Options for Simplifying Baseline Setting for Joint Implementation and Clean Development Mechanism Projects

Tim Hargrave, Ned Helme and Ingo Puhl, November 1998

I. Introduction

Article 6 of the Kyoto Protocol created Joint Implementation (JI), which provides for the transfer or acquisition of emission reduction units (ERUs) from project activities among Annex I Parties, while Article 12 of the Protocol established the Clean Development Mechanism (CDM), which allows for the transfer of certified emissions reductions (CERs) from non-Annex I nations to Annex I Parties. Central to the success of JI and the CDM will be the satisfactory resolution of the issues of how to set project emissions baselines and how to determine whether or not project activities are additional to what would have happened otherwise. Complicated rules for baseline setting and determining additionality would increase project transaction costs and decrease the number of executed transactions, which would reduce the effectiveness of the two mechanisms both in reducing the compliance costs of buying countries and in providing capital flows and other economic and environmental benefits to developing country Parties and countries with economies in transition.

To date, project baseline setting and additionality determination has taken place on an *ad hoc*, case-by-case basis because formal rules do not yet exist. This "bottom-up" approach has required project developers to expend significant time and resources in preparing projects, and both host countries and importing countries to devote substantial resources to reviewing project applications. Two fundamental problems have been encountered that have slowed the development and approval of new projects:

- First, project sponsors must develop *emissions baselines* that are highly specific to the local context, with assumptions about an array of variables. This process requires a great deal of information and leaves room for sponsors to engage in gaming -- overstating baseline emissions and therefore projected emissions reductions. For this reason regulators must carefully check the underlying data and assumptions.
- Second, project developers must devote considerable time and effort to explaining why the emissions reductions benefits of their projects are *additional* to what would have happened otherwise, and regulators must review these explanations. This requires regulators to try to understand the motivations of project sponsors to determine the precise reasons they have undertaken projects. This review process is very subjective and not transparent.

Alternative approaches are now being examined that would simplify baseline setting and additionality determination. Under these methods governments would develop simple rules for setting baselines. Projects that produced emissions below these baseline levels would be able to generate CERs and ERUs and would automatically be considered to be

additional. These approaches would result in reduced transaction costs for project developers, host country governments and nations importing emissions reductions, which in turn would mean increased project throughput. There are three main benefits to an increased number of projects:

- host countries would attract more new investment and would receive greater and more immediate local benefits of projects, such as improvements in air quality and public health;
- a greater number of transactions would mean the generation of more ERUs and CERs, which in turn would translate into lower costs and improved compliance by Annex I countries; and
- greater CDM activity likely would mean an increased pool of funds for climate change adaptation activities, as Article 12 paragraph 8 of the Protocol calls for a portion of the proceeds of CDM activities to be used to assist developing countries that are particularly vulnerable to climate change impacts.

Several issues must be addressed regarding the development and use of simplified approaches. First, the use of simplifying methods would require an upfront investment of time and resources on the part of host countries. Parties must weigh these costs against the benefits of increased project flow. It is important to note that smaller countries might be able to mitigate their set-up costs by working together to develop regional approaches to simplifying baseline setting and the determination of additionality. Second, it is imperative that the benefits of simplifying project preparation not come at the expense of the environmental integrity of the CDM.

The purposes of this paper are first, to describe some of the new methods for baseline setting and additionality determination; and second, to briefly call attention to some of the major policy considerations surrounding the use of these new methods. The simplifying methods described here include the technology matrix, emissions benchmarks and top-down baselines.

II. The technology matrix approach

Introduction

Under this approach, a number of pre-defined default technologies would be identified as the baseline technologies for a defined region and for a specified time. The emissions baseline for a project would equal the emissions rate for the specified technology. Projects that introduced technologies with GHG emissions lower than the specified baseline technology would be considered to meet the additionality requirements. Periodically, the matrix would be updated so that technologies that represented a certain threshold share in a country or region's technology inventory were added to the matrix and therefore were no longer considered additional.

