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TECHNICAL NOTE 13 | MAY 2016

Carbon Credits and Additionality

Past, Present, and Future

WORLD BANK GROUP

Acknowledgments

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1. Background and Terms of Reference

The World Bank's Partnership for Market Readiness (PMR) brings together developed and developing countries to build readiness for carbon market instruments to support cost-effective reductions in greenhouse gas emissions.

As part of the PMR's Technical Work Program, the PMR Secretariat asked Get2c to develop a technical briefing on the issue of additionality. The PMR's offset and crediting working group identified the topic as an area of particular relevance to inform countries about the consideration of additionality in the context of new crediting mechanisms that they are exploring.

The terms of reference identify three key objectives, as follows, to:

- clarify the concept of additionality and its significance for crediting mechanisms;
- describe the different approaches that have been used to demonstrate or test additionality; and
- explore the implications of the evolving carbon markets on the application and importance of additionality.

The analysis is based on desktop research and consultation with relevant experts, including with the PMR's Offsets and Crediting Working Group.

2. Additionality—Why It Matters

Key Messages:

- Additionality matters for two separate reasons:
  - Cost effectiveness: Additionality is a prerequisite to a socially and economically efficient allocation); and
  - Environmental integrity: If offsets are generated in an uncapped situation, a nonadditional offset implies a violation of the cap undermining the environmental integrity of the system.
- Additionality testing improves environmental integrity at a cost, including through excluding viable actions that do not cover the transaction costs involved.

Most countries or constituencies considering climate mitigation policy instruments have considered the role of baseline-and-credit schemes. In a baseline-and-credit scheme, an incentive is provided to an action that is deemed to reduce emissions from a reference scenario. The units generated—"credits"—represent emissions reductions and are mostly sold to buyers in compliance or voluntary markets[1] to compensate for emissions which would be more expensive to mitigate than the price of the credit. Crediting schemes have both been considered and developed at an international level and, increasingly at a domestic level (see section 4, below).

2.1. A Word on Terminology

Carbon market instruments fall essentially into two categories: cap-and-trade (C-T) and baseline-and-credit (B-C) instruments. Under the former, units are issued to installations or entities included under the cap by an administrator, and entities are meant to surrender a specified quantity of units to offset/compensate their emissions. Units represent therefore an "allowance" to emit that is usually denominated in metric tons of CO_2e. In a B-C scheme, units are earned from a calculation of the difference of emissions between a baseline scenario (that is, that which would have occurred in the absence of the scheme itself) and the actual prevailing (or "project") scenario. If that calculation yields a reduction between baseline scenario emissions and project emissions, these emission reductions accrue to the entity responsible for the action. They represent therefore a "credit."

It is important to understand that "offset" refers to a particular use of either "allowances" or "credits." If an allowance is used to offset emissions elsewhere in a cap-and-trade scheme, it becomes effectively an "offset." If a "credit" coming from a B-C scheme is used to demonstrate achievement of emission reductions under a payment-for-results scheme, emissions credited may indeed end up failing to offset any emission increase elsewhere. Instead, most professionals tend refer to "offsets," which are effectively the products of baseline-and-credit schemes.

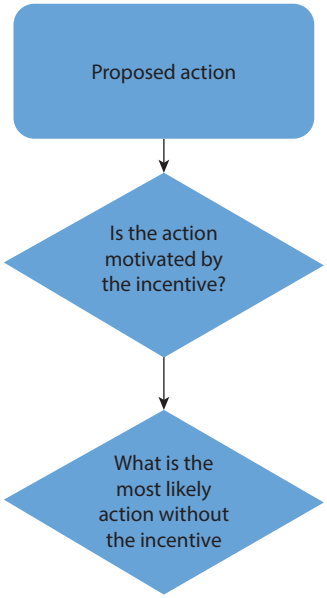
[1] "Compliance markets" refer to markets created through legal obligations or mandates on entities to cover their emissions with carbon assets, such as offsets or allowances. Voluntary markets (which have often preceded compliance markets) refer to voluntary compensation or offsetting undertaken by corporate entities, the social sector, or individuals looking to compensate their carbon footprint, without any legal mandate.

Additionality is an essential criterion for credits in all standards and schemes.[2] All existing standards and schemes apply a common definition of additionality: *A credit is considered additional if the* emissions reduction *that* underpins *the credit would not have occurred in* the absence of the activity that generates the credit (the *BAU scenario*).

Additionality is, however, a complex concept. It is essentially a question of causation. What causes a particular policy intervention or mitigation action? Can one relate the emission reduction to a particular incentive? In the case of credits, a credit is additional if, in the absence of the incentive provided by the crediting scheme, that mitigation action likely would not have occurred. The incentive provided by the unit relates to the price, which results, in turn, from supply and demand for units that demonstrate a credible emission reduction.

As the word "offset" indicates, the typical use for this unit is to allow companies or individuals to compensate for their emissions by supporting reductions elsewhere. With this rationale, an action cannot be certified as an offset, merely because it reduces emissions, but rather because it is motivated by the incentive provided by the scheme. Once one determines the link between the incentive and the action undertaken, it is then possible to proceed to the elaboration of the reference scenario (for example, what would have been the emissions outcome without the incentive). A common approach in credit certification is to have as a first step the determination of additionality and as a second, to calculate baseline emissions (figure 1).

Figure 1. Approaches to Additionality and Baseline Calculation—The Two-Step Approach

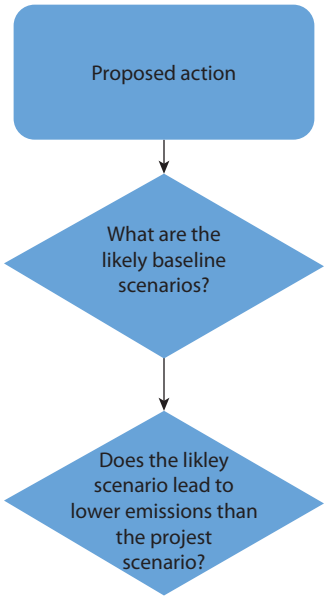


[2] In what follows, an "offset standard" is a required procedure that stipulates what level of quality is expected in the generation of an offset unit. These procedures include methodologies, calculation protocols systems, and validation and verification requirements that must be followed to achieve certification under an offset. An "offset scheme" represents the set of institutions that assist in the development and operation of an offset standard, encompassing usually a standard setting body, a regulatory board, and a validation/verification system (typically autonomous institutions).

Alternatively, some protocols (for example, the combined baseline selection and additionality demonstration tool of the Clean Development Mechanism) (see figure 2 and box 1, below) incorporate the determination of additionality into the step calculating the baseline:

Additionality is key in crediting schemes for two separate but related reasons. Carbon crediting schemes have as a stated goal the certification of emission reductions from a baseline. If these emission reductions would have occurred anyway, their certification and later use as offsets, that is, compensating for somebody else's emissions, causes a net increase in emissions in that such emissions have not in reality been compensated. There is a direct impact on environmental integrity from such "non-additional" credits.

Figure 2. Approaches to Additionality and Baseline Calculation—The Combined Approach



Box 1. The Combined Tool

The combined tool for the determination of additionality and baseline can only be applied to methodologies for which the potential alternative scenarios to the proposed project activity available to project proponents cannot be implemented in parallel to the proposed Clean Development Mechanism (CDM) project activity. For example, the combined tool may be used for an energy efficiency CDM project where the possible alternative scenarios are the retrofit of existing equipment, replacement with new equipment, or the continued use of the existing equipment without any retrofits. Only one of the above scenarios could be implemented at any one time (Executive Board meeting 70, Annex 9, paragraph 5).

