Transformative Carbon Asset Facility (TCAF)

Crediting Blueprint Synthesis Report

December 2020

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Part I. Background and context

1 Introduction

The Transformative Carbon Asset Facility (TCAF) is an innovative carbon crediting facility which provides new opportunities for developing countries to address climate change. Going beyond project-based mitigation opportunities, TCAF uses innovative carbon accounting methodologies to attribute emission reductions to scaled-up crediting interventions (i.e., policy-based, sectoral and jurisdictional approaches). Through its results-based payment approach, TCAF can assist countries in raising their climate change mitigation ambition in a broad range of sectors and with flexibility in the choice of instruments. This report provides an overview of the different crediting approaches that are relevant and provides useful illustrations of what scaled-up carbon crediting supported by TCAF could look like in practice.

Box 1. Key concepts

In this report, **climate finance** refers to international climate-related financing that supports mitigation in host countries that does not result in any international transfers of mitigation outcomes under Article 6 of the Paris Agreement. **Results-based climate finance** is financing that is only delivered based on verified emission reductions, as opposed to financing provided up front. **Carbon markets**, on the other hand, refer to international payments for mitigation outcomes (by public or private actors) that are transferred from one country to another under Article 6 of the Paris Agreement and require "corresponding adjustments" by the host country (see section 4.6), regardless of whether or not the acquiring country uses the mitigation outcomes for compliance with its nationally determined contribution (NDC) target. The term **carbon crediting** is used broadly to cover both types of financing.

TCAF includes both modalities for international cooperation: a result-based climate finance component and a carbon market component that pays for internationally transferred mitigation outcomes (ITMOs). All TCAF disbursements are based on verified emission reductions, as opposed to other metrics for measuring mitigation impact (e.g., increased renewable power generation).

The report is structured to first, in Part I, briefly introduce the background and context of TCAF's approach to carbon crediting, showing how it differs from other financing initiatives, and how it relates to international crediting under the Paris Agreement. Part II introduces different approaches to carbon crediting and the TCAF core parameters for crediting. Part III then applies these core parameters to six hypothetical case studies (i.e., "blueprints"). Each of these blueprints has been selected to illustrate the different crediting approaches and some key sectoral opportunities. Conclusions follow after the blueprints, with more detail on the range of mitigation possibilities presented in an annex.

2 TCAF and scaling up international carbon crediting

Climate change threatens to push millions of people into poverty and undo hard-won development gains, particularly in the most vulnerable countries suffering adverse effects from climate change. The challenge of reaching the Paris Agreement targets is massive – and must be faced on a global scale. National ambitions, as stated in countries' nationally determined contributions (NDCs), must be raised, and increased international mitigation cooperation is necessary to overcome this challenge. International carbon crediting – through both climate finance and carbon markets – can play a pivotal role in achieving transformative and cost-efficient global emission reductions. The cost of implementing the Paris Agreement goals will run into trillions of dollars. Moving from project-based and programmatic crediting approaches (see section 3) to scaled-up approaches is essential, for both results-based climate finance (RBCF) and international carbon market mechanisms.

To maximize impact TCAF funds must be directed towards initiatives not only with a high direct impact on emissions, but which also contribute to transformational change. TCAF can incite transformational change by identifying programs with the potential for subsequent scaling-up of measures, increasing country ambitions, or laying the foundations for domestic and international carbon pricing in various forms. This requires careful selection of programs and projects, and discussions with potential host countries on how to maximize the transformational effect.

TCAF will only require a portion of the carbon assets generated by the cooperative mitigation programs to be transferred to TCAF. The remaining emission reductions can be used by the host country towards achieving its NDC. Contributors to TCAF may use the portion of the carbon assets transferred to TCAF for their own NDC compliance. This will be based on internationally transferred mitigation outcomes (ITMOs) under Article 6 of the Paris Agreement. Importantly, this type of carbon market transaction between countries that have made mitigation pledges in their NDCs under the Paris Agreement is different from crediting emission reductions in developing countries under the Kyoto Protocol using the clean development mechanism (CDM), because under the Paris Agreement only one country may use the mitigation outcomes toward its NDC goals (see section 4.6).

