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INFORMATION PAPER

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FOREWORD

This document was prepared in June 2000 at the request of the Annex I Expert Group on the United Nations Framework Convention on Climate Change. The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy makers and other decision-makers. In a collaborative effort, authors work with the Annex I Expert Group to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the Annex I Expert Group. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document refer to those listed in Annex I to the UNFCCC (as amended at the 3rd Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Where this document refers to “countries” or “governments” it is also intended to include “regional economic organisations”, if appropriate.

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EXECUTIVE SUMMARY

This framework paper discusses the main methodological issues for baseline setting. It explores some insights that could be valid for all sectors on the key elements needed for baseline determination. These insights are drawn from the different baseline case studies undertaken by the OECD and the IEA on cement, electricity, energy efficiency, iron and steel and forestry. This paper is intended to help Parties identify the basic elements that might be included in baseline guidelines that could be adopted at COP6.

Choice of approach

Different approaches are possible for project developers in setting up baselines: multi-project baselines or project specific baselines. Baselines could also be drawn up using either an already existing baseline methodology or a new methodology. One option is that baseline guidelines recommend circumstances in which project specific or multi-project baselines might be preferable. Another option is that project developers would themselves choose the best option for their particular project, but would require them to justify their choice, i.e. whether the baseline proposed conforms to the circumstances of that project activity.

Even if project developers are allowed to choose the best option for their project, it is expected that such a choice would face scrutiny during the baseline approval process as part of the project validation process. Here a distinction might be made between new multi-project baselines and multi-project baselines that have already been approved and between new and already approved baseline methodologies. Project developers would be free to use new multi-project baselines or new methodologies. However, new multi-project baselines and new methodologies would face greater scrutiny in the approval process.

Project categories

Project categories might be used for two main purposes. The first one is reporting, the other is to determine the appropriate methodological guidance for a particular project. Although the case studies provide some interesting insights as to how project categories might be defined, elaborating a detailed list of categories in baseline guidelines might prove too complex. Indeed, all the methodological implications of different project categories are not yet clearly understood.

Project boundaries

Baseline setting needs to be consistent with the determination of project boundaries. In theory, it would be desirable to include all greenhouse gases and sources (and/or sinks) within the project boundaries. However, case studies suggest that greenhouse gases and sources (and/or sinks) that make up a small percentage of total emissions (and/or removals) would not need to be accounted for in the baseline.

The definition of a project boundary itself is a more difficult issue and case studies provide sector-specific guidance that is difficult to generalise in this respect. As a practical rule, case studies have considered that direct emissions as well as indirect emissions from electricity generation should be included in the project boundary. Other indirect emissions, such as transport related emissions, might be either included or excluded, but should in any case be somehow accounted for in the project evaluation.

Project crediting lifetime (and baseline revisions)

All case studies indicate the difficulty in finding one single criterion for determining the crediting lifetime, because of the necessary trade-off between investor certainty and environmental additionality. The crediting lifetime is also intrinsically linked to the possibility of baseline revisions, i.e. changes in the baseline that are required for a particular project after a fixed period of time[1]. The case studies suggest two options: (1) that baselines are fixed for a project for the entire crediting lifetime, and (2) to allow and/or require baseline revisions at certain time intervals (e.g. 5 years). A decision on whether baselines should be fixed or revisable might also depend on the institutional process for baseline revisions: would it be a procedure equivalent to approving a new baseline or would it be a less complex type of procedure?

Baseline units

All case studies recommend that baselines should be expressed in terms of emissions (or removal) rates, rather than absolute emissions (or removals). The case studies also investigated what units should be used to define rate-based baselines, and all concluded that the numerator should be consistent with the project boundaries (in terms of gases covered). As for the denominator, the case studies recommend that it be expressed in terms of the unit of activity (e.g. ton of steel, kWh).

Baseline methods and assumptions

The choice of baseline methods and the choice of key assumptions within each type of method lie at the core of baseline determination. There are many different methods and assumptions for constructing both project specific and multi-project baselines. These methods and assumptions are likely to differ considerably between project categories and it remains an open question as to whether any general guidance can be provided that spans all possible methods and assumptions.

Case studies have mainly focused on so-called comparison-based methods, and more specifically, on methods based on determining baselines on the basis of the *past performance of a reference group*. Case studies provide preliminary insights regarding four distinct assumptions that need to be made (when using such a method) in order to select what data set should be used as a reference and how it should be used.

(1) Geographic aggregation

The common recommendation across case studies is that, when a project activity has very similar characteristics in the different world regions in terms of homogeneity of product or processes, the correct level of aggregation for the baseline is the world wide performance of the (sub-) sector. When a project activity tends to differ across countries in terms of products, processes and levels of performance, nationally-based performance should be used[2].