A related argument is that of the cost-effectiveness of policy intervention. A non-additional unit generated and used as an offset implies a redistribution of the social cost of reducing emissions, as follows:

- If a non-additional unit is used as a means to offset a carbon tax liability, the government will see its carbon tax intake reduced, while the social goal of emission reduction is not met. Meeting the initial goal will require emission reductions elsewhere; in essence, there is a transfer of value from the treasury to the entity generating the non-additional units.
- If a non-additional unit is used to offset emissions of agents under a cap-and-trade system, the cap will be violated, and meeting the cap would then require extra emission reductions elsewhere. In this case, there is a transfer of value from the agent in the emission trading system to the issuer of units.

Both situations imply a move away from a socially desirable outcome. Note that in practice, the presence of non-additional credits or allowances has not led to any change in cap in any existing cap-and-trade scheme. The theoretical point nevertheless still stands: non-additional units will still lead to a transfer or appropriation of value to the issuer of non-additional units.

Furthermore, in a market context, non-additional units will compete with additional units. Given their likely lower cost—they imply no additional costs to the project developer beyond the certification costs—and therefore will be able to undercut credits generated from truly additional emission reductions on price (box 2). Additionality is thus both a question of environmental integrity and of protecting cost-effectiveness, particularly in a market-based context.

Finally, a word on additionality versus conservativeness in baselines. Both in the development of existing offset protocols (CDM, Verified Carbon Standard [VCS]) and in the development of new crediting mechanism policies, there has been a justifiable drive towards "conservativeness" in baseline determination.

Box 2. Additionality, Non-additionality, and Markets

In a market setting, demand and supply determine the prevailing price for offsets. The shape of the supply curve will be determined by cost factors related to the generation of offsets. Projects that would not otherwise have taken place, that is additional projects, will have as costs both project-related costs and certification costs. Non-additional projects only incur additional costs for the certification component. So for the same prevailing price and assuming that non-additional and additional projects have the same certification costs, non-additional projects will be able to undercut additional ones.

There has been much controversy over the additionality of industrial energy efficiency projects. Such projects would normally be justified whenever energy costs are high. Nevertheless, project developers often claim that such projects, albeit justifiable from an economic perspective, are not prioritized inside companies and are laden with uncertainty. Assuming, however, that such projects would go ahead anyway, such projects will be profitable as long as the certification costs alone are lower than the prevailing price. (This interpretation is primarily relevant when applying the concept of financial additionality, as noted below).

In essence, using this principle of conservativeness is consistent with efforts to minimize the risk of over crediting from an inaccurate baseline scenario definition. Such caution may also reflect positive assumptions with regard to technology or other market developments. This principle of conservativeness is especially important when crediting instruments are used in an offsetting context, providing extra assurance that units generated correspond to actual emission reductions from the baseline. Similarly, "net mitigation," that is the assumption, mostly in relation to new market mechanisms, that these should achieve mitigation beyond that required by formal treaties for limiting GHG emissions, is an extreme application of the principle of conservativeness. It is important to note however that "net mitigation" does not address the issue of whether an action is additional or not. The only relation between conservativeness and additionality is that, should a non-additional action be credited, taking a conservative approach will minimize the quantity of issued non-additional units.

3. Additionality—How to Define It

Beyond the generic concept of additionality outlined in the previous section, different approaches have been used to make the concept operational in practice. These different concepts coexist in the literature[3] and are reflected in several protocols[4] as they reflect particular contexts (for example, statutory requirements), objectives, and preferences of policymakers.

3.1. Emissions (or Environmental) Additionality

Under this concept, an action is deemed additional if it leads to lower levels of emissions than would have otherwise occurred under business as usual; this concept is perhaps the most simplified form of additionality. Under such a concept, the question is not raised regarding whether other factors would have resulted in that action occurring. For example, an action may indeed be profitable and yet lead to emissions reductions, on the assumption that not all profitable options will take place. This is the case for many energy efficiency projects, which are often commercially available and profitable, but barriers related to information costs or financial constraints mean they are not taken up. A technology may lead to lower emissions yet be on the cusp of being deemed commercially available. Under this additionality concept, as long as the project lowers emissions from a baseline scenario (which may or may not take into account factors like financial constraints or prospective technological cost decreases), the project is deemed additional.

Advantages/Limitations

The advantage of emissions additionality as a concept is its focus on emissions as the sole criterion. However, considering emissions alone would overstate the additionality of projects, for example, whenever lower emission technologies are applied without any kind of further incentive. In practice, therefore, other factors—financial and economic decision making, technological maturity, social acceptability, or any other factor with an impact on the baseline scenario—are taken into account. Although sometimes criticized as being simple, this approach simply shifts the burden of determining whether an action would have been present without the incentive onto the design of the baseline or reference scenario.

The main criticism of emissions additionality is that it contains the implicit assumption that all lower emitting technologies, practices, or behavior than those in the reference scenario either: a) face barriers and will not occur in the baseline; or b) that even if they would occur in the baseline, they would still benefit from being considered additional and being rewarded. Hence, the validity of this additionality concept requires an accurate assessment of the reference or baseline scenario. If this concept is achievable, it can be as equally stringent as other concepts.

[3] As an example, see G. Valatin, (2011), "Forests and Carbon: A Review of Additionality," Forestry Commission Research Report, Forestry Commission, Edinburgh, pp. i–vi, 1–22.

[4] Some systems, such as the CDM, use more than one additionality concept, depending on the project type.

3.2. Financial Additionality

An action is additional if it leads to higher costs or relatively lower profitability than would have otherwise occurred. The working assumption is that most agents will be profit-maximizing (cost-minimizing). If one can replicate the conditions under which financial decisions are made by the agent undertaking the action, it should be possible to assess whether a certain action makes financial sense and therefore, would be undertaken in any event. The most typical example of the application of this concept requires the establishment of a hurdle rate of return, which must be met in order for a project to go ahead. The argument for a project to be additional is that a project is not by itself making that hurdle rate (that is, it is not profitable enough) and that carbon credits can help in meeting that profitability requirement.

Advantages/Limitations

The main advantage of financial additionality testing is that it anchors the decision on additionality on a definite decision-making theory, that is, the assumption of economic rationality and profit-maximizing behavior. Even if one does not observe this behavior all the time, proponents argue that it is a good approximation to actual decision making at the corporate level or at the individual level.

Criticism is usually based on the observation that decisions at any level do not directly correspond with the economic theory of profit-maximizing behavior; issues of limited information, bonded rationality, and financial constraints will impact any decision making so as to render any financial test to be, at best a crude reflection of reality. Of particular relevance when moving from the project to the policy level, is the fact that public entities, even when formally corporate, often have as their objective more than simple profit maximization. They are often regulated to ensure that access, quality, and affordability of service are ensured or maintained at certain mandated levels, which are not compatible with full profit-maximization. Furthermore, modern day decision making takes into account a variety of intangible factors which do not show up on financial statements (for example, one need only consider the move towards voluntary, non-mandated compensation or offsetting). Yet another problem is the dependence of the test result on profitability rates that are themselves dependent on an expected price for the credits. Typically, to have an effect on the rates of return on projects, either the volumes of carbon reductions are extremely high in relation to the actual costs of the action involved or carbon revenues make up a small portion of the total revenue and therefore do not have a sizable impact on profitability. This situation puts into question the argument that the project would not be implemented without this extra revenue. Other criticism (specific to the CDM) is the lack of transparency and the selective use of financial data in many project documents (box 3) (du Monceau et al. 2011).[5] Finally, any additionality assessment based on project-level data will likely be based on information provided by project proponents. Given the stakes, there is no incentive for the provision of the best data available (which is not to say that the information provided is necessarily unreliable). The regulator can only address this lack of the incentive to provide accurate information by either relying on third-party data and/or by having a strong technical capacity to assess data quality.

