Standardized Baseline Setting Methodology for Energy Related Projects in the International Climate Change Policy

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1. International Environmental Cooperation

Climate change problems led nations to develop an international mechanism to cope with the aim of reducing GHG (greenhouse gases) emissions. Under UNFCCC (United Nations Framework Convention on Climate Change), KP (Kyoto Protocol) was enacted with its first commitment period ending in 2012 and the second period started in 2013.

More special about climate change problem for the international relations is now developing countries can blame developed countries for the past emissions. Mostly due to its cumulative nature, past emissions from developed countries (which more or less overlaps with the Annex I countries) are considered culprit for the current problem. Aids (primarily financial) from developed nations to developing countries can be negotiated as a legitimate claim by developing countries. As a consequence, the pressure to provide more aids became one of the central issues in the international environmental negotiation.

A related issue is the energy policy. Since CO2 is one of the major GEG, and fossil fuel is the major energy source, reducing GHG emissions imply saving energy, switching to energy whose emission of GHG is less, or resorting to renewable energy, which involves more costs and more technology. Technology transfer is one issue discussed at UNFCCC or KP, and oil producing countries ask for compensation for the possible decline in the petroleum demand. Also we have seen the trend toward exploration of new energy sources like biogas and shale gas.

2. Mechanisms and Certification

In 2013, the second commitment period of the KP started. A marked difference from its first period lie in the fact that less Annex I countries participated, with less CDM (clean development mechanism) credits are allowed to trade in the EU-ETS (European Union-Emissions Trading System), the largest emission trading market. Still the decline in demand overweighs to result in very low emission prices.

More attentions are paid to new mechanisms including REDD+ (Reducing emissions from deforestation and forest degradation in developing countries and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries) or bilateral crediting schemes as this might induce new financial flows into non-Annex I countries while they more or less counted on the infrastructure created by the CDM. Also Cancun agreement suggests that Annex I countries (countries listed in the Annex I of UNFCCC, which was assigned a quota on GHG emissions, and almost overlaps with Annex B of KP) may pursue own reduction targets separately with emission prices or credit scheme as a reference indicator. Although the arguments are not settled, already large amount of funds are pledged and already substantial amount of funds are used up, more flow of funds are needed either directly or through mechanisms. In order to justify inflows of funding through new mechanisms, many of planned mechanisms tend to employ result-based way of payment. Thus, KP might be replaced by several different and fragmented mechanisms, and participation of private sector is somewhat uncertain, but the method of MRV (measurement, reporting, and verification) developed under Kyoto Mechanisms (CDM, JI (joint implementation) and Emissions Trading) would remain important.

Multiple methods are developed for CDM projects, where emission reduction projects undertaken in non-Annex I countries are registered, in order to issue credits for those reductions from these projects can be traded at the emission trading. In order to assure that those emission reduction credits correspond to real and additional reduction, several methodologies for different projects are developed and listed. In this paper, we shall examine some of the working of these methodologies along with a proposal to improve this procedure.

3. Projects in CDM

For instance take a fuel switch project, like from coal to LNG at power plant. Project proponents must submit a PDD, in which baseline setting methodology is specified and the additionality of the project to be proved, together with substantiation of the allowance for possible leakage.

Typically there is a methodology relevant for the project, which usually tailored to the type of technology used, and other conditions like if the project is greenfield project or brownfield, and if it is grid-connected or not (in the case of power plant).

Methodology often asks to establish the additionality of the project, i.e. the project is not undertaken if it were not for the CDM credits. First, it must be ascertained that the

project is not required by the regulation of the host country. Then investment analysis is required that without the revenue from the CDM the project is not profitable (for the case of a for-profit entity). As the emission price is very low currently, this condition would be very difficult to satisfy. Also one could claim that there is a barrier to undertake such project, while the use of this test is getting stringent, because often this is considered as a loophole clause. Then the baseline emission level is set by using the data required by the methodology. For example, maximal level in the recent three years is chosen, in the case of brownfield project, in some methodology. Often, a direct evidence of emission level is not available, and through an indirect data like production level of output, emission level is estimated with some specific formula provided by the methodology, which is sometimes also provided by IPCC (Intergovernmental Panel on Climate Change). In order to calculate credits ex post, similar conversion formula could be used to calculate the actual emission and the difference between the baseline emission level and the actual emission level is regarded as the credit level (often with a cap level so that manipulation through inflating output level is not possible). The methodology also specifies the adjustment of possible leakage like possible conversion of LNG from other use.

