Determining a Baseline for Project Co-operation under the Kyoto Protocol: A General Overview

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1 Introduction

Already since the inclusion of Joint Implementation (GHG) in the UNFCCC in 1992, the issue of additionality of projects has been an important one. In order to determine what the greenhouse gas emission reduction or sequestration of a JI project is it is necessary to determine a reference scenario to estimate what the emissions at the project site would have been in absence of the project. The main difficulty with determining such a reference scenario (often referred to as the *baseline*) is that it is counterfactual, e.g. it describes a situation that will, because of the project, never exist. As a result, many have argued that because of this the additionality issue is the weak point of JI. Since Parties may have an incentive to inflate the baseline so that a higher emission reduction can be claimed (especially in the CDM system), a careful (third party) check is required to judge whether a project's baseline is correct and fair or not. The discussion on this is not finished yet, and will be continued at the future sessions of CoP and CoP/MoP.

Several options for baseline determination have been proposed in the literature. The fundamental point in this respect seems to be how one wants to consider the essential characteristics of a baseline. On the one hand, it may be argued that the baseline needs to be an as technically precise as possible description of the counterfactual situation of a particular JI project. This approach requires detailed information about the conditions, under which a particular project is undertaken, and so on. On the other hand, an opposite view can be taken by arguing that irrespective the amount of detailed information gathered to construct a baseline, bold assumptions will, to a certain extent, always have to be made to construct the baseline. In other words, baseline determination will to a certain extent be an arbitrary, and therefore, subjective process. According to this approach, the particular characteristics of a project are therefore not extremely relevant. What matters, though, is what a *reasonable* baseline could be in a situation that is broadly comparable to the circumstances of the project at hand. For just an illustration of the difficulties that may surround the determination of a baseline for JI and CDM projects, the reader is referred to Box 1.

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Box 1 How to choose a baseline for JI and CDM?[2]

The following stylistic example illustrates the complexity surrounding the choice of the 'right' baseline for a JI or CDM project. Suppose that a company from an OECD country wants to invest in a coal gasification project in India. The greenhouse gas emissions per unit of energy of the technology the company wants to implement in the project amount to 400 tonnes. Technologies applied by comparable multinationals from the OECD in a similar investment would cause an emission of 450 tonnes greenhouse gas per unit of energy (let us call this the OECD average). In India itself the GHG emissions per unit of energy from the most modern power plant available amount to 500 tonnes and those from an average power plant to 600 tonnes. Finally, the greenhouse gas emissions from an average power plant in South Asia amount to 700 tonnes per unit of energy.

What would the most appropriate baseline be if this investment would apply for CDM recognition? Unfortunately, the answer is not very straightforward. One (say the UNFCCC) could argue, for example, that since it might be very complicated and time-consuming to determine a baseline for each CDM power plant project in India and other countries in South Asia, the best way to calculate a baseline is to take the South Asian average as a reference. In that case, the baseline would amount to 700 tonnes per unit of energy, resulting in 300 tonnes as 'credits' (700 minus the new plant's emissions of 400 tonnes).

One could also argue that the differences between India and several other countries in South Asia are too big to use an average South Asian baseline for CDM power plant investments in India. In that case, only the average for India should be taken, which is 600 tonnes per unit of energy. Using this figure as the baseline would result in 600 - 400 = 200 tonnes per unit of energy to be credited to the CDM investment.

But even this baseline could overestimate the greenhouse gas mitigation through the project. After all, why should we take the current average emissions from a power plant in India as a reference point, as it may be fair to assume that as a result of India's economic development better and more efficient power plants will be established anyway? Then we could perhaps better use the greenhouse gas emissions from the most efficient power plant that is currently used in India as the baseline. In that case, the 'credits' would only amount to 500 - 400 = 100 tonnes per unit of energy.

A fourth possibility to determine a baseline on the basis of the information given in this example is not to look at the emissions from Indian power plants but to take the current average greenhouse gas emissions from power plants in OECD countries into account. After all, a successful economic development in India may result in a commercially driven transfer of the current average OECD power plant techniques to India. This approach would amount to 50 'credits' only (the current OECD average of 450 tonnes per unit of energy minus 400) for the CDM investors.

Finally, one could simply argue - as some still do, even if this is no implication that can be derived from the Protocol text - that investing in this project is commercially feasible anyhow,

[2] Derived from Jepma, 1997. "Progress with AIJ during the Pilot Phase", in: K. Chatterjee (ed.), 1997. *Activities Implemented Jointly to Mitigate Climate Change: Developing Countries Perspectives,* Development Alternatives, New Delhi, India, pp.59-76.

so that no CDM credits should be given at all, e.g. because the project would not satisfy the additionality criterion.