(2) Sectoral aggregation

Another assumption regarding the level of aggregation relates to the choice of sector level or subsector (or process, or source specific) level to set the performance benchmark for a project. Case studies suggest very different levels of (sectoral) aggregation, which at least partly reflect sector differences. As a general rule, the lower the homogeneity in the inputs, processes and products within a sector, the more disaggregated should be the level at which a baseline is set. It may be difficult to ensure a consistent interpretation across sectors about what level of homogeneity should be required for determining (sectoral) aggregation.

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1 Baseline revisions can be distinguished from baseline updates, in the sense that the former would be required for one particular project, while the latter refers to updates of multi-project baselines, which are independent from any particular project.

2 With slightly narrower or broader geographic definition, depending on the country examined.

It may also be particularly important to recognise that this type of assumption may have large implications in terms of which incentives are given to project activities within a sector. Selecting the “wrong” aggregation level might lead to over-crediting of projects or acceptance of projects that are not additional or, alternatively, under-crediting of projects or rejection of projects that are additional.

(3) Average vs recent practice

The case studies generally indicate that most recent performance within a reference group (at the appropriate aggregation level) would better reflect what would otherwise occur than an average value for that reference group (at least for new or “greenfield” projects). However, there are different ways to define “recent” performance levels and this may vary depending on the size and growth of the sector concerned. These different choices seem to be driven by how much variability there is in each project category as well as the type, quality and quantity of data available.

A number of case studies suggest, however, that a formula based on the average performance of existing plants in a particular country would be used for refurbishment projects, rather than a formula based on recent performance. A number of questions emerge from a distinction between greenfield and refurbishment projects. It may create in some cases an incentive to refurbish existing installations rather than building new ones, or vice versa. It may even be difficult to distinguish between some greenfield and refurbishment projects.

(4) Static vs dynamic performance

Case studies provide different suggestions as regards the use of a trend in the baseline to reflect the change in performance levels over time. One suggestion is that the baseline would vary through time with a trend indicator that would be based on the evolution of past performance. It would allow the construction of a “dynamic baseline” with a built-in evolution in performance that is specified at the outset. A trend based on past performance may not always reflect, however, at what rate technologies are expected to develop in the future.

Conclusion

Case studies provide some consistent generic recommendations for baseline determination, but also leave many other questions unanswered at this stage. A possible “minimum” solution is to define in the decisions to be adopted at COP6 the appropriate baseline terminology as well the list of key methodological elements (project boundaries, project crediting lifetime, baseline units, methods and assumptions). These elements would need to be addressed by project developers and further elaborated in the future methodology development process. Another option is to further elaborate these methodological elements prior to COP6. In this case, however, any methodological guidance will need to be very precise and carefully drafted in order to avoid misinterpretations, yet be flexible enough to avoid pre-empting future methodological development.

1. INTRODUCTION

1.1 Context and objective of the paper

This framework discusses the main methodological issues for baseline determination.

- The paper provides a structure for discussion, as well as suggests the use of a specific terminology that might facilitate common understanding of the key baseline issues.

- Insights are provided from the different case studies undertaken for the Annex I Expert Group on cement, electricity, energy efficiency, forestry and iron and steel[3].

This may help Parties identify key methodological elements of baseline guidelines that could be adopted at COP6.

The paper does not provide a framework to decide how to integrate baseline guidelines into the decisions on the CDM and/or JI (see UNFCCC 2000). However, it indicates in which case baseline issues are related to other CDM and/or JI issues. Institutional issues (e.g. related to the baseline approval process) are only addressed in this paper in so far as they are linked to the methodological issues. Institutional elements might be included in baseline guidelines or be integrated in other sections of the decisions on the CDM and/or JI.

1.2 Objectives of baseline guidelines

In this context, it might also be useful to define the objectives of baseline guidelines. Three are proposed here:

1. to provide initial methodological guidance to project developers and host countries on how to set up baselines;

2. to provide guidance on further methodological work that would need to be elaborated, possibly in a handbook or reference manual. Generic guidance on how baselines should be determined might be most useful to to develop (sector) specific methodologies that are consistent across sectors (and/or project categories);

3. to provide guidance to project developers on how to register baselines and to operational entities and/or the executive board of the CDM on how to validate baselines for specific projects (as well as approve methodologies for project categories and/or multi-project baselines).

3. Although in some cases these studies may provide a basis for some generic recommendations, they also raise additional questions or issues. In addition, the possibility of drawing insights or recommendations that could be valid for all sectors need to be somewhat qualified, in view of the fact that the type of analysis and data quality varies between case studies.