[5] Du Monceau, et al., (2011), "Baseline Setting and Additionality Testing within the Clean Development Mechanism (CDM)," briefing paper available at http://ec.europa.eu/clima/policies/ets/linking/docs/additionality_baseline_en.pdf.

Box 3. Investment Additionality in the CDM—Early Criticism

In a briefing study to the European Commission (du Monceau et al. 2011), a review was made of the different additionality assessment tests in the CDM. The literature review therein highlighted a number of early studies (Michaelowa 2007; Schneider 2007) that demonstrated significant weaknesses in the approach to investment additionality:

- Lack of proper understanding of the guidance given
- Arbitrary choice of the financial indicator
- No clear guidance on sensitivity analysis and robustness of the test

It is unclear in this review whether the review of the guidance in 2008 and 2009, including guidelines on investment analysis and the publication of comprehensive validation and verification standards and procedures, had an impact on this situation. At any rate, new guidelines tried to introduce discipline in the choice of financial indicators and pin down the rationale for the use of specific indicators, such as company benchmarks on investment. It remains, nevertheless, a fairly complex and subjective area, in relation for example to the definition of allowable costs, the use of project- versus equity-specific IRRs.

3.3. Technological Additionality

An action is additional if it leads to the accelerated deployment of a technology than would have otherwise occurred. Most approaches to technological additionality are based on models that assess technological penetration in a market. These models deem technological progress to occur in most countries at a certain constant autonomous rate (box 4). If an action can be deemed to promote an accelerated deployment of a technology that would otherwise face difficulties and have slower penetration, then it is assumed that the increased rate results in lower emissions.

Advantages/Limitations

Two main advantages of the concept of technological additionality are that technologies are for the most part identifiable and easily defined. Technical standards, such as those developed by certification bodies such as ISO or ASA, lend themselves to benchmarking and more easily support the application of tests that rely on particular technical features or parameters (for example, a boiler's combustion efficiency). Testing for technological additionality will usually be based on some combination of performance benchmarking/ barrier analysis, which implies that any new technology faces some types of barrier to its uptake, in particular the fact that costs will be higher in the early stages of adoption, whether due to yet unrealized economies of scale or due to social, regulatory, or institutional barriers. However, technological innovation is often coupled with cost decreases, especially when dealing with minor process innovations. If that is the case, simply assuming a particular penetration rate increase under Business as usual scenario (BaU) may vastly underestimate the actual spread of the technology in question, leading to systematic "false positives.[6]" In addition, it is often

[6] In line with statistical hypothesis testing jargon, a "false positive" in an additionality assessment describes the situation in which an action is deemed additional in testing, but in reality, is not additional. Likewise, a "false negative" would imply that an action is deemed not to be additional, but in reality, is additional. While minimizing both is desirable, "false positives" are a greater risk to environmental integrity, as they imply the generation of units not corresponding to real emission reductions that may be used in offsetting real emissions elsewhere.

Box 4. Technological Additionality

Examples of application of technology standards include the Energy Conservation and SF_6 offset protocols within the Regional Greenhouse Gas Initiative of the Northeastern US. Under such protocols, projects are only eligible if energy conservation measures have less than a 5 percent penetration rate (for Energy Conservation) or if they meet and exceed baseline emission rate standards (for SF_6).

Another example is the use of technological additionality in CDM methodology on manufacturing and servicing of energy efficient domestic refrigerators (AM70), under which a benchmark approach is applied to establish the baseline scenario and demonstrate additionality. The methodology further states "a benchmark approach is used because project activities under this methodology can involve a range of energy efficiency improvement measures, implementation of which will be spread over the duration of the crediting period. For this reason, it would be difficult to undertake a solid barrier or investment analysis for the whole range of measures at the start of the project activity. Moreover, the benchmark approach provides a good basis to assess whether the efficiency of refrigerators manufactured under the project activity exceeds what is the common practice in the respective market."

quite difficult to estimate the future penetration rate of any technology without any incentive given that deployment depends on many variables, including consumer sentiment, cost assumptions, and technological breakthroughs.

Given the limitations above, some protocols are considering standardization and the increased use of benchmarking while retaining the option of addressing additionality in limited ways for actions that, while falling outside the benchmark approach, may be deemed worthy in respect of other tests.

Finally, in some protocols, a much simpler condition is imposed of "legal additionality." In essence, this condition stipulates that credits shall not be earned for actions that are mandated by law or in order to achieve compliance with policy requirements. In both California and Quebec, legal additionality has been imposed such that in the linked markets, offset projects must be additional to both jurisdictions' legal requirements.

4. Additionality—Methods for Determining It

A number of processes have been used to operationalize the different definitions of additionality, as follows:

4.1. Checklists of Criteria

Under this approach, eligibility criteria, either positive or negative, help define which activities can be deemed additional (see box 5 for examples). This approach is typically based on a previous analysis of the drivers of additionality in a particular context, wherein some of the other types of the additionality test discussed below have been used (barrier tests, investment analysis, and technological analysis).

Box 5. Checklists in Different Offset Schemes

There are various examples of this approach, such as in the Californian forest offset protocol, part of the eligibility determination is a checklist including five criteria.[7] In Alberta, additionality is determined in the protocol, rather than when certifying projects. Once a new protocol is being developed, its additionality assessment defines key eligibility criteria that projects must fulfill. Once these are met, the project is deemed additional. As an example, the protocol on Enhanced Oil Recovery stipulates that it is applicable to Alberta-based projects that meet six concrete eligibility criteria related to the ability to avoid fugitive emissions, the measurability, metering, and licensing of operations.

In the CDM, eligibility criteria for additionality were developed for microscale projects. The rationale for that decision is that given the very small scale of these projects, they can be deemed additional once these eligibility criteria (location, type, and scale) are met, without further scrutiny of their financial viability or of the intent of the developer.

Defining additionality through eligibility criteria alone simplifies the determination of additionality at the project level. If, as with the Alberta system, eligibility determines additionality, there is in fact no further process of determining additionality. This situation lowers the costs for the project developer. However, depending on the specific context, it may lead to higher costs for the regulator, who has to develop and approve the eligibility criteria. As long as the scope of eligible activities is narrowly defined, this may not be a problem. But once the scope is broadened to include projects in which the argument for automatic additionality is not so clear cut, the possibility increases of non-additional projects being automatically deemed additional. For example, in discussions within the CDM regulatory body on the scope of eligible activities for automatic additionality, only very narrowly defined microscale projects were deemed safe enough to be automatically additional. These projects were seen to have such insurmountable barriers

[7] From section 2.1.2 of the U.S. Forest Projects Compliance Offset Protocol (October 20, 2011), these are:

1. The offset project takes place on land that has greater than 10 percent tree canopy cover.
2. The offset project employs natural forest management practices, as defined in Section 3.8.2 of this protocol.
3. The offset project does *not* employ broadcast fertilization.
4. The offset project does not take place on land that was part of a previously listed and verified Forestry Project.
5. If the offset project was an offset project in a voluntary offset program, the offset project can demonstrate it has met all legal and contractual requirements to allow it to terminate its project relationship with the voluntary offset program and be listed using this compliance offset protocol.

in terms of technological costs, regulatory frameworks, and so on, that deeming them automatically additional was considered low risk. Were the threshold for "microscale" to increase, for example, from 5kW to 20 or 30 kW, the barriers would not have been the same and the risks would have prevented the CDM Executive Board from approving automatic additionality. Likewise, domestic regulators wanting to apply this approach must be clear that additionality is addressed in the eligibility criteria. Furthermore, if a regulator wishes to minimize cost associated with establishing automatic additionality, it is recommended that a checklist approach is applied to a narrow scope of activities, as in the case of California (see box 6 below).

