Baseline as the Critical Issue of CDM —Possible Pathway to Standardization—

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EXECUTIVE SUMMARY

The issue of baseline setting is a critical issue for designing CDM regime in terms of determining incentives (credit generation) for investors. Despite the clarity of its concept, the methodologies of baseline setting are technically difficult. This issue can be construed rather as the problem of how to *define* the additionality. This paper clarifies the criticality of baseline setting in the whole CDM regime, classifies various methodology concepts, and identifies the cross-cutting issues. Based on these studies, The potential for "standardization" which will be critical for reducing transaction costs is also discussed.

Furthermore, by contemplating on phase-by-phase development for CDM, a menu of potential approaches to overcome technical difficulties stated above is considered in addition to searching for practical resolutions, thereby projecting on possible options for future negotiation process.

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1.0. Backgrounds

Clean Development Mechanism (CDM) is a project-based mechanism introduced in the Kyoto Protocol, under its Article 12. This mechanism is the realization of the Joint Implementation concept defined under the United Nations Framework Convention on Climate Change (UNFCCC), and is a critical mechanism as a way for developing countries without obligations in quantitative targets to participate. At the same time, it provides incentives for Annex I countries as an opportunity to earn credits, thus the success of CDM will significantly affect the cohesion and development of a whole framework of the Kyoto Protocol.

However, unlike the emission trading defined under the Article 17 of the Protocol, the CDM requires the identification of reduced amount through the implementation of CDM projects, thus there will be many technical barriers to overcome before the mechanism can be implemented. At the fourth Conference of the Parties in Buenos Aires (COP 4) in November, 1998, it was agreed that the details of regime should be determined at COP 6 to be held by the end of year 2000. Therefore, we expects intensified discussion on the designing of this scheme in coming years.

In this paper, the issue of *baseline setting* which is technically most difficult issue in designing the CDM is focused, and the possibility of *standardizing* the baseline setting methods is considered.

1.1. Purpose of CDM and Baseline Issue

First, let us remember the purpose of CDM in order to determine the criticality of baseline issue in a whole regime of CDM.

According to the Article 12 of the Kyoto Protocol, the purposes of CDM are:

- To assist the sustainable development of non-Annex I countries, and
- To assist the Annex I countries to comply with their emission targets.

The designing of a CDM scheme should be based on these two points. Especially important is the former.

For non-Annex I countries, *i.e.*, developing countries, the CDM should be a "new channel for funds and technologies", and a framework which enable them to earn *ancillary* benefits in addition to the benefits of climate change mitigation. In order to ensure the fulfillment of these conditions, the most critical issue is the project screening in the CDM approval process. The item 5 (a) of the Article 12 has stipulated that the participation in CDM requires the approval of relevant country's Government.[1] Therefore, it will be desirable at this stage to

[1] 5. Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of:

(a) *Voluntary participation approved by each Party involved*;

(b) Real, measurable, and long-term benefits related to the mitigation of climate change; and

request each Government concerned to formulate its own guidelines under the general criteria determined by COP, in order to ensure its intrinsic sustainability conditions.[2]

On the other hand, the interests of a investing entity in an Annex I country will be the credit volumes to be earned through the implementation of the project. It will be not only an incentive for the actual implementation of the project, but also a determining factor for the success or failure of this scheme as a whole, depending on how much credits can be generated from this scheme as a whole.