4. CDM in ECO countries

Eco countries vary in their characteristic and also status in CDM. Turkey was among Annex I initially and got out of the status to have an assigned amount after some years. No CDM or JI project is registered by far. Kazakhstan is Annex A (essentially equivalent to Non-Annex I) but sought for the status of Annex B (equivalent to Annex I) , which was approved in the CMP (conference of the parties of UNFCCC and meeting of the parties of KP) in 2012, and so far no project registered yet. Uzbekistan is hosting the most registered CDM projects among this group and projects are mostly on N2O reduction as well as prevention of leakage from gas pipelines. Two large countries, Iran and Pakistan are the only other countries hosting registered CDM projects among this group by far including fuel switch and small scale hydro-power plant projects. Pakistan has many proposed projects including industrial projects some of them are still in the pipeline or rejected. Also oil or other energy producing countries like Azerbaijan have some projects related to energy industry in those not yet registered projects. Other countries including Kyrgyz, Tajikistan, and Turkmenistan have a few unregistered projects, possibly due to allegedly heavy transaction costs. Finally Afghanistan did not have any projects in the pipeline by far.

5. CDM reform

Many problems were pointed out on the actual operation of CDM (cf. Wara and Victor (2008) for example). Major complaints are on earlier dominance of "industrial gases" (HFC3 and N2O whose reduction was not imagined at all prior to KP, and its destruction is almost costless; therefore the addtionality of these gases are easily established, and credits can be obtained almost costlessly), geographical biases in projects (especially dominance of China, followed by India, Brazil, and Mexico in part due to that they have large industrial sector already and the size of project could be big, together with the fact that there are enough entrepreneurship in these countries), very slow handling of the projects by the CDM office and high transaction costs (because EB (executive board) tried to judge all individual projects by themselves, and also the costs charged by DOE (designated operational entities) is rather high), and registration of many suspicious or allegedly non-additional or BAU (business as usual) projects (due to the lack of ability of EB and insufficient examination of PDD (project design document)) coupled with some scandals.

These complaints led some conclude that the mechanism was a failed experiment. The CDM office also tried to respond to these complaints, and one answer is the standardization of the baseline setting methods, which we focus upon below.

6. New Mechanisms

Several mechanisms are proposed to coexist or replace CDM and JI both at UNFCCC and KP as well as domestic emission reduction program of several countries. Its concrete form is changing day by day. We list some of those below:

REDD+: This program is meant to cover forestry project not covered by CDM. Then its use is proposed to expand especially land related projects, which is the reason for + after its name. Now stress is placed on the fact that it is result-based. How to reward the resulting emission reduction is not settled yet. This scheme is discussed outside the KP, and hence the USA is more enthusiastic.

NAMA (nationally appropriate mitigation actions): Non-Annex I country engage in a certain project or more likely to employ a certain policy measure. In return, a certain fund is awarded, likely to be after the fact.

SCM (Sectoral crediting Mechanism) : Instead of individual projects, a certain sector (like transportation) of a host country is subject to a crediting or rewarding scheme. A nation may become the main actor, and because of aggregation, some effort by an entity may be cancelled out by a bad performance of another. Non-Annex I country reluctant to have an assigned amount in the future regard this mechanism as a step toward such status, and very suspicious about this scheme.

BOCM (Bilateral Offset-Crediting Mechanism) : An Annex I country and non-Annex I country sign a contract so that aids may be given from the former to the latter for an emission reduction in the latter. Relationship could be multilateral, and aids could be an upfront payment, or result based. The type of project could be NAMA type or sectoral type or much smaller projects like CDM. Japan is in favor of this mechanism.