2. CHOICE OF APPROACH

2.1 Baseline approaches

Different approaches are possible for project developers in setting up baselines. They can use a baseline that is drawn up for multiple projects (so-called multi-project baseline) or they can draw up a baseline that is valid only for their particular project (so-called project-specific baseline). It is also important to note that the baseline could be drawn up using either an already existing baseline methodology or a new methodology.

Case studies were not meant to look at the relative merits of these different approaches. However, they do provide interesting insights as to what extent baseline standardisation is possible for CDM/JI projects in different sectors. In each sector, there is some scope for standardisation, whether in the form of:

– multi-project baselines, i.e. baselines that could be used for more than one project;

– parameters that could be used in so-called hybrid baselines (i.e. project-specific baselines with standardised elements);

– methodologies that could be used to calculate baselines for different projects.

One option is that baseline guidelines recommend circumstances in which project specific or multi-project baselines might be preferable. One criterion for using multi-project baselines, suggested in other studies, could be whether the project is very similar to other projects within a project category (for which the multi-project baseline was developed). If so, multi-project baselines would be used. If not (i.e. the project is one-of-a-kind), project specific baselines would be better suited to that particular project. Similarly, baseline guidelines could recommend the use of common parameters or methodologies for similar projects within a project category (when these parameters or methodologies have been drawn up for that project category). This prescriptive approach might be difficult to implement in practice, because it would require clear criteria that specify when projects can be considered "similar" to other projects and when they are considered one-of-a-kind.

Another option is that project developers would themselves choose the best option for their particular project, but would require them to justify their choice, i.e. whether the baseline proposed conforms to the circumstances of that project activity.

2.2 Baseline (and baseline methodology) approval process

Even if project developers are allowed to choose the best option for their project, it is expected that such a choice would face scrutiny during the baseline approval process as part of the project validation process. More specifically, it is expected that the host country and the operational entity would assess the conformity of the baseline to the circumstances of that project activity, whatever baseline approach has been used[4].

[4] Some case studies have also indicated that project developers might be required to provide, in addition to a baseline, a *qualitative assessment of additionality*. They would need to explain in which sense the project is additional to what would have occurred in a business-as-usual situation and provide justification for the choice of the baseline. This would help the host country and operational entity assess the baseline.

A question that might be raised is whether multi-project baselines would face greater (or lesser) scrutiny than project-specific baselines (in addition to assessing whether the baseline conforms with the circumstances of the project activity). Here a distinction might be made between new multi-project baselines and multi-project baselines that have been already approved. New multi-project baselines would face more scrutiny than already approved multi-project baselines, in the sense that the baseline calculation and data sources would also need to be assessed. The baseline approval process for project-specific baselines would in this sense resemble more the approval process for new multi-project baselines since there would also be a need to check the baseline calculation, i.e. whether the chosen methodology for baseline calculation has been correctly applied, as well as data sources.

A similar distinction could be made between new and already approved baseline methodologies. Project developers would be free to use new methodologies rather than already approved methodologies. However, new methodologies would face greater scrutiny in the approval process.

This approval process raises many institutional issues, not dealt with in this paper: Would the approval of new multi-project baselines and/or new baseline methodologies require a specific approval process (e.g. by the Executive Board of the CDM)? How and by whom would they be assessed? Would they become part of a baseline handbook or reference manual? How and how frequently would these multi-project baselines and methodologies be updated[5]? There is a need to ensure that there is enough consistency in baseline (and methodology) development across countries and sectors, while this baseline (and methodology) assessment remains within the limits of management capacity of the relevant institutions.

3. PROJECT DEFINITION

When a project is submitted by a project developer for host government approval as well as validation/registration, it is expected that it will be defined, inter alia, in terms of project category, project boundary and crediting lifetime. This paper discusses these issues, in so far as they are related to baseline determination. They may also be relevant to other aspects of CDM and/or JI guidelines, such as project monitoring and verification as well as crediting. Any rules or guidelines regarding these issues might be placed elsewhere in the CDM (and/or JI) guidelines, but should be consistent with any baseline guidelines.

3.1 Project categories

Project categories might be used for two main purposes. The first one is reporting, the other is to determine the appropriate methodological guidance for a particular project, as it may vary according to project categories[6].

The case studies provide different suggestions as to the level of detail that should be considered for methodological guidance.

- One option is to define a project category according to sectoral activity, as suggested in the electricity generation case study. In this case, all electricity generation projects would fall into one category.

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[5] In this paper, the term “baseline update” is used when a baseline change is not related to one particular project. Baseline revisions are related to any change in the baseline *for one particular project* (see section 3.3).