Establishment and use of a technology matrix would involve the following steps:

1. Specification of default technologies for different sector/project types based on current technologies and practices in the host country or region.
2. Creation of a matrix to be approved by the Conference of Parties (COP) that specified the emission performance level for each technology included in the matrix. Countries probably would want to start with a limited list of technologies, and expand it as more was learned.
3. Calculation of project emissions against the default emissions baseline. If the developer preferred to use another method he would have to prove that his emission estimates were more accurate than the default estimate.
4. Evaluation and updating of the technology matrix regularly, and application of the revised matrix to new projects. As noted, the matrix should be revised so that technologies already in widespread use no longer qualified as additional. Default technology baselines should be reviewed every five to ten years, because behavior/technology will realistically change within that time frame. The matrix should not be used retroactively to affect existing project baselines.

This simple default approach offers some advantages over a case-by-case approach:

- It would reduce project developers' transaction costs, because developers would no longer have to spend money on developing project-specific baselines.
- It would reduce gaming, because project developers would have to select their baseline technologies from the predetermined technology matrix.
- It would increase certainty and transparency, because the performance benchmark would be clear and predictable.
- It would eliminate the confidentiality issues that are often encountered in commercial projects because it would not require sharing of sensitive financial or technical information.
- It would eliminate uncertainty about assumptions about future energy prices and economic growth, because these factors would not be central to the establishment of the matrix.

Issues

A number of issues arise in implementing a technology matrix approach:

- ***Simplicity vs. rigor***: Simplicity should not give rise to a significant decrease in the quality of emissions benefit estimates. One issue of particular importance is the fact that the development of a technology matrix would involve the identification of current technologies and practices without regard to expected future trends. More investigation is needed of the accuracy of the technology matrix approach.
- ***Gaming***: Technology-specific baselines would eliminate opportunities for gaming on a project basis, but it could create a large opportunity for gaming at the system level. Establishing default technologies would have a political dimension and

forging agreement between host countries and the COP or CDM Executive Board might be difficult.

- ***Large projects***: The costs of establishing baselines for large projects are relatively low per dollar of investment, so it is possible that little would be gained by simplifying the rules for establishing baselines for these projects.
- ***Proper matching of baseline technology and project investment***: Considering the possible range of investment options, it might be difficult to match a baseline technology to a specific project context.

III. Benchmarking

Introduction

Under this approach, project emission baselines would be set based on emission performance "benchmark" rates that were determined with reference to criteria such as historic or projected sector-specific emission intensity trends. Like the technology matrix approach, benchmarking would simplify project characterization, in that all projects that reduced emissions to below benchmark levels would generate CERs and ERUs and would automatically qualify as additional. Benchmarking differs from the technology matrix approach, however, in that emissions baselines can be set in reference to a mix of technologies rather than a specific technology. For instance, the baseline emissions rate for new power projects in a region might be set at the weighted-average emissions rate for new clean coal and combined cycle natural gas plants (rather than in reference to one or the other). This is especially important for projects that may offset emissions from a range of facilities using different technologies. Also, unlike with the technology matrix approach, benchmarks may be "forward-looking", or set based on projected technologies rather than the current capital stock. Countries would seek COP or CDM Executive Board approval for the benchmarks they had developed.

Four different types of benchmarks could be set:

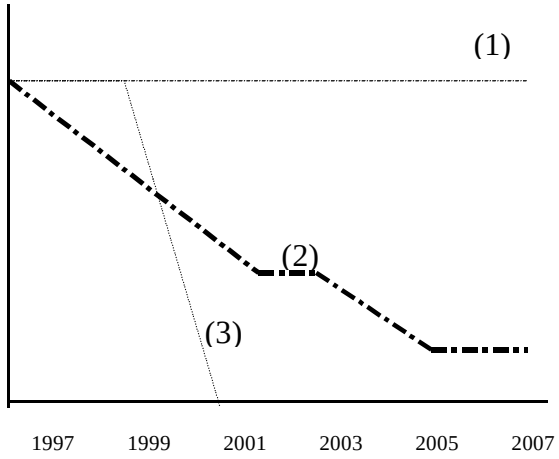
- **static and historic**: This method would create a constant benchmark over the life of the project based on historical emission levels of the emitting source(s) being replaced;
- **static and forward-looking**: This approach would result in a constant benchmark over the life of the project based on the carbon emissions profile of the planned energy mix within the sector or subsector during the life of the project;
- **dynamic and historic**: Here the benchmark would change periodically over the life of the project based on historical changes in carbon intensity rates; and
- **dynamic and forward looking**: This method would create a changing benchmark based on emissions rates of projected new capacity.