The TCAF approach, where supported programs share the resulting emission reductions between host countries and TCAF contributors, incentivizes host countries to participate in developing international carbon markets while also supporting new and robust monitoring, report and verification (MRV) methodologies. The carbon assets (or carbon credits) generated through TCAF will have strong environmental integrity and are likely to be compliant with a future international regime for ITMOs. This is achieved by using conservative baselines and stringent MRV and accounting practices. To determine and pay for the mitigation impact of scaled-up initiatives such as policy changes, it is necessary to have a robust analytical framework to assess the mitigation impact of a policy. The purpose of this report is to inform interested stakeholders in developing countries and climate finance and carbon market practitioners of the opportunities TCAF can offer, present the methodological framework to implement programs, and provide inspiration to develop initiatives which may be credited through TCAF.

Before moving to some of the opportunities for TCAF operations, it is useful to note how TCAF will select potential mitigation interventions for funding. These interventions should support, in client countries, transformative climate action and promote sustainable development. To achieve this, TCAF has well-defined selection criteria for participating programs:

1. **Coherence with national mitigation aims**. The program should be consistent with the country's NDC and fully aligned with domestic policy objectives and sectoral priorities.
2. **Support increased ambition**. The program should enable the country to increase its mitigation target beyond what it would achieve with its own efforts.
3. **Achieve a lasting impact**. The program should ensure the sustainability of emission reductions after the Facility's support ends.

4. **Have sustainable development co-benefits** and maintain environmental and social safeguard standards.
5. **Demonstrate environmental integrity** of emissions reductions.
6. **Avoid any distortionary effects** on international competitiveness or the sector's GHG emissions.
7. **Establish a robust baseline** for the program.
8. **Be ready to implement in the near term**.

Part II. Overview of crediting approaches

This part explains not only the different types of interventions but also different conceptual approaches to scaled-up crediting (e.g., policy-based vs jurisdictional-aggregated vs sectoral-aggregated).

3 Different approaches to scaled-up crediting

As discussed in section 2, TCAF explores different forms of scaled-up crediting that can have transformational impacts on sectors and entire countries. This is in contrast to the more traditional project-based and programmatic approaches used both in carbon markets and for RBCF. These scaled-up approaches apply fundamentally different approaches to crediting baselines and MRV of emission reductions. Understanding these approaches, their strengths and weaknesses, and where they may be more or less applicable, is important for identifying opportunities for TCAF support (see Table 1 for summary). These different approaches apply equally for the climate finance and carbon market elements of TCAF funding sources. Note that, while the Paris Agreement potentially allows for mitigation-related transfers in units other than tCO_2 emission reduction, TCAF would only make payments against quantified emissions reductions.

3.1 Project-based and programmatic crediting

In both project-based and programmatic crediting, the baseline setting process, additionality assessment and MRV are related to actions at one or more specific sites (e.g., one or more power plants, one or more landfill sites). The actual performance at these sites after implementation of the project or program is used to calculate project emissions, and often this data is also used as an input to baseline emissions calculations. The baseline scenario is a counterfactual scenario that describes the most likely choice of technologies, behaviors, and actions at the project site(s) without the incentives provided by the crediting mechanism. While different tools might be used (e.g., historical emissions analysis, economic analysis of most likely alternative), these tools are generally applied to the conditions at a specific project site.

An example of project-based crediting would be capturing the landfill gas that would have been vented into the atmosphere and flaring this methane into carbon dioxide. If there is no regulatory requirement to flare the gas and no other source of revenue other than carbon credits, then the most likely alternative would be to continue venting the gas. An example of programmatic crediting would be developing a program for distributing solar cookstoves, without knowing ex-ante how many cookstoves would be distributed and/or exactly where they would be used. Emissions reductions would be calculated from ex-post tracking of the total size of the accomplished intervention and per unit emission reductions, which would largely be fixed ex-ante.

3.2 Jurisdictional crediting

The key distinctions for jurisdictional crediting are the boundary of the credited intervention and how baseline and project emissions are calculated. First, the boundary is not defined by facility sites but rather the physical boundaries of a national or sub-national jurisdiction. In addition, for sub-national jurisdictions (e.g., municipalities or provinces), a further clarification would be required on what indirect emissions would be included, such as emissions from energy generation or waste disposal that occur outside the jurisdiction but are driven by consumption in the jurisdiction. In terms of emissions calculations, the baseline emissions for the entire jurisdiction are fixed prior to the crediting intervention. While they might be scaled based on monitored changes (e.g., fixed baseline in tCO_2/GDP and updated GDP), they are not modelled nor are they entirely revised based on new modelling ex-post. In other words, the crediting baseline essentially becomes a fixed target against which emission reductions are measured.[1] Project emissions are then based on a detailed emissions inventory of the entire jurisdiction ex-post, taking into consideration the boundary issues discussed above. Of course, this means that the emission reductions capture the combined effects of many different driving forces, including the specific actions, incentives or interventions that might be supported by crediting.