[6] Geographic differences might be distinct from, but as important as project categories.

- Other case studies recommend further breakdown at sub-sector or process (plant type) level. In the cement case study, projects are distinguished even further according to which *process step* they cover (e.g. blending, grinding).

- Energy efficiency projects might also be broken down into different categories. The energy efficiency case study identifies project categories according to the particular type of equipment or process step (e.g. lighting, motors) that is targeted within one (or several) sector(s). Other energy efficiency projects could well cover many different process steps (or pieces of equipment) within one plant or installation.

- Some of the case studies (but not all) also suggest distinguishing between greenfield and refurbishment projects.

Although these case studies provide some interesting insights as to how project categories might be defined, elaborating a detailed list of categories in baseline guidelines might prove too complex. Indeed, all the methodological implications of different project categories are not yet clearly understood.

At this stage, it might, however, be useful to elaborate some general guidance as to how project categories should be defined in the future. Two criteria might be worth considering:

- each category could be defined in such a way that it groups together projects that are most similar, so that these projects could share common methodological guidance for setting up baselines. For instance, the distinction between greenfield and refurbishment projects might need further refinement (see section 5.3), because some large refurbishment projects may more resemble greenfield projects (e.g. when a plant is completely refurbished) than other refurbishment projects (e.g. when only one equipment/process step is replaced/upgraded);

- categories could also be defined in such a way that they are mutually exclusive, so that one project cannot be counted in more than one project category. For instance, categories should be defined in such a way that a project could not be placed in two categories e.g. energy efficiency and iron and steel. However, this might be difficult to achieve, as it would require a very clear and specific definition for each project category.

3.2 Project boundaries

Guidelines should provide a framework for deciding which greenhouse gases and which sources/sinks need to be included in the project boundaries. Any baseline should be consistent with those boundaries.

3.2.1 Gases and sources/sinks

It might make sense to require project developers to include in project boundaries all greenhouse gas emissions by sources (and/or removals by sinks) related to the project activity[7]. Case studies suggest, however, that in particular circumstances project developers should be allowed to exclude certain gases and/or source/sink categories. For instance, several case studies have only included in the project boundary CO_2 or CO_2 and CH_4, because the contribution of other gases is relatively insignificant. Simple rules could,

[7] By “greenhouse gases” and “sources”, it is meant all GHG listed in Annex A of the Protocol and (at least) all sources listed in the same annex. Whether further sources/sinks should be covered, i.e. those as referred to in Art .3.3. and 3.4. of the Protocol, is conditional to other decisions to be taken in the framework of the Protocol.

for instance, specify that gases and/or source/sinks categories would not need to be included in the project boundary:

– if they make up a small percentage of total emissions (i.e. lower than 2 per cent), and/or

– these emissions (removals) are not expected to increase (decrease) compared to the baseline as a result of the project implementation.

3.2.2 Direct and/or indirect emissions (and/or removals)

Guidelines should also provide an indication of whether only direct –or both direct and indirect- emissions (and/or removals) should be included in the project boundaries. Case studies suggest including in the project boundary direct emissions, as well as (at least) some indirect emissions, like those resulting from reductions in electricity use. This would in any case be necessary for electricity efficiency projects. Standard methodologies and/or values may be available to calculate indirect emissions from electricity use (see Bosi 2000).

For other indirect emissions, it is unclear at this stage whether they should fall inside or outside the project boundary. Even if they would fall outside the project boundary, project developers might still be required to indicate where leakage effects could occur and/or to place a quantitative evaluation on these, in particular if they are significant. These potential impacts, if significant, may need to be taken into account when assessing the project additionality. Specific methodologies might need to be developed to evaluate these leakage effects (including, possibly, standard correction factors that could reduce the cost of evaluating these effects).

Whatever approach is taken for the treatment of indirect emissions, particular attention needs to be given to possible double counting of these emissions (i.e. accounting for the same emissions in different projects).

3.3 Project (crediting) lifetime

CDM and/or JI guidelines need to include guidance on the (maximum) crediting lifetime of a project[8]. All case studies indicate the difficulty in finding one single criterion for determining this crediting lifetime, because of the necessary trade-off between investor certainty and environmental additionality. The recommendations made are usually presented as a rule of thumb (or expert judgement) that takes into account different considerations. These include: technical and/or economic lifetime of the installation, pay back time for the investor, period during which the project is considered to be additional (technology is not yet business-as-usual investment).

[8] There is no consistency across case studies on the precise definition of a crediting lifetime. According to one definition, the crediting lifetime is the period of time during which a project can be credited. According to another definition, the crediting lifetime is the length of time during which a project developer could consider a particular baseline valid. The first definition implies that there could be baseline revisions during the crediting lifetime of the project. The second definition implies that the baseline is always fixed during the crediting lifetime of the project. For consistency, this section uses the first definition throughout the text.