Box 6. Eligibility in California

In California, covered entities may use offset credits to satisfy up to eight percent of their compliance obligation. Compliance offsets are tradeable credits that represent verified greenhouse gas (GHG) emissions reductions or removal enhancements from sources not subject to a compliance obligation under the Cap-and-Trade Program. The scope of potential project types is quite limited as the provisions exclude any projects that are a result of compliance with existing or prospective legislation. Given the level of ambition and policy plans across major sectors in California, this situation has resulted in a very limited number of offset protocols. To date, only six protocols have been issued. The standardized approach to the development of the protocols has resulted in an approach to additionality where the eligibility conditions by which an action may be deemed additional are determined by an analysis and consultation process at the protocol development stage. The analysis of eligibility will refer to legal requirements and a performance test to evaluate common practice, technological parameters, and an analysis of barriers to the development of a proposed technology or practice.

The increased use of eligibility criteria stems to a large degree from two related trends, as follows:

1. The drive towards simplification of additionality requirements has led to a stronger focus on a "protocol level" of additionality assessment. Previously, schemes such as the CDM or VCS were developed from the bottom up, with individual developers driving revisions based on real project activities. With the protocol level focus assessments on clarifying the conditions for determining the additionality of a "typical" (that is, not necessarily real) project. The result is that additionality testing has been translated into objective eligibility/applicability conditions. Once these are satisfied, the project developer has no further need to demonstrate additionality. This drive toward standardizing the evaluation and creating a more transparent process for determining additionality implies a step away from a more nonpublic, subjective evaluation. Having objective criteria that are publicly available and evaluable increases the integrity of an offset program. Once the criteria have been independently verified, the project developer has no further need to demonstrate additionality.
2. The drive toward crediting more "transformational," "programmatic," or "policy" interventions implies a step away from the notion of identifying the same the individual motivation of each agent taking part in the program—since this would render any crediting nearly impossible,

especially in programs with large numbers of potential agents. As indicated in the long debate on "programmatic CDM," such types of schemes require the conversion upfront of additionality conditions into specific eligibility criteria for each action/agent (see box 7).

Box 7. Programmatic CDM

Under programmatic CDM, the scheme promotes, through a price incentive, the development of a program or policy that results in multiple actions (individually known as CDM Programme Activity). A typical example might be the distribution of compact fluorescent light bulbs. Under such a scheme, the promoter has to demonstrate additionality at a generic level, but then is required to translate such additionality assessment into eligibility requirements for each CPA. These eligibility requirements could relate, for example, to geographical areas for the CFLs distributed, means testing for the recipients, or other such eligibility requirements as would be deemed relevant from the overall additionality assessment. At the CPA level, it would then no longer be required to assess the individual motivation of each agent (the CFL buyer in the example).

4.2. Barrier Analysis

Another type of test relies on the identification of barriers to the proposed actions to be supported. The rationale is that only in the presence of financial, technological, institutional, and regulatory barriers would a project be deemed additional (see box 8).

Box 8. Barrier Analysis in the CDM

The CDM developed the concept of a barrier to implementation analysis as a way to screen in/out projects which, despite their profitability or even their conformity with legal mandates, may not be realized for nonfinancial reasons. This concept allows the CDM to be more flexible in supporting activities addressing the issue of unrealized emission reductions, which occur anywhere, but which may not materialize due to a lack of information, awareness, or a lack of access to capital (in jurisdictions where companies or other agents face a credit crunch), all of which might not be mirrored in a simple investment analysis. Over time, the CDM has developed more guidance on how to interpret the different types of barriers.

The Alberta Offset Credit System took the emission additionality conception of additionality, while essentially adapting the barrier testing principle from CDM, testing (that is, testing for technological, financial, and social barriers) and a common practice test, supplemented by a "sector adoption test," something similar to the common practice test.

One particular issue with this type of test is the need to understand in which way the barrier acts on the additionality and how the crediting of the proposed project/action would remove the barrier in question. As an example, if the targeted agents do not take up a technology for lack of knowledge about its costs and benefits, should the proposed action be a marketing campaign? The question becomes how to assure in

such cases the causality between the proposed action and the removal of the barrier. Crediting an action results only in the issuance of a credit that may or may not have monetary value. How does crediting generate the potential to remove the barrier?

A second issue relates to the description of the barrier itself: how can a barrier be described and justified in an objective way that makes a sensible argument and yet allows for the least discretion possible. In some cases, barriers are relatively easy to assess: physical barriers, such as those facing infrastructure projects in isolated locations such as islands. In other cases, barriers may describe issues that are less obvious, such as the low social acceptability of a particular type of additive in the combustion mix for clinker production. How do you measure this? How do you assess some social opposition as significant and other as not?

On the other hand, barrier testing is a more flexible approach than the strict enforcement of eligibility criteria because it allows for greater discretion in the consideration of key factors in determining additionality.

4.3. Common Practice, Best Practice, "First-of-Its-Kind," Performance Benchmarks

Such tests identify additionality with the prevalence or uptake of a certain technology or process, that is if a technology or practice is commonly observable or conversely, if it is not available at all, then a determination on additionality can be presumed. This approach takes a "technological" view of additionality and will tend to disregard issues of specificity to a geographical context, that is a technology may be "common practice" and have high penetration in a particular part of the country but not in another, because of specific barriers. However, this situation can be easily addressed by creating regional additionality assessments as was done in the California Rice Cultivation Compliance Offset Protocol, where each rice growing region was independently evaluated. Another issue is how to credibly classify a "new," "top runner," or "first-of-its-kind" technology. Wind power broadly defined is no longer a "new technology" in European countries. Nevertheless, certain wind projects are extremely innovative and represent technological leaps in relation to existing ones. Separating these projects according to their particular features can become cumbersome and potentially subjective.

The usual way to apply common practice tests relates to the use of a threshold penetration rate, above which the practice or technology is deemed non-additional (see box 9). Conversely, one can also define a performance standard deemed as common practice (typically associated with the concept of best available technology not entailing excessive cost) as a threshold above which activities are deemed additional. Figure 3 depicts the typical view of technology uptake; in broad terms, it follows a curve.

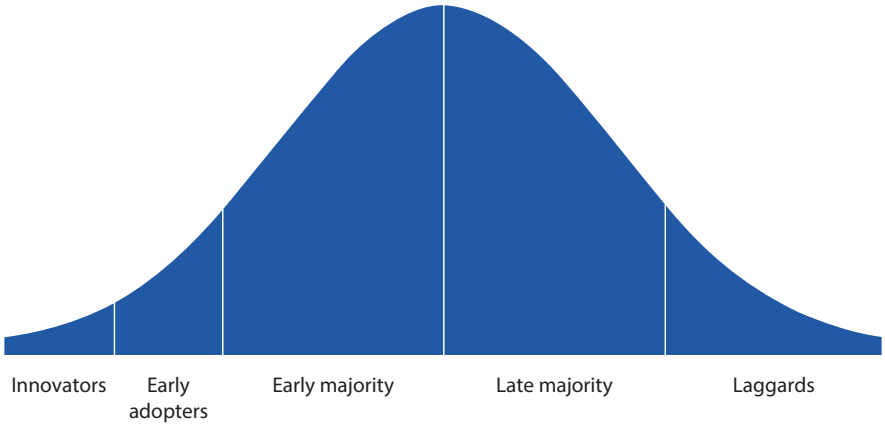
In that sense, "first-of-its-kind" or "top runners" want to reward innovators or early adopters by simplifying additionality requirements (to the point that they are deemed automatically additional in the CDM). However, the cutoff differentiating "top runners" from anyone else will ultimately have to depend on the regulator's view of the ease of uptake of the technology in question and the relevant control group and definition of technology.