It is likely that the choice of the proper benchmarking approach will be specific to the local context; however, a detailed assessment of the suitability of different benchmarking methods for different types of GHG mitigation activities and in different regions has not

yet been conducted. Clearly, the choice of benchmarks will have a strong impact on the amount of CERs generated. This is demonstrated in Figure 1, which displays alternative benchmarking scenarios for a wind project in Costa Rica replacing a diesel generator. The figure illustrates three baseline emission scenarios:

1. a static and historic baseline using the emissions profile of the existing diesel plant over the lifetime of the project;
2. a static and forward-looking benchmark based on the emission profiles of a new wind plant for the baseload and of a diesel plant for the peak; and
3. a static and forward-looking baseline using the emissions profile of the diesel plant and the emissions profile of the planned conversion of the national grid to 100% renewable power in 2001.

Figure 1: Benchmark Options for Wind Power Plant



Issues

The implementation of the benchmarking approach raises a number of issues:

- ***Geographical scope of benchmarks***: Should benchmarks be established on a project, regional or country-specific basis? In larger countries, standard technologies may vary regionally based on the proximity of fuel and other factors.
- ***Sectoral specificity***: Establishing benchmarks for each different sector and project type probably would increase the environmental accuracy of the benchmarks but also would require more resources to develop. Further, the cost-effectiveness of the benchmark approach under particular circumstances will depend on the availability and accuracy of data for the sector. More concrete experience is necessary to obtain a better understanding of this issue.
- ***Planning certainty***: The use of dynamic baselines would mean that at project inception investors would not know the number of emission reduction credits that

they would earn each year. It appears that private sector companies, because they like planning certainty, would prefer benchmarks based on conservative estimates of emissions-related performance, even though this would lead to generation of a small number of CERs. This trade-off needs to be better understood.

IV. Top-down baselines

Introduction

Top-down baselines are project baselines derived by the host government from a more aggregate baseline. This would be the national assigned amount in the case of JI; in the CDM context, it could be a national or sectoral emissions baseline. Baselines could be set either in terms of absolute emissions or based on GHG emissions per unit of output (e.g., carbon emissions per unit of GDP). The latter approach might be preferred because it would not restrict economic growth, allowing emissions to grow in absolute terms as long as the carbon efficiency of economic activity was improving.

In the CDM context, the aggregate top-down baseline set by a developing country would not be binding in the same way as an obligation made by an Annex I country under the Kyoto Protocol; however, because the level at which baselines were set would determine the number of CERs created and impact the compliance activities of Annex I countries, baselines would have to be established through a consultative process with the Conference of the Parties or the Executive Board of the CDM. The aggregate baseline would have to be set tightly enough so that it was acceptable to other Parties from a climate change perspective, but loose enough to ensure 1) that the country adopting the baseline was fairly rewarded for new activities and initiatives; and 2) that local development needs and national circumstances were taken into account.

In both the JI and CDM context, national regulators would establish project baselines by allocating the aggregate baseline to individual project activities. This would be done so that the sacrifices and benefits from engaging in GHG emission mitigation activities were distributed to sources under the baseline in a way that was consistent with broader sectoral policies and development objectives. Once baselines had been assigned to them, projects would not be required to undergo further additionality tests. Further, government decisions on how to allocate baselines to project activities could occur without further international review. In essence, top-down baselines would give national governments greater flexibility in setting baselines for JI and CDM projects; the price of this flexibility would be a non-binding agreement to control all emissions sources covered under the baseline.

In Annex I countries, which will have to adopt national policies to meet their Kyoto emissions obligations, top-down baselines could be imposed as regulatory requirements on emissions sources. In developing countries, the sponsors of project activities covered under the aggregate baseline would have a choice as to whether or not they participated in

the CDM. Those who believed that they could reduce project emissions to below their assigned baselines would be able to generate CERs, while those who thought that they could not would opt not to participate.