3.3.1 *Fixed vs revisable baselines*[9]

The crediting lifetime is intrinsically linked to the possibility of baseline revisions. The case studies suggest two options: (1) that baselines are fixed for the project crediting lifetime (i.e. the project developer can use the agreed baseline for the whole crediting lifetime of the project), and (2) to allow and/or require baseline revisions at certain time intervals (e.g. five years). The case studies do not provide consistent recommendations in this regard.

Relatively short crediting lifetimes would not require any baseline revisions. The question arises whether longer crediting lifetimes (e.g. 10-15 years) would require baseline revisions. This could vary by sector and/or project category, as suggested by the different case studies. Alternatively, a project crediting lifetime may be dependent on whether baselines would need to be revised. For instance, it could be relatively long if baselines would be revised at regular intervals. Another option is that the crediting lifetime would be extended through a revision of the baseline.

Deciding on the crediting lifetime (and on baseline revisions) is also related to other issues, like the stringency of the baseline (investors might more easily accept a short crediting lifetime if the baseline were less stringent). For instance, if a baseline includes a trend factor, a longer crediting lifetime might be more acceptable. But no general rule can be defined that could apply to each sector and/or project category. Any decision and/or recommendation on the crediting lifetime might therefore best be taken once there is more clarity on the other methodological and institutional issues.

3.3.2 *Baseline revision process*

A decision on whether baselines should be fixed or revisable might also depend on the institutional process for baseline revisions: would it be a procedure equivalent to approving a new baseline or would it be a less complex type of procedure? For instance, baseline revisions could consist in revising regularly one specific parameter, while other elements of the baseline would remain the same. Another issue is whether, when and how a baseline should be revised for a particular project in case this baseline, any parameter used in this baseline, or the baseline methodology has been updated. These updates would also presumably take place at regular intervals, but would not be related to one particular project (see section 2.2).

4. CHOICE OF UNITS

4.1 Rate based vs absolute baselines

All case studies recommend that baselines should be expressed in terms of emissions (or removal) rates, rather than absolute emissions (or removals). This is not only related to the fact that case studies focused on multi-project baselines (and therefore on possibilities for standardisation across projects). It is reasonable to assume that baselines in terms of emission rates would simplify the development of baselines and the process for project crediting. Absolute baselines would need to include assumptions on what the activity level is expected to be (in the absence of the project activity). Such forecasting is usually very uncertain. Credits might not be given to projects, because the level of activity is higher than expected. Alternatively, more credits would be given to projects, when output is lower than expected (which could happen if the project is mis-managed). However, baselines in terms of absolute emissions might provide

[9] This should not be confused with the updating of baseline methodologies and/or multi-project baselines, which is an issue that is not related to one particular project.

additional information on the size of the project activity under business-as-usual conditions. They could therefore be useful for information purposes.

It is unclear at this stage whether rate-based baselines could be applicable to all project types. For instance, projects that are not related to one single (unit of) activity might need to provide baselines in terms of absolute emissions only. The case studies did not investigate this issue.

4.2 Baseline units

Case studies investigated what units should be used to define rate-based baselines:

- The numerator should be consistent with the project boundaries (in terms of gases covered). In principle, it should be expressed in terms of emissions (or removals) of all greenhouse gases (GHG). But, as already indicated, some case studies recommended excluding minor gases in the project boundary. The numerator could therefore be expressed in terms of major gas(es) e.g. CO_2 only or CO_2 and CH_4. If it includes more than one gas, the numerator should be expressed in CO_2 equivalents using the appropriate GWP. In addition, reporting the baseline separately for each gas might increase baseline transparency.

- As for the denominator, it is commonly expressed in terms of the unit of activity (e.g. ton of steel, kWh). However, the unit of the denominator may not necessarily be the final product of the activity. For instance, the cement case study recommends that baselines for energy-related projects be expressed in terms of CO_2/ton clinker produced, because this allows the use of a multi-project baseline for these projects.

Although all (rate-based) baselines should ultimately be expressed in terms of GHG/unit of activity, it is possible to standardise parameters in another unit. For instance, the iron and steel case study recommends that the key parameter be expressed in terms of GJ/ton crude steel. For energy efficiency projects, key parameters would vary from project to project (e.g. input wattage, energy use/square foot).

5. CHOICE OF METHODS AND ASSUMPTIONS

There are many different methods and assumptions for constructing both project specific and multi-project baselines. These methods and assumptions are likely to differ considerably between project categories and it remains an open question as to whether any general guidance can be provided for all projects participants and/or for methodology development (e.g, for inclusion in a common handbook/reference manual).

