Expanding Global Emissions Trading: Prospects for Standardized Carbon Offset Crediting

International Emissions Trading Association

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Executive Summary

The global carbon offset market, as currently realized under the Kyoto Protocol, has tremendous potential to deliver low-cost greenhouse gas emission reductions and promote investment in sustainable technologies and practices throughout the world. Fully realizing this potential will require a market that functions as efficiently as possible, with low transaction costs and a minimum of regulatory uncertainties. Currently, the global market is dominated by the Kyoto Protocol's Clean Development Mechanism (CDM) and Joint Implementation (JI) programs, which credit emission reductions largely on the basis of individual project assessments. Though rigorous, this approach can be costly, time-consuming, and uncertain. Standardized approaches, which credit reductions on the basis of general criteria and emission factors, offer a way to reduce transaction costs for project developers, alleviate uncertainties for investors, and increase the transparency of regulatory decisions.

There are two elements to standardized offset crediting: (1) streamlining the estimation of project baselines by using standard assumptions and emission factors; and (2) deciding the "additionality" of projects using standard eligibility criteria. The basic requirements for developing standardized baselines have been well-documented. In fact, many carbon offset programs outside the Kyoto Protocol are already adopting standardized approaches. Both research and experience indicate, however, that there are limits to how much standardization is possible. Standardized approaches work best where projects and their baseline alternatives are fairly homogeneous; where similar technologies and practices are in use across wide geographic areas; and where performance data on those technologies and practices are readily available. Even where certain types of projects are highly suited to standardized methods, most carbon offset programs have relied on at least some project-specific data in order to accurately estimate baseline emissions.

There are also practical constraints to standardized crediting. The CDM has adopted mostly project-specific evaluation methods largely because is has to accommodate a potentially unlimited number of project types across widely disparate geographic areas. Faced with limited resources, the CDM has relied on individual project proponents to develop baseline estimation methods, which are frequently designed around project-specific circumstances. By contrast, most offset programs with standardized rules have focused on a few categories of projects within limited geographic areas.

Despite the challenges, there are several ways in which the CDM and JI programs could pursue greater standardization. First, standard emission factors or parameters could be developed for specific sectors and countries, based on the application of current CDM tools and methodologies. This is occurring already for grid-connected electricity projects in JI countries and in some CDM countries. Second, CDM and JI administrative bodies could explore ways to streamline existing baseline methodologies based on their experience with actual project approvals. Third, a variety of institutions could support the development of new methodologies incorporating standardized elements, including baselines based on performance standards.

Finally, offset crediting can be greatly simplified where additionality is determined on the basis of standard eligibility criteria. Although less analytical work has been done in this area, non-Kyoto carbon offset programs have almost uniformly embraced this approach. Applying standardized tests under a global program like the CDM may be more challenging, but standardized additionality tests should be considered for some project types in conjunction with the efforts to develop standardized baselines.

Pursuing any of these options will require CDM and JI administrative bodies, national governments, and other institutions to work together. New resources will be needed to build the capacity of these institutions to collect necessary data and develop and apply standardized baseline methodologies and additionality tests across multiple regions. Because standardization involves balancing policy objectives related to cost, equity, and environmental integrity, institutional processes should be transparent and accountable. Efforts should focus on project categories with high suitability for standardization and the greatest potential contribution to sustainable development, such as renewable energy, industrial energy efficiency and process emissions, and efficient vehicles.

Introduction

This study examines the prospects for standardizing carbon offset crediting rules. It argues that moving away from project-specific determinations of emission reductions and additionality, at least for some types of projects, could enhance the ability of carbon offset programs like the CDM to deliver low-cost reductions and promote sustainable development.

The essence of "standardized" offset crediting is to minimize the subjective judgment required in evaluating whether a project should receive credit for emission reductions, and how much credit it should receive. The more that such evaluations can be based on standard criteria or benchmarks, the more certainty, efficiency, and transparency there will be in the creation of offset credits. Increased efficiency and transparency will be necessary for the global offset market to reach a scale where it can truly help to support developing economies. At the same time, standardization will only make sense to the extent that it delivers accurately quantified and truly additional greenhouse gas (GHG) emission reductions.

This study builds off a substantial body of work examining the development of standardized baselines and additionality tests. Section I provides an overview of "standardized" offset crediting and how it contrasts with project-specific methods. Section II explores the challenges associated with developing standardized baselines and additionality tests, and identifies the types of projects most suited to standardized approaches. Section III surveys the baseline and additionality methods used by the CDM and other carbon offset programs. Section IV synthesizes the findings of the preceding sections and examines the prospects for greater standardization of offset crediting rules under the CDM and JI. Section V provides summary conclusions and recommendations.

Section I: What Is Standardized Offset Crediting?

There are two essential requirements for a GHG emission reduction to be certified as a carbon offset: (1) The reduction must be quantified and verified against an emissions baseline; and (2) The reduction must be additional to any "business-as-usual" emission reductions.[1] These two requirements are related, since baseline emissions should in theory be estimated from business-as-usual activities.[2] In practice, however, baseline emissions and "additionality" are usually determined separately. Under the CDM, for example, nearly all methodologies require a demonstration of additionality separate from the determination of baseline emissions.[3]

Carbon offsets are generally derived from specific projects designed to reduce GHG emissions, or increase their removal from the atmosphere.[4] Because of this, the vast majority of methodological work concerning baseline and additionality determinations (under the CDM and elsewhere) has focused on projects – that is, specific activities or sets of activities intended to reduce GHG emissions.[5] In theory, every project is unique and should be individually assessed to identify an accurate baseline scenario. For practical reasons, it frequently makes sense to group similar types of projects together and to adopt simplifying assumptions about their likely characteristics and baseline conditions. In broad terms, different methods for determining baseline emissions and additionality fall along a spectrum, from unique, project-specific analyses to generic, standardized emission factors and criteria. Along this spectrum, methods can be grouped into three categories: project-specific methods, "hybrid" methods, and standardized methods (Figure 1). [6]

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[1] Strictly speaking, "business as usual" refers to a scenario involving the absence of a market for offset credits. The question of additionality boils down to whether the emission reductions claimed as offsets would have occurred under this counterfactual scenario. In practice, there are numerous ways to answer this question that do not depend on a direct assessment of credit revenues or financial analysis.

[2] See, for example, Section 2.14, pp. 15-16 of the WRI / WBCSD *GHG Protocol for Project Accounting* (2005).

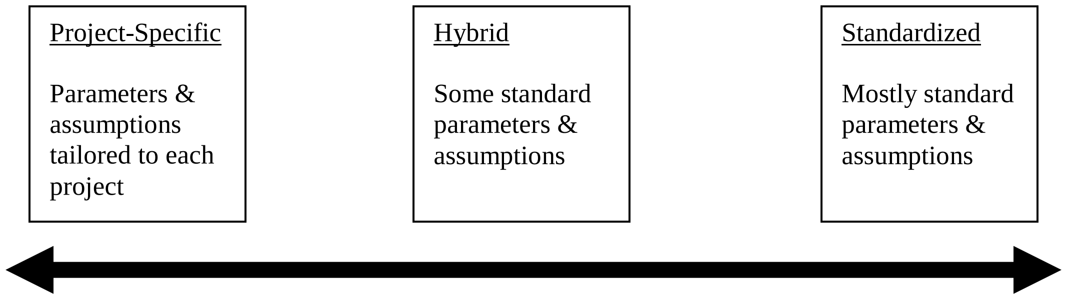
[3] The exceptions are those that rely on the CDM's "Combined tool to identify the baseline scenario and demonstrate additionality" – see http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

[4] Other forms of offset crediting have been proposed, e.g. relative to national or sectoral baselines. To date, however, offset markets generally and the CDM in particular have focused on project-level crediting (or, at most, projects aggregated under a program of activities). "Top-down" national or sectoral baselines and additionality determinations require different analytical and institutional approaches that are not considered here. For further reference, however, see Deshun and Rogers (2000).

[5] *GHG Protocol for Project Accounting*, p. 11.

[6] Ellis and Bosi (1999), p. 13.

Figure 1. Spectrum of Methods for Determining Baseline Emissions and Additionality



Project-Specific Methods

Project-specific methods for estimating baseline emissions and determining additionality involve consideration of a project's unique location and circumstances. Key parameters are determined using site-specific data or measurements.

Project-Specific Baseline Estimation

Under a project-specific approach, baseline emissions are generally estimated by identifying a distinct "baseline scenario" from among the project's plausible alternatives. A typical baseline scenario analysis will consist of evaluating implementation barriers and potential benefits of the project and its various alternatives, and identifying the most likely alternative in a scenario where climate change benefits are not considered. The project and its alternatives are generally screened against legal requirements, and also compared to "common practice" in the area where the project is implemented. The WRI/WBCSD *GHG Protocol for Project Accounting* ("*Project Protocol*") describes in detail how to conduct this kind of analysis.[7] It is also the approach prescribed by the CDM "Combined tool to identify the baseline scenario and demonstrate additionality."[8] The ISO 14064, Part 2 standard also prescribes a project-specific approach to baseline determination.[9]

Emissions "leakage" is likewise evaluated using locally defined parameters. The sources of GHG emissions affected by the project are individually assessed and changes in emissions are quantified. Changes that occur outside the project's identified boundary (or that are unrelated to its primary intended reduction[10]), are assessed as "leakage" and factored into final calculations of emission reductions.

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[7] *GHG Protocol for Project Accounting*, pp. 48-59.
[8] Available at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.
[9] http://www.iso.org/iso/catalogue_detail?csnumber=38382
[10] The WRI/WBCSD *GHG Protocol for Project Accounting* prescribes defining a "GHG assessment boundary" (rather than a physical project boundary) which includes all sources of GHG emissions affected by a project. Changes in GHG emissions unrelated to the primary intended reduction of a project are

Project-Specific Additionality Determinations

Project-specific additionality determinations generally follow the same kind of analysis used in identifying a baseline scenario. The project and its alternatives are screened against legal requirements and common practice, and subjected to an analysis of implementation barriers and expected benefits (e.g., financial returns). If an option other than the project itself is identified as the most likely alternative for the baseline scenario, the project is considered additional.[11] This basic approach is prescribed by the CDM "Tool for the Demonstration and Assessment of Additionality," and by most approved CDM methodologies.[12]

Pros and Cons of Project-Specific Methods

In an academic sense, a project-specific approach is the most rigorous and precise way to quantify and credit emission reductions from offset projects. It attempts to fully account for project circumstances and take into account unique factors that determine a project's baseline scenario. Since baseline scenarios describe counterfactual circumstances, however, their identification inevitably involves some degree of subjective judgment. The analysis and evidence submitted by project developers is interpreted on a case-by-case basis by verifiers and regulators. Despite the academic rigor of this approach, it creates a relatively high degree of uncertainty for project developers, who must guess at the likely decisions of regulators. Furthermore, the integrity and consistency of crediting decisions depends on the regulators' consistent judgment, which may be difficult to maintain over long time periods and for certain types of projects. Finally, some observers have also noted that project-specific approaches may be prone to gaming, since individual project-developers will have an incentive to inflate their baseline estimates using unique (and possibly hard-to-evaluate) information.[13]

Standardized Methods

"Standardized" approaches to baseline and additionality determinations seek to avoid the case-by-case approach of project-specific methods while maintaining overall levels of quantification accuracy and environmental integrity. Rather than use site-specific data and parameters, standardized methods rely on general information about categories of projects.

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considered "secondary effects," or leakage. Similarly, the ISO 14064 Part 2 standard requires the identification of all "sources, sinks, and reservoirs" affected by a project, without regard to the project's actual boundaries.

[11] *GHG Protocol for Project Accounting*, p. 16.

[12] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

[13] Joint Implementation Network, *et al.*, 2003.

Standardized Baseline Estimation

For baseline determinations, a fully standardized approach usually involves setting a single emission rate (e.g., tons of CO_2-equivalent per unit of production) that is used to calculate baseline emissions for all projects of a particular type. Baseline emissions are calculated simply by multiplying a project's verified output of a particular good or service by the standard emission rate. Standard baseline emission rates can be determined in several ways, but the procedure generally involves three major steps:[14]

1. Identifying a product or service produced by the type(s) of project(s) that will be recognized for offset crediting.
2. Identifying the set of technologies and practices that can provide the product or service.
3. Either:
    a. Calculating a representative emission rate for the identified technologies and practices; or
    b. Selecting a particular "default" technology or practice to represent the baseline.

Representative emission rates will generally be defined as a "performance standard." The performance standard can be calculated in different ways. The WRI/WBCSD *Project Protocol*, for example, recommends using a "better than average" (below the mean or 50th percentile) emission rate for identified technologies.[15] Under the CDM, methodologies are allowed to use (among other methods) the average emission rate of technologies "whose performance is among the top 20 percent of their category."[16]

Default baseline technologies or practices may similarly be identified in different ways. For example, baseline developers may choose the technology/practice that is: [17]

1. Most conservative (i.e., with lower emissions than other possible alternatives);
2. Least cost;
3. The technically defined "best available technology"; or
4. Equivalent to what is required by law or statute.

In general, a standard baseline emission rate is derived from known, average performance characteristics of the default technology/practice. In some cases, however, emission rates for the default technology/practice are calibrated using project-specific information (see next section on "hybrid" methods).

In general, standardized baseline emission rates are designed to quantify the intended emission reduction caused by a project. They do not incorporate estimates of baseline emissions associated with leakage. As discussed later in this report, standardized approaches may not be well-suited for project types where leakage is a significant concern.

[14] See the WRI/WBCSD *GHG Protocol for Project Accounting*, Chapters 7 and 9.
[15] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 69.
[16] Paragraph 48(c) of Decision 17/CP.7: http://unfccc.int/resource/docs/cop7/13a02.pdf#page=37.
[17] See also Joint Implementation Network, *et al.*, 2003, p. 47.