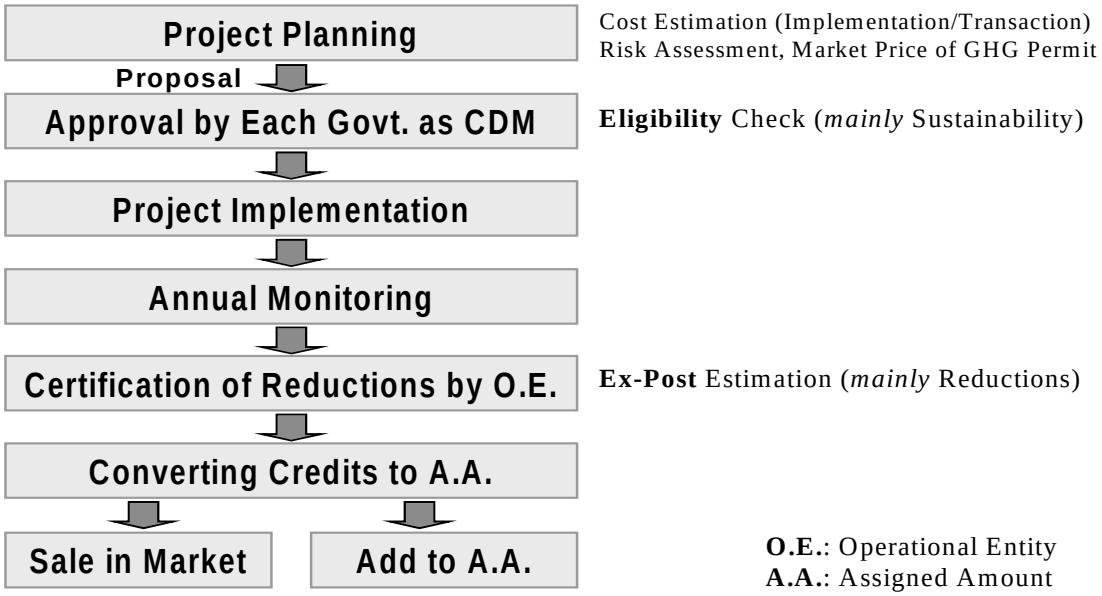
Nonetheless, to determine the amount of the credits, it will be necessary to introduce the scenario of "in the absence of the project (baseline)". By subtracting the actual emissions from that of this base scenario, the credit volume be *defined*. From the experiences of the Activities Implemented Jointly (AIJ) in the pilot phase, projects usually require high transaction costs in addition to implementation costs, which obstruct the promotion of a scheme. In case of ambiguous baseline setting method, there will be a difference between the *actual* reductions and the credits generated. If the credit earned is too small, the incentive to implement projects will be suppressed, and if too large, it will lead to increase of greenhouse gas emissions.

Therefore, the future development of CDM regime itself relies heavily on how a baseline can be determined using simple and less costly methodologies, while attaining these balances.

1.2. Process for Credit Certification

Let us study the actual procedures of CDM project credit certification in order to determine the criticality of baseline issue.

Figure 1: Flow-Chart of CDM Project Procedures



(c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity. (*Italic* by the author)

[2] Each country may adopt *different* concept of sustainable development, and there will be no need to adopt a common guideline on this. Since the project screening process is before the project implementation, periodical review may be necessary.

As shown in Figure 1, CDM project developer is to formulate a plan for project, by assessing implementation costs, transaction costs, and various risks, while referring to the market price of tradeable emission permits. At this phase, the credit volume is first assessed with the determination of the baseline.

At the next phase, the project is proposed to relevant governments for approval as CDM project. The assessment and confirmation process at this phase will focus on project's benefits on the sustainable development aspects of the host country rather than on the appropriateness of the baseline.

Once approved by relevant governments, the project will be implemented. Monitoring on the effects of the projects shall take place every year, and one of the third party (operational entity) designated by the CDM Executive Board will evaluate the following items on the project:

1. Appropriateness of emission monitoring method (methodology, accuracy, *etc*.)
2. Appropriateness of baseline scenario (methodologies, parameters, *etc*.)
3. Other items (such as sustainability benefits *etc*.), when required.

Depending on the assessment result, the operational entity shall certify the emission reductions of the project.