For the purpose of this paper, methods are divided into:

- Comparison-based methods, which determine baselines on the basis of the real world performance of a reference group. This can be further subdivided into baselines that are based on the *past* performance of a reference group (allowing the use of already existing data) and baselines that are based on the performance of a reference group *during the project lifetime (*control group*)*. By reference group, it is meant a number of plants/installations/households or just one plant/installation/household.

- Simulation-based methods, which determine baselines by simulating what emissions (removals) would be in the absence of the project (i.e. projections). The latter could include the use of technical potential standards or the simulation of the effect of specific policies and measures.

Case studies provide some guidance on both types of methods, but do not provide any general recommendation on which are the best methods for particular project categories. The focus of the case studies is on determining baselines on the basis of the *past performance of a reference group*. Based on the studies, this option appears to provide a relatively high potential for standardisation[10]. Case studies provide preliminary insights regarding four distinct assumptions that need to be made (when using such a method) in order to select what data set should be used as a reference and how it should be used: (1) world-wide vs national/regional performance; (2) sectoral vs sub-sectoral performance; (3) average vs recent practice performance, and (4) static vs dynamic performance. The choice of assumptions should best represent what would otherwise occur in the absence of the project activity[11].

The case studies do not provide insights as to whether methods and assumptions for project specific baselines would differ much from methods and assumptions for multi-project baselines. The question might be raised whether it would be desirable to ensure that both types of baselines share common methods and assumptions and whether multi-project baselines should be made more (or less) stringent than project-specific baselines.

It should be noted that assumptions on both geographic and sectoral aggregation are collectively referred to in the literature as the "level of aggregation". These two issues are discussed separately, because they correspond to two distinct choices to be made on the most appropriate reference group (or data set).

5.1 World-wide vs national/regional performance level

The common recommendation across case studies is that, when a project activity has very similar characteristics in the different world regions in terms of homogeneity of product or processes, the correct level of aggregation for the baseline is the world-wide performance of the (sub-) sector. In this case, the overall performance of the project activity (e.g. in terms of efficiency) should not vary widely across world regions. This is in general due to the fact that the product is internationally traded. This is the assumption used in the cement and iron and steel case studies.

When a project activity tends to differ across countries in terms of products, processes and levels of performance, nationally-based performance should be used[12]. This is the assumption used in the electricity generation case study, which provides estimates of country-specific baselines. This study also recommends the possibility of using a sub-national level of aggregation, in case a country includes different electricity grids. Similarly, it would be possible to imagine that the level of aggregation could be a group of (small) countries.

However, the results of some case studies, e.g. for iron and steel, are based on incomplete samples. This means that data quality may not be consistent or comparable across countries. Therefore additional research might be needed to ensure that there is indeed a similar level of performance in this sector across world regions and that one worldwide baseline standard could be constructed.

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10 This type of method could be used to develop both project specific and multi-project baselines, however.

11 The issue of which data set best represents what would otherwise occur is different from the issue of whether such data is available and, if not, how it should be collected. However, there are obvious links between both issues. The choice of assumptions regarding the appropriate data set may be dictated by data availability, particularly if such data cannot be collected at reasonable cost (see next section).

12 With slightly narrower or broader geographic definition, depending on the country examined.

5.2 Sectoral vs subsectoral (process or source specific) performance level

Another assumption regarding the level of aggregation relates to the choice of sector level or subsector (or process, or source specific) level to set the performance benchmark for a project. Case studies suggest very different levels of (sectoral) aggregation, which reflect sector differences. The electricity generation case study investigates both a sectoral baseline and source-specific baselines[13]. The iron and steel suggests setting baselines at sub-sector level, reflecting the different process routes of steel making. The cement case study recommends different baselines for different cement processes as well, but also suggests that for some projects, (multi-project) baselines be set for some process steps only (e.g. clinker production). For energy efficiency projects, the level of aggregation also varies according to the type of project. Even within sub-sectors, it is sometimes recommended to adjust for specific characteristics of a sub-sector, a process or even a plant.

As a general rule, the lower the homogeneity in the inputs, processes and products within a sector, the more disaggregated should be the level at which a baseline is set. However, this inevitably leaves room for interpretation about what can be considered homogeneous in each sector (or project category). It may be difficult to ensure a consistent interpretation across sectors about what level of homogeneity should be required for determining (sectoral) aggregation.

It may be particularly important to recognise that this type of assumption may have large implications in terms of which incentives are given to project activities within a sector. Selecting the “wrong” baseline might lead to over-crediting of projects or acceptance of projects that are not additional or, alternatively, under-crediting of projects or rejection of projects that are additional.