Standardized Additionality Determinations

Standardized approaches to additionality follow the same logic as standardized baseline estimates. Instead of assessing the barriers and motivators of individual projects, standardized additionality tests establish general criteria for determining project eligibility. Criteria are linked to objective and verifiable conditions, so that little or no subjective judgment is required in determining whether a project qualifies. The simplest kind of test to apply (although potentially difficult to develop) is a list of technologies or practices that automatically qualify as additional. Another approach is to link additionality to the standard baseline emission rate – projects that have lower emission rates are considered additional. A variation of this approach is to specify two standard emission rates, one for establishing additionality (which is generally more stringent), and another for estimating baseline emissions. Other criteria can be added for greater credibility and effectiveness, such as excluding projects required by law, or specifying that projects must use particular technologies or methods in addition to having a low emission rate. The conceptual and analytical issues associated with standardized additionality tests are addressed later in this report.

Pros and Cons of Standardized Methods

Standardized baseline and additionality approaches lack the precision of project-specific approaches, but in theory can be designed to accurately (or conservatively) quantify and credit aggregate emission reductions across multiple projects. The essential qualitative differences between standardized and project-specific approaches to offset crediting are summarized in Table 1.

Table 1. Standardized vs. Project-Specific Baseline/Additionality Determinations

Fully Standardized Approach	**Completely Project-Specific Approach**
Same baseline for each project	Different baseline for each project
Uniform, rigid	Tailored, ad hoc
Based on category-wide information	Based on site-specific information
Aims to be accurate for a family of projects	Aims to be accurate for individual projects
Review process is simplified, transparent	Review process is rigorous, may not be transparent
Lower transaction costs (at least for small projects)	Baseline identification can be a source of significant transaction costs
Rewards activities that are low-emitting	Rewards activities that differ from a uniquely identified baseline scenario
Additionality determined by qualifying projects against objectively verifiable criteria or conditions	Additionality determined through weighing evidence and evaluating project circumstances
Credit for non-additional reductions limited in aggregate through the design of general criteria	Credit for non-additional reductions limited through case-by-case evaluation of projects

Source: Adapted from Lazarus et al., 1999

Despite some of the advantages of standardized approaches, they also have their limitations. Using a standard baseline emission rate can unfairly penalize projects whose actual baseline emissions are higher. Conversely, standardized baselines may unfairly allow reductions to be quantified for projects whose true baseline emissions are lower.[18] Whether these two effects will counterbalance each other on an aggregate level depends on how carefully standardized baselines are designed. Parallel concerns arise for standardized additionality criteria. Tradeoffs will arise between screening out non-additional projects and excluding additional ones. Finally, it can be difficult to effectively standardize baseline emission estimates and additionality criteria for many kinds of projects. These issues are taken up in detail in Section II of this report.

"Hybrid" Methods

Baseline and additionality determinations do not have to be either completely project-specific or fully standardized. In many cases it is possible to combine elements of both kinds of approaches. In fact, many baseline methodologies adopted under the CDM and other offset programs follow a "hybrid" approach, combining project-specific methods with some standardized elements to estimate baseline emissions. Additionality tests in most offset programs, on the other hand, tend to be either project-specific or fully standardized. An overview of the approaches used by the CDM and other programs is provided in Section III of this report.

"Hybrid" Baseline Estimation

Hybrid approaches to estimating baseline emissions can be configured in many ways. In general, hybrid approaches rely on site-specific data and measurements for some parameters, but use standardized assumptions for others. The simplest form of hybrid approach is largely project-specific, but allows project developers to use default emission factors or assumptions for some calculations. For example, the CDM methodology for flare reductions and gas utilization at oil and gas facilities (AM0037) allows project developers to use standard factors for leakage rates from pipelines.[19]

Another form of hybrid approach constrains the list of project alternatives that must be considered for the baseline scenario. Under this approach, if an offset project is determined to be additional, project developers identify a baseline scenario from among a small number of predefined standard alternatives. This is similar to a purely project-specific approach, but avoids the need for project developers to comprehensively identify the list of alternatives.

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[18] See Fischer, C., 2005. "Project-Based Mechanisms for Emissions Reductions: Balancing Trade-Offs with Baselines," in *Energy Policy*, Vol. 33, pp. 1807-1823.
[19] http://cdm.unfccc.int/UserManagement/FileStorage/ULCRVS4USZZ44K3RGA87P7YC68FPV0

Finally, some hybrid methods employ a single, standard baseline alternative calibrated to project-specific conditions. There are two general versions of this approach:

1. *The baseline scenario is assumed to involve continuation of current activities at the project site.* For example, the default baseline scenario for projects that capture and utilize coalmine methane to generate electricity could be specified as the continued emission of methane, rather than potential alternatives for the methane such as flaring or delivery to pipelines. This approach is also frequently applied to energy efficiency retrofit projects, where the baseline is assumed to involve the continued use of pre-project equipment or facilities (without having to consider possible alternative retrofit projects).[20]
2. *The baseline scenario is assumed to involve a standard technology, but the baseline emission rate is still tied to site-specific variables.* For example, industrial boilers have emissions that vary considerably according to site-specific design features. The baseline emissions for a retrofit project, however, could still be determined in a standardized manner by calculating emissions associated with a default efficiency enhancement applied to the specific boiler involved in the project.[21]

Other combinations are possible as well. For example, a program may specify that project developers must use the more conservative of either a standard baseline emission rate, or historical emissions at the project site.

"Hybrid" Additionality Determinations

Hybrid approaches to additionality are also possible. As with hybrid baseline methods, the idea is to combine project-specific evaluations with standard, objectively verifiable eligibility criteria to come to a conclusion about additionality. In fact, many otherwise project-specific additionality tests are technically "hybrid" to the extent they include the basic eligibility condition that projects must not be required by law or regulation. But other combinations of evaluative assessments and standardized eligibility criteria are possible. One approach, for example, would be to assess additionality according to standard eligibility criteria for all projects in a particular sector, but require further project-specific evaluations for a sub-set of those projects. For example, standardized criteria might be used to evaluate the additionality of small-scale renewable energy projects, but the same criteria plus a barriers/benefits analysis might be required for large-scale power plant retrofits or cogeneration projects.[22]

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[20] See, for example, the CDM "Baseline methodology for water pumping efficiency improvements" (AM0020) at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

[21] The U.S. Environmental Protection Agency's "Climate Leaders" program has proposed a methodology using this approach, which calculates baseline emissions for boiler upgrades by assuming the baseline scenario involves integration of a non-condensing economizer in the design of the boiler involved in the project. Emission reductions are possible if the project installs additional enhancements to the boiler beyond a non-condensing economizer. See http://www.epa.gov/stateply/resources/optional.html#offset.

[22] See, for example, Lazarus, Kartha, and Bernow (2000) and Kartha, Lazarus, and Bosi (2002), pp. 38-44.

Pros and Cons of "Hybrid" Methods

Hybrid approaches to baseline and additionality determinations can in principle strike a balance between the shortcomings associated with fully project-specific or fully standardized approaches. The strengths and weaknesses of any hybrid approach will depend on its relative composition of standardized and project-specific elements.

Why Is Standardized Offset Crediting Desirable?

Offsets are a unique kind of environmental trading instrument. Unlike tradable emissions permits or allowances, which are created in fixed amounts by government fiat, offset credits are issued in theoretically unlimited quantities for activities that reduce emissions below a counterfactual baseline. The central challenge for any offset program is defining the appropriate counterfactual circumstances for different activities. This is a theoretical exercise that in essence requires educated guessing about what would have happened in the absence of a market for offset reductions. From a purely theoretical perspective, such "guessing" should be done for each marginal reduction in emissions being claimed. This theoretical requirement, however, is at odds with the practical necessities of creating a market.

If the objective of offset markets is to achieve a maximum of cost-effective emission reductions at sources that would otherwise not reduce emissions, then project-by-project evaluations of counterfactual baselines may not be the best approach. The transaction costs involved in project-specific evaluations can present a practical barrier to many projects that otherwise offer least-cost reduction opportunities. Questions about counterfactual circumstances are unavoidable, but the more that such questions can be answered on an aggregate basis across multiple project or activities, the lower transaction costs will be for each project. Lowering transaction costs will in turn increase the number of emission reductions than can be brought to market – which ultimately enhances the market's potential for mitigating climate change.

Standardized rules for crediting offer other practical advantages as well. First, they provide relative certainty for project developers about whether projects will be eligible for credit, and how many credits they are likely to receive. This in effect removes another kind of risk-based "transaction cost" associated with project-specific determinations, and makes it easier for developers to obtain funding for projects to supply reductions.

Second, although some subjective judgment and negotiation are required in setting standardized baselines and additionality criteria, they ultimately make the process of determining baseline emissions and additionality more transparent and objective. Once standard criteria are set, the process for crediting reductions is straightforward and not subject to second-guessing or negotiation. This is an advantage not only for project developers, who can clearly understand the basis for regulators' decisions, but also for other market stakeholders. For verifiers, validation and verification decisions can be simpler and subject to lower liability risk. Moreover, third parties concerned about overall environmental integrity do not have to review regulators' assessments and decisions for each project. Possible gaming of project-specific methods is avoided.[23] Instead, stakeholders can have confidence about aggregate environmental outcomes based on the relative stringency of the standard criteria.

Of course, such confidence will only come if standardized crediting rules are designed to ensure an acceptable level of environmental integrity, by not over-crediting reductions and effectively screening out non-additional projects. For standardized baseline and additionality rules to work they must be carefully designed, and all stakeholder involved in their development should agree on the basis for their development and specification. Standardized approaches should not be adopted for technologies or sectors not amenable to standardization. Credible methodological procedures, criteria, and institutional processes for developing standardized baselines and additionality rules are paramount.

The rest of this report examines in detail both the theoretical and practical work that has been done to date on the development of standardized baseline and additionality rules. It summarizes commonly agreed methodological requirements for developing standardized baselines and proposes a conceptual framework for designing standardized additionality criteria. Section III of the report assesses currently established standardized baseline and additionality methods under the CDM and other programs. Section IV draws some preliminary conclusions what types of projects and activities may be most amenable to standardized crediting rules and outlines priorities for further work. Finally, Section V discusses possible institutional and procedural frameworks for developing standardized baseline and additionality rules that will ensure the participation of stakeholders and achieve maximum credibility.

Section II: Developing Standardized Baselines and Additionality Tests

Only a few existing offset programs have adopted fully standardized baseline estimation methods and additionality tests. Very few (if any) CDM methodologies prescribe fully standardized approaches. Nevertheless, a significant body of knowledge has been developed through academic studies as well as the practical experience of some programs. This section summarizes the basic conceptual and methodological requirements for devising standardized baselines and additionality tests, as well as some of the theoretical limitations of standardized approaches.

Developing Standardized Baselines

In a definitive study of how to establish "benchmark" emission factors for estimating project baselines, Lazarus, Kartha, and Bernow (2000) identified four fundamental methodological considerations. These considerations are generally applicable to any kind

[23] Joint Implementation Network, *et al.*, 2003, p. 60.

of standardized baseline estimation method, including "hybrid" methods that combine project-specific methods with standard assumptions:

- **Aggregation**. Standardized methods apply uniform assumptions about baseline emissions to all projects in a given category. The first step in developing a standardized baseline is clearly defining the category of projects to which it applies – including the geographic area where projects may be located.
- **Cohorts**. The next step in developing a standardized baseline is to identify the maximum age or vintage of the alternatives against which projects will be compared.
- **Stringency**. A key challenge with standardized baselines is striking a balance between over-crediting and under-crediting for applicable projects. The stringency of the baseline will determine where this balance is struck.
- **Updating**. To maintain accuracy, standard baselines must be updated periodically to reflect changing economic, social, technological, and environmental circumstances. The frequency and procedures for updating should be determined as part of the process of developing a standardized baseline.

Aggregation

Defining the category to which a standardized baseline will apply may seem intuitively straightforward – and in some cases it is. In many cases, however, care must be taken to describe the defining characteristics of a project category in order to properly identify appropriate baseline alternatives. The more general the defining characteristics, the more widely a standardized baseline can be applied to a variety of project activities. Where defining characteristics are too general, however, a standardized baseline may end up being unacceptably inaccurate for important subsets of projects. For example, a single baseline set for all commercial and industrial boilers may significantly mischaracterize baseline emissions for projects in both subcategories.

The WRI/WBCSD *Project Protocol* requires that categories be defined according to the "product or service" provided by relevant project activities.[24] In principle, any project providing the same product or service can be assessed against the same standardized baseline. As the guidance for the *Project Protocol* notes, however, the appropriate definition of a "product or service" may not be intuitively obvious. In most cases, the guidance recommends defining the product or service narrowly, to include only the "immediate or direct outputs" associated with a relevant set of project activities. For example, the appropriate "service" defined for transportation fuel-switching projects would be energy used for transportation (e.g., joules), not transportation itself (e.g., kilometers traveled). The standardized baseline developed around this service would therefore apply to the use of different fuels with different carbon contents – not to alternative modes of transportation with varying fuel use efficiencies.

[24] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 39.

Of course, the desire might be to develop a broadly applicable standard baseline for any kind of transportation sector project – fuel-switching or improved vehicle efficiency. The service could then be defined as "transportation." However, in this case care would need to be taken to ensure that certain subcategories of potential projects are not over-credited (e.g., using a baseline calibrated to gasoline consumption where projects might involve efficiency upgrades to vehicles running only on compressed natural gas) or under-credited (e.g., using a baseline calibrated to a blend of biofuels where projects might involve simple upgrades to the efficiency of vehicles running on gasoline).

Similar kinds of considerations arise in other sectors. For projects in the power generation sector, the obvious "service" would be electrical energy (e.g., measured in megawatt-hours). However, as several observers have noted, it may often be desirable to further characterize this service according to more specific project attributes.[25] Projects that provide electricity during times of peak demand, for example, may have different emissions characteristics – and baseline emissions – than projects that provide baseload power. The WRI/WBCSD *Project Protocol* guidelines therefore recommend incorporating the timing of generation as part of the service provided by "load-following" power projects.[26] Other possible refinements for power-sector projects include distinguishing between the services provided by retrofit projects and new facilities; distinguishing between the services of on-grid and off-grid projects; and distinguishing between the services provided by power plants using different fuels (e.g., to establish baselines for projects that improve power plant performance within a specific fuel class).[27]

In developing a standardized baseline, there is not always a technically correct answer for how the appropriate product or service should be defined. Instead, answers will involve tradeoffs between a desire for broad applicability across a range of project types, the accuracy of baseline estimation for important project sub-types, and the feasibility and value of developing separate baselines for these sub-types.