This example, which is summarised in table 1, has shown that one could easily derive five different baselines for this CDM gasification investment on the basis of at first sight (seemingly) reasonable arguments. It is therefore a very important task for the CoP to formulate modalities and procedures (see Article 12.7) for CDM baseline determination and elaborate guidelines for JI (see Article 6.3) project baselines. Given the facility to bank early emission reductions of CDM projects, time seems to run very short for this process to be successfully completed in time (i.e. before the start of the year 2000). The fundamental trade-off in the procedure of determining the baseline does seem to be between precision, fairness and transparency on the one hand, and transaction costs and loss of time and momentum on the other hand.

Table1 Theoretical example of how to choose a baseline for a CDM gasification project in India

Baseline (tonnes GHG emission per unit of energy)	GHG emissions CDM project (tonnes per unit of energy)	'credits'
I South Asian average (700)	400	700-400 = 300
II Indian average (600)	400	600-400 = 200
III Most efficient Indian power plant (500)	400	500-400 = 100
IV OECD average power plant (450)	400	450-400 = 50
V Project commercially feasible (400)	400	400-400 = 0

In the following, and against the background of the remark made above, four different approaches to baseline determination will be discussed in somewhat greater detail, thereby shifting from primarily the first to predominantly the second approach.

2 Project-specific baselines

The first option for baseline assessment is straightforward and deals with **a project-specific best acceptable estimate** of what the emissions on the site would have amounted to in absence of the project. This estimate can be made in several ways and depends on the characteristics of the project and the host country where the project is to be implemented. We will not elaborate in great detail on the many complexities (for instance, with respect to project boundaries, incorporation of externalities, etc) that will arise in this approach because this has extensively been dealt with elsewhere.[3] It may be illuminating, though, to just illustrate how difficult it is to determine what the *ex ante* baseline is, even if the AIJ/JI/CDM project seems to be rather straightforward.

Just to give a small illustration, let us take, for example, a number of pilot projects improving energy efficiency carried out in the Baltic region under the auspices of the Nordic Council of Ministers. According to the report compiled by the Council, most of these projects turned out to have only speeded up the investments.[4] Without the projects, the investment would

[3] For example, see Chomitz, 1998. *Baselines for Greenhouse Gas Reductions: Problems, Precedents, Sollutions*, paper prepared for Carbon Offsets Unit, World Bank, Washington, D.C., USA.

[4] Nordic Council of Ministers, 1997. 'Criteria and Perspectives for Joint Implementation', *TemaNord*, Kopenhagen, Denmark.

probably have been made by the host countries anyway, but with a delay of three to five years. If these projects were JI projects under the Kyoto Protocol, the projects' baseline would only deviate from the actual emissions (e.g. result in credits) during the first three to five years of the projects. It should be noted, however, that this conclusion does probably not hold for all countries in Central and Eastern Europe. Some of them have a better-developed infrastructure and have achieved a higher income and welfare level than other countries with economies in transition. The projects studied by the Nordic Council of Ministers are mainly implemented in countries that belong to the first category. For countries belonging to the latter category it will probably take (much) longer before they are able to carry out the investments themselves.

This example clearly illustrates the complexity of baseline determination. Some of the potential host countries are undergoing a process of a rapid economic transition (like, for example, most of the countries in Central and Eastern Europe or some rapidly growing developing countries). In these countries, several JI (or CDM) projects probably only speed up investments that would have been carried out by themselves anyway in the medium term. For several other potential host countries (for example, lower income developing countries), it is less likely that the JI (or CDM) project investment would have been carried out anyway in the short or mid term. For these countries, the period for which the JI (or CDM) project is additional, is often (much) longer.

Determining the length of the period, during which a JI (or CDM) project is additional, is not the only uncertainty surrounding the baseline determination. Also factors like economic growth, energy prices, currency prices and political risks can be important. The difficulty is that if the project developers have determined a project baseline that indicates an additional emission reduction resulting from the JI (or CDM) project during a period of 10 years, but after five years it turns out that the host country would obviously have carried out the project itself (for example, because the host country itself invests in several similar projects), the reported emission reduction is larger than what has actually been achieved. Such a case is obviously beneficial for the investing Party and could be advantageous for host country Parties (for example, if it has some surplus in its assigned amount), but is clearly disadvantageous for the global climate.