Therefore, the baseline is a decisive factor at the first phase of an *ex-ante* assessment process conducted by project planners themselves, and at the phase of *ex-post* assessment of emission reduction units. Baseline applied at these two phases of assessment process should utilize the same methodology, but the values of applied parameters will usually differ, since the latter phase uses the actual values.

It is possible to confirm the appropriateness of baseline at the phase of CDM project approval by relevant governments, but only as a reference. The baseline applied for the determination of emission reduction units, *i.e.* the credits certification, should be *ex-post*. Nevertheless, since the assessment of the additionality condition of emission reductions associated with the CDM projects—although they may be overturned by the *ex-post* assessment by operational entity—is to be conducted by relevant Governments at first. Therefore, it will be necessary to clarify the baseline concepts or methodologies applicable for the project at the phase of government approval.

2. View of Baseline Standardization

2.1. Classification of Issues Pertaining Standardization

The above described, the baseline issue is critical in the CDM regime. Here the merits and demerits in *standardizing* the baseline setting methods are discussed.

The standardization on baseline setting is preferable because of the following reasons.

1. Project developers do not need to seek the approval of the Executive Board on baseline setting methodology or to develop their own specific to the project, thus leading to transaction cost reduction, increase in the numbers of projects, and hence, to the development of CDM regime as a whole;

2. By integrating the methodology for the same type of projects, it is possible to secure consistency in mutual assessment of emission reductions and reduce gaming.

On the other hand, the standardization may cause the following difficulties:

3. Technical difficulty to generalize baseline setting which can fully incorporate the specific conditions of each project, leading to the loss of accuracy in determining the emission reductions.

Contemplating further on this issue, the issue can be further divided to:

I. Difficulties *intrinsic* in the baseline setting itself (may exist even for case-by-case methodology);

II. Difficulties specific to *standardization*.

It will be necessary to differentiate these difficulties (though not independent from each other).

In the following, we discuss the possibility of standardizing the baseline setting methodology by examining the requirement risen from the guiding principle for baseline setting, that is the "additionality of emission reductions", and by studying typical baseline setting methodologies.

2.2. Additionality and Baseline-Setting

The Kyoto Protocol requires the emission reductions by project to be *additional*; in other words, the (CDM) project must provide *additional* reductions to any that would occur in the absence of the project (baseline scenario). This means that the difference between the *virtual* baseline emissions and the *real* emissions monitored is the *definition* of reductions to be the origin of credits. It is transparent concept, but difficult to *define* this additionality.

Here we notes that the baseline is *virtual*, and cannot be measured *by definition*. Even with sufficient time and cost spending, *baseline setting will never be exact*. There is no guarantee that the accuracy will improve when specific conditions are addressed case-by-case.

Baseline is, by definition, virtual, and cannot be complete in itself. The uncertainty factors included are

1. Intrinsic difficulty (undetectable and impossible to prove);
2. Technical difficulties (difficulty in assessing indirect impacts, *etc.*).

In this sense, we need to search for *definition* of baseline which is somewhat *easier to attain consent* based on guideline principle of additionality criteria being without project.

The conditions on additionality in the approval process of U.S. Initiative on Joint Implementation (USIJI) are divided into three categories of:

A. (Technological) emissions additionality;

B. Financial additionality; and

C. Program additionality.

The Kyoto Protocol only embraces a broader definition of *emissions additionality*. Therefore, we need to make this emissions additionality, of *additional emission reductions over the "virtual" scenario without project* a guideline principle, while applying both the *financial additionality* and *program additionality* as the operational (interpretation) guideline, as those belonging to broader sense of emissions additionality.

Among the methodologies to assess additionality, the *virtual* status without project which

1. Everyone can agree to, and
2. Practically operational

will be extremely difficult to contemplate. In this sense, we need to seek for methodologies that can balance these two factors. Similar difficulty can be found in the assessment of incremental cost in GEF project assessment.