Box 9. The Regional Greenhouse Gas Initiative and the Use of Performance Standards

The Regional Greenhouse Gas Initiative (RGGI) has approved five offset protocols, including one on reducing sulfur hexafluoride (SF_6) emissions to the atmosphere from equipment in the electricity transmission and distribution sector, through its capture and storage, recycling, or destruction. Eligible projects are required, nevertheless, to demonstrate a baseline entity-wide SF_6 emissions rate that is less than the applicable regional performance standard specified in state regulations.

Under a different protocol on agricultural manure management, some additionality requirements do not apply to offset projects if the offset project is located in a state that has a market penetration rate for anaerobic digester projects of five percent or less.

Figure 3. Typical "Bell Curve" of Technological Development



4.4. Conclusions on Additionality Testing

There are no hard and fast rules on the link between the concepts of additionality and different tests, and in fact, regulators can choose to adopt a variety of concepts and tests (as is the case with the CDM) (see table in annex I for a wider analysis and table 1, below).

However, some conclusions can emerge as to the range of choices that are available to each regulator, as shown in table 2:

Taking as an example, the concept of emissions additionality—testing for emissions additionality will usually require (as with the combined additionality and baseline tool of the CDM) the upfront selection of baseline scenarios. These scenarios will usually be screened by asking which of the scenarios would be facing barriers or which would reflect common practice. Quite often, particularly in more recent protocols, these tests would be reflected in eligibility criteria, so that only projects facing conditions, which are deemed to be barriers, or projects that have very low levels of technology penetration are eligible under the scheme.

Table 1. Use of Additionality Tests in Selected Existing Programs

Clean Development Mechanism (CDM)	The CDM uses all types of tests. In its additionality tool, barrier analysis, tech analysis, and financial analysis coexist. In the context of simplification, checklists have evolved for automatic additionality (for microscale activities) but also standardized additionality benchmarks (as with AM70 methodology).
Joint implementation (JI)	Under JI track 1, eligibility requirements are set by the host Party and determined on a project-by-project basis. Under JI track 2, the CDM Additionality Tool is often used.
Gold Standard	The Gold Standard relies on additionality tests used in CDM or JI. Note that Gold Standard CDM or JI projects are not required to carry out a further demonstration of additionality.
Verified Carbon Standard (VCS)	VCS projects often use the CDM Additionality Tool. Also a number of methodologies under development are applying a positive list for additionality.
Chinese CCER (Chinese Certified Emission Reductions)	Same as in CDM
Joint Crediting Mechanism	Eligibility criteria for each one of the methodologies, similar to a positive list
California Air Resources Board Cap-and-Trade Program	Standardized criteria based on technical analysis and public consultation
Alberta offsets	Barrier testing and a simplified technological analysis underlines the eligibility criteria.
RGGI	Use of performance benchmarks to determine additionality
Switzerland's Offset Program (CH OP)	Additionality tests include investment analysis, barrier analysis, and common practice analysis. For programs the additionality criteria is similar to the programmatic CDM approach.
Costa Rica	The additionality determination will be standardized. Test criteria is yet to be defined according to specific methodology.
Thailand Voluntary Emission Reduction Program (T-VER)	Project activity must comply with the additionality criteria set up by the T-VER. For a large-scale project, the payback period is used to prove additionality.

Two final points should be made: the note has not dwelled on the issue of information, that is data requirements and information asymmetry, but these are crucial in the development of a crediting scheme. In a crediting scheme, the certification process will generate value and therefore a vested interest in achieving certification from both developers of additional and non-additional projects. As with any other regulatory function, asymmetric information requires the regulator to exercise skepticism in all information provided by those seeking to achieve certification. Beyond the use of third-party analysis, it is important that in choosing the additionality determination method, the regulator be aware of the quality of information it is seeking, as follows:

- Making the additionality determination contingent on project information that can be manipulated (as is the case with complicated financial information) is a risk. To the extent possible, even if using financial additionality, the regulator should use third-party objective information

Table 2. Concepts and Determination Methods for Additionality

Methods / Concepts	Barrier testing	Investment analysis	Common practice, technological analysis	Checklists
Emissions additionality	Under emissions additionality, all three tests can be used in shaping the range of available baseline scenarios and determining the baseline.			Checklists will likely reflect a previous analysis built on the other three types of tests (barrier, Investment and common practice analysis).
Technological additionality	Barrier tests will be focused on technological barriers, but it is not directly suited to technological additionality.	Technological additionality does not depend only on financial costs but other factors affecting the availability of the technology.	Common practice tests follow implicitly the logic of technological additionality.	Eligibility criteria/ positive lists will be based on the type of technology proposed, usually with some conditions on technology uptake.
Financial additionality	Barrier testing will be focused on barriers to investment, such as poor credit conditions.	Investment analysis is the essential type of test if focused on deriving the financial additionality of a given investment.	Technological analysis would not matter so much for financial additionality, unless a direct link is presumed or can be ascertained between the profitability of a technology and its uptake (ignoring other social and policy factors).	Eligibility criteria will be based on financial indicators.

(for example, thresholds related to published financial indices rather than corporate indices). This process also goes for technological information, where data from independent testing is preferable to project developer data.

- In many situations, both in developed and developing countries, the relevant information for the determination of additionality is not readily available. Data availability whether on financial, technological, or social issues, should guide the choice of additionality testing approach.

Lastly, there is a potential tradeoff between increased transaction costs related to the different types of testing and environmental integrity. On the one hand, increased transaction costs, mostly related to achieving a more project-customized approach, may go hand-in-hand with higher quality of the testing and so improve the environmental integrity of the scheme. Note that whether this relation between transaction costs and environmental integrity holds depends crucially on the level of trust in the determination process and on whether transaction costs are justified. On the other hand, higher transaction costs may deter more genuinely additional projects or actions from pursuing crediting.

One potential solution to this double-edged issue is to resort to a more standardized approach that puts more of the costs on the protocol developer or manager, as opposed to the project developer. This approach has been used in several contexts, such as the development of programmatic guidance under the CDM, California, RGGI, and Alberta protocols.

As we shall see in the upcoming section, this trend is particularly relevant in light of the overall evolution of domestic and international climate policy.

5. The Development of Carbon Offsets and Additionality

The Past Context of Offsets—A Centralized System under the Kyoto Protocol

Key Messages

- Offsets were a central part of the Kyoto framework. Most of these were developed with an eye to the specific international context.
- Kyoto defined many of the additionality tests but also demonstrated some of their limitations.

The Kyoto Protocol provided the first international context under which offsets were a significant part of the toolkit for countries to meet emission reduction commitments. Carbon market allowance trading and carbon credit generation and trading were a key component of the Kyoto Protocol and one of its most innovative features. Under the Kyoto Protocol, both allowance trading (trading of Assigned Amount Units, issued to countries on the basis of their quantified caps) and credit trading (either within the countries with reduction or limitation commitments, through JI or from projects generated in countries without commitments, through the CDM), were pursued.

Additionality was defined in the Marrakesh Accords, but most technical discussions on additionality effectively took place at a later stage, as developers and the regulator faced the need to develop more detailed guidance. That guidance in the case of the CDM is brought under a number of tools and standards, most notably the Additionality Tool. The CDM uses most of the testing methods developed in the previous section, and over the years detailed guidance has been developed on barrier analysis and technological analysis (common practice and "first-of-its-kind," investment analysis).