Top-down baselines are particularly sensible for Annex I Parties, because these countries probably will want to monitor emissions from all major sources and impose ceilings on the emissions of major sectors anyway. Non-Annex I countries might also want to adopt top-down baselines for a number of reasons:

- They could avoid the administrative burden and transaction costs of negotiating and approving baselines on a case-by-case basis;
- By reducing transaction costs, they potentially could increase the level of investment activity;
- In establishing national/sectoral baseline strategies and project baselines, they could account for emissions reductions that cannot be attributed to particular projects -- for example, those from activities such as pricing reforms -- and then monetize these reductions through the CDM. The additional revenues gained through this strategy could be used to finance adjustments to the new sector policy framework (e.g., demand-side energy efficiency improvements to offset higher electricity prices);
- By expanding the coverage of baselines to include entire sectors, they could decrease emissions leakage, as well as the costs of monitoring leakage; and
- They could gain access to a flexible energy policy and planning tool that enabled them to operationalize their climate change priorities.

Issues Regarding the Use of Top-Down Baselines in the CDM

The use of top-down baselines in the CDM could significantly increase the number of projects undertaken by a country, but a number of issues must be resolved. The first of these is the cost of building the capacity needed to establish and implement top-down baselines. To use a top-down approach, countries would need to engage in national or sectoral baseline planning and would have to set up comprehensive systems for monitoring and verifying emissions. Neither of these steps would be required if the country were to take a project-by-project approach to the CDM. Thus the use of a top-down approach would impose some additional upfront costs on participating nations. It is not clear whether these costs would be greater or less than the cost reductions that a top-down approach would provide by eliminating the need for project-by-project baseline setting. This issue will need to be examined separately by each country.

A second issue associated with top-down baseline setting is what may be referred to as the "carrots with no sticks" problem. This issue derives from the fact that even if non-Annex I countries were to establish aggregate baselines, they still would not be subject to binding emissions obligations. Thus projects would have a financial incentive to reduce emissions below baseline levels so that they could sell CERs, but they would not necessarily face sanctions if they exceeded their baselines. Some projects would sell CERs while others increased their emissions, with the net result possibly being that the country exported

CERs even though the sources covered under the aggregate baseline as a whole had exceeded that baseline. This would be an unacceptable result from an environmental standpoint, because the use of top-down baselines is predicated on the idea that CERs sold by a project are supported by corresponding emissions reductions from some emissions source covered under the aggregate baseline.

A number of options is available for addressing this problem. One is to establish a rule that Parties buying CERs would not be able to count the CERs for compliance purposes unless all of the sources under the aggregate baseline had met their project baselines or that in aggregate all covered sources had met the aggregate baseline. Application of this type of rule in the context of the CDM would ensure that the emissions reductions supporting exported CERs had not actually been offset by emissions increases by other sources covered under the cap.

This approach raises two difficulties. First, enforcement of this rule likely would require countries to impose domestic penalties on sources that produced emissions above baseline levels. This in effect would convert the project baselines into binding targets and the CDM program into a mandatory domestic regulatory program. This step would probably be unpopular in most developing countries, where binding GHG regulation is for the most part not now contemplated.

Second, the rule would pose a risk for project investors, because the delivery of CERs by a particular project would depend on the performance of all projects covered under the aggregate baseline. Investors would not know until the end of the commitment period whether or not their projects would be able to deliver CERs. They would respond to this uncertainty by increasing their discount rates, which would make the projects less competitive. This problem does not exist in Annex I JI because the existence of the national emissions cap gives investors confidence that leakage effects will be addressed and that ERUs are backed by real reductions.

Another way of approaching the "carrots with no sticks" problem would be to establish the aggregate baseline as an internationally binding emissions target. This target would be like those agreed to by Annex B countries, except that they likely would be set as "growth baselines" (measured in carbon emissions per unit of output) rather than in terms of absolute emissions levels.[1] If countries were to accept binding obligations of this sort, then the CDM really would be no different than Annex I JI. Thus, as in Annex I JI a top-down approach would be sensible because there would be no chance that emissions would leak to other sources covered under the baseline. It is worth noting that if they adopted targets, countries also would have the option of engaging in emissions trading under Article 17.

[1] The concept of growth baselines was first proposed by the Center for Clean Air Policy several months prior to the Kyoto negotiations in 1997. The idea was then adopted by the US delegation and proposed in Kyoto.

This approach to setting CDM project baselines obviously has serious implications, in that countries would be bound by international law to meet their emissions targets. Countries would have to decide whether this extra commitment was justified by the additional capital and technology that could be attracted through Annex I JI or emissions trading.