The appropriate level of aggregation for a standardized baseline will also involve considerations about geographic applicability. The predominant technologies and practices used to provide a particular product or service often vary significantly among different regions of the world, and even among sub-regions within individual countries. Thus, to ensure accuracy, it will often make sense to develop separate baselines for different geographic regions. In developing a standardized baseline, it is important to consider the largest geographic area for which the technological, economic, social, environmental conditions are reasonably similar. These conditions generally will determine the mix of relevant project alternatives used to establish a baseline.

As with defining a product or service, there is often no technically correct way to define an appropriate geographic area. Instead, the process involves balancing a desire for broad

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[25] Lazarus, Kartha, and Bernow, 2000; Joint Implementation Network, et al., 2003, pp. 70-71.
[26] WRI/WBCSD, 2007. *Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects*. World Resources Institute, Washington, DC, p. 37.
[27] Lazarus, Kartha, and Bernow, 2000.

applicability with the need to accurately estimate baseline emissions within different regions. For some technologies and practices – e.g., those that are mature, similar across different regions, and/or used to serve global markets – the appropriate geographic area may be global. For others, appropriate geographic areas may be defined by legal or jurisdictional boundaries (e.g., national borders), physical infrastructure boundaries (e.g., electricity grids), or biophysical areas (e.g., ecological zone for forestry practices).[28] There are many reasons why it may be desirable to make the geographic area as large and international as possible, e.g., to level the playing field among different countries.[29] Ultimately, however, the question boils down to whether the mix of alternatives found within a larger geographic area is reasonably representative of the mix within each of its sub-regions. If not, then developing separate baselines for different sub-regions may be more appropriate.

Finally, questions about how to define the product or service for a standardized baseline and the appropriate geographic area can be interrelated. For example, there is no need to be concerned about over-crediting CNG vehicle projects in regions where CNG vehicle fleets do not exist. Designers of a standardized baseline for only to these regions could safely ignore such projects in deciding the appropriate definition of a product or service.

Cohorts

The "cohort" used to develop a standardized baseline specifies age of project alternatives that will be used to estimate baseline emissions. Generally, project technologies and practices should be compared to contemporary alternatives, i.e., those that are likely to be implemented in a project's absence. Because of technological advances, it would not make sense to compare a new power plant's emissions to those of a plant built 30 years ago.

Ideally, a standardized baseline will reflect the emission rates of alternatives being deployed at the same time as any projects. Some efforts to develop standardized baselines have used models or projections to estimate future project alternatives (primarily in the electricity sector).[30] Even sophisticated projections, however, can be prone to significant uncertainty – and for some sectors it such modeling may not be feasible. Furthermore, unless conditions are changing rapidly, the performance characteristics of alternatives implemented within the past several years often provide a reasonable indication of near-future baseline emissions.[31] Thus, many standardized baselines are developed using historical emission rates of current, or recently deployed, technologies or practices.

Deciding how far back to go in identifying a cohort depends on several considerations. The primary consideration is how rapidly conditions are changing with respect to the

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[28] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 42.
[29] See, for example, Lazarus et al., 1999.
[30] See Ministry of Economic Affairs of the Netherlands, 2004 (ERUPT program) and Joint Implementation Network, et al., 2003 (PROBASE project).
[31] Murtishaw, Sathaye, and LeFranc, 2006.

adoption of relevant technologies or practices in the identified geographic area. Where technologies and practices are changing rapidly, a shorter time frame should be used. If changes in policies or market conditions caused a significant break with past practices, the cohort should not extend past the time of the change. A counterbalancing consideration is data availability. As the WRI/WBCSD *Project Protocol* notes, the "most important criterion … is that [the cohort] should contain a sufficient number and diversity of [project alternatives] to allow a credible analysis and estimate of baseline emissions."[32] Where an appropriate historical period yields too few candidates on which to base a credible emissions estimate, it may be necessary to look planned or under-construction project alternatives.

Finally, planned and under-construction alternatives are often included in a cohort where sufficiently accurate data are available, or as a check against the validity of recent historical data.

Stringency

Setting the stringency of standardized baselines is probably the most difficult aspect to deal with conceptually, because it involves presumed tradeoffs against counterfactual circumstances. Choosing an overly stringent baseline – a standard emission rate that is too low; a standard baseline technology that is too uncommon; or a standard sequestration removal rate that is too high – risks the unnecessary exclusion of real potential emission reductions.[33] But a standard baseline that is too lenient will give too much credit for "phantom" reductions that overstate a project's real impact. Furthermore, changing the level of stringency will generally increase the frequency of one kind of error while reducing the frequency of the other – although it is impossible to actually measure these changes. Setting stringency is therefore primarily a matter of judgment, and the area where the greatest amount of subjectivity is involved in developing a standardized baseline.

The WRI/WBCSD *Project Protocol* and other sources generally recommend choosing a stringency level that reflects a "better than average" emission rate from among identified alternatives.[34] There are at least two rationales for this. The first is that the performance of technologies is generally expected to improve over time. A standard based on a simple average of historical data will not reflect this improvement going forward, and will therefore tend to over-credit reductions. The second is that as a general presumption of environmental integrity, it is better to under-credit rather than over-credit. Thus, the argument is that standard baselines should be relatively stringent in order to be conservative (at the risk of excluding some possible valid reductions).

Stringency can also be tied to questions about additionality, particularly where a comparison of project emissions to standard baseline emissions is used as a test for additionality. In this case, the notion of over-crediting and under-crediting becomes

[32] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 42.
[33] Joint Implementation Network, *et al.*, p. 47.
[34] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 69; Sathaye et al. (2004); Sathaye et al. (2001).

linked to what proportions of additional and non-additional projects will qualify against the standard. The same conceptual principles that apply to developing additionality tests may therefore apply to setting the stringency of baseline emissions. These are discussed in the second part of Section II.

Updating

Project-specific baselines are established once and in principle remain valid for the life of the project. Standardized baselines can be used by multiple projects over time and therefore generally require updating. For any given standardized baseline, two questions must be answered with respect to updating:

1. With what frequency should the baseline be updated using new data?
2. Will the updated baseline apply only to newly proposed projects, or also to existing, pre-approved projects?

Frequency of updating generally boils down to practical questions about the availability of new data and the cost of acquiring it to revise baseline emission estimates. For some project sectors, new data may be readily available on an annual basis. For other sectors, annual updating may be impractical. The tradeoff for less frequent updating is that baseline emission estimates may become inaccurate if conditions are changing rapidly. Deciding on an appropriate frequency can therefore involve striking a balance between the need for accuracy and practical considerations about costs and access to data.

Deciding whether revised baseline estimates should apply to existing projects depends largely on the assumptions informing how the baseline is set, as well as practical considerations about providing certainty for project investors. From an investment perspective, a single baseline emission factor that is valid throughout the project’s life or crediting period is clearly advantageous. If a standardized baseline is linked to a single type of project alternative, however – such as the use of a low-cost fuel – it may be necessary to apply revisions across the board if conditions change in a way that would significantly change ongoing estimates (e.g., a fuel price change).

Design Challenges for Standardized Baselines

As the preceding discussion suggests, there are several practical challenges for developing standardized baselines. The most important have to do with data availability and the feasibility of aggregation. A separate distinct challenge has to do with secondary emissions accounting issues related to leakage.

Access to Data

Developing credible standardized baselines heavily depends on having access to accurate data. Solid information is required about the range of technologies and practices available within relevant geographic regions that can provide the same product or service as potential project activities. Furthermore, good data are needed on the performance of these technologies, preferably in the form of historically confirmed GHG emission rates. These data are needed not only to decide on acceptable levels of aggregation, but also to calculate emission factors and inform decisions about setting a stringency level.

Data availability, however, can vary dramatically depending on the geographic regions and technology sectors being considered. Lack of accurate data can limit the potential for developing credible standardized baselines, even those based on a single default technology or practice. For performance standard baselines, there may simply be an insufficient number of candidate technologies or practices in a given region to establish a credible benchmark emission rate.[35] Challenges may also arise in situations where conditions in a sector or geographic region are unstable or rapidly changing, in which case even good historical data may inaccurately predict future baseline conditions. Where insufficient historical data are available (or where such data are clearly poor predictors of the future) it is sometimes possible to use data on planned or under-construction facilities, technologies, and practices, or to use economic models to predict future baselines.[36] However, these approaches may be subject to significant uncertainties.

Deciding on Levels of Aggregation

Besides data availability, the most important factor in deciding the feasibility of developing standardized baselines is the degree to which they can be broadly applied across a range of potential projects and geographic areas. The more narrowly they must be tailored – due to lack of common project characteristics, or to variations in practice among geographic regions – the more costly they will be to develop and apply on a per-project basis.

A key challenge with aggregation, as described above, is defining the product or service provided by relevant projects. Aggregation will be difficult wherever the specified product or service is heterogeneous (e.g., where different facilities produce different versions or quality levels of the "same" product, with corresponding differences in emissions performance). Aggregation will also be problematic where there is a wide range of alternative production technologies or practices for a defined product, or where a single production technology exhibits wide variances in emission rates due to project-specific factors (e.g., industrial boilers). In these cases, standardized baselines are likely to be unacceptably inaccurate. To improve accuracy, baseline developers can either: (1) define the product/service and project category more precisely (which will limit the baseline's applicability), or (2) develop hybrid baseline methods that combine standardized elements with project-specific considerations.[37]

[35] Joint Implementation Network, et al. (2003), p. 50.
[36] See, for example, Joint Implementation Network et al. (2003).
[37] A third option would be to adopt a standardized baseline that is conservative (e.g., based on a low-emitting project alternative). Depending on the circumstances, however, this may significantly under-credit many potential valid projects.

Finally, aggregation will also be difficult where there are significant variations in the mix of technologies or practices used in different geographic regions. The smaller the scale on which variation occurs, the more separate baselines will have to be developed and applied for different regions in order to ensure accuracy. At some point, the cost and effort required may make fully standardized approaches infeasible.

Leakage

Much of the literature on standardized baselines, along with standard baseline development efforts under existing programs, has largely ignored the question of emissions leakage. For some types of projects, however, leakage can be a significant concern, and the amount of leakage expected from a project can often depend on site-specific considerations. For example, secondary emissions associated with biomass energy projects will depend on the distance that fuels must be transported to reach project sites. In some cases, it may be possible to develop standardized estimates of “average” emissions leakage expected from a category of projects. However, very little work has been done to evaluate the feasibility of such estimates. Alternatively, it may make sense to focus standardization efforts on project types for which leakage is not a significant concern (e.g., less than three percent of emission reductions) and then ignore it.

Sectors Most Conducive to Standardized Baselines

In light of the various challenges described above, standardized baselines are likely to be most feasible where:

1. There is a similar mix of technologies/practices and market conditions across large geographic areas;
2. Sufficient data are available on the range of potential projects and their alternatives within a geographic area, along with their respective emissions levels;
3. Social, economic, and technological conditions related to potential projects are relatively stable;
4. Projects and their alternatives provide a relatively homogeneous product or service;
5. Potential projects within a defined category have similar characteristics and performance;
6. There are relatively few baseline alternatives to potential projects;
7. Leakage associated with potential projects is not an issue, or can be conservatively adjusted for on an “average” basis.

Using these criteria, Tables 2a and 2b present a qualitative assessment of the suitability of various climate change mitigation technologies and practices for standardized baseline development.[38] In Table 2a, each category of technology or practice has been rated as

[38] The technologies and practices are organized according to key sectors identified by the Intergovernmental Panel on Climate Change. See IPCC (2007), p. 10.

either “Good,” “Mixed,” or “Poor” against the seven criteria listed above. Ratings for each criterion are then combined into an “Overall Rating” indicating the relative ease with which standardized baselines could be developed. Ratings were applied considering the general characteristics of each category on a global level. For specific types of technologies or practices within each category, and for different geographic areas, the relative potential for standardized baseline development may be better or worse than the overall ratings presented here. Table 2b provides notes and explanations related to the ratings in Table 2a.

As Table 2a indicates, the most promising project categories for standardized baselines are in the energy, industry, buildings, and waste management sectors.

