Brazil, Mexico and South Korea, which are experiencing high economic growth compared with other host countries, dominate the CDM market in terms of number of projects as well as volume of CER supply. These five countries represent 77% in terms of number of registrations and 87% of expected CER supply between 2013 and 2020 based on our analysis in the current pipeline. Due to a continuous increase in Chinese projects, solving unequal regional distribution may become even harder. Therefore, in order to solve current unequal regional distribution with an increase of projects from currently underrepresented countries, self efforts by those five countries on mitigation can be considered to give more CDM opportunities to other countries.

Therefore, if it is assumed that projects from these five countries are not allowed to renew their crediting periods and to be registered after 2012, CER supply between 2013 and 2020 may be lower than projected based on our analysis, which equals around 3.6 billion tons, 41% of our estimation (only 21% from simple projection without adjustment). Determination of host countries on projection from April 2010 to the end of 2020 is made on the current proportion of those five countries in volume of issued CERs.
Table 5-1: CER supply between 2013 and 2020 with limited participation

<table>
<thead>
<tr>
<th>Estimated CERs after adjustment (2013-2020)</th>
<th>Current CER share (%)</th>
<th>Renewal is not allowed</th>
<th>Registration is not allowed after 2012</th>
<th>Both measures applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>From projects in China</td>
<td>48.21</td>
<td>8,757</td>
<td>8,757</td>
<td>8,757</td>
</tr>
<tr>
<td>From projects in India</td>
<td>19.66</td>
<td>8,726</td>
<td>7,976</td>
<td>7,945</td>
</tr>
<tr>
<td>From projects in Brazil</td>
<td>10.02</td>
<td>8,659</td>
<td>8,359</td>
<td>8,261</td>
</tr>
<tr>
<td>From projects in Mexico</td>
<td>0.15</td>
<td>8,729</td>
<td>8,751</td>
<td>8,723</td>
</tr>
<tr>
<td>From projects in South Korea</td>
<td>13.26</td>
<td>8,668</td>
<td>8,230</td>
<td>8,141</td>
</tr>
<tr>
<td><strong>Total CER supply (applied to all five countries)</strong></td>
<td><strong>91.3</strong></td>
<td><strong>7,230</strong></td>
<td><strong>5,129</strong></td>
<td><strong>3,602</strong></td>
</tr>
</tbody>
</table>

Unit: million t-CO$_2$e

As a result, if this scenario is realized, dramatic decrease on CER supply between 2013 and 2020 may be occurred from China (36.5% reduction from our initial estimate), followed by India (9.3%) and South Korea (7.0%). Both scenarios influence the most in Chinese CDM projects. Due to the relatively large dependence on future projects to be entered into the pipeline from those five countries (there are few projects in China claiming retroactive credit), a scenario of no registration after 2012 influences more on CER supply rather than the single scenario of no renewal of crediting period.

Scenario 3: Denial of renewal of crediting period and registration after 2012 for projects in steel and cement sector

The steel and cement sectors are one of the high energy intensive industries exposed to international competitive market, which also means that they have a high potential in the CDM. For example, 43 steel companies from developing countries were ranked in the top 80 companies in the world in terms of crude steel production in 2008, which also counts for 52% of total crude steel production in volume (World Steel Association, 2008). There are several CDM projects at steel sector already in place aiming at the use of waste gas, such as Coke Oven Gas, Blast Furnace Gas, and Convertor Gas, as well as introduction of Coke Dry Quenching (CDQ) technology. There are also projects in the cement sector in place such as waste heat recovery at production line, introduction of alternative fuels and more energy efficient blended cement. Those technologies are not only reducing Greenhouse Gas emissions but also strengthening the high competitiveness of the company by increasing their producing capacity. Therefore, it is sometime difficult to expect full technology transfer between companies under the CDM without any supplemental treatments for companies investing their technologies as CDM projects into developing countries.

Having said this, assuming that there are some constraints on CDM eligibilities for sectors where there is already high competitiveness and capacity to increase energy efficiency on their own, the steel and cement sectors may be two of the top sectors categorized in this group. If it is assumed that projects in both the steel and cement sectors are not allowed to renew their crediting period and aim to be registered after 2012, the estimated CER supply between 2013 and 2020 may be downsized by 0.52 billion tons, which is just 4% of our original estimation.

Since only 12% share of projects from those sectors in number as well as expected volume of CERS in projection to the end of 2020, there will be not so significant impacts from both scenarios. Projection in number in both sectors is considered to being affected by the recent high rejection rate: rejected rate for cement is 26.8% and waste heat/gas utilization project at those sectors is 20.6%.
Table 5-2: CER supply between 2013 and 2020 with limited participation from steel and cement sectors

<table>
<thead>
<tr>
<th></th>
<th>Current CER share (%) in cement and steel sector</th>
<th>Renewal is not allowed</th>
<th>Registration is not allowed after 2012</th>
<th>Both measures applied</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total CER supply</strong></td>
<td>5.9</td>
<td><strong>8,715</strong></td>
<td><strong>8,280</strong></td>
<td><strong>8,239</strong></td>
</tr>
</tbody>
</table>

Unit: million t-CO₂e

According to the initial analysis taking into consideration CDM procedural risks, the anticipated loss of CERs may largely occur during the dropout in the middle of validation process (23% loss) followed by issuance success rate (9.0% loss). There has already been some tightening of the rules in those steel and cement sectors, which results in a relatively higher dropout rate in these two sectors. Overall, as seen from the table below, the largest factors influencing CER supply after 2012 may be the limited participation from currently dominating countries such as China, India, Brazil, Mexico and South Korea.

Other scenarios that we have considered in this paper were relatively lower influence on the future CERs supply. However, since 62% projects in projection are renewable energy type of projects in number, the same approach with steel and cement sector to this type of projects could have a larger influence on overall CER supply between 2013 and 2020.

Chart 5-1: Forecasted CER supply between 2013 and 2020

[Note] Unit: million t-CO₂e

Scenario 1: Renewal of crediting period and registration after 2012 is disallowed for HFC type projects
Scenario 2: Renewal of crediting period and registration after 2012 is disallowed for projects in five countries (Brazil, China, India, Mexico, and South Korea)
Scenario 3: Renewal of crediting period and registration after 2012 is disallowed for projects in steel and cement sector
Conclusion

Our analysis has revealed that the current prolonged procedure combined with a tightening of the rules may significantly affect CER supply particularly up to 2012. In addition, we may have to pay more attention to the status of the activities of projects which have been registered but have still not reached the issuance process. Even we have estimated future projects coming into the pipeline by the simple regression analysis, this current environment may discourage project proponents from entering the CDM market so that our projection may have to be downsized more.

Under the current circumstances, in which no international agreement has been made, it is difficult to assert that any of the scenarios explained in this paper are likely be introduced and modified towards the supply of CDM credits after 2012.

However, our scenario analysis clearly revealed that future CERs supply will be still dependent on limited five countries currently dominating the CDM market. The current prolonged procedure as well as high dropout rate in the middle of validation process is already decreasing maximum CER supply and also influencing current international discussions on CDM reform as well as other market mechanisms, which may further decrease CER supply over the next ten years.
References

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IGES, 2010. *IGES CDM Project Data Analysis*, updated as of 1 April 2010
UNFCCC, 2010. UNFCCC ([http://cdm.unfccc.int/index.html](http://cdm.unfccc.int/index.html))
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