A final means of addressing the "carrots with no sticks" issue would be to require countries using the top-down approach to establish very strict baselines, and then allocate these baselines evenly among covered sources. These sources thus would be able to generate CERs for export only if they had very low emissions. This approach would not eliminate the "carrots with no sticks" problem, in that it would still be possible for some firms to export CERs even as the covered sector as a whole failed to achieve the aggregate baseline; however, requiring a country exporting CERs to install some very clean facilities would ensure that that country had taken some steps to control average emissions rates. The obvious problem with this approach is that it would make the generation of CERs more difficult, restricting the level of project activity.

V. Policy Considerations

Simplifying methods for baseline setting will be effective and credible only if they do not impair the environmental integrity of JI and the CDM and they are not too costly to develop and administer.

Environmental Integrity

Under a technology matrix or benchmarking approach, a project's baseline would be determined through consideration of the key factors that determine the choice of technology and practice. All factors affecting the decision would not be considered, however, as they theoretically would be under a case-by-case approach. This means that simplifying methods could result in the establishment of an incorrect baseline.

The magnitude of the estimation error associated with the use of these methods is not obvious *a priori*, nor is the direction of the error. It is also not clear that the level of error associated with simplifying methods is greater than that associated with the case-by-case approach, given many of the problems (such as quantifying project leakage) that can exist in establishing case-by-case project baselines. Further, more research and discussion is needed regarding the level of error that is tolerable in exchange for the increase in projects that could come through the use of simplifying methods. A key component of the COP's future research agenda should be to investigate the environmental tradeoffs (if any) associated with the use of simplifying methods.

The use of top-down baselines presents a slightly different set of environmental issues. The use of this approach in the context of Article 6 joint implementation poses very little environmental risk, because the fact that the host country is operating under an emissions ceiling provides confidence that emissions reductions corresponding to the AAUs sold will be made somewhere in the host country. As already noted, though, the use of top-down

baselines in the CDM context does pose an environmental risk, however, because the host country is not subject to an emissions cap. This "carrots without sticks" issue has been addressed above.

Set-up Costs

The main purpose of using any of the simplifying methods described above is to reduce transaction costs for project developers and reduce the costs to government of reviewing and approving projects; however, the implementation of these methods will require a commitment of resources initially. In the case of the technology matrix and benchmarking, resources also would be needed on an ongoing basis to update the metrics.

Each baseline-setting method comes with different implications for government set-up costs. At one end of the spectrum is the current bottom-up project-by-project approach, which requires host countries to do little more than dedicate staff to approving projects that are submitted. At the other end is the top-down baseline approach, which would require countries to develop sectoral baselines, allocate baselines to individual projects, and then monitor emissions at each project covered under the sectoral baseline. The technology matrix and benchmarking approaches would fall somewhere in between, requiring host nations to define emissions reference cases for the major GHG-emitting sectors in their countries. This would demand the collection and analysis of energy and emissions data for these sectors.

In assessing the advantages and disadvantages of various baseline-setting methods, countries will need to weigh the administrative costs associated with implementing a particular method against the projected increase in the number of projects resulting from use of the method. At first glance it might seem that for smaller countries the set-up costs associated with simplified baseline-setting methods would outweigh the benefits; however, at the same time, it is probably true that the development of benchmarks, technology matrices and top-down baselines would be easier to do in smaller countries than in large. In addition, it is worth noting that smaller countries that have similar energy and GHG profiles could defray the set up costs of developing simplifying baseline-setting methods by working together to develop a common set of baseline-setting rules. This idea deserves further discussion.

VI. Conclusion

To date, project emissions baselines have been set on a case-by-case basis. This process has been very time- and resource-intensive, has not been consistent across projects, and has not been transparent.

This paper has described three approaches to simplifying project baseline setting – the technology matrix method, benchmarking, and top-down baselines. The use of these methods would facilitate project preparation, review and approval, leading to a greater number of projects. More projects would in turn mean increased investment, greater and

more immediate local benefits, improved Annex I Party compliance, and greater funding for adaptation projects.

Two issues must be addressed regarding the use of the baseline setting methods described here. First, these methods must not harm the quality of project emission benefit estimates. While it is not clear that they would, more research here is necessary. Second, the costs of establishing and administering simplifying methods must not outweigh the benefits of using the methods. On this point, the paper has noted that neighboring countries of like circumstances could consider working together to develop regional approaches to baseline setting. Examining the advantages and disadvantages of simplifying baseline setting methods should be at the top of the COP's JI and CDM research agenda.