Program additionality, which is the additionality when *the program is not implemented without CDM scheme*, is difficult to prove. It will be necessary to simulate the decision making process for project implementation. There will be many factors influencing the investors' decision making, many of which are confidential or difficult to quantify (such as risks). Considerable increase in transaction cost is expected (including psychological factors).

Financial additionality interacts with those conditions stipulated above. In case of financial additionality in *government* funded projects, should we include the ODA or other official funded (OOF) projects or not? In case of loans, how much interest rates are acceptable? Since the government funded projects may be utilized to conform to the original purpose of CDM, *i.e.*, to benefit for the sustainable development of host countries, by filling the gaps of private funded projects (such as projects with low profitability) or by enabling the project exclusive to capacity building (less emphasis on credit generation) as an incentive for accumulating experiences at the initial stage of CDM implementation, it can actually contribute to the development of a overall CDM regime, if some kind of a system to clear financial additionality is introduced.[3]

Financial additionality for *private* funded projects will rely heavily on the project's profitability. In terms of above program additionality, the profitability is *not* an only factor for decision making, and the profitability may embrace confidentiality information. In the examples of USIJI, there has been the report on projects which would be profitable but would not be implemented without the USIJI. When determining the profitability, further complication comes in relation to the fossil fuel subsidies in host countries. Thus, it will be difficult to make profitability a sole factor of assessment.

Furthermore, like in the case of DSM program, the entity that receives energy cost reduction benefits through energy saving may not be the same entity that bears the cost of project (investor). The program implemented at net negative cost may not be minus cost at the investor side. In such case, it may be possible to coordinate benefits by sharing credits among stakeholders. We need to determine how much we can differentiate the cost and benefits.

Focusing on the benefits in host country's sustainable development, some projects may be approved even with some doubts on the additionality. In case of multi-purpose projects such as the project to reduce SO_2 emissions and to simultaneously generate credits by energy saving, it may be difficult to differentiate the SO_2 emission reduction benefits from energy saving benefits, in other words, difficult to separate the costs and benefits.

A method of *standardization* to resolve the problems relating to the investor side decision making will be to set a specific format based on the designated procedure, and to prepare a *menu-type spreadsheet* that incorporates various profitability concepts and financial situation information. If the spreadsheet is designed in a way to enable to draw conclusion automatically when each item is filled, it will significantly reduce the difficulties pertaining in such decision-making process. In this way, it will be possible to elucidate the barriers of project

[3] Opening a new and separate account, formulating a formula to *define* financial additionality, *etc*.

implementation, and to facilitate the statistical treatment of issues. Furthermore, the different types of assessment items can be introduced depending on the types and scales of projects.[4] However, such spreadsheet will only allow to determine whether the investment decision making will be *marginal* or not, and will not determine the baseline itself.

2.3. Methodologies for Identification of Reductions

Classifying Issues

This section is devoted to the discussion of methodologies for the identification of reductions when the aforementioned conditions of program additionality and financial additionality are cleared, and determine how to standardize the methodology for emission reductions.[5]

This is the problem of which baseline or reference scenario to select. From various studies, the outstanding issues for review are;

1. Which baseline concept and methodology to apply (what set of parameters)?
2. Generally, these parameters are the functions of time and space. How are we to standardize them?
3. Methodologies of standardization (statistical processing (averaging) by region/ development phase/time; past records; (non-)extrapolation; technology specific values; virtual/real reference project, *etc*.)
4. Setting of lifetime (reduction throughout the lifetime of a project?)[6]
5. How to make a portfolio of various methodologies (single methodology, combined methodologies, menu-selection type, *etc*.)
6. Study of indirect effects and their assessment (depending on project scale, positive or negative leakage, *etc*.)
7. Timing to review the baseline.

These are the problems concerning the baseline setting as a whole. These should be addressed both for case-by-case approach and for standardization. Not only the item 3 but also every item can be standardized.