It should be noted that other regional emission trading systems like California, Australia etc. also propose to allow some credits based on (possibly their own) offset scheme can be used in their trading. Also there is a strong outcry to open the room for private sector play some role in these new mechanisms, especially from the environmental finance businesses.

7. Measurement and Standardization

In response to the criticism and competing proposals, CDM EB discussed CDM reform. One eminent option is the standardization of the baseline setting methodology, because this is a part of transaction costs in collecting data necessary and drafting PDD.

At the 65th meeting of CDM EB, a proposal is presented in which a way of standardization is carried out. Taking up an example of grid-connected new power plant, they propose to obtain a list of emission coefficients of existing power plants in the region. Plotting those plants (weighted by output levels) in an ascending order by its emission factor, they propose to set baseline at the 80% level of this distribution and to set additionality level at 90% with costs averaging over all plants below this level. This has certain demerits and for instance, Hayashi and Michelowa (2012) analyze this proposal critically.

One apparent problem in this proposal lies in the fact that they aggregate projects too much. If it is a new power plant in a particular region, then there must be a reasonable candidate of the type of power plant to be built in the absence of credits for emission

reductions. In fact, ranking according to emission coefficient does not correspond to the ranking according to profitability, and it is not necessarily the case that always newly adopted projects involve cleaner technology.

Earlier, we have examined a possible implication of standardized baseline setting methodology utilizing framework of theoretical economic analysis where incentive plays the key role. Employing the assumptions adopted by Fischer, and proceeding more or less analogously with her analysis of industrial average baseline, we showed that it could be possible that the projects attracted by the standardized baseline could be completely different from the set of projects which would become viable under the historical baseline, which essentially correspond to the current practice in CDM. We show the essence of the argument in a simplified version below.

Since we focus upon the standardized baseline and its self-selection biases, here, we take up the situation considered by Fischer (2005) as an example, and we compare the situation where standardised baseline is introduced with the currently dominating relative baseline based on the project-by-project base.

In the paper, she assumes that the emission level prior to the CDM, μ, and profitability after the CDM, π, are distributed independently and uniformly on the unit interval, respectively. The profit advantage obtained by adopting the project is given by $s(1 - \rho)\mu + \pi$, where ρ is the proportion of energy saved by this project, and s is the pecuniary value of energy. Thus compared with the investment cost k, if $s(1- \rho)\mu + \pi$ is greater, then investment would be carried out without credits, and so the additionality requirement is not met.

In this comparison, it seems that μ is fixed in her analysis. To be consistent with this supposition, demand level and price would not be affected by the supply decision of the firm. (Possibly we may assume that the production level of a firm is fixed because only at the full utilization level, production can be carried out efficiently, and changing output level results in extremely high costs.)

Let t be the emission price in the global emission trading market, and an unspecified baseline setting scheme be $A(\mu)$. Then the resulting amount of credits is $A(\mu)-\rho\mu$, and so its value is $t(A(\mu) - \rho\mu)$. Therefore, now the amount to be compared with k is $s(1 - \rho)\mu + \pi + t(A(\mu) - \rho\mu)$.

Now the real practice of CDM differs from what Fischer has assumed in several aspects. We list some of them below

1. Baseline method is project-by-project and so PP must reveal and specify the parameters for their own projects (which under historical baseline, the situation is not different from the one Fischer investigated.).
2. Baseline methodologies are approved in the bottom-up manner and so not necessarily many baseline setting methods are not available for a firm, depending upon the type of the project.
3. Additionality of the individual project is judged separately from the baseline setting method and in that test, profitability of the projects and expected emission levels are reported by the PP and hence profitability measure may not be a private information to some extent (although its reliability can be questioned)
4. The baseline setting methods are mostly relative (or rate-based as Fischer put) rather than absolute. (Again, under the fixed output level, this difference does leave no consequence.)
5. Also the classification listed in the Marrakech Accord did not correspond to the way formulated in Fischer. The "expected emission" is not used very often. Secondly, this classification is also used in the methodologies, but the correspondence is quite diverse. (In fact, hardly any methodology chooses industrial top average as the corresponding Marrakech provision, but some methodology uses industrial average as a reference within the method it specifies.)