The CDM was initially conceived as a project-based mechanism in countries that had no emission reduction or limitation obligations. Given that context, under which the host country government has no stake in limiting the generation and transfer of credits, there was a perceived risk to environmental integrity from the lack of incentive to check additionality; hence the need for a resource-intensive and strict additionality testing protocol and extensive supervision.

JI allows for the trading of credits from projects in countries with targets under the Kyoto Protocol. Countries with a target had an incentive to ensure any emission reductions traded were truly additional, otherwise this would increase the burden of achieving the target (if not additional, a unit is traded without the corresponding reduction in the inventory). Therefore, for countries with stringent targets additionality, and in fact all methodological development of projects, could be left to the discretion of participant countries. Environmental integrity would not be compromised, as long as it could be safely assumed (based on a zero-sum approach supported by the inventory systems in countries under the emission cap) that selling a "non-additional" Emission Reduction Unit (ERU) would entail an opportunity cost to the seller in the form of having to make up for effective emissions monitored and reported under the inventory system.

However, this last statement is only applicable for the seller if the country produces inventories of good quality[8] and if it faces a strong enough opportunity cost as a seller. Commitments under Kyoto were such that, for a group of countries—mostly economies in transition in Eastern Europe—there was the perceived notion on the part of prospective buyers of an "excess allocation" of units in-built into their Kyoto commitments, that is units for which the opportunity cost would be zero and that could lead to the generation of excessive supply on the carbon markets, in particular associated with the international emission trading transactions under the Article 17 of the Kyoto Protocol. To assuage concerns of the buyers and invite climate friendly investment, several countries then took the initiative to complement the purely International Emissions Trading transactions by the reinvestment into the domestic emission reduction programs, under so-called Green Investment Schemes (GIS). Under such schemes, bilateral or multilateral deals would associate the stream of Kyoto units to a number of policy/programmatic interventions in the host country, in most cases, national policies or programs (for example, energy conservation in buildings, district heating upgrades). Given the voluntary nature of the GIS, additionality was not a strong consideration for the selected greening activities. Where applicable, additionality (mainly interpreted as environmental additionality) was discussed not on the level of each policy intervention but at the overall level: Did the policy/program financing lead to increased emission reductions than would have otherwise have been the case? The case was often made that the host country would use the AAU-related revenues to accelerate the deployment or the ambition of its domestic mitigation efforts as compared to some finite level of policy and financial capacity. Therefore, GIS would lead to increased mitigation. The environmental performance was then not only assessed for each individual action (through eligibility conditions), but mainly evaluated and monitored for the entire program.

Whether under the Kyoto mechanisms or under GIS, the motivation behind additionality testing derived from the international context (and was mainly driven by the expectations of the demand side of the market (buyers) seeking to demonstrate sufficient level of integrity of crediting): with CDM, the lack of caps in developing countries under Kyoto; with GIS, the need to provide some evidence of underlying emission reductions to the purchased AAUs. Therefore, the driving force for these tests was the need to avoid dilution of the emission targets negotiated under the Kyoto Protocol.

Kyoto mechanisms developed many of the tests already mentioned. The learning-by-doing and top-down approach involved the development and to a certain extent the experimentation with many of these concepts. The additionality tool developed early on was revised and supplemented many times in the following years, by additional guidance on specific tests. Most importantly, experience showed that as this guidance was developed, transaction costs often increased. The regulator had to develop guidance while reviewing the first projects coming into the scheme, and as more projects and situations were requiring special consideration, the guidance developed went through a lot of early changes (the CDM additionality tool is now in its eleventh version). Steps were taken to progressively consolidate that guidance and to apply simplified and standardized additionality tests. This included consolidation of

[8] Good quality inventories are a participation requirement for JI. The rationale behind it is that only countries with good quality inventories are effectively backing up their trades with credible units. If a country would not have good quality inventories, rules still allowed it to trade, but generation of credits would need to follow an international oversight mechanism (known in the jargon as "track 2 JI").

methodologies, application of eligibility criteria for microscale projects, and lately, the development of standards such as financial additionality default benchmarks. Alongside these developments, domestic international crediting programs in development learned from the Kyoto mechanisms' history and took on innovations. As an example, the Verified Carbon Standard was quicker in developing guidance on the use of standardized baselines and additionality tests than similar development process under the CDM.

A key issue arising from the Kyoto experience is the interaction between carbon credits and their policy environment. Very early on, regulators realized the need to address that relation through specific rules as to which policies should and should not be taken into account in the development of the baseline. This generic rule on defining baselines entailed consequences in the longer term for the assessment of additionality in some specific cases. This case (known as E+/E- in the CDM context) (see box 10) can be seen as foreshadowing the complex relation of carbon credits with policy environments. This relationship takes on even more significance with the development of the new climate regime: as countries develop their nationally determined contributions and hence their climate change policies, the additionality/complementarity between climate change policies included in the contribution and climate change policies financed through the sale of carbon credits becomes more complex (see box, below, on changing context).

Box 10. Wind Power in China

The peak years of development of Chinese CDM projects coincided with a boom in wind power in China. Much of this followed the establishment of a fairly complex system of feed-in tariffs at the federal and provincial levels in China. In certain cases, it would seem that the feed-in tariff had been reduced in the presence of the CDM "subsidy." This situation raised questions as to whether CDM would not simply be replacing existing Chinese wind subsidies. The issue was further complicated by CDM baseline guidance (but not additionality) that stipulated that national policies working to reduce emissions could be excluded from any baseline as long as they had been enacted since the enactment of the Kyoto Protocol. This E- ("emission educing" policy) provision was meant to provide the right incentive to countries, making sure that they could still be ambitious in their emission reduction policies without excluding themselves and their projects from CDM finance. As the vast majority of wind projects in China by 2009 were in fact seeking CDM status, the issue became as to whether the "no subsidy" baseline would be still valid.

For a good analysis of the interaction of national policies and crediting, set in the CDM context, see Spalding-Fecher (2013) "National Policies and the CDM Rules: Options for the Future," available at https://www.energimyndigheten.se/.

The Present Context—The Fragmentation of the International Carbon Market and the Differing Uses of Carbon Credits

Key Messages

- Different jurisdictions had different motivations to include crediting in their policy package.
- These different motivations justify differing approaches to additionality, often moving towards more streamlining and standardization.

Under Kyoto, the vast majority of offsets were used in a specific policy context of compliance with prescribed targets for developed countries under Kyoto. Interest in offsets spread however to other political contexts. Offsets were used to promote international cooperation with subnational constituencies, to promote price management in domestic trading schemes, or as a way of introducing some market flexibility elements in a carbon tax context.

Many but by no means all of these situations took their lessons from Kyoto and in particular from the range of testing adopted under the CDM. Most new programs, even when using the CDM as a point of departure, took sometimes radically different approaches, depending on the particular role that carbon crediting played in their particular context.

In **RGGI**, "offsets" are considered a potential price control mechanism. In addition, given that RGGI covers only power sector emissions, offsets can broaden the carbon price signal to other parts of the economy. Given the actual demand for offsets at current levels, this function is secondary, however. The scope for offsets is relatively limited. RGGI's protocols follow a checklist/eligibility approach to additionality, based mostly on a technological and sector analysis.

In **Alberta**, similarly to RGGI, "offsets" are used as one of the potential means of compliance (the others being payment to a fund and purchase of credits from other regulated facilities). The motivation is to move climate-friendly innovation in sectors not covered by regulation. As mentioned before, Alberta relies as well on eligibility criteria defined on a protocol level, themselves based on a barriers testing approach.