Table 2a. Suitability of Potential Carbon Offset Project Categories for Standardized Baseline Development

Sector	Potential Geographic Aggregation	Data Availability / Reliability	Need For Updating	Homogeneity Of Products / Services	Similarity Of Project Types	Few Project Alternatives	Low Leakage Risk	Overall Rating
Energy								
Improved generation efficiency	Good/Mixed	Good	Mixed (depends on region)	Good	Good	Good	Good	Good
Improved supply and distribution efficiency	Mixed	Mixed	Good	Mixed	Mixed	Good	Good	Mixed
Fuel switching (including renewables)	Good/Mixed	Good	Good/Mixed (depends on region)	Good (mixed off-grid)	Mixed	Mixed	Good	Good/Mixed
Carbon capture & storage	Good	Good(?)	Good	Good	Good	Good	Unknown	Good
Transport								
Fuel-efficient vehicles	Good	Mixed (depends on region)	Mixed	Mixed	Good	Good	Good	Good
Biofuels	Good	Good	Good	Good	Good	Good	Poor	Mixed
Switching transportation modes	Poor	Poor	Mixed	Poor	Poor	Poor	Poor	Poor
Land-use & transport planning	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor
Buildings								
Efficient lighting	Good/Mixed	Mixed	Mixed	Mixed	Mixed	Good	Good	Mixed
Efficient appliances	Good/Mixed	Good/Mixed (depends on region)	Good/Mixed (depends on category)	Good	Good	Good/Mixed (depends on region/category)	Good	Good
Efficient HVAC / building design	Poor	Mixed	Mixed	Poor	Poor	Poor	Good/Mixed	Poor
Industry								
End-use electrical equipment efficiency	Good/Excellent	Good	Good/Mixed (depends on region/category)	Good/Mixed	Good	Good/Mixed (depends on region/category)	Good	Good

Heat and power recovery	Good	Mixed	Good/Mixed	Mixed/Poor	Poor	Mixed/Poor	Good	Mixed/Poor
Material recycling/ substitution	Mixed	Mixed	Good	Good/Mixed (depends on category)	Mixed	Mixed/Poor (depends on category)	Mixed	Mixed
Process emissions / non-CO_2 gases	Good/Excellent	Good/Mixed (depends on region/category)	Good	Good	Good	Good	Good	Good
Agriculture								
Soil carbon sequestration	Mixed	Mixed/Poor	Good	Mixed/Poor	Good/Mixed	Mixed/Poor	Poor	Mixed/Poor
CH_4 reductions from livestock	Good	Mixed	Good	Good/Mixed	Good/Mixed	Good	Good	Good/Mixed
N_2O reductions from fertilizer	Good	Poor	Good	Mixed/Poor	Mixed/Poor	Mixed	Good/Mixed	Mixed/Poor
Forestry								
Afforestation / reforestation	Mixed	Mixed	Good	Mixed	Mixed	Mixed	Mixed	Mixed
Forest management	Mixed	Mixed	Mixed	Mixed/Poor	Mixed/Poor	Mixed/Poor	Mixed	Mixed/Poor
Reduced deforestation	Mixed/Poor	Mixed	Poor	Mixed/Poor	Mixed	Poor	Poor	Poor
Waste Management								
Landfill CH_4 capture	Good/Mixed	Good	Good/Mixed (depends on region/type)	Good/Mixed	Good	Good	Good	Good
Controlled wastewater treatment	Mixed	Mixed	Good	Good	Good	Good	Good	Good/Mixed
Recycling / waste minimization	Mixed/Poor	Mixed/Poor	Mixed	Poor	Poor	Poor	Poor	Poor

Table 2b. Notes and Explanations of Offset Category Ratings

Sector	Notes/Explanation
Energy	
Improved generation efficiency	Highest standardization potential for baseload power plants. Aggregation potential generally limited by grid boundaries. Off-grid power and thermal energy projects may have mixed standardization potential. May need frequent updating depending on region.
Improved supply and distribution efficiency	Some types of supply/distribution efficiency upgrades may be fairly standard. Baseline estimation for other types of projects in this category is likely to require project-specific parameters. The "service" provided for evaluating baseline options may often be location-specific, particularly at the distribution end.
Fuel switching (including renewables)	Standardization potential is probably highest for on-grid projects; off-grid project may face diverse circumstances. Aggregation potential generally limited by grid boundaries for on-grid projects. May need to differentiate baselines by duty cycle (baseload vs. load-following); by type of project (firm power vs. intermittent); and/or by type of fuel (coal-to-gas vs. fossil-to-renewables).
Carbon capture & storage	Many technical uncertainties remain, but good potential for standardization if these are resolved. Leakage could be a possible concern requiring project-specific estimations.
Transport	
Fuel-efficient vehicles	Generally good standardization potential, although separate baselines would probably be needed for different kinds of vehicles.
Biofuels	Conducive to baseline standardization in most respects, but leakage issues could be a significant barrier (due to high variability in upstream emissions associated biofuel production).
Switching transportation modes	Baseline conditions will vary considerably among projects and emissions estimates will generally be driven by location-specific variables and the types of transportation involved.
Land-use & transport planning	Baseline conditions will vary considerably among projects and emissions estimates will generally be driven by location-specific considerations.
Buildings	
Efficient lighting	Good potential for standardization within project subcategories, e.g., residential, commercial, particular building types. Baseline estimates generally must still be tied to grid regions where projects are located.
Efficient appliances	Generally good potential for standardization within appliance categories. Potential may be limited by data availability on baseline appliance usage in some areas. Baseline emission estimates must still be tied to grid regions where projects are located. Frequent updating may be required in some areas.
Efficient HVAC / building design	Project performance and baseline emissions will be driven in most cases by project-specific parameters. There may be some potential for hybrid baselines for projects involving particular types of heating/cooling equipment.
Industry	
End-use electrical equipment efficiency	Aggregation may be possible internationally in some cases. Potential for standardization is generally high, but may depend on the industry, type of equipment involved, and regional characteristics.
Heat and power recovery	There are numerous possible configurations for heat and power recovery projects, and these will often depend on site-specific variables. Possibly some potential for standardization in conjunction with project-specific parameters (hybrid approach).

Material recycling/ substitution	Some potential for standardization in some categories of recycling/substation projects. May often still require project-specific parameters. Leakage may be an issue in some cases (e.g., from recycling energy requirements).
Process emissions / non-CO_2 gases	Generally good potential for standardization. Possible aggregation across large (international) geographic areas for some project types. Baseline estimates may require some use of project-specific parameters.
Agriculture	
Soil carbon sequestration	Geographic aggregation potential depends on physical extent of similar soil types. Data on sequestration rates/potential exist for some regions, not others. Numerous possible soil types, and land-use/management regimes. Some standardization possible across similar land-uses and soil types in specific regions with good data.
CH_4 reductions from livestock	Standardization potential is generally good, possibly with some project-specific parameters. Potential barriers include quantification uncertainties as well as some variability in baseline livestock feeding and/or manure management practices.
N_2O reductions from fertilizer	Barriers to standardization include poor data quality and a large potential variety of fertilizer and farming practices.
Forestry	
Afforestation / reforestation	Potential for baseline standardization limited by diversity of physical land characteristics and mix of possible baseline land-use regimes.
Forest management	Standardization may be possible in some regions for some specific types of project activities. Challenges include diversity of physical land characteristics, forest types, and baseline management practices.
Reduced deforestation	Potential for baseline standardization limited by diversity of potential project sites, management regimes, and drivers of deforestation, as well as high leakage potential in many instances.
Waste Management	
Landfill CH_4 capture	Standardization potential very high for simple flaring projects. May be more limited where utilization/energy production is involved. Baseline estimates may need to be linked to grid regions where electricity is used.
Controlled wastewater treatment	Standardization may be possible in regions where practices are uniform and good emissions data are available.
Recycling / waste minimization	Standardization potential limited by diversity of project types and baseline practices, lack of data, leakage potential.

Developing Standardized Additionality Tests

Determining additionality is on some level always a subjective process. Under a project-specific approach, it is a process of deciding whether a proposed project actually differs from what would have occurred under a "business as usual" scenario. Standardized additionality tests seek to remove this kind of subjective, counterfactual determination from the project level to the level of aggregate outcomes. Developing standardized tests is process of deciding on criteria that limit the eligibility of all potential projects to those that seem likely to differ from their business-as-usual alternatives.

Just as standardized baselines may over-credit or under-credit individual projects, standardized additionality tests are likely to misidentify the additionality of some projects. Under virtually any set of tests, some non-additional projects are likely to qualify and be counted as additional. Likewise, some truly additional projects may be unfairly excluded as non-additional. Of course, these kinds of mistakes will happen with project-specific evaluations as well. The challenge for standardized tests is to calibrate them to achieve an overall balance between these potential errors across an entire set of projects.

Very little research has looked directly at the question of how to develop standardized additionality tests. Most examinations of standardized additionality criteria have been done in the context of considering "benchmark" emissions baselines.[39] These studies generally suggest that a standardized baseline can serve double-duty as an estimate of baseline emissions and a determiner of project eligibility – in other words, projects with lower emissions than the baseline may be automatically considered additional. The WRI/WBCSD *Project Protocol* also describes this as a valid way to determine additionality.[40]

Another commonly discussed option, as mentioned in Section I, is to specify two standard emission rates, one for establishing additionality and another for estimating baseline emissions. Only projects with emission rates lower than the additionality benchmark are considered eligible, but their baseline emissions are determined by the other (usually higher) standard emission rate.

Whether a simple emission-rate test is sufficient to determine additionality in all situations, however, may be open to question. For instance, a standard baseline emission rate applied to the power sector would qualify any generation technology with zero emissions, including any that are business as usual (e.g., some wind power or biomass energy projects). The baseline could in theory be calibrated so that total crediting for zero-emission projects is not excessive, even allowing for some non-additional projects. Alternatively, other kinds of tests might be employed to try to exclude the majority of

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[39] See, for example, Lazarus et al. (1999); Sathaye et al. (2001); Lazarus, Kartha, and Bernow (2000); Houdashelt, et al. (2006).

[40] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 16.

non-additional projects. As the WRI/WBCSD *Project Protocol* notes, some offset programs “may decide that a performance standard [baseline] by itself is insufficient” and “In some cases, therefore, performance standards may be combined with [other] additionality tests” to ensure environmental integrity.[41] The question is what form these further tests should take.

Possible Types of Standardized Additionality Criteria

Beyond standardized emission rates, a number of other standard criteria can be devised. Table 3 provides some possible options that may make sense for some types of projects.

Table 3. Options for Standard Additionality Criteria

Projects Are Only Additional If…	**Considerations**
They are not mandated by law	May require clarification about what constitutes a “mandated” project
They are not a least-cost option	Requires a clear definition of alternative technology/practice costs
They are not common practice	Requires a clear definition for what constitutes common practice.
The involve a particular type or sub-type of technology	Generally, the type should be decided in conjunction with developing a standardized baseline (e.g., considering questions of aggregation and cohorts)
The are of a certain size	Effective where there is a clear size threshold for business-as-usual projects (e.g., due to economies of scale)
The are initiated after a certain date	Generally weak at isolating additional projects, but can effectively screen out many business-as-usual projects depending on circumstances.
They have certain performance characteristics (e.g., projects using “best available technology”), distinct from GHG emissions rates	Most applicable where GHG emission reductions are caused indirectly (e.g., electrical energy efficiency projects).

Taking a “Statistical” Approach to Additionality

Even using standardized criteria, there is no “one size fits all” way to test for additionality. A set of tests that provides sufficient confidence about the additionality for one type of project may not provide the same level of assurance for another. For solar energy projects, simply excluding projects required by law would probably eliminate the

[41] WRI/WBCSD *GHG Protocol for Project Accounting*, p. 71.

vast majority of non-additional ("business as usual") projects. The same test applied to combined-cycle natural gas power plants probably would not.

Deciding what is "sufficient" is, of course, subjective. As a conceptual matter, it helps to think of additionality tests in statistical terms.[42] As mentioned above, additionality tests always produce two kinds of mistakes: they classify some non-additional projects as additional; and they classify some additional projects as non-additional. In statistical terminology, these mistakes are referred to as "false positives" and "false negatives." As with any test used in science to evaluate a hypothesis, standard additionality tests will result in different proportions of these mistakes depending on how the tests are configured. Furthermore, calibrating a test to reduce the incidence of one mistake will generally increase the incidence of the other. Using a more stringent GHG emissions standard to test for additionality, for example, may decrease the number of credits for non-additional reductions, but will increase the exclusion of additional reductions.

Because of the inherent tradeoffs involved – and the fact that there is no *technically* correct way to calibrate an additionality test – the sufficiency of tests must be decided relative to the policy goals of a carbon offset program. For example, program designers may decide to strictly limit credited reductions to those that are very clearly additional – at the risk of eliminating many valid project opportunities. Or they may design additionality tests to maximize project opportunities and incentives, at the risk of crediting significant numbers of business-as-usual reductions and somewhat weakening overall emissions goals. The right calibration will also depend on expected levels of demand for carbon offsets. Crediting 100,000 tons of non-additional reductions matters much less in a billion-ton market than in a million-ton market.

The sufficiency of any particular set of standardized additionality tests will ultimately be subjective. Agreement on sufficiency can be achieved, however, by clearly laying out intended policy objectives and clarifying the expected statistical outcomes of the tests relative to the overall size of the offset market.[43]

Deciding on Appropriate Standard Additionality Criteria

In general, the process of deciding on standardized additionality criteria should mirror the methodological steps used to develop standardized baselines. Determining whether a set of criteria is sufficient requires clearly defining the types of projects to which it will apply (e.g., defined according to product or service) as well as the geographic area where it will apply. It also requires understanding technology trends and the economic, social, physical, and other factors driving the adoption of project alternatives. The same factors that determine the stringency of a standard baseline emission rate (described above) will also be relevant to setting standard additionality criteria. Finally, depending on how

[42] Trexler, Broekhoff, and Kosloff, (2006).
[43] Trexler, Broekhoff, and Kosloff, (2006).

additionality tests are specified, they may have to be revisited and updated periodically in order to remain credible and accurate.

Because baselines and additionality are closely related, it will generally make sense to develop standardized baselines and additionality criteria together. A unique set of additionality criteria should generally be associated with each type of project for which baselines are developed.

Design Challenges for Standardized Additionality Tests

A number of challenges exist in developing standardized additionality tests, many of which mirror the challenges involved in developing standardized baselines.[44] Chief among them are getting access to data and clearly defining the types of projects to which a given test can apply.

Beyond these challenges, however, there may be situations where it is difficult to identify appropriate standard criteria. Easily specified criteria may either appear too lenient, or too strict. For example, it may seem too lenient to specify that all wind energy projects not required by law are additional; there may be too many such projects that are expected to be business-as-usual. Yet limiting the pool of eligible projects to those that are below a certain size (for example) may seem overly strict, disqualifying many legitimately additional projects.

There are several options in these situations. One is to simply err on the side of being too lenient or too strict. Another is to establish a stringent baseline emission rate that discounts the number of credits that eligible projects are allowed to receive. A third option would be to combine standard criteria with some kind of project-specific additionality determination (e.g., a barriers analysis for the project and its alternatives). Again, the appropriate option will largely depend on which one most closely aligns with clearly defined policy objectives.

Sectors Most Conducive to Standardized Additionality Tests

Because of the subjective and policy-driven nature of additionality determinations, it is difficult to come up with conclusive rules about the feasibility of standardized tests. Nevertheless, some general observations are possible for many sectors. Table 4 presents a preliminary qualitative assessment of the feasibility of standardized tests for all the project sectors and categories presented in Tables 2a and 2b. As with the assessment of standardized baseline potentials, each category is rated “Good,” “Mixed,” or “Poor” with respect to standardized additionality potential. In all cases, it is assumed that projects required by law would be considered non-additional as a standard criterion. The question is whether further standard criteria could be effectively employed to accurately and

[44] Houdashelt, et al. (2006).

consistently screen out business-as-usual (BAU) from non-BAU projects in each category.

As Table 4 indicates, there are promising project categories for the application of standardized additionality criteria in the energy, transport, industry, buildings, and waste management sectors. However, the suitability of project categories tends to vary within each sector.