Based on this model with profitability parameter unknown, and before the project, emission level being distributed uniformly (as the real distribution), consequences of the choice of baseline schemes are compared. As mentioned above, "expected" emission is not quite relevant in the later development of CDM, however, the comparison of the "historical" emission baseline, and the "industrial average" baseline remains important as the former is the closest to the baseline scheme employed in reality, while the latter is close to the standardized baseline proposed both in the CDM reform as well as the method proposed in the bilateral mechanism by the Japanese government under discussion.

For instance, under these specifications, the historical baseline yields $A(\mu) = \mu$. Then the investment becomes worthwhile if $\pi + (t + s)((1- \rho)\mu) \geq k$, or $\mu' \geq (k - \pi)/(t + s)(1-\rho)$. If the scheme is the average baseline, then $A(\mu)$ is constant at some level specified by the particular benchmark utilized. Let this level be M. Then the critical level becomes $s(1-\rho)\mu + \pi + t(M - \rho\mu) = k$ or $\mu'' = (k - \pi - tM)/[s(1- \rho) - t\rho]$. Assuming

that investment is not profitable without credits (additionarity requirement), which implies $\pi < k$, we have $\mu' > \mu''$. Note that when s is relatively small compared to t, then the interval of initial emission levels for which CDM investment is guaranteed to be profitable is $[\mu', 1]$ under the historical baseline provided that $\mu' \leq 1$, whereas it is $[0, \mu'']$ when $\mu'' > 0$. When $\mu'' < 0$, this interval is $[0, 1]$. It seems that Fischer (2005) mostly concentrates on the former case. In that case, industrial average baseline attracts firms having initially lower emission level while the historical baseline attracts firms with initially higher emission levels.

One also has to think about the additionality constraints, i.e. if the investment is worthwhile even without the credits revenue, then credite should not be awarded (similar criterion is imposed in other mechanisms in the other area of environmental agreement, like the financial mechanisms under UNFCCC). This implies that $\pi + s((1 - \rho)\mu < k$ or $\mu < (k - \pi)/s(1 - \rho) = \mu'$. Thus especially for the historical baseline, the interval shrinks to $[0, \mu']$.

This relationship shows the self-selection problem generated by the average baseline. That is, under the average baseline, firms with the lower initial emission level find it attractive to engage in the CDM project. If average baseline is employed as a proxy for the historical baseline, then these firms receive more credits than it should be.

The heart of the issue would be that the information which used to be available (but may not be utilized fully) becomes unavailable. This usually would be hazardous for the society as a whole. Of course, counterargument could be made from the viewpoint of costs of collecting data, which is now born by the project proponents. Under the proposed standardized scheme, these costs are born by the system itself, like CDM-EB or the UN office. Certainly this would help raise incentive to undertake emission reduction projects on the side of participants. However, the current proposal seems to require extensive data which could be equally costly. Is it worthwhile to bear such costs from the viewpoint of the world as a whole is a question which needs an answer.
After all, standardization should be confined to the type of projects where not much variation in the baseline level within the category was observed from the experience of CDM in the past.

8. Implication for ECO countries

The future course of international climate policy is not certain but from the several

directions proposed, one could foresee some possibilities. One is that even though the new mechanisms under considerations are mostly applied at the aggregate level, so that private efforts may be canceled out, among ECP countries, there is a possible coordinated benefit sharing across countries. I.e. some countries produce energies which can be used by other countries allowing some emissions, while producing countries may employ several emission reducing projects. These emissions are not cancelled out and may benefit each other until the framework for non-Annex I countries to bear quota on their emission levels to come out. Secondly, possible adoptions of standardized methodology to measure emission reduction could benefit some sectors which were not qualified before. Even though this can have negative effects from the viewpoint of original emission target set, the reduced transaction costs could benefit many ECO countries which did not have a good access to such opportunities via lowered transaction costs.

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