Categorizing the Assessment Concepts

The original idea of baseline is to assume the virtual emission pathway where project is not implemented, thus the issue is how to *define* the alternative pathway setting. What kind of concepts (views) are for alternative pathway setting?

First, there is the ***micro-baseline setting*** method which incorporates the characteristics of each project. In this concept the project specific characteristics are addressed to some extent, and the alternative scenario of similar or different type can be set. The key for standardization is how far project specific situation is to be addressed. Whatever the degree of specific

[4] Acceptable are “direct inquiry” method and others.

[5] *Emissions* additionality is not independent from other additionalities. *Definitions* on *program* additionality and *financial* additionally will influence the emission additionality, *i.e.*, may alter the baseline setting concept.

[6] Especially, forestry-related projects require coverage beyond the project’s lifetime. (For example, to introduce an agreement on no deforestation after the completion of the project.)

condition being addressing, however, baselines will differ significantly in terms of parameters' chronological dependency, system's boundary, the adoption of virtual or real reference projects, and whether to average statistically, or adopt own records in the past. Also the degree (accuracy) of incorporating indirect effects may increase the risk of perpetual rise in transaction costs for fixing the reductions.

Second concept is ***technology matrix*** method specific to applied technologies.[7] This is the method to prepare the default technology matrix. Technology matrix is not necessarily being two-dimensional, but can have various suffixes depending on the background considered. Whether to make the matrix elements the fixed numbers, or to incorporate time and space dependence will determine the degree of standardization. In such case, a problem is what kind of technological level to use.[8] Also there is a case where it will be difficult to make proper comparison between technologies. Also difficulty is how to incorporate indirect effects.

Thirdly, there is the methodology of ***macro-baseline setting***, a ***top-down*** methodology. It is a way to set baseline from macro-economic indicators such as economic growth rate. In this case, the keys for standardization also depend on the selection of macro parameters. By incorporating regional and chronological dependencies, however, it may be possible to set more cross-cutting baselines independent of the type of project. In some cases this method will make a similar result from the first method, but may raise psychological resistance in terms of pursuance in precision.

Common problems for these methods include how broad a range to consider in the parameter settings, and how to incorporate chronological changes. Profitability also, will influence these methodologies. For example, in case of the project of new thermal power plant construction, it may be possible to give CDM project approval only for the part of efficiency improvement equipment whose high cost will hinder its installment without CDM scheme.

Addressing Chronological Changes

Generally, the external factors changes over time. Therefore, it will be appropriate to incorporate chronological changes into the parameters of the baseline. However, *unique* determination of parameters is difficult. The forecasted values in chronological change of parameters at the proposing phase to relevant Governments should be modified to actual values at the phase of emission reduction certification.

Addressing Indirect Effects

The suggestion was made that the projects may induce possible indirect effects on greenhouse gas emissions elsewhere. However, it is extremely difficult to evaluate this effect accurately. In general, it can be positively correlating to the scale of projects. Therefore, to induce the indirect effect assumption only for the projects with significant scale (in terms of emission reductions) will be practical. In such case, the assumption on indirect effects will require costs, and at the same time increase in administration costs for approval process to be paid to the CDM Executive Board.

Indirect effects represented by *leakage*, may not necessarily be *negative* in emission reductions but be *positive* in some cases. For example, there may be technology penetration

[7] Possible two-dimensional matrix with fuel input and applied technology as suffixes.

[8] Possibilities include: some type of averaging (per region), available (average) technologies in developed countries, economically feasible technologies, best available technologies, *etc.*

effects, correcting of market imperfection, and demonstration effects, which are considered positive impacts and called *spillover* effects.[9] Such beneficial side of indirect effects may be difficult to quantify, but it is preferable to be assessed fully as review items in project approval process.