Table 4. Suitability of Potential Carbon Offset Project Categories for Standardized Additionality Criteria

Sector	Conduciveness to Standardized Additionality Tests	Notes
Energy		
Improved generation efficiency	Good/Mixed	Possible on basis of least-cost, common practice, technology, or performance standard tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in many areas for many types of upgrades. Frequent updating may be required.
Improved supply and distribution efficiency	Mixed	Could be difficult to classify BAU and non-BAU activities on a standardized basis for some areas.
Fuel switching (including renewables)	Good/Mixed	Possible on the basis of least-cost, technology type (for many renewables), common practice, or project size tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU for some project types. Emissions performance standards may not be effective, especially for projects switching to zero-emission fuels (e.g., renewables). Frequent updating may be required.
Carbon capture & storage	Good	Possible on basis of least-cost, common practice, or technology tests.
Transport		
Fuel-efficient vehicles	Good/Mixed	Possible on the basis of least-cost, common practice, or performance standard tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas. Frequent updating may be reqired.
Biofuels	Good	Possible on the basis of least-cost, common practice, or “technology” (fuel-type) tests.
Switching transportation modes	Poor?	Projects generally involve unique programs to induce or promote changes in transportation choices. Additionality is generally presumed, although might need to be considered on project-specific basis.
Land-use & transport planning	Poor?	Projects generally involve unique programs designed to change transportation patterns. Additionality is generally presumed, although might need to be considered on project-specific basis.
Buildings		
Efficient lighting	Good/Mixed	Possible on the basis of least-cost, common practice, or technology tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas. Frequent updating may be required.
Efficient appliances	Good/Mixed	Possible on the basis of least-cost, common practice, technology, or performance standard tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas for some types of appliances. Frequent updating may be required.
Efficient HVAC / building design	Good/Mixed	Possible on the basis of least-cost, common practice, technology, or performance standard tests (e.g., for standard HVAC equipment, or building certification standards). May be difficult to clearly and consistently distinguish non-BAU projects from BAU for some project types.
Industry		

End-use electrical equipment efficiency	Good/Mixed	Possible on the basis of least-cost, common practice, technology, or performance standard tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas and for many project types. Frequent updating may be required.
Heat and power recovery	Mixed	May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas and for many project types.
Material recycling/ substitution	Mixed	Possible on the basis of least-cost or common practice tests. May depend on type of project.
Process emissions / non-CO_2 gases	Good	Possible on the basis of least-cost, common practice, technology, or performance standard tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas and for some types of projects.
Agriculture		
Soil carbon sequestration	Mixed/Poor	May be possible on the basis of least-cost, common practice tests. May be difficult to clearly and consistently distinguish non-BAU activities from BAU in many areas.
CH_4 reductions from livestock	Good	Possible on the basis of least-cost or common practice tests.
N_2O reductions from fertilizer	Mixed/Poor	May be possible on the basis of least-cost, common practice tests. May be difficult to clearly and consistently distinguish non-BAU activities from BAU in many areas.
Forestry		
Afforestation / reforestation	Good/Mixed	May be possible on the basis of least-cost, common practice tests. May be difficult to clearly and consistently distinguish non-BAU activities from BAU in some areas.
Forest management	Poor	Depends on type of management practice. May be possible on the basis of least-cost, common practice tests. May be difficult to clearly and consistently distinguish non-BAU activities from BAU in many areas.
Reduced deforestation	Mixed	Possible on the basis of common practice test, though "common practice" may be difficult to specify across large geographic areas.
Waste Management		
Landfill CH_4 capture	Good	Possible on the basis of least-cost, common practice, or technology tests. May be difficult to clearly and consistently distinguish non-BAU projects from BAU in some areas where methane utilization for energy is involved.
Controlled wastewater treatment	Good	Possible on the basis of least-cost, common practice, or technology tests.
Recycling / waste minimization	Mixed	Possible on the basis of least-cost or common practice tests. May depend on type of project.

Section III: Survey of Baseline and Additionality Approaches Under Existing Programs

To better understand the prospects for developing standardized offset crediting rules, it helps to review the efforts and experience of existing carbon offset programs. The largest of these programs – the Kyoto Protocol's Clean Development Mechanism – generally requires project-specific analyses. By contrast, the rules of other carbon offset programs tend to be more standardized. However, many CDM methodologies contain standardized elements, and crediting rules in other programs frequently include project-specific parameters for certain types of projects.

The following review is in part intended to suggest where greater standardization may be possible under the CDM. It also indicates where practical limits may exist to standardization for certain sectors and project categories. The review also sheds light on what sorts of institutional arrangements are necessary to successfully develop standardized crediting rules. The CDM is the only carbon offset program that was designed to establish a market in multiple countries simultaneously. Limited program resources and the need for broad applicability have strongly influenced the nature of CDM methodologies. Programs that have adopted more standardized rules have focused on smaller geographic areas and fewer project categories.

The Clean Development Mechanism

The CDM is by far the largest and most prominent carbon offset program established to date. It is designed to help industrialized countries meet their emissions commitments under the Kyoto Protocol by purchasing cost-effective, project-based emissions reductions in developing countries. The CDM is also intended to promote "sustainable development" in developing countries, through the transfer of non-polluting and less resource-intensive technologies and practices. Volumes traded under the CDM currently dwarf those of every other market for carbon offsets.[45]

The rules and procedures for the CDM were agreed under the "Marrakesh Accords" in 2001.[46] The accords lay out in broad terms the requirements for estimating baseline emissions and determining additionality for CDM projects. These broad requirements have been elaborated for specific types of projects through a set of baseline "methodologies" proposed by project developers and approved by the CDM Executive Board. There are three basic sets of CDM methodologies:

1. **Large Scale** methodologies approved for use with projects above a certain size;
2. **Consolidated** methodologies, which combine the requirements of multiple large-scale methodologies designed for similar project types; and

[45] Capoor and Ambrosi (2007)
[46] http://unfccc.int/resource/docs/cop7/13a02.pdf#page=20

3. **Small Scale** methodologies, which are simplified methodologies devised for projects that are below a certain size (e.g., they reduce fewer than 60,000 tons of CO_2-equivalent per year).

There are currently 57 large-scale methodologies (including 10 for afforestation/reforestation projects), 13 consolidated methodologies, and 29 small-scale methodologies (including one for afforestation/reforestation projects).[47]

CDM Approaches to Baseline Estimation

A preliminary survey of the CDM's large-scale and consolidated methodologies indicates that the vast majority follow a project-specific approach to estimating baseline emissions (See Appendix A). Nearly all require a project-specific analysis that identifies a baseline scenario from among likely alternatives to the project.[48] In fact, the CDM Executive Board has approved a "Combined tool to identify the baseline scenario and demonstrate additionality" that provides a procedural framework for undertaking this kind of project-specific analysis.[49] Eleven methodologies explicitly require the use of this tool to determine baseline emissions (including five consolidated methodologies), and nearly all other methodologies require an analogous set of procedures.[50]

There are at least 11 large-scale methodologies (including one consolidated methodology) that contain some standardized elements. These "hybrid" methodologies range from highly standardized approaches (e.g., where the baseline scenario is largely predefined and default emission factors are allowed)[51] to mostly project-specific approaches with some default parameters.[52]

The CDM's consolidated methodologies are "standardized" in the sense that they allow a single set of procedures to be applied to multiple types of projects with similar characteristics. However, all but one of the currently approved consolidated methodologies still requires a project-specific analysis of baseline scenario alternatives. Consolidation has mostly served to create consistent procedural requirements for similar kinds of projects, without necessarily establishing default baseline assumptions or performance standards.

[47] http://cdm.unfccc.int/methodologies/index.html
[48] Including reforestation/afforestation methodologies, although the baseline analyses generally rely on land-use projection models.
[49] http://cdm.unfccc.int/methodologies/Tools/EB28_repan14_Combined_tool_rev_2.1.pdf
[50] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html
[51] See, for example, methodology AM0001 for HFC projects, which assumes a baseline set by legal requirements and applies a performance standard maximum for HFC-23 emission rates; or methodology AM0043 for gas pipeline replacement projects, which uses a standard algorithm to estimate pipeline replacement rates along with default emission rates for leakages on different types of pipeline.
[52] See, for example, AM0026 for renewables projects in Chile, which allows some default assumptions about renewable energy emissions and emissions from hydro facilities; or AM0037 for flare reduction projects at oil and gas facilities, which allows the use of some default parameters for fugitive emission rates

By contrast, a fair amount of standardization (or streamlining of project-specific requirements) is allowed under the CDM's small-scale methodologies. Baseline emissions for different types of energy production and efficiency projects, for example, can be determined using established equipment performance standards. For many of the small-scale methodologies, simplified assumptions about baseline technologies or practices are allowed, and/or project developers can assume that the baseline involves continuation of current practices.[53] Default emission factors are allowed for many types of baseline calculations (it is not necessary to derive project-specific values). However, a project-specific analysis of baseline alternatives is still required for non-energy projects involving new facilities.[54]

More recently, the CDM Executive Board approved procedures and guidance for the registration of "programs of activities" involving multiple emissions-reducing projects.[55] In principle, this will allow multiple project activities of the same type to apply for credit under a single program, using a single set of rules. However, no such programs have yet been established, and the requirements are that each activity under a program must still follow an approved methodology (which may be a small-scale methodology). The main advantages of "programmatic" CDM rules appear to be that they allow verification of project activities through sampling, and that project activities can be added to a program at any point in time.[56]

Significantly, the Marrakesh Accords do nominally allow the CDM Executive Board to adopt standardized baseline methodologies.[57] In fact, one provision of the Marrakesh Accords allows baselines to be determined by "[t]he average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 percent of their category."[58] However, no currently approved baseline methodologies follow this particular approach. The reason most likely relates to the expense involved for project proponents to develop and apply these kinds of performance standards. For individual project proponents, it is generally easier to develop methodologies that rely on project-specific analysis than to define criteria for performance standards. Furthermore, it can be difficult to obtain the data necessary to calculate performance standard emission rates in specific regions. And although it is incumbent upon individual project developers to make these calculations, they will face little incentive to do so because others can effectively "free ride" on their work.

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[53] See for example, small-scale methodology II.C for appliance energy efficiency projects, or methodology III.C for vehicle efficiency projects (http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html). The same is true for small-scale afforestation/reforestation projects (http://cdm.unfccc.int/methodologies/SSCmethodologies/SSCAR/approved.html).
[54] EB 35 Report, Annex 35, pp. 3-4. http://cdm.unfccc.int/methodologies/SSCmethodologies/methSSC_guid06_v11.pdf
[55] EB 32 Report, Annexes 38 and 39. http://cdm.unfccc.int/EB/index.html
[56] Sutter, C., 2007. "Will It Fly?" in *Carbon Finance*, July 2007, p. 16.
[57] Paragraph (b)(v) of Appendix C to Decision 17/CP.7; see http://unfccc.int/resource/docs/cop7/13a02.pdf#page=46.
[58] Paragraph 48(c) of Decision 17/CP.7. http://unfccc.int/resource/docs/cop7/13a02.pdf#page=37.

CDM Approaches to Additionality Determinations

Paralleling the CDM's approach to baseline determinations, additionality determinations under the CDM are uniformly project-specific in nature. The Marrakesh Accords state that "[a] CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity."[59] The methodologies for large-scale projects all require some sort of structured analysis of the project and its alternatives to make this determination. The general approach is to screen the project and its potential alternatives against legal requirements; evaluate their relative implementation barriers and/or financial attractiveness; and to compare the project activity to "common practice." The project is considered additional if an alternative is determined to be a more likely option for the baseline scenario. This general approach has been codified in the CDM "additionality tool" as well as the "combined tool" for demonstrating additionality and determining a baseline scenario.[60] Notably, even some methodologies that allow a "default" assumption about the baseline scenario (to estimate baseline emissions) still require a comprehensive project-specific analysis of alternatives to demonstrate additionality.[61]

For small-scale projects, additionality determinations are somewhat less onerous. Project proponents only need to demonstrate that the project faces a significant barrier not faced by alternatives. This demonstration is still project-specific in nature, however. Under the CDM, projects are never assumed to be additional simply because they fall into certain categories or meet certain (objective) criteria.

Summary of CDM Approaches

The current set of approved methodologies under the CDM is heavily oriented towards project-specific baseline and additionality determinations. There are few methodologies that prescribe setting baseline emissions using performance standards, that allow project-developers to assume default alternatives for the baseline, or that prescribe extensive use of default emission factors and parameters for baseline activities. Only the CDM's small-scale methodologies regularly incorporate these kinds of "standardizing" elements. No CDM methodologies go so far as to establish default baseline emission rates for specific countries, regions, or circumstances. Finally, all additionality determinations under the CDM involve some sort of project-specific evaluation of alternatives.

There are important institutional reasons why the CDM is oriented towards project-specific approaches. First, the CDM was designed in principle to incorporate projects

[59] Paragraph 43 of Decision 17/CP.7. http://unfccc.int/resource/docs/cop7/13a02.pdf#page=36.
[60] Both available at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html
[61] For example, the methodology for water pumping efficiency improvements (AM0020) effectively defines a baseline scenario involving the continued use of pre-existing pumping equipment. However, project additionality must still be demonstrated using the CDM "additionality tool," which in principle requires consideration of multiple possible baseline alternatives (e.g., alternative equipment replacement or operation practices).

from any sector involving any kind of valid reduction (or removal) of GHG emissions. Practically, this meant that the CDM had to follow a "bottom up" approach to adopting methodologies. Individual project developers are responsible for proposing methodologies for new kinds of projects, which are then approved by the CDM Executive Board. Inevitably, most methodologies have been designed around the specific projects being proposed by developers. As noted above, it has generally been much easier (and attractive) for developers to design methodologies around project-specific factors than to propose standardized approaches, including performance standards.

Second, the CDM was designed to recognize projects located in any developing country that has ratified the Kyoto Protocol. This has biased the development of methodologies towards general procedures that can be applied across a wide range of country-specific circumstances. The cost (and potential political difficulty) of establishing parameters and emission rates tailored to individual countries or regions has presented a significant barrier to full standardization. Developing such standardized factors has certainly been beyond the capacity of individual project developers proposing new methodologies.