In **South Africa**, the National Treasury presented the carbon offsets provisions of the future South African market in a 2014 Carbon Offsets paper. A carbon tax was preferred to emission trading as a carbon pricing instrument, due to concerns on liquidity of any potential carbon market. As a way to introduce price flexibility and an additional compliance option for regulated entities, the government approved the inclusion of carbon credits as a way to offset the emissions liability. Companies will have the flexibility to either pay the carbon tax or to purchase carbon credits to cover the emission liability. The decision was taken early on to adopt South African CDM projects as eligible offsets, that is for those projects occurring outside entities covered by the carbon tax regime or which benefit already from other government incentives. The Carbon Offsets paper proposed that additionality assessment be standardized, that is based on eligibility criteria, but leaving the door open to specific approaches to additionality in project-specific proposals, not yet covered by any protocol.

In **California, "**offsets" are limited due to regulation of many of the relevant carbon-emitting sectors (that is, the Cap-and-Trade Program covers 85 percent of statewide carbon emissions including electricity generation and transportation fuels). Allowing offset generation in covered sectors would not be additional to the existing policies. Emission reduction projects are already incentivized under a cap-and-trade scheme as they reduce the cost to comply for regulated entities. Allowing such projects to generate offsets would be double-counting and would have resulted in a double incentive, distorting additionality assessments. Limiting offset generation to sectors not covered by the Cap-and-Trade Program or other statewide regulations resulted in narrow eligibility criteria for offsets.

In **Korea**, the Korean Emission Trading law allows for domestic offsets in the first phase of the Emission Trading Scheme (ETS) from non-ETS entities that meet international standards, for activities implemented after 14 April 2010 (and not registered under international protocols). From an additionality standpoint, this situation implies that the additionality provisions in CDM protocols are imported wholesale into the Korean Offset Credit Scheme.

In **China**, carbon credits were in fact used as a way to link up the five pilot emission trading systems, by importing existing CDM methodologies into the CCER protocol (the Chinese CER Protocol). This particular use of CDM had the advantage of importing the international norms on additionality, lowering regulatory costs, and providing Chinese project developers with a familiar program from the start. Further development of the CCER system beyond the initial set of imported CDM methodologies has included the development of homegrown methodologies. At the same time, the CCER replicated to an extent and in a domestic setting the CDM governance system, including in relation to the assessment of additionality. Pilot emission trading schemes were left to decide on the internal use of CCER (level, scope of methodologies accepted). A final point on CCERs: as project developers could, under certain circumstances, develop their projects as either CDM or CCER projects, China advocated at the international level for a system of de-registration from CDM, to make sure that projects would not seek certification under both schemes and be counted towards both schemes.

A recurring trend can be seen in that jurisdictions have, by and large, innovated towards more standardization and streamlining of additionality, using additionality testing at protocol rather than at the project level. Another recurring trend is that, given the fragmentation of the carbon market, most jurisdictions have set about creating their own offset scheme, more appropriate to the circumstances and motivations, with some “carving out” CDM from the international market as a way to quick start the development of their offset pool.

The Changing Context—Moving onto a World with Contributions and the Prospect for Linking

Key Message
INDCs will hopefully move global ambition to a higher level. Therefore, they will have a twofold effect on the situation of offsets worldwide. Increased ambition will likely raise the demand for international trading of offsets, but will also increase scrutiny on the credibility of additionality determination of offsets.

The current development of markets will be impacted by the development of national contributions (INDCs) in the new regime. National contributions will vary in their shape, but for many already presented, access to carbon market instruments, including international ones, is at least foreseen in the initial submissions made to date.

This is a welcome development as in many cases, INDCs have signaled increased ambition. All things being equal, this increased ambition should reflect itself in higher marginal costs and higher prices for carbon across the world. In turn, this implies a potentially bigger role for international transfers of carbon allowances and credits. However, this increase in potential trade comes at the same time as an increase

in coverage by national contributions overall. Countries with contributions will want to ensure that their offsets are generating real emission reductions, that is, are additional. Selling units without corresponding emission reductions would increase the cost of meeting their nationally determined contributions. There is henceforward a stronger incentive on both the buying and the selling side to ensure proper scrutiny of offsets.

As domestic carbon initiatives interact with national contributions, issues of accounting will arise. Assume for arguments sake a country, which has defined its contribution as a reduction of emissions in the power sector, covered by an emission trading system. How would that country account for any domestic credits used by companies covered by its emission trading system? In which way should the domestic transfer of units between a sector or initiative covered by a contribution to and from other sectors not covered be reflected in accounting for the contribution?

As indicated earlier on, additionality in carbon crediting implies the comparison between a scenario with the presence of an incentive and one without—the baseline scenario. In the description of the baseline scenario, a set of policies will be deemed as part of the baseline. Are nationally determined contributions themselves part of the baseline upon which to build carbon credits? What if the contribution is itself defined on the premise of it being financed by external sources, including the carbon market? The interaction of national policies and crediting was already an issue under the Kyoto framework, in the context of defining whether certain policies and measures were part of the baseline scenario in the development of CDM projects. When more climate policy initiatives are defined in both developed and emerging economies, the issue of demarcating the realm of "baseline" climate policy and differentiating additional credits becomes more difficult. Issues such as the role of overlapping policy instruments (feed-in tariffs, fossil fuel subsidy reform programs) and the generation of offsets will need to be unraveled.

Linking through domestic initiatives in a bottom-up world can either be encouraged or discouraged by the existence of offsets. It has been effectively already the practice given the recognition of Certified Emission Reductions from CDM in some existing markets, while not formally linked bilaterally. Bear in mind that offsets have been important but not determinant in ongoing discussions on linking to date (that is the proposed Australia/European Union link). However, offsets with similar additionality protocols may result in mutual acknowledgment between two schemes, as was the case of the California/Quebec link. Carbon credits with different additionality protocols or demands may significantly hinder linking, depending on the use made of offsets by the different schemes and their motivation in accessing an international pool of credits.

6. Conclusions

Additionality is a key concept behind any crediting scheme. Different additionality concepts have been used by different schemes, and in some cases, more than one concept has been used by the same scheme, as has been the case with the CDM. As this technical note hopefully has highlighted, the use of different concepts and different approaches to additionality testing across schemes is a reflection of the motivations behind each regime, their learning from other experience, and the policy context under which each regime has developed. As such, the search for an ideal additionality protocol is senseless, as each case is its own.

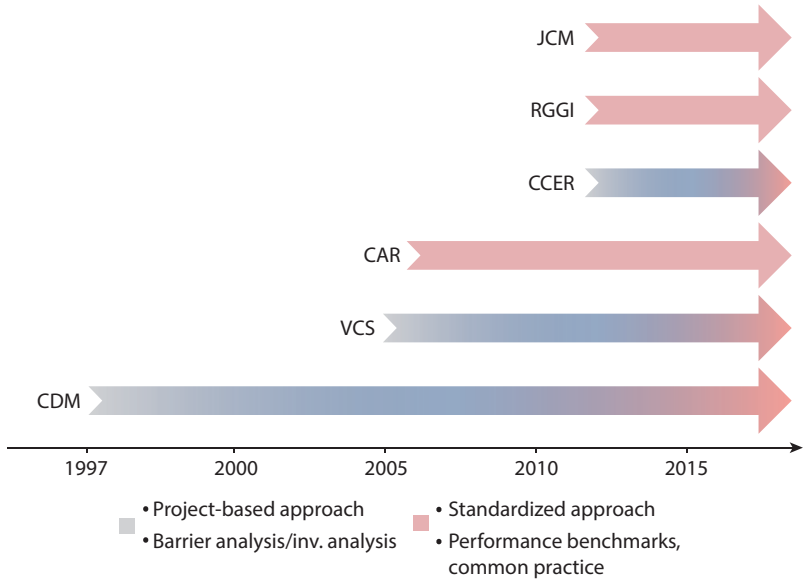
Nevertheless, some emerging trends can be ascertained (see figure 4).