3 Top-down baselines

A second approach for baseline determination, developed by the US Center for Clean Air Policy, was recently added to the debate: the methodology of **top-down baselines**. The idea is that national governments of JI host countries would use their Quantified Emission Limitation or Reduction Commitment (QELRC), or, which boils down to the same, the assigned amount that follows from this restriction, as a basis to calculate for their respective sectors and/or technologies what the per unit of energy used GHG emissions would amount to, at which their commitment could be fulfilled. So, to give an example, it might be that the QELRC of a Central and Eastern European Party can only be achieved if - as a part of a whole set of measures - the CO_2 emissions per unit of energy produced in the power sector would become, say, 20 percent less than the average in the present situation. In that particular case, the minus 20 percent figure would then determine the baseline for JI projects in that particular sector, and so on.

With respect to CDM projects, a similar top-down methodology cannot be applied, simply because the non-Annex I Parties will be the host countries here, and they have not accepted QELRCs. A similar norm for baseline determination, as was suggested for projects in Central and Eastern European Annex I Parties, can, therefore, not be applied for the non-Annex I

Parties. To solve this dilemma, it has been suggested to nevertheless try to construct baselines on the basis of acceptable *simulated* targets for potential non-Annex I Parties (which is obviously a politically tricky affair). The latter element of the top-down approach is rather contentious indeed, which made Goldberg (1998)[5] once remark that this could create 'tropical air' in the determination of CDM projects' baselines.

4 A baseline default system

A third option, which was proposed for baseline determination quite recently, notably by Iestra, Jepma and Michaelowa[6], is to adopt default project/technology specific baselines with a possible differentiation per country/region. A panel of experts could determine a baseline for a number of project types, which could serve as a benchmark for the UNFCCC. This project categorisation could then be extended to a categorisation by *regions or countries* resulting in a *region-by-project* matrix. As such, a *matrix of baselines* can be constructed, which project developers can consult. If an investing and a host country party agree on a project, they can just look up the baseline in the matrix and calculate the credits. An example of what the elements of the matrix may look like can be found in Michaelowa (1997).[7]

Some advantages of this option are the following. First, the transaction costs for the project developers will be lower, as they probably do not have to hire consultants anymore, or at least to a much lesser degree. A visit to, for example, the UNFCCC internet homepage may be sufficient. Second, also a third party check for each individually determined baseline is no longer necessary, which may also result in a significant cost saving. A third advantage of such a categorisation system is that it provides a way out of the dilemma of choosing the correct baseline out from several ones, each of which can equally well be defended as being correct (see also the dilemma illustrated in Box 1).

One could argue that the matrix approach is too imprecise because in particular circumstances the matrix elements are so clearly unfair to the project participants that an *ad hoc* adjustment seems to be imperative in terms of fairness. Therefore, as an additional element of this matrix approach, it has been suggested to include the possibility for the project participants to appeal for an adjustment of the baseline used in their particular case. This would be an optional opportunity. In other words, project participants can decide for themselves if they take the risk to lose the appeal, by making an investment in data gathering, in order to apply for an exemption. The extra costs associated with this procedure - the costs associated with the appeal - as well as with possible extra third party verification, will have to be born by the project developers.

With respect to the procedure to set up the matrix system just mentioned, it has been suggested to let UNFCCC authorised international third parties participate in the process of determining the aggregate sector/technology set of baselines. Furthermore, a periodical international verification process of the aggregate baselines would be necessary insofar as technological progress would require this. A particular point in this respect is the risk of leakage between sectors: setting a target for a sector in a non-Annex I Party may affect the appropriate target for other sectors, and so on.

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[5] Goldberg, D., 1998. *Carbon Conservation: climate change, forests and the CDM*, CIEL, CEDARENA, Washington, D.C./San José.

[6] JIN, 1998a. Joint Implementation Quarterly, vol. 4, nr. 2, pp.11-12.

[7] Michaelowa, A., 1997. *AIJ: the Baseline Issue from an Economic and Political Viewpoint*, HWWA, Germany.

5 Will the baseline stay the same throughout the project duration?

Suppose, the project developers have determined a project baseline that indicates an additional emission reduction resulting from a particular JI (or CDM) project during a period of 10 years. After five years, however, it turns out that the host country would obviously have carried out the project itself. It is clear, then, that with hindsight the reported emission reduction is larger than what has actually been achieved. Such a case is obviously beneficial for the project partners, but may be considered an undesirable outcome for the global climate.