For instance, in the case of electricity generation, a sectoral baseline (e.g. based on all recent fossil fuel fired power stations) would in some countries give a relatively large amount of credits to low carbon or carbon free technologies, because of the large share of coal fired power stations (see Bosi 2000). Selecting such a sectoral baseline for e.g. a gas-fired power plant might lead in some countries to over crediting of this particular project, if it is a normal process route in this country. In this case, the project would indeed not qualify as additional when considered as a fuel switching project. However, it could still qualify as an energy efficiency project (e.g. because it would perform better than state-of-the-art technology in the country). The most appropriate baseline for such a project might therefore be a source-specific one (i.e. a baseline that would reward BAT, but not fuel switching) rather than a sectoral baseline. Similarly, a sectoral baseline might be more appropriate for a renewable project that would not otherwise occur (because it is more expensive than fossil based power plants).

It may therefore be important for project developers to provide a justification for which baseline or baseline methodology is used as well as justification that the baseline methodology has been correctly applied (see section 2).

5.3 Average vs recent practice performance level

All case studies seem to indicate that recent performance of a reference group (at the appropriate aggregation level) would best reflect what would otherwise occur (at least for greenfield projects). However, there are different ways to define “recent” performance levels. The electricity generation case study suggests using the (average) performance of the pool of new capacity additions in the last five years as the reference data set. The cement case study uses as a reference the most common plant type currently installed (essentially best available technology), while the iron and steel case study uses a technology

[13] Different baselines for peak-load and base-load power plants are also examined.

performance standard. The energy efficiency case study uses the average performance of new equipment sold as a reference.

These different choices seem to be driven by how much variability there is in each project category as well as the type, quality and quantity of data available (see section 6). When one plant type has become the reference for a specific industry, it makes sense to use this plant type as a reference (e.g. in the cement industry). When there are clearly different types of possible processes within a project category (with no clear trend towards adopting a specific one), using an average value of recent plants/equipment seems a more logical solution.

Using the most recent plant or plant/equipment types as a reference usually leads to a baseline that is more stringent than using the average performance of existing plants/equipment. However, it should not be noted that it is not always the case. For instance, in the electricity generation sector for some countries, the most recent capacity additions are more carbon intensive than the average of existing plants. This should not raise any problem, though, as recent capacity additions should still be a better proxy for "what would have happened otherwise" than an average performance of existing plants/equipment[14].

Based on the conclusions reached in the case studies, it seems difficult to provide one formula for all sectors of what is a "recent performance level".

The case of refurbishment projects

A number of case studies suggest that a formula based on the average performance of existing plants in a particular country would be used for refurbishment projects, rather than a formula based on recent performance. However, a number of questions emerge from this distinction. If the environmental performance of a refurbished plant is below that of a greenfield plant, there may be implications from using a separate standard. It may create an incentive to refurbish existing installations rather than building new ones. It may also be difficult (as already mentioned) to distinguish between some greenfield and refurbishment projects. On the other hand, it is essential to provide appropriate incentives to undertake refurbishment projects, which might be the most common type of projects for some sectors (e.g. iron and steel and cement).

One possible solution is to define a specific formula that would take into account both the most recent performance and average performance of existing plants (as suggested in the iron and steel case study). Another possible solution is to further distinguish between different types of refurbishment projects:

- Some major refurbishment projects very much resemble greenfield projects, when an entire facility is refurbished. In this case, it might not be appropriate to set up a baseline that is different from the one that would be selected for a greenfield project.

- When refurbishment is only concerned with improving some process steps (e.g. replacing a motor), different baselines might need to be set up, e.g. similar to baselines that would be set up for energy efficiency projects.

- When a refurbishment project is clearly a one-of-a-kind project, a project specific baseline could be constructed.

14 However, case studies do not provide evidence that the recent performance level is the "best" proxy for what would otherwise occur, since they do not discuss all possible baseline methods and assumptions.

5.4 Static vs dynamic performance level

Case studies provide different suggestions as regards the use of a trend in the baseline to reflect the change in performance levels over time. One suggestion is that the baseline would vary through time with a trend indicator that would be based on the evolution of past performance (within a reference group, covering five to ten years). The use of trend (e.g. through an autonomous energy efficiency improvement indicator) would resemble very much a baseline method that is based on projections. It would allow the construction of a "dynamic baseline" with a built-in evolution in performance that is specified at the outset.