Lately, some individual countries have begun to publish standard emission factors for important categories of projects (e.g., renewable energy) by applying approved CDM methodologies within their borders.[62] This is a possible model for further "bottom up" standardization and is discussed at greater length in Section IV, below.

Other Carbon Offset Programs

A number of significant programs besides the CDM have established formal requirements for offset project baseline estimations and additionality determinations. These programs are reviewed below. Some, like the Kyoto Protocol's Joint Implementation program and the New South Wales GHG Reduction Scheme, have established full trading systems for offsets. Other programs have developed offset quantification protocols and methodologies without creating a formal market. The programs reviewed here are:

1. Joint Implementation
2. The New South Wales GHG Reduction Scheme
3. The Chicago Climate Exchange
4. The Regional Greenhouse Gas Initiative
5. The Alberta Offset System
6. The California Climate Action Registry
7. The U.S. Environmental Protection Agency "Climate Leaders" Program

[62] India, South Africa, and possibly others.

Joint Implementation

"Joint Implementation" (JI) is a sister program to the CDM. It allows the generation of offset credits for projects located in countries with national commitments under the Kyoto Protocol (i.e., industrialized or "Annex B" countries). Because emission reductions from JI projects are reflected in the national GHG inventories of their host countries, host countries must cancel/retire a Kyoto Protocol "allowance" for every JI credit they issue.[63] Countries that have submitted timely national GHG inventories and established GHG registries (among other eligibility requirements) have a fair amount of flexibility in how to account for and verify JI emission reductions. The simplified procedures for JI projects in these countries are referred to as "Track 1" procedures. Countries that do not meet eligibility criteria must have JI projects evaluated and verified by an international "Joint Implementation Supervisory Committee" (JISC). Such "Track 2" projects generally follow CDM methodologies and have similar monitoring and verification requirements. In fact, nearly all countries participating in JI are expected to meet the eligibility requirements for Track 1 (although they can still choose to follow "Track 2" procedures).[64]

Significantly, the rules for JI projects stipulate that baselines may be established "[o]n a project-specific basis *and/or using a multi-project emission factor*" (emphasis added).[65] In practice, few JI methodologies employing multi-project (performance standard) emission factors have been developed. The notable exception involves the power sector. In 2001, the Dutch government's ERUPT program published guidelines for JI projects that contained standard baseline emission factors for electricity sector projects in Central and Eastern European countries.[66] These standard emission factors were used to quantify prospective emissions reductions from candidate JI projects.[67] Although the ERUPT program has ended, these standard factors are still being used in many cases to quantify emission reductions for proposed projects in these countries.

More recently, several JI host countries have begun to develop similar standardized emission factors for electricity sector projects, using a different methodological approach from the ERUPT program. The Ukrainian government, for example, helped commission the development of a set of standardized baseline emission factors for Ukraine, derived using a CDM methodology.[68] Similar efforts have been undertaken in Bulgaria and the

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[63] Without such cancellation, each ton of reductions would get counted twice – once in the form of a freed up allowance (called an "Assigned Amount Unit"), and once in the form of the JI credit (or "Emission Reduction Unit").
[64] Karousakis (2006).
[65] Paragraph 2(a), Annex B of Decision 9/CMP.1. http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=12
[66] Ministry of Economic Affairs of the Netherlands (2004). The Emission Reduction Unit Procurement Tender (ERUPT) program was established by the Dutch government as a pilot effort to support the development of JI projects and establish contracts for JI emission reductions credits.
[67] Project developers in fact had the option of using these standard emission factors, or developing project-specific factors. See Van der Gaast (2006a).
[68] Global Carbon B.V. (2006).

Czech Republic.[69] Some observers have encouraged the JISC to coordinate the development of multi-project baselines, but so far the JISC has not undertaken this work.[70]

With respect to additionality, the Kyoto Protocol JI guidelines require that emission reductions from JI projects must be verified as "additional to any that would otherwise occur."[71] In practice, this has generally meant applying CDM additionality tests for "Track 2" projects. Countries eligible for "Track 1" status have the leeway in principle to specify more standardized additionality criteria. Nevertheless, most JI projects developed to date have followed some type of project-specific procedure to demonstrate additionality.[72] There have been general proposals to allow automatic additionality determinations for certain types of JI projects (e.g., renewables), but these have yet to be codified and adopted.[73]

The New South Wales GHG Reduction Scheme

The New South Wales Greenhouse Gas Reduction Scheme (GGAS) in Australia began operation in 2003. GGAS requires electricity retailers in the state of New South Wales to meet mandatory targets for greenhouse gas emissions associated with the production of the electricity they supply.[74] Retailers must in effect reduce the average emissions intensity of the electricity they supply, which they can do by purchasing tradable GHG "abatement certificates" (also known as NSW Greenhouse Abatement Certificates, or NGACs), or by purchasing renewable energy certificates (RECs).[75]

NGACs are functionally equivalent to carbon offset credits, and are created through specific activities that reduce GHG emissions. Qualifying activities include:[76]

- Improving the efficiency of residential, commercial, and industrial electricity use;
- Improving electricity generation efficiency;
- Generating electricity from low GHG-intensity sources (e.g., renewables);
- Using captured methane to generate electricity;
- Reforestation or afforestation; and
- Reductions in emissions from certain industrial processes.

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[69] In partnership with the Danish government, Bulgaria has developed revised standard emission factors (see Van der Gaast, 2006b). In 2004, the World Bank sponsored a project to develop standardized power sector baselines for the Czech Republic (http://unfccc.int/cooperation_and_support/capacity_building/items/4086.php).
[70] See, for example, Van der Gaast (2006a).
[71] Decision 9/CMP.1. http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=7
[72] This was the approach under the ERUPT program, for example. See Ministry of Economic Affairs of the Netherlands (2004).
[73] For example, see World Bank Carbon Finance Unit (2006).
[74] Certain industrial electricity consumers are also assigned targets based on the electricity the use.
[75] See http://www.greenhousegas.nsw.gov.au/default.asp.
[76] http://www.greenhousegas.nsw.gov.au/acp/acp_overview.asp

GGAS has taken a "top down," standardized approach establishing baselines in these project categories. GGAS rules prescribe in detail how to calculate baseline emission rates for activities involving improvements to electricity consumption and generation. Default benchmarks and emission factors are used as much as possible, complemented with project-specific data where appropriate (e.g., to determine historical generation or consumption rates at the project site). For industrial processes, detailed methods are prescribed for effectively determining a baseline scenario and calculating associated baseline emissions. For reforestation/afforestation activities, project participants may assume that lands would have remained un-forested in the baseline scenario.

Additionality determinations are also fully standardized. GGAS does not require separate additionality tests or demonstrations. Instead additionality is presumed for any qualifying activity that reduces GHG emissions below baseline levels, as calculated under predefined rules. (The rules exclude reductions that are required by statute.)

GGAS is an example of a system that has applied a fully standardized approach to offset crediting. There are several reasons GGAS was able to do this. First, the rules were developed upfront by a central team of regulators; the system did not have to rely on individual project proponents to develop and propose methodologies. Second, rules were developed for a limited number of project categories particularly amenable to standardized baseline and additionality determinations. Third, the system was designed to apply to projects within a limited geographic area (New South Wales), for which data were readily available and within which conditions are relatively stable and homogeneous. It should be noted that GGAS baselines for efficiency projects are still primarily linked to project-specific measurements of historical consumption or generation.

The Chicago Climate Exchange

The Chicago Climate Exchange (CCX) is a voluntary GHG emissions trading system located in North America. While participation in the CCX is voluntary, participants take on a collective binding commitment to reduce their GHG emissions to six percent below 1998-2001 levels by 2010. Members of the CCX can meet their obligations by reducing emissions internally, purchasing allowances from other participants, or by purchasing CCX offset credits. The CCX has established a program for standardized crediting of offsets from projects in the following categories:

- Agricultural methane
- Agricultural soil carbon
- Forestry carbon
- Landfill methane
- Renewable energy
- Coal mine methane
- Rangeland soil carbon
- Ozone-depleting substance destruction

Like GGAS, CCX rules for estimating baseline emissions and quantifying GHG reductions are specified in detail for each type of eligible project activity. Standardized parameters and emission (or sequestration) factors are used wherever possible. For example, conservative standard factors are used to estimate baseline emissions for renewable energy projects and to estimate baseline soil and forest carbon sequestration;[77] likewise, baseline emissions for agricultural methane projects are derived using a default "per animal" emission factor.[78] For some types of projects, limited project-specific data are required. Baselines for large reforestation projects, for example, are determined by measured site-specific carbon levels prior to the start of the project.[79] Projects are primarily located in the United States, although some are located in other countries, including Canada, Mexico, China, Brazil, Germany, and Costa Rica.[80]

The CCX will also recognize offset reductions from energy efficiency and fuel switching projects (and possibly other types of projects). However, baseline emissions for these types of projects are determined on a project-specific basis.[81]

Determination of additionality for CCX projects is similar to GGAS in the sense that it is largely based on standardized eligibility and baseline criteria. CCX rules establish project eligibility criteria requiring that projects be new, beyond regulation, and/or that they involve uncommon practices. In addition, each project undergoes review by the CCX Offset Committee, where additionality is explicitly considered (although not using a formal methodological framework).

Like GGAS, the CCX has developed standardized offset rules using a "top down" approach, with dedicated technical staff focusing on a limited number of sectors within a constrained (though much broader) geographic region. The CCX is notable for the extent to which it has adopted standard factors to estimate baseline emissions for many project types. To compensate for potential inaccuracies, these factors are in most cases very conservative.[82]

The Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a regional GHG cap-and-trade program currently under development in the Northeast United States. The program will establish a regional cap on power plant emissions from 2009 through 2018. Each power plant covered by the program will initially be allowed to cover up to 3.3 percent of its

[77] http://www.chicagoclimateexchange.com/content.jsf?id=244 and http://www.chicagoclimateexchange.com/content.jsf?id=781.
[78] http://www.chicagoclimateexchange.com/content.jsf?id=103
[79] http://www.chicagoclimateexchange.com/content.jsf?id=242
[80] http://www.chicagoclimateexchange.com/offsets/projectReport.jsf
[81] http://www.chicagoclimateexchange.com/content.jsf?id=23
[82] For example, U.S. renewable energy projects are credited at a rate of 0.4 tons of CO_2 per megawatt-hour of generation, which is well below marginal emission rates in most parts of the country.

emissions using carbon offset credits. This limit will be increased if the price of RGGI allowances rises above certain thresholds ($7 and $10).

The Model Rule for the RGGI program (which is currently being adopted and enacted by each member state) specifies baseline estimation methods for offset projects in five categories:

- Landfill methane capture and destruction
- Agricultural methane capture and destruction
- Electric utility sulfur hexafluoride (SF_6) reductions
- Afforestation
- End-use thermal energy efficiency (reducing use of oil, gas, or propane)

Like GGAS and CCX, the RGGI offset program provides largely standardized approaches to estimating baseline emissions. Project proponents will not have to undertake any project-specific analysis of baseline alternatives. However, most of the prescribed baseline estimation methods include significant project-specific parameters. Baselines for afforestation, $SF_{6,}$ and energy efficiency projects, for example, must be estimated using site-specific historical measurements.[83] Agricultural methane project baselines are also calculated using site-specific data.[84]

RGGI will also apply standardized additionality tests in the form of eligibility requirements. Eligible projects cannot be required by law, and cannot be the recipients of any public funding or revenues from other environmental credit sales (e.g., renewable energy certificates).[85] In addition, SF_6 and energy efficiency projects must meet pre-specified performance standard criteria in order to eligible, which function as an implicit additionality screen.[86] No project-specific demonstrations of additionality are required.

The RGGI offset program will be “top down” and largely standardized. In order to maintain accuracy across a potentially wide range of projects (especially in end-use energy efficiency) and in many different locations (potentially anywhere in the United States), the program’s baseline estimation methods incorporate some significant project-specific parameters and measurements

The Alberta Offset System

In April 2007, the Canadian province of Alberta passed legislation requiring industrial facilities emitting over 100,000 tons of GHG per year to reduce their emissions intensity to 12 percent below the facility’s average emissions intensity from 2003-2005. New facilities must reduce their intensity by two percent per year after their third year of operation. Reductions can be achieved through internal operational efficiency

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[83] RGGI Model Rule, pp. 120, 125, and 138. http://www.rggi.org/modelrule.htm
[84] RGGI Model Rule, pp. 147-148. http://www.rggi.org/modelrule.htm
[85] RGGI Model Rule, pp. 105-106. http://www.rggi.org/modelrule.htm
[86] RGGI Model Rule, pp. 117-118 and 133-137. http://www.rggi.org/modelrule.htm

improvements, contributions into a climate change Technology Fund, or the purchase of offsets. Under this legislation, Alberta offsets are viewed as a compliance tool and it is not anticipated that companies will be allowed to trade offset credits amongst themselves.

To facilitate compliance, the Albertan government has collaborated with industry to develop various offset project protocols. To date, 15 protocols have been completed specifying how to estimate baseline emissions and quantify GHG emission reductions projects in different categories. Many of these protocols cover projects in the agriculture sector (e.g., livestock methane emissions, soil carbon sequestration, methane reductions from organic waste decomposition, biofuels, etc.). Protocols have also been developed for enhanced oil recovery projects, waste-heat recovery, energy efficiency, and afforestation projects.[87] All the protocols were developed following the basic requirements of the ISO 14064, Part 2 standard.[88]

Most of the baseline estimation methods in the protocols are standardized to some extent. For example, they all specify a standard "baseline condition" for projects (usually the continuation of current activities). Project developers do not need to identify a baseline scenario from among plausible alternatives. However, similar to the RGGI program, most of the protocols require the extensive use of project-specific parameters in order to calculate baseline emissions. These parameters are necessary in most cases to account for variations in project-specific conditions. Required use of project-specific data and measurements is generally more extensive than under RGGI offset rules, reflecting in part the difficulties of standardizing baseline estimates in the sectors targeted by the Alberta program (e.g., agricultural sector projects and various types of energy efficiency).