Some would therefore suggest to allow for ***ex post* corrections** of the baseline, simply because only then would the generated credits most likely be based on real emission reductions. The main counter-argument, however, is that the possibility to face *ex post* baseline corrections will scare off potential investors, who feel like being subjected to unpredictable future moves of bureaucratic systems frustrating their well-informed overall assessment of the project's commercial potential. A second option for dealing with the baseline issue is to follow the approach just mentioned, but to allow for *ex post* corrections of the baseline. Such corrections may be required if it turns out that the underlying assumptions of the reference scenario were not correct. For investors, but also for the host country parties, this may increase the risk to invest in JI (or CDM), as it will not be clear beforehand how many credits will be generated by the project. On the other hand, *ex post* corrections of the baseline have the advantage that the generated credits are, most likely, more based on real emission reductions than without *ex post* corrections. In this case, as far as the project is concerned, it is not the global climate that runs the risk of losing, but the project partners.

Were CoP to decide, if necessary, on *ex post* corrections of baselines, the project developers will probably tend to select only those projects, of which it would seem extremely likely that they would not have been carried out by the host countries themselves, even not on the medium term. In this respect, it is worth mentioning that on the basis of a detailed analysis of 30 projects in Central and Eastern Europe,[8] it was concluded that mainly three factors hamper the automatic improvements in the processes of energy production and consumption in the region:

- The funding required for emission reduction investments in power plants and district-heating plants is often insufficiently available.
- In several Central and Eastern European countries, the legislation prescribing energy efficiency improvements is often lacking.
- The technical and management skills to implement and maintain new energy efficient technologies are often insufficient.

With respect to this, the above-mentioned analysis by the Nordic Council of Ministers[9] makes a distinction between projects at the energy demand side (for example, district heating) and those at the supply side (for example, power plants). First, energy supply side investments are often much larger than demand side investments, which makes it relatively easier to invest in district heating improvements. Second, as a result of the gradual reduction of energy subsidies during the transition process, there is a larger pressure on governments to improve the energy efficiency at the energy demand side. Finally, consumers in Central and Eastern European countries are becoming more and more eager to have comfortable living conditions, including a comfortable domestic heating system. Based on this analysis, the Nordic Council of

[8] CCAP/SEVEn, 1996. Joint Implementation Projects in Central and Eastern Europe, Prague, Czech Republic.

[9] Nordic Council of Ministers, 1997. 'Criteria and Perspectives for Joint Implementation', *TemaNord*, Kopenhagen, Denmark.

Ministers concludes that there is a larger pressure on the governments to invest in projects at the demand side of the energy market than to invest in project at the supply side. As a result, in case of *ex post* corrections of baselines, JI energy supply side projects in Central and Eastern Europe are probably less risky than demand side projects, since the baseline for supply side projects is probably more stable.

An example of a project, for which a methodology has been developed to deal with *ex post* baseline corrections is the Costa Rican *Protected Areas Project*.[10] This project aims at sequestering 15.6 m tons of carbon-equivalent on an area of 530,000 ha. Through an international verification and certification procedure carried out by the Oxford-based Société Générale de Surveillance (SGS),[11] the government of Costa Rica has been able to issue a certificate (a so-called certified tradable offsets, CTO) for the first one million tons of carbon sequestered via the project. In order to ensure the buyers of CTOs, a risk free (98 percent covered) offset, 700,000 tons of carbon have been retained in buffer. According to the project developers, the largest component of the coverage of the buffer relates to uncertainty about the position of the baseline. They expect this uncertainty to correspond with 16.1 percent of the total amount of carbon sequestered.

To summarise the above, it could be put as simple as possible:

- The project-based approach to the baseline is micro-based and focuses on what (most likely) *would* have happened without the project.
- The matrix-approach to the baseline is meso-based and focuses on what *could* have happened (acceptable approximation) without the project.
- The top-down approach to the baseline is macro-based and focuses on what *should* have happened without the project.

The various approaches can be assessed on the basis of various criteria, and may be 'scored' as follows:

Criterion	**Project-specific**	**Matrix approach**	**Top-down**
Externalities covered	?	+	?
Transaction costs	-	0	+
Cheating potential	-	+	+
Uncertainty for investor	-	+	+
Political sensitivity	+	0	-
Time required to operationalise	+	0	
Potential measurement error	+	0/+*	-
Host country capacity bottle-neck	-	+	+
Baseline objective and non-normative	0	+	-

* If appeal procedure is included
\+ positive assessment
0 neutral assessment
\- negative assessment

[10] This example is included in this section for illustrative reasons. As will be discussed later in this report, it is still unclear whether forestry will be eligible for CDM and whether forest conservation projects, as the one described here, will be eligible for JI.