Addressing Gaming Issue

Generally, incentives to set higher baseline will act on both investor side and host country side.[10] The concerns for such game theory activities may be addressed by letting third party (operational entity) to approve the project. For greater stringency in approval process, especially at the initial stage, it may be possible to introduce plural operational entities to certify the emissions reductions of each project. Suitable standardization contributes to suppress this phenomenon as well.[11]

Addressing Uncertainties

Uncertainties in CDM will include those associated with the *monitoring* of net emissions and those related to the *baseline* setting. These two should be discussed separately.

To reduce the overestimation of emission reductions due to uncertainties, it will be possible to introduce discounts within the range of uncertainties, and *partial crediting* in which only a part of credits is allowed to generate. However, depending on the estimated range of uncertainties and in concern of possible underestimation, it may be possible to limit its application to clear-origin tolerance.

In case of baseline uncertainties, the definition of uncertainties itself is ambiguous. *Proper* baseline itself may be a rather arbitrary existence. To qualify such uncertainties is possible, in a sense, but quantitative estimation is rather difficult. Only after defining the baseline formulation method, it may be possible to quantify the uncertainties in applicable parameters and other factors.

In Case of Projects in Series

Though not discussed much, if the project is comprised of multiple processes in series of projects, the issues of additionality requires closer attention. If one of such process in series is to become the CDM project, *the additionality without the process* means that the whole series of projects including the processes before and after the CDM process will not function. Example is the case of a pipeline construction from a dock to a power station as a part of natural gas thermal power plant construction is designated as a CDM project.

In spirit of the Protocol, it will not be appropriate to certify the effects of whole series of projects to a part (a process) of projects (in this case pipeline setting). Possibility is to utilize some methods such as the weighed distribution of project series implementation cost. However, in case of projects, such as capacity building, that requires less cost but *essential* for host countries in terms of CDM's purposes, it will be preferable to apply weighed distribution

[9] Spillover effects are extremely important merit for the existing pure *technological cooperation* and *technology transfer*.

[10] At the initial stage of CDM, misunderstanding between developed and developing countries may induce a host developing country tends to underestimate the credits (lowering baseline), especially where investor side is the sole beneficiary of credits.

[11] It is possible to divide the functions of monitoring review and credit certification, and to authorize each to separate operational entities.

of benefits including not only cost benefits but also other factors.

In Case of Negative Reductions

The implementation of approved CDM project may result in *negative* emission reductions. In such cases, should the investor give out credits in forms of emission permit or credit?

Generally speaking, it is hardly plausible for a project with anticipated emission increase to receive an approval as CDM project. In this sense, one option is for the project executor not giving out credits (of course they cannot earn credits). There can be the condition that projects provide benefits other than global warming mitigation. Anyhow it will require political judgement.

Other Considerations

The CDM's purposes of *assisting the sustainable development of a host country* stated at the first section and others can be incorporated into baseline formulation.

To implement the projects of mini-hydropower or PV power generation in an isolated island, for example, what will be the applicable type of baselines? Even with the absence of fossil fueled power supply plan as an alternative to the project, it may be possible to set the baseline using the case of diesel fueled power generation.

It is possible to explicate the appropriateness of this project's baseline by:

1. Emphasizing the economic and social benefits for island residents due to the electrification of the isolated island;
2. Emphasizing the *positive* indirect effects for disseminating technologies and providing the resources for indigenous clean energy sources such as renewable energies.

This case also requires some political judgement.

2.4. Options for Policy Implementation

Importance of Early Implementation

Overlooking the whole CDM scheme and more broadly the framework for conforming to the Kyoto Protocol, it is essential to have early implementation and penetration of CDM scheme as well as the introduction of incentives for early implementation of many projects. In terms of baseline issue, this need for early implementation is a trade-off with the stringency of a scheme. How to balance will be a political issue judging merits and demerits. Let us consider baseline issue in this view.

Focus should be on the momentum to launching and promoting a scheme. Demanding stringency from the initial stage of a scheme and causing higher cost and more delays will not be desirable. Especially important is to formulate something *definite* at the earliest stage, and to indicating them to private sector entities, thus reducing concerns of private entities in investment risks, so that we can encourage and hasten the vigorous launching of the CDM scheme.