The Alberta program does not apply any explicit additionality tests. To be eligible, projects must have started after January 1, 2002 and cannot be required by law. In effect, these eligibility criteria function as a limited, standardized additionality screen.

The California Climate Action Registry

The California Climate Action Registry (CCAR) is a voluntary greenhouse gas registry designed to allow companies and organizations with operations in California to inventory and report their GHG emissions. Although CCAR is focused on registering entity-level GHG emissions, it is in the process of developing protocols for quantifying and reporting GHG removals and reductions from individual projects. CCAR has not established a carbon offset program as such, since it does not issue offset "credits" or retire project-based reductions against any obligations. CCAR has so far published offset project protocols for two sectors: forestry (which includes reforestation, forest management, and forest conservation projects) and agricultural methane capture and destruction.

[87] http://www.carbonoffsetsolutions.ca/offsetprotocols/finalAB.html
[88] http://www.iso.org/iso/catalogue_detail?csnumber=38382

In developing its offset protocols, CCAR has sought to adopt standardized approaches. Its protocol for forestry projects, for example, links baseline conditions to mandatory forest management laws and regulations where applicable. However, both the forestry and agricultural methane protocols include significant project-specific elements in their baseline estimation procedures. For forestry projects, developers are still required to provide a “qualitative characterization” of “what would have occurred … in the absence of the project.”[89] For agricultural methane projects, the baseline is assumed to be the “continuation of current practice,” but baseline emissions are calculated using project-specific data and information.[90] Project-specific elements are necessary in both cases to ensure accuracy given the significant variations that are possible in baseline conditions for these sectors, the variations in possible projects types (especially for forestry), and broad geographic coverage (the agricultural methane protocol can be applied to projects throughout the United States).

CCAR has also sought to adopt explicit standardized additionality criteria under its protocols. Forestry projects are considered additional if they differ from their baseline characterizations and go beyond the requirements of forestry laws and regulations.[91] Agricultural methane capture projects are automatically considered additional as long as they are not required by law. This criterion is based on a “performance standard” technology review concluding that biogas control systems are not common practice throughout the United States.[92]

The U.S. EPA Climate Leaders Program

“Climate Leaders” is a voluntary industry-government partnership program run by the U.S. Environmental Protection Agency. Its goal is to help companies develop long-term comprehensive climate change strategies. Partners set a corporate-wide GHG reduction goal and inventory their emissions to measure progress. The Climate Leaders program is focused on entity-wide accounting and reporting, but EPA is in the process of developing rules under the program for offset project accounting and reporting. These rules will allow partner companies to report GHG reductions associated with specific projects as part of their overall GHG reduction efforts. Such projects must be outside the boundaries of the reporting company.

EPA is developing and road-testing a set of eight offset project accounting methodologies. The methodologies will cover the following types of projects:

- Afforestation
- Commercial boilers
- Industrial boilers
- Landfill methane

[89] CCAR Forest Project Protocol, Version 2.1, p. 17. http://www.climateregistry.org/PROTOCOLS/
[90] CCAR Livestock Project Reporting Protocol, pp. 11-18. http://www.climateregistry.org/PROTOCOLS/
[91] CCAR Forest Project Protocol, Version 2.1, p. 5. http://www.climateregistry.org/PROTOCOLS/
[92] CCAR Livestock Project Reporting Protocol, p. 4. http://www.climateregistry.org/PROTOCOLS/

- Manure management (agricultural methane)
- Reforestation
- SF_6 Repair and Replacement
- Bus fleet upgrades

Draft methodologies are currently available for boiler, landfill methane, manure management, and bus fleet upgrade projects.

EPA has deliberately attempted to apply a "performance standard" approach to baseline estimation and additionality determinations for offset projects. For example, baseline emissions for new commercial boilers are determined by a standard CO_2 emission rate reflecting better-than-average performance for U.S. boilers.[93] The same approach is used for projects involving deployment of efficient new bus fleets.[94]

Project-specific parameters and data are still used where appropriate. Baseline emissions for retrofit projects, for example, are set according to historical pre-project measurements.[95] Baselines for methane capture projects are assumed to involve the continuation of prior practices, with baseline emissions calculated using project-specific data.[96] For industrial boiler projects, baseline emissions are calculated according to site-specific engineering specifications, assuming that certain standard equipment is installed (i.e., a non-condensing economizer).[97]

The Climate Leaders protocols are notable for their approach to additionality determinations, which are linked explicitly to performance standard thresholds. Commercial boiler and bus fleet upgrade projects, for example, are considered additional if their GHG emission rates are below pre-specified thresholds (representing better-than-average performance). Methane capture and industrial boiler projects are considered additional if they involve the application specific technologies considered to be beyond "business as usual."

The offsets component of the Climate Leaders programs is still in its early stages. Like other programs adopting standardized approaches, Climate Leaders is adopting protocols developed by program staff, for a limited set of project types, and that apply within a limited geographic area (in this case, the United States). Current project categories were selected largely based on their suitability for applying "performance standard" baselines and additionality thresholds. Notably, even following a highly standardized approach, the Climate Leaders protocols rely on some project-specific data in most cases for baseline estimations.

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[93] http://www.epa.gov/stateply/docs/CommBoilerProto.pdf
[94] http://www.epa.gov/stateply/docs/TransitProtocol.pdf
[95] For both boiler and bus fleet upgrades.
[96] http://www.epa.gov/stateply/docs/ClimateLeaders_DraftManureOffsetProtocol.pdf and http://www.epa.gov/stateply/docs/ClimateLeaders_DraftLandfillOffsetProtocol.pdf
[97] http://www.epa.gov/stateply/docs/IndustrialBoilerProtocol.pdf

Section IV: Potential and Prospects for Greater Standardization

As the survey in Section III indicates, most current or developing carbon offset programs have adopted relatively standardized baseline and additionality rules. The CDM and JI programs are the major exceptions. At the same time, the CDM and JI form by far the largest segment of the global carbon offset market. They are likely to strongly influence the shape of the international carbon offset market going forward, even under a possible successor regime to the Kyoto Protocol. Because of this, it makes sense to consider the prospects for greater standardization at an international level under these programs – in particular under the CDM.

On a general level, the analysis in Section II suggests that several categories of offset projects might be particularly suited for both standardized baselines and standardized additionality tests. These categories are presented in Table 5.

Table 5. Offset Project Categories Most Suited to Fully Standardized Crediting

Project Category	Suitability for Standardized Baselines	Suitability for Standardized Additionality Tests
Process emissions / non-CO_2 gases	Good	Good
Landfill CH_4 capture	Good	Good
Carbon capture and storage	Good(?)	Good
Improved generation efficiency	Good	Good/Mixed
End-use electrical equipment efficiency	Good	Good/Mixed
Efficient Appliances	Good	Good/Mixed
Fuel-efficient vehicles	Good	Good/Mixed
CH_4 reductions from livestock	Good/Mixed	Good
Controlled wastewater treatment	Good/Mixed	Good
Fuel-switching / Renewables	Good/Mixed	Good/Mixed
Biofuels	Mixed	Good
Efficient Lighting	Mixed	Good/Mixed

Notably, several of the project categories in Table 5 are important for their potential to advance "sustainable development" in developing countries (e.g., energy supply and energy efficiency projects). Under the CDM, these sectors are attracting less total investment than other sectors, in many cases due to high relative transaction costs.[98] These project types may be good targets for standardized baseline methodologies and additionality tests to the extent greater standardization could reduce transaction costs and attract more investment. The question is how feasible the adoption of standardized approaches in these sectors would be, notwithstanding their theoretical suitability.

Practical Limitations

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[98] Capoor and Ambrosi (2007).

While the sectors in Table 5 may be good targets, it is important to keep in mind the main practical challenges to standardization identified in Section II. As previous studies have noted, the energy supply infrastructure in many developing countries can be diverse and heterogeneous.[99] The same goes for circumstances related to end-use energy consumption. Furthermore, these circumstances often go hand in hand with political and economic uncertainties.[100] Partly as a result, the availability of data on which to construct valid and credible standardized baselines may be limited. Thus, even for sectors where standardization is generally a viable option, local circumstances in many areas may make standardized baselines and additionality tests difficult to develop.

A related challenge is that even where access to data is good, a fair amount of disaggregation may be necessary to ensure the accuracy of standardized baselines and additionality tests. Accurate baseline emission factors for electricity projects, for example, must generally be developed for each separate power grid – and in many cases should be differentiated by projects' operational characteristics, e.g., whether they provide baseload or load-following power, and whether their power is firm or intermittent.[101] Standard emission factors based on national political boundaries will not be viable in some cases.[102] Furthermore, while the standardization potential may be high for projects involving individual kinds of end-use electrical appliances, for example, the sheer number of possible appliances and end-uses can make the development of performance standards for this entire sector seem daunting. An alternative is to adopt "hybrid" standards that incorporate project-specific elements in order to broaden their applicability. In fact, the experience of existing carbon offset programs suggests that the adoption of hybrid methods is often the most feasible approach.

Lessons From Current Carbon Offset Programs

The experience of non-Kyoto carbon offset programs reveals some important insights into the requirements, potential, and possible limitations of standardized offset crediting. Key points include the following:

- *Non-Kyoto programs have generally focused on a limited number of project categories*. In general, these categories have been particularly amenable to standardized baseline and additionality determinations. Common project categories include landfill methane destruction; commercial and industrial end-use energy efficiency; renewable energy; reduction of industrial process emissions (including destruction of non-CO_2 gases); and agricultural (livestock) methane destruction. These are all categories found in Table 5. Another common category is afforestation/reforestation projects. Programs have applied standardized rules to these sectors by focusing on specific geographic regions,

[99] Joint Implementation Network (2003), p. 76.
[100] Joint Implementation Network (2003), p. 76.
[101] WRI/WBCSD (2007).
[102] Joint Implementation Network (2003), p. 78.

forest types, and/or by relying to a significant extent on project-specific baseline parameters.

- *Non-Kyoto programs have generally defined baseline and additionality rules for limited and clearly defined geographic areas*. All of the non-Kyoto programs surveyed are administered in the United States, Canada, or Australia. Almost every program has designed its offset crediting rules specifically for projects located in these countries (or individual states or regions within these countries). These are all areas for which data are readily available and within which conditions are relatively stable and homogeneous. The one exception is the Chicago Climate Exchange, which recognizes offsets on a limited basis located in other countries. For these projects, the CCX has adopted either very conservative baseline assumptions, and/or conducted project-specific reviews.

- *Under non-Kyoto programs, rules were generally developed upfront by a central team of regulators*. All of the non-CDM programs have essentially been "top down" in their development of baseline and additionality rules; they did not rely on individual project proponents to develop and propose methodologies. In most cases, protocols were developed in consultation with stakeholders in targeted sectors. The extent of such consultation has varied, however. Some programs developed their rules mostly with "in-house" technical staff. Others, like the Alberta program, have developed protocols in direct collaboration with outside experts and industry.[103] This collaborative approach may be one reason that the Alberta program has been able to develop protocols for a greater number of project categories than other programs in a fairly short time period.

- *Programs differ in the degree of standardization*. Nearly all non-Kyoto programs eliminate the need to identify a "baseline scenario" from among various alternatives; generally a single baseline option is (implicitly or explicitly) assumed. However, programs have differed in the extent to which they specify standard emission factor baselines versus adopting "hybrid" approaches. Programs like the Chicago Climate Exchange and Climate Leaders have emphasized the development of "performance standard" baselines. The tradeoff for greater standardization is generally less accuracy – and greater conservativeness – in baseline estimates. Other programs have opted for less standardization and a reliance on more project-specific data and analysis. This has allows for more precise baseline estimates – and in some cases, more broadly applicable baseline methods – at the expense of requiring more project-specific data and analysis.

- *Even for programs where standardization has been a priority, many protocols still incorporate project-specific data and measurements*. None of the non-Kyoto programs has adopted baseline estimation rules that are fully standardized for all project types (i.e., based solely on standard emission rates and/or on the

[103] http://www.offsetsgroup.ca/

performance of a "typical" baseline technology). In fact, for most project-types, existing programs have found it expedient to develop "hybrid" baselines that include at least some project-specific elements. Reasons for this have varied. For some sectors, some project-specific data are simply necessary to accurately estimate baseline emissions (e.g., many retrofit projects; landfill methane capture projects). For others sectors, creating standard benchmarks on a technology-by-technology basis would be extremely time-consuming and resource intensive. This is especially true for sectors like energy efficiency, where standardization potential is high but generally only within narrowly defined project/technology categories. Program designers have frequently opted to include project-specific elements to broaden the applicability of baseline estimation protocols and reduce the costs of developing them.[104]

- *Most non-Kyoto programs have adopted standardized approaches to additionality, but their effectiveness is unclear*. While many programs effectively have standardized additionality tests, it is not clear in many cases how much consideration has gone into their design. In particular, many programs do not seem to have explicitly designed their criteria around expectations about how well the criteria: (1) screen out business-as-usual projects; and (2) minimize exclusion of truly additional projects. In fact, several of these programs have no explicit additionality rules at all, even though their eligibility criteria function as proxies for additionality (e.g., GGAS, the Alberta Program, and the Chicago Climate Exchange). The effectiveness of standard additionality criteria adopted under current programs should be a subject for further study and review.

Prospects for Greater Standardization Under the CDM

The general practical limitations to standardized crediting, along with the experiences of other carbon offset programs, suggest that standardization of offset rules at a global level will be difficult to achieve. Nevertheless, there are some ways in which greater standardization might progress under the current structure of the CDM. Discussed below are some key obstacles to CDM standardization, as well as possible options for moving forward.

Obstacles to Standardization

As noted in Section III, the CDM was established under very different institutional and programmatic constraints than most of the other offset programs discussed above. The CDM was designed to apply across multiple developing countries and include nearly any type of project. Limited resources and the need for broad applicability have necessitated a "bottom up" approach to developing methodologies, and the result has been a system oriented towards project-specific baselines and additionality determinations.

[104] For example, see the RGGI and Alberta Program protocols for energy efficiency projects.