In this case, a dynamic baseline would only be possible if there is a discernible trend that can be derived from the past. This does not seem to be the case for all sectors (e.g. the electricity generation sector), although it may be applied to others (the iron and steel and cement case studies suggest the use of an autonomous energy efficiency indicator to estimate the baseline over time). Indeed, such an indicator might be better suited to baselines whose level of aggregation goes down to the process level (where there is an expected trend in technology improvement). A trend based on past performance may not always reflect, however, at what rate technologies are expected to develop in the future.

The case studies do not provide any recommendations as to how such trends should be estimated, nor do they provide any general guidance as regards the use of dynamic baselines (whether they are based on past trends or not). It may be important to use a dynamic baseline in sectors where:

- the rate of change in performance is relatively high;
- the baseline is inherently dynamic (e.g. in the case of a reforestation project on land where the carbon stock is naturally regenerating, but at a lower rate);
- the crediting lifetime and/or the time between setting and revising a baseline is relatively long.

Alternatively, when a baseline declines over time, this might make it easier to accept a longer crediting lifetime for a project and/or a longer period between setting and revising baselines. However, in some cases, a dynamic baseline could still be used together with (regular) baseline revisions, as suggested by some studies. In some other cases, a static baseline could be used together with a rather long crediting lifetime (without revisions). This might depend on the characteristics of each sector (or project category).

6. DATA SOURCES

The sources and availability of data will influence the choice of both baseline assumptions and baseline units. Moreover, the data availability will be influenced by the data source (e.g. international, default, national, project specific). For example, qualitative data on which production processes are used for cement or iron and steel may be easily available at a national level, but less available in an international collection of statistics.

Availability of quantitative data will also vary depending on the data sample required. For example, the different case studies have considered basing emission baselines on the performance of:

- A complete sample (e.g. all recent electricity plants)
- A single existing plant (e.g. for alternative fuel use levels in cement manufacture), and
- Technology performance standards (e.g. for iron and steel).

These choices were largely based on data availability (or lack thereof) rather than on a preference for a particular data set. Complete samples may be available at the national level. Single plant data will be available to the project developer (often at little or no cost) but possibly not available at a national level, and probably not available at an international level. Technology performance standards should be widely available throughout in most sectors.

Data availability will also be influenced by whether the project is a refurbishment or greenfield. Obviously, refurbishment-type projects will have project specific historical data on which future performance could (or not) be based, while greenfield projects will have no such data.

In this regard, the key issue is whether there is a need to define standard methodologies (or protocols) for data collection as part of the baseline methodologies. Such standard methodologies would help improve the quality and consistency of baselines over time. However, elaborating such methodologies might be difficult as data quality and availability varies substantially from country to country. Another possibility is to ensure transparency by requiring project developers to provide detailed information on data sources and data collection methods.

7. CONCLUSION

The OECD and IEA case studies on baselines provide some consistent generic recommendations for baseline determination, but also leave many other questions unanswered at this stage. A possible “minimum” solution is to define in the decisions to be adopted at COP6 the appropriate baseline terminology as well the list of key methodological elements (project boundaries, project crediting lifetime, baseline units, methods and assumptions). These elements would need to be addressed by project developers and further elaborated in the future methodology development process. Another option is to further elaborate these methodological elements prior to COP6. In this case, however, any methodological guidance will need to be very precise and carefully drafted in order to avoid misinterpretations, yet be flexible enough to avoid pre-empting future methodological development.

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Glossary

Baseline	A hypothetical reference case representing the estimated level of greenhouse gas emissions (and/or removals) that would occur in the absence of the JI or CDM project.
Baseline revision	Change in the baseline that is required *for a particular project* after a fixed period of time.
Baseline (methodology) update	Change in baselines and/or baseline methodologies that occur independently of one particular project.
Dynamic[15] baseline	A baseline whose level varies with time.
Fixed baseline	A baseline whose level (or rate) is fixed at the start of the project for the duration of the crediting lifetime of a project.
Leakage	An increase in GHG emissions, or a decrease in GHG sequestration, caused by the project activity but not accounted for in the emissions baseline for that project as these increases or decreases occur outside the GHG boundary used for that particular project.
Project	An activity, undertaken in the context of the Kyoto Protocol's project-based mechanisms (i.e. CDM and JI), that can generate emissions credits based on emission reductions (or sink enhancement) compared to what would have occurred otherwise.
Multi-project baseline	A baseline that can be applied to a number of similar projects.
Project-specific baseline	A baseline that is drawn up for an individual project by examining it on a case-by-case basis. Each project-specific baseline is used only for the project for which it is developed.
Revisable baseline	A baseline whose level or rate will or could be revised during the course of the project.
Static baseline	A baseline that has a constant level through time.

15 This graph distinguishes between static and dynamic baselines. This is to illustrate the difference with fixed or revisable baselines, which are related to the possibility of baseline revisions.