An example of jurisdictional crediting would be an urban crediting program, where the boundary of the crediting program could be the entire municipality or metropolitan area. The crediting could include emissions related to energy, waste, industry, agriculture and even land use change. Key decisions would be whether to include emissions related to consumption in the urban area but where the emissions source is located outside the municipal boundary (e.g., a power plant). Other leakage conditions that need to be taken into account could include automotive fuel that is purchased within the urban boundary and consumed elsewhere (e.g., long-distance freight transport). The baseline emissions would be related to the actual GHG inventory of the urban area prior to the start of the crediting program (or an ex-ante projection based on this inventory), while project emissions would be the actual GHG inventory in each year after the crediting intervention was implemented.

3.3 Sectoral aggregated crediting

Sometimes referred to as just "sectoral crediting", this approach is similar to jurisdictional crediting in terms of using a fixed baseline and measured emissions for project emissions, but the boundary is set differently. The baseline emissions could be fixed in absolute terms or in terms of emissions intensity (e.g., tCO_2/t industrial production or tCO_2e/MWh electricity production), where the latter would require an ex-post calculation but would not involve modelling baseline emissions. For sectoral aggregated crediting, the boundary is defined based on an economic or industrial sector or sub-sector. This could be as large as the "energy sector" (i.e., all energy supply and demand) or as disaggregated as "building heating and cooling energy" or "municipal solid waste management". As with jurisdictional crediting, the boundary definition should clarify what indirect emissions are included.

As an example, a cement sector crediting program could include the process emissions associated with cement manufacturing (i.e., carbon dioxide released in the manufacture clinker, an input for cement), emissions from on-site energy consumption (e.g., coal or oil for process heat), and also indirect emissions (e.g., from electricity generation). A variety of tools could be used to forecast baseline emissions, including tools that would reflect the impact of the country's NDC, but once these baseline emissions are fixed at the start of the crediting intervention, they would not be revised (e.g., based on changes in fuel prices).

3.4 Policy-based crediting

In policy-based crediting, the mitigation impact of the policy itself is determined by modelling both the baseline counterfactual and the project scenario, with the only change in the two modelling exercises being the introduction of the crediting intervention (e.g., application of a carbon tax or emission-related incentives). For a national policy (e.g., economy-wide carbon tax), this means using modelling tools – largely macroeconomic modelling approaches – to project what the economy and emissions would be

[1] Fixed does not mean static. Baselines for jurisdictional or sectoral programs can embed projected or expected trends.

with and without this policy. While some inputs to the modelling might be included ex-post (e.g., international fuel prices), this form of crediting does not just rely on an actual emissions inventory conducted after the implementation of the crediting intervention. The reason is that actual emissions will be affected by many factors other than just the climate policy, and so modelling can isolate the effect of just this specific policy on national emissions, albeit based on a series of assumptions embodied in the modelling tool structure and inputs.

Examples of policy-based crediting at the **national** level could include the introduction of a carbon tax or a change in energy subsidies and incentives. In both cases, constructing baseline and project emissions would require applying an appropriate modelling tool that could translate the change in prices caused by the policy intervention into changes in consumption, and therefore changes in emissions. Another possibility would be crediting for **sectoral** policies. Here the modelling approach would be basically the same, but the intervention might directly affect only one sector – for example, a "feebate" scheme that increases the price of fossil fuel-based vehicles and subsidizes the price of electric vehicles. For sectoral policy crediting, as well, both baseline and project emissions would be modelled, to show how the policy would affect economic activity and, in turn, emissions. This is, therefore, distinct from sectoral aggregated crediting, as described above, which does not rely on modelling.