On top of these structural constraints, lack of sufficient data may be a real impediment to the adoption of standardized approaches in many areas of the developing world. Even if more methodologies were adopted around which standardized baseline emission factors could be developed, for example, it is not clear how widely they could be applied. This is a shortcoming that could be overcome to some extent by the establishment of new institutions for facilitating the development of standardized methodologies (discussed in the next sub-section). However, even if more standardized methodologies were developed, there may large geographic areas for which their application would be difficult. This could have significant equity implications if countries able to apply standardized methods were able to attract greater investment as a result. (Possible alternatives – developing "universal" standards that would apply uniformly across many countries, for example – would most likely result in baseline estimates that are too inaccurate to be credible.)

Finally, the experience of other carbon offset programs suggests that full standardization of baseline estimates is unrealistic. Nearly every program to date has followed a "hybrid" approach and relied on some project-specific parameters for many sectors. The same will undoubtedly be true for any efforts to pursue greater standardization under the CDM.

Options for Greater Standardization of Baselines

Despite the obstacles, there are some ways in which it is possible to imagine the CDM moving incrementally towards greater standardization. One possibility is the elaboration of standard emission factors or parameters for specific sectors and countries, based on the application of current CDM tools and methodologies. As noted in Section III, this is already happening for grid-connected electricity projects in JI countries and in some CDM countries. The establishment of standard grid emission factors is a logical development, since the same emission factors naturally apply to any project of the same type on the same electricity grid. However, it may be possible to develop standardized emissions factors – or at least default parameters – for other project types as well, using already-approved baseline methodologies. Under this approach, some standardization could evolve organically out of the current set of mostly project-specific methodologies. This is a relatively "low risk" strategy that could be encouraged, for example, by capacity-building efforts for CDM host country governments – very similar to efforts currently underway in JI countries targeting the electricity sector.

Another incremental option would be to systematically look for ways to streamline existing baseline methodologies. The Marrakesh Accords explicitly allow for the CDM Executive Board to propose "specific guidance" on "[t]he appropriate level of standardization of methodologies."[105] So far, such guidance has primarily taken the form of consolidated methodologies (still largely project-specific), small-scale methodologies, and various methodological "tools." However, with experience gained from the approval of significant numbers of actual projects in many sectors, it may be possible to identify

[105] Paragraph (b)(v) of Appendix C to Decision 17/CP.7; see http://unfccc.int/resource/docs/cop7/13a02.pdf#page=46.

areas where methodological steps could be streamlined (e.g., by allowing the automatic selection of default, conservative baselines), or where default emission factors could be applied without greatly sacrificing accuracy.

A third and more significant step towards standardization would be to encourage development of methodologies incorporating performance standard baselines, following the approach allowed under Paragraph 48(c) of the Marrakesh Accords.[106] Given the difficulties and disincentives faced by individual project developers in developing such methodologies (described in Section III), this approach would probably require the active establishment and promotion of separate institutions capable of developing them. Possible options for such institutions are discussed in the next subsection.

Finally, some standardization of baselines (and additionality tests) may be possible under the CDM's new provisions for crediting reductions under "programs of activities." As mentioned in Section III, however, current "programmatic CDM" rules still require the application of existing (mostly project-specific) methodologies to individual program activities. Fully realizing the potential of programmatic CDM will probably require the development of more streamlined methods for evaluating individual activities.

Options for Standardized Additionality Tests

In the longer term, CDM stakeholders could consider allowing at least some standardized additionality determinations. Several approved CDM baseline methodologies are "quasi-standardized" to the extent that they are valid for only one possible baseline scenario alternative (usually the "continuation of current practice").[107] However, they still require a project-specific analysis to determine that this "default" alternative is appropriate for individual projects. The crediting process for such projects could be greatly streamlined if standardized, objective criteria could be used instead to identify individual projects for which the "default" baseline is valid. In fact, this is the approach followed by most non-Kyoto carbon offset programs. Standardized additionality tests may work well for other project types as well, in particular those falling into the categories identified in Table 5.

The prospects for adopting standardized additionality tests under the current CDM are somewhat unclear. The language of the Marrakesh Accords (i.e., projects are additional if emissions are "reduced below those that would have occurred in the absence of the registered CDM project activity") could be interpreted as requiring a project-specific determination, or at least a determination explicitly linked to an identified baseline. So far, no approved methodologies (including small-scale methodologies) allow a determination of additionality based simply on categorical criteria. Furthermore, although most non-Kyoto offset programs have adopted standardized additionality tests, the design

[106] Paragraph 48(c) allows the construction of baselines using "[t]he average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category."
[107] See, for example, approved methodologies 18, 20, 35, and 59; as well as consolidated methodologies 7 and 11. http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

of these tests has frequently not been very sophisticated. This may be an area for further exploration and development as the CDM and other carbon offset programs evolve, perhaps under a post-2012 international regime.

Institutional Options for Promoting Greater Standardization

Regardless of how further standardization is achieved at a global level, a key question is which institutions could undertake the necessary work, and from where they might get sufficient resources. Developing standardized baselines requires considerable amounts of upfront data collection and analysis. Institutions must be capable of both developing standardized baselines and updating them over time. Furthermore, because of the policy questions involved in deciding the stringency of baselines and additionality tests, institutional processes should be transparent and accountable to the programs under which they operate.

Successful institutional models to date have involved official (or quasi-official) government entities with limited jurisdictions, designing standard baseline and additionality rules that apply primarily *within* those jurisdictions. Examples include the New South Wales GGAS, RGGI, CCAR, Climate Leaders, and the Alberta Offset Program. These programs have been able to focus on limited geographic areas, and limited project categories, for which data are generally readily available.

At an international level, the question is whether the "local" model adopted by smaller programs can be replicated and expanded. The challenge is to create a globally robust and consistent institutional framework, most likely a network of institutions whose efforts are coordinated. In establishing such a network, two sets of issues must be addressed: (1) capacity and resources; and (2) coordination and accountability.

Capacity and Resources

As noted in Section II, developing standardized baselines requires access to accurate data. Solid information is required about the range of technologies and practices available within relevant geographic regions, the performance and/or emissions rates of those technologies, and general economic, political, and social conditions driving the use of technologies. Gathering these kinds of data will generally require the involvement of multiple institutions, including:[108]

- National statistical offices
- Industry associations
- Local or international research institutes
- International organizations (e.g., OECD/IEA, World Bank)

For some sectors, such as forestry and land-use, the involvement of local "on-the-ground" institutions may be required.

[108] Joint Implementation Network (2003), pp. 118-119.

A key question is which organizations are best positioned to coordinate data collection and compile it for the purpose of developing standardized baselines and additionality criteria. For a number of reasons, national government offices seem a logical choice. They are often most likely to be already collecting the right kinds of data, and may be best positioned to coordinate the data collection efforts of other organizations. Where standardized approaches are being developed on a sectoral basis or across multiple countries, however, industry associations or international organizations may be better positioned.

Obtaining data is clearly easiest where they are already being collected for other purposes. Where data are not being collected, resources will be needed to establish new institutions or build the data-collection capacity of existing institutions (e.g., within national governments). As noted in Section III, bilateral capacity-building exercises of this nature are already enabling the development of standardized electricity sector baselines in some Joint Implementation countries. In principle, similar government-to-government capacity-building efforts could be undertaken on a larger scale for other sectors and in developing countries.

Another option for bringing resources to bear is for governments to collaborate with international organizations and industry associations. The Alberta Offset Program, for example, has enlisted the support of industry in developing its set of baseline protocols, which has enabled it to quickly adopt rules for a relatively large number of project types. The World Business Council for Sustainable Development's Cement Sustainability Initiative has been working for several years to develop a set of proposed "performance standard" baselines for offset projects in the cement sector. As long as such efforts are effectively coordinated and sufficiently transparent, they can be an effective way to support the development of standardized approaches in an international context.

Coordination and Accountability

Aside from questions about who *can* undertake development of standardized offset crediting approaches, another important set of considerations concerns who *should* undertake it in the context of a global carbon offset market. The primary concern is that standardized baselines and additionality rules should be consistent – and reflect similar levels of stringency – wherever they are applied. This is much easier to achieve under smaller programs with limited geographic and sectoral coverage than it is in under a global program. Two related concerns arise: coordination and accountability.

Coordination is necessary to ensure the consistent development and application of standardized crediting rules. Where different local institutions are allowed to independently adopt their own rules, they are likely to pursue different approaches. Furthermore, they will have an incentive to be less stringent and allow over-crediting in order to attract greater investment. To maintain consistent and appropriate levels of stringency, a coordinated international process is required. Realistically, this probably means a single institution should oversee the development of high-level standardized baseline methodologies and additionality tests. The same institution should approve the application of these methodologies and tests in individual sectors or countries, regardless of which institutions (e.g., host country governments, international organizations) carry out their application.

Accountability in the development of standardized crediting rules is also important. Given the policy questions that inevitably arise related to baseline stringency and additionality objectives (discussed in Section II), close consultation is necessary with the public bodies responsible for creating the global offset market. This includes international regulatory bodies as well as other stakeholders including industry, international organizations, and environmental groups. Data collection, baseline development methods, and the establishment of additionality criteria should be as transparent as possible in order to encourage stakeholder input and feedback.

Institutional Options in the Context of the CDM and JI

How might the considerations above be addressed in the context of the Kyoto Protocol's offset programs, the Clean Development Mechanism and Joint Implementation? The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol have established international institutions that should be capable of coordinating standardization efforts and ensuring accountability (e.g., the CDM Executive Board, the CDM Methodology Panel, and the Joint Implementation Supervisory Council). The main question is how standardization efforts should be encouraged, promoted, and funded. Cooperation with other international, national, and sub-national institutions will be necessary. The appropriate mix of institutions, however, will depend on what kinds of standardization are pursued.

Under an incremental approach, where individual country emission factors are established using currently approved methodologies for example, new institutional arrangements would probably not be necessary. Instead, the primary concern would be ensuring that national governments have the capacity to compile, publish, and update baseline emission factors (or other standard baseline parameters) for different project types. Scaled-up efforts along the lines of current capacity-building efforts in JI countries could be pursued, ideally using multilateral funding sources. Alternatively, international organizations or research institutes could be supported to conduct this type of work, in collaboration with host country governments.

Similarly, incremental efforts to streamline existing methodologies (as described in the previous subsection), could most likely be conducted under the auspices of the CDM Methodology Panel. The Methodology Panel would probably require additional resources to undertake a full review of existing methodologies and identify options for standardization. This work could be assisted by other international, national, or local organizations where "standard" options are likely to vary by region, country, or sector.

Unlike incremental approaches, the development of new standardized baseline methodologies (e.g., incorporating performance standards), would probably require new institutional arrangements and/or the deployment of significant additional resources. As indicated in Section III, it is unlikely that such methodologies can be developed by individual project developers under the current "bottom up" system. However, there are several possible models for how they could be developed:

- *By the CDM Methodology Panel*. Under this approach, the Methodology Panel would require significant new staff and resources to develop new methodologies.
- *By national governments*. Host country governments could in principle develop and propose standardized baseline methodologies for specific sectors. To do so, most governments would need to devote significant resources – and there would still be incentives to "free ride" on the work of other governments or institutions. Because of this, and the need for coordination and accountability, the CDM Executive Board (or other UNFCCC institutions) would probably need to provide technical and funding support for these efforts.
- *By industry associations*. Some industries have already begun exploring standardized crediting methods on a voluntary basis, including the development of performance standard baselines (e.g., the Cement Sustainability Initiative). However, the progress of these efforts has been slow, and constrained to only a very few (if significant) sectors. To succeed, industry efforts will likely have to be supplemented with technical support and coordination from official CDM bodies.

Finally, even where standardized baseline methodologies are developed, additional funding and resources will most likely be necessary to facilitate their application in multiple countries. As noted previously, there may be large areas for which their application would be difficult. Coordinated efforts would be required to overcome data constraints and ensure that standardized baseline methods are applied and implemented equitably.

Section V: Conclusions and Recommendations

Standardizing offset crediting rules is not without challenges. If baseline estimates and additionality determinations are to be fair and accurate, there are limits to how much standardization is possible for many project types. Developing standardized approaches requires access to data and a significant investment of resources. The potential benefits of standardization, however, are compelling. They can reduce transaction costs for project developers, alleviate uncertainties for investors, and increase the transparency of regulatory decisions. Ultimately, these advantages can enable offset markets to attract more investment and have a larger impact on emission reductions and sustainable development.

The advantages of standardized crediting rules have led many carbon offset programs around the world to adopt them. Most of these programs, however, have employed a central team of regulators to design rules for only a few project categories within limited geographic areas. The theoretical and practical challenges of developing credible, accurate rules at a global level are much greater.

The Kyoto Protocol's CDM and JI programs are, and will continue to be, the central foundation for the global carbon offset market. For a variety of reasons, these programs have adopted largely project-specific crediting methods. As they continue to develop and evolve, it is recommended that policymakers and CDM and JI administrators consider ways to further standardize project baseline estimates and additionality determinations. There are several ways these efforts could proceed:

1. By compiling standard emission factors or parameters for specific sectors and countries, derived by applying current CDM tools and methodologies.
2. By exploring ways to streamline existing baseline methodologies based on experience with actual project approvals.
3. By facilitating the development of new methodologies incorporating standardized elements, including baselines based on performance standards.

Methodologies incorporating performance standards are particularly worthy of attention, since they are nominally allowed under the Marrakesh Accords but no methodologies following this approach have yet been approved. Their development and application will most likely require new resources and institutional arrangements. Policymakers should consider the allocation of new funding and capacity-building efforts aimed at promoting the development of standardized baseline methodologies and applying those methodologies consistently in multiple regions and countries. This work should be carried out by a variety of institutions, including national governments, industry associations, and international organizations. To ensure that standardized methodologies are applied consistently, equitably, and accurately, the work should be coordinated and overseen by CDM and JI administrators. Efforts should focus on project categories with high suitability for standardization and the greatest potential contribution to sustainable development, such as renewable energy, industrial energy efficiency and process emissions, and efficient vehicles.

Finally, offset crediting can be greatly simplified where additionality is determined on the basis of standard eligibility criteria. Standardized additionality tests can be challenging to devise and apply equitably across multiple jurisdictions and geographic areas. Nevertheless, standardized additionality tests should be considered for some project types in conjunction with the efforts to develop standardized baselines.

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