[11] For a description of this project, see JIN, 1998b, 'Costa Rican Carbon Offsets Certified,' *Joint Implementation Quarterly*, vol. 4, nr. 2, pp. 10-11.

It may be obvious that the views on the above assessment may differ, and also that one can take different perspectives with regard to the weights to be attached to the various criteria.

6 Baseline determination for JI projects

A final issue that will be addressed in this paper is the question whether a baseline for JI projects would have to be verified by an independent third party or that this can be left to the Parties themselves. Some observers argue that the answer could be the latter option because if Annex I Parties, for example, deliberately inflate the baseline, in order to obtain more credits, the actual total emissions of both Parties together will be higher than the total of both Parties' assigned amount. This would imply that the Parties (or one of them) are not in compliance with their commitment under the Kyoto. Assuming that a reliable compliance system will exist under the Protocol, the Parties (or one of them) will have to compensate for the excess of emissions.

A stylistic example may illustrate this argument. Suppose that the Netherlands wants to set up a JI project with Poland. Both the Netherlands and Poland have an assigned amount of, say, 100. Under a business-as-usual scenario, Poland's annual emissions during the commitment period would have amounted to 104. Suppose now that both countries set up a JI project in Poland, resulting in an annual emission reduction during the commitment period of 10 units, of which the Netherlands acquires 6. Poland's annual emissions will be 10 units lower, of which it can only use 4. Or, in other words, Poland's assigned amount has been lowered with 6 units and the Netherlands has increased its assigned amount with 6. The final record of the JI co-operation is that the Netherlands' assigned amount has increased with 6 (becomes 106), whereas Poland's emissions have decreased to 94 (= 104 - 10) and its assigned amount to 94 (= 100 - 6) as well. In this example, both Poland and the Netherlands have achieved their QELRCs, assuming that the Netherlands will stay below the emissions level of 106.

What if the Netherlands and Poland decide to deliberately inflate the baseline and to claim 20 units of emission reduction, whereas in reality the project's reduction is only 10 units?[12] In case of a 50-50 percent credit sharing agreement, the Netherlands acquires 10 units as credits, whereas Poland's assigned amount, as a result of the double-bookkeeping principle of the Kyoto Protocol, is reduced with 10 units. In other words, Poland transfers 10 units of its assigned amount to the Netherlands. The final record of the JI co-operation now is that the Netherlands has more domestic flexibility - its assigned amount has increased with 10 units to 110 - whereas Poland's assigned amount has decreased to 90. Poland's actual emissions level, however, has only decreased with 10 units, so that Poland is short of 4 units (104 units under business-as-usual - 10 units emission reduction = 94). Poland is now in non-compliance (again, assuming that the Netherlands will not surpass its assigned amount of 110), but who is responsible and who is liable?

Those, who are in favour of a system without third party registration and verification of baselines, actually argue that the host country (Poland in our example) is liable. The host country may, in fact, transfer as many credits to the investing country as it wishes, as long as it compensates for the difference between its assigned amount and its actual emissions level during the commitment period in case the latter is higher. It may be obvious that this is a risky business for the host countries. If they make some miscalculations, and transfer too many

[12] It should be noted that deliberate inflation is not the only risk in this respect. Also a change in the value of the underlying economic and demographic variables of the baseline during the project lifetime may cause the project to result in less emission reduction than expected beforehand (see also the discussion in section 2.3 on *ex post* baseline corrections).

credits to the investing countries, they will have to make up for that later on. This may make potential host countries reluctant to get involved in JI projects.

Some have argued that the responsibility in case of baseline inflation (be it deliberate or not) should be shared between the host and the investing Party. This could be an argument in favour of having third party checks and verification. If, for example, a host country has 1000 JI projects, of which a few may have an incorrect baseline, how can those incorrect projects be identified if there is no third party verification? Third party verification could be a tool to distinguish the right from the wrong projects if the host countries are not able to do this themselves. An additional argument in favour of third party verification of JI projects could be that it could have a strong learning component.

Recently, the question was raised if determining a baseline for JI really is an issue. To a certain extent, the answer may be ‘no’. After all, because of the double bookkeeping system of the assigned amount system under the Kyoto Protocol, it is certainly not anymore in the interest of **both** Parties to inflate the baseline of JI projects. However, it is still in the interest of the investors to do so. If they could, in one way or another, claim too many emission reductions from JI projects (for example, because of a lack of capacity and equipment in the host country to control the baseline calculations), the host countries have to compensate for this at home. The reluctance this could create among the potential host countries may eventually turn out to be a higher price than the extra transaction costs associated with third party verification.