Before exploring some of the examples of these crediting approaches discussed in the sectoral blueprints, it is useful to consider how these different approaches address the role of mitigation caused by other drivers of emissions (e.g., economic shocks, other policy changes unrelated to climate policy). This is separate from the important issues of attribution of emission reductions across both climate finance and carbon market sources of funding, which is discussed in section 4.3 and applied by TCAF for all of the crediting approaches. Here what is important is that different approaches to crediting – and their corresponding MRV approaches – may or may not distinguish between the impacts of crediting and other influences on emissions. In particular, the baseline setting process under different crediting approaches could be a tool to distinguish between these drivers of emission reductions. Project-based and programmatic crediting are less impacted by changes in other drivers of emissions because of the narrower scope and boundary, and because ex-post parameters (e.g., actual production of cement or actual fertilizer production) may be used to calculate baseline emissions (e.g., ex-post activity level multiplied by a baseline emission factor). Both jurisdictional and sectoral aggregated crediting, on the other hand, are quite different. Because the total change within the relevant boundary is the basis of emission reduction calculations, these emission reductions include the impact not only of the crediting intervention but also of other drivers of emissions (e.g., changes in economic activity, trade, or input prices). Finally, policy-based crediting uses modelled baseline and project emissions precisely to isolate the impact of the crediting intervention from other factors. These same models could be used to estimate the impact of any other changes in emissions drivers, but these would not be part of the emission reductions awarded to the crediting intervention.

Table 1. Baseline emissions, project emissions and MRV in different crediting approaches

Type/approach	*Baseline emissions*	*Project emissions*	*MRV*
Project-based/ programmatic	Counterfactual estimate of emissions at specific site(s) based on historical, technology, economic or performance analysis	Measured emissions or parameters directly related to emissions (e.g., energy consumption) at project site(s)	Measure emissions or other drivers of emissions at project site(s); ex-post data may be used to calculate baseline emissions
Jurisdictional	Total projected emissions in the jurisdiction, fixed ex-ante*	Total reported emissions in the jurisdiction ex-post	Detailed bottom-up jurisdiction-level GHG inventory, with clear boundaries
Sectoral aggregated	Total projected sector emissions, fixed ex-ante*	Total sector emissions reported ex-post	Detailed bottom-up sectoral inventory, with clear boundaries
Policy-based	Based on economic modelling of economy-wide emissions or sectoral emissions *without* policy (e.g., carbon tax, performance standards, regulation)	Based on economic modelling of economy-wide emissions or sectoral emissions *with* the policy	Modelling baseline and project emissions using ex-post input parameters (e.g., GDP, sectoral GDP, fuel prices)

Note: *The baseline could be fixed in terms of tCO_2/GDP and then updated with ex-post actual GDP, or a similar factor, but there is no modelling of emissions or reassessment of modelling ex-post.

TCAF uses jurisdictional, sectoral or policy crediting approaches to maximize the transformative impact of its programs in client countries and to best contribute to ambition raising. To ensure robustness of its operations, environmental integrity, alignment with client country NDC targets and contribution to sustainable development, TCAF follows a set of core parameters. These parameters are common to each of the three crediting approaches and discussed in the next section.

4 TCAF core parameters

This section presents an overview of the TCAF core parameters for crediting. Potential TCAF programs must demonstrate their performance in all of these areas, and proposals should explain how the concepts would be applied to the relevant sector, program and activities. The core parameters are: transformational change; baseline setting; additionality; MRV; avoidance of double counting; sustainable development; crediting period; safeguarding against regrets; and pricing. The concepts behind sustainable development – avoiding double counting, safeguarding against regrets, crediting period and some aspects of pricing – are not, however, specific to sectors but are mostly country-level issues. The application of these is explained in this section – and accordingly have longer sub-sections – while the case study blueprints focus on how to apply the parameters for transformational change, baseline setting, additionality, and MRV to each sector and program type.

4.1 Transformational change

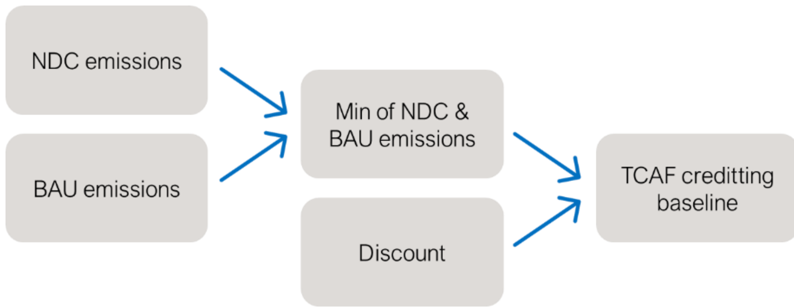
The core parameters document provides several indicators or factors that can be used to demonstrate the potential for transformational change. These include the following:

- **Size**: TCAF operations are expected to show their transformational quality in achieving a large volume of emission reductions, i.e., at least five million tons CO_2e over the crediting period of five to seven years.
- **Sustainability**: This has three dimensions: technology, policy, and financing. The host country has a responsibility to achieve program sustainability, and its commitment to this objective is an important criterion in the assessment. Each of these dimensions needs to be assessed, and appropriate indicators will need to be defined.
- **Ambition raising**: TCAF operations are expected to enable the host country to increase its domestic emissions-reduction ambition over time.
- **Carbon pricing**: TCAF operations should contribute directly or indirectly to the development and implementation of explicit or implicit domestic carbon pricing policies. A global objective of TCAF is to catalyse a scaled-up international carbon market and to contribute to effective and efficient programming of international climate financing.

4.2 Baseline setting

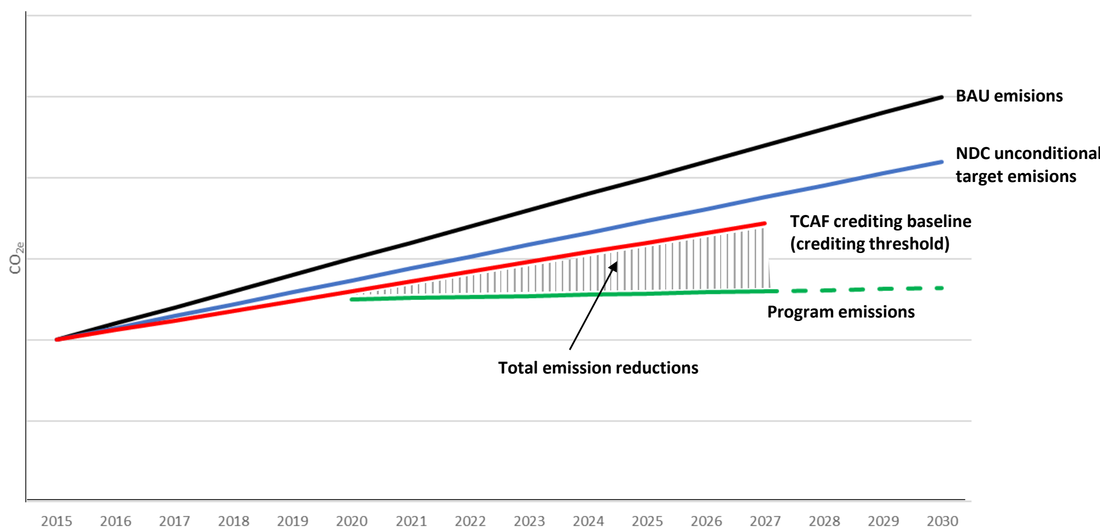
All countries that are signatories of the Paris Agreement agreed to reduce their GHG emissions and strengthen their commitment over time. Most high-income developed countries committed to an emissions reduction target in absolute terms compared to an earlier year. Developing countries, however, typically committed to reducing their emissions versus a business-as-usual (BAU) scenario or reducing the emissions intensity of their future growth. Most commonly, they offered in their NDCs a single-year target (for 2030) that is a percentage reduction of the expected BAU emissions.

The emission reductions needed to meet these targets will not be credited and should be part of the baseline. Additionally, since the Paris agreement anticipates that the NDCs will strengthen over time, and since emission reduction units (ERs) that have been sold cannot be applied to future more ambitious commitments, the TCAF baseline should be more conservative than the unconditional NDC target to ensure a high level of environmental integrity and compensate for uncertainties in the ER determination and calculation process (see Figure 1). If any other project-based ERs are sold (e.g., from a project-based mechanism such as Article 6.4 under the Paris Agreement), these would have to be subtracted from the crediting emissions reductions in the scale-up crediting program. In practical terms, this means that TCAF will credit against a crediting threshold (or “TCAF baseline“) that is well below the BAU emissions trajectory and typically also below the target emission trajectory (see Figure 2). Single-year targets will conservatively be broken down to a trajectory of annual targets, with the default being linear interpolation to the 2030 goal.



Note: BAU = business as usual; NDC = nationally determined contribution; Min = minimum

Figure 1. Process for calculating TCAF crediting baseline



Note: BAU = business as usual; NDC = nationally determined contribution