Emerging trend 1: standardization. Carbon crediting protocols (CDM, VCS) are developing more and more standardized additionality protocols, moving away from project-by-project determination and relying less and less on actual project-specific information at the validation or approval stage.

Emerging trend 2: simplification by narrowing scope. Given the state of the carbon market, its fragmentation and the supplemental role that offsets now tend to take in most carbon markets, regulators such as California are choosing to define narrowly the eligibility of offsets, relying on extensive upfront analysis at the protocol level to get at strong additionality criteria with little additionality determination at the project level. This trend can also be motivated by the need to reduce the risk of crediting non-additional projects to protect the environmental integrity of the overall market.

Emerging trend 3: simplifying moving away from barrier and investment analysis, especially at the project level. The experience in CDM has shown that both barrier analysis and investment analysis have been controversial, given the level of subjectivity in the assessments and the dependence on project-level information.

Figure 4. A Broad Overview of the Evolution of Additionality Criteria among Different Systems



Newer protocols incorporate the notion of barrier analysis and investment analysis but only at a protocol level, not using it for individual project assessments.

Emerging trend 4: moving from project-level through programs to the policy level. This trend can be seen in the developments in the CDM (in particular, the emphasis in the rule development on programmatic CDM in the last few years), but also in the approach many offset schemes have taken to directly link additionality determination and eligibility to specific policy goals in certain sectors. For domestic offset schemes without any links to international carbon markets, the link between the use of offsets and the promotion of certain sector policy goals in the "offset sectors" is simplified: offsets are seen as a complementary domestic financing option.

For the future, additionality approaches will continue to diverge as long as the contexts diverge. There is, however, one important element which will be present across many initiatives: their interaction with the international climate regime through their impact on accounting for the INDCs. To the extent that "tradability" will be explored, there will be a push towards a convergence of approaches and standards, including additionality.

Appendix. Rules/Information on Additionality Determination in Different Offset Schemes

Program Name	Rules/Information on Additionality Determination
Clean Development Mechanism (CDM)	• Usually determined on a project-by-project basis • Some small-scale positive lists have been developed, and technologies on a positive list are automatically considered additional. • A CDM project activity is additional if anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. • Rules on demonstrating additionality defined in Additionality Tool (Step 1: Identification of alternatives to the project activity; Step 2: Investment analysis to determine that the proposed project activity is either (a) not the most economically or financially attractive or (b) not economically or financially feasible; Step 3: Barrier analysis; Step 4: Common practice analysis)
Joint Implementation (JI)	• Under track 1, requirements are set by the host Party and determined on a project-by-project basis. • [...] a host Party may verify reductions in anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks from an Article 6 project as being additional to any that would otherwise occur [...] • In practice, verification of additionality varies significantly by the host party and JI track 2 rules are often applied, which allow for the use of the CDM Additionality Tool.
Gold Standard (GS)	• GS relies on the UNFCCC's decision on additionality for CDM or JI projects applying for GS registration, and GS CDM or JI projects are not required to carry out further a demonstration of additionality. • GS VER projects apply UNFCCC additionality requirements, including small-scale projects, validated by the DOEs and further checked by the GS Secretariat. • Positive list approach for GS microscale projects
Verified Carbon Standard (VCS)	• All projects approved under the VCS must be additional, and the additionality requirements are those set out in the methodology that the project uses (for example, the CDM Additionality Tool). • New methodologies can include new approaches for the demonstration of additionality, either within the methodology or as a separate tool; both are subject to the VCS Methodology Approval Process. • A number of methodologies under development are applying a positive list for additionality, in line with the VCS framework for standardized methods
Chinese Certified Emission Reductions (CCER)	Same as in CDM

table continues next page

Appendix. Rules/Information on Additionality Determination in Different Offset Schemes *(continued)*

Program Name	Rules/Information on Additionality Determination

Japan's Joint Crediting Mechanism (JCM)	• Additionality determination is substituted by eligibility criteria for each of the methodologies, similar to a positive list.
	• Both governments (Japan and the host country) determine what technologies, products, and so on, should be included in the eligibility criteria through the approval process of the JCM methodologies by the Joint Committee.
	• Eligibility criteria for registration can be based on:
	  • the efficiency of products/technologies (for example, tons output/kWh), a benchmark approach, or;
	  • type of product/technology (that is, the group of accumulating methodologies will eventually form a kind of positive list)
	  • Only projects that started their operation on or after January 1, 2013, are eligible for the JCM (Rules of the procedures for the JC—Mongolia).

California's Compliance Offset Program (CA COP)	• GHG emissions reductions and GHG removal enhancements must be beyond what would otherwise be required by law, regulation, or legally binding mandate, and exceed what would otherwise occur in a conservative business-as-usual scenario. • Offset credits can only be generated in sectors not covered by the CA Cap-and-Trade Program.
Quebec	The reductions in GHG emissions: • must result from a project that is voluntary, that it is not being carried out at the time or registration of renewal, in response to a legislative or regulatory provision, a permit or other type of authorization, an order made under an Act or regulation, or a court decision; • must result from a project that goes beyond the current practices described in the applicable protocol for the project

Climate Action Reserve (CAR)	• GHG reductions must be additional to any that would have occurred in the absence of the Climate Action Reserve, or of a market for GHG reduction
	• "Business as usual" reductions—that is, those that would occur in the absence of a GHG reduction market—should not be eligible for registration.
	• CAR additionality criteria include:
	  • a legal requirement test
	  • a performance standard test (Section 2.4 of the Program Manual)

Australia's Carbon Farming Initiative (AU CFI)	Additionality test requires: • the project must go beyond common practice • must not be required by another law

Appendix. Rules/Information on Additionality Determination in Different Offset Schemes *(continued)*

Program Name	Rules/Information on Additionality Determination

Switzerland's Offset Program (CH OP)	• Usually determined on a project-by-project basis
	• Rules on demonstrating additionality:
	  • Step 1: Identification of alternatives to the project activity
	  • Step 2: Investment analysis to determine that the proposed project activity is either: (a) not the most economically or financially attractive or, (b) not economically or financially feasible
	  • Step 3: Barrier analysis
	  • Step 4: Common practice analysis
	• In programs, additionality can be determined for single activities on the basis of additionality criteria, similarly to the approach in the programmatic CDM.

Costa Rica	• The determination of additionality for a given class of project activity will be standardized. • The additionality is to be determined for the class of project activity, and qualifying conditions and criteria are to be set out in the methodology. • Individual projects need to meet the conditions and apply the predefined criteria set out in the standardized method, obviating the need for each project to determine additionality and/or the crediting baseline via project-specific approaches and analyses.

Thailand Voluntary Emission Reduction Program (T-VER)	• Eligibility criteria for project activities will include:
	  • Scope/boundary: project activities located within the municipality geographical boundaries
	  • Baseline and monitoring: projects will apply methodologies under the T-VER
	  • Time: project activities starting after a given date
	  • Lawfulness: baseline cannot be illegal and project line must comply with environmental and legal requirements
	  • Double counting: project activity cannot benefit from another carbon standard
	  • Additionality: project activity must comply with the additionality criteria set up by the T-VER

Sources: (1) Overview of Carbon Offset Programs - Similarities and Differences, Technical Note 6, January 2015; (2) https://www.thepmr.org.

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