Chronological Development

The Protocol prescribes that the CDM project shall be able to start from the year 2000. At the COP 4, the Parties agreed to determine the details of a concrete scheme for CDM and other Kyoto mechanisms by the COP 6 at the end of year 2000. Furthermore, among three flexible mechanisms, the CDM has received the highest priority. The issue now is to prioritize the formulation of baseline within the limited time-frame. The baseline issue presents considerable technical difficulties, and long hours of discussion may not complete the resolution of difficulties unless there is a sufficient political momentum. It may be possible, however, to start the scheme case-by-case and to standardize within the designated time-frame.

Standardization of baseline itself requires periodical or sporadic review of its methodologies and parameter values. The chronological development of a CDM scheme may vary as stated herein, and will require the full reviewing of scheme's reality.

Selective Options for Standardization

Standardization method can be one of various methodologies discussed before, or can be a menu-selection method. In case of a menu-selection, the selection may be among standardization methodologies based on different concepts, or between the given standardization method and self-developed case-by-case method. For instance, the selection between relatively stringent standardization method and flexible case-by-case method may be preferable in reducing the uncertainties. Case-by-case method may require additional costs, but, if additional credit generation exceeds additional costs, it can be adopted (if merits are sufficient to persuade the Executive Board).

Another method in introducing standardization will be to standardize from those areas where obtaining agreements of relevant parties is relatively easy, and, to modify such standardized type in response to special conditions, case by case.

In any cases, it is impossible to prepare standardization methods for all possible CDM projects from the beginning. Therefore, we must incorporate case-by-case approach in any cases. In this case, it may take some time to set up the baseline method for new type of project,[12] however, standardization can be possible using this experience for the following similar type of projects as precedent.

For a case of projects such as highway construction where the judgement of additionality is extremely difficult, it is possible to remove such cases from the types of applicable projects (may need to identify which types of projects). Then, as the experiences and knowledge in other project types accumulate, such types of projects can gradually be introduced as the applicable projects.

Ad-Hoc Executive Board and Operational Entities

In any case, it is necessary to determine which institutional body of FCCC shall be responsible for the review and tentative operation of a CDM scheme (before the Protocol entering into force). Among exiting subsidiary bodies, SBSTA will be the most appropriate,

[12] Problem is which entity shall bear the cost to set up the baseline methodology at this initial stage. Also, the responsibility of baseline methodology development is optional for either the Executive Board (or its designated institutes) or the project applicants.

but to establish a subsidiary body exclusive to CDM scheme can be an option.

3. Toward the Realistic Solutions

At stated in the above sections, there are several options for future negotiations. Here a policy package process for a credible direction is suggested:

1. Establish a Ad-Hoc CDM Executive Board under the SBSTA, providing certain degree of authorities (such as the authority to determine baseline methodologies *etc.*);
2. This Ad-Hoc Executive Board is to determine the most preferable baseline setting and standardization methods for each type of CDM projects plausible from the experiences in AIJ, and based on several consigned studies and the works of expert committees;
3. The standardization methods shall be reviewed every five years;
4. Upon the receipt of application for a new type of project (request from each Government), the Ad-Hoc Executive Board shall determine the applicable baseline setting methods within a year of application submission;
5. Any additional administrative cost shall be born by the payment of administrative fee for CDM project certification. The fee shall not be set to add excessive cost burden for a new type project applicant (averaging in a whole system).

Above is an example for developing the CDM scheme. There could be other and better methods. Nonetheless, we must proceed to design and implement the CDM scheme. Unfortunately, our experiences may not be sufficient to do so. Therefore, it will be essential to maintain flexibility such as *learning-by-doing* or *step-by-step* in adopting whatever the methodologies we are to apply for the CDM and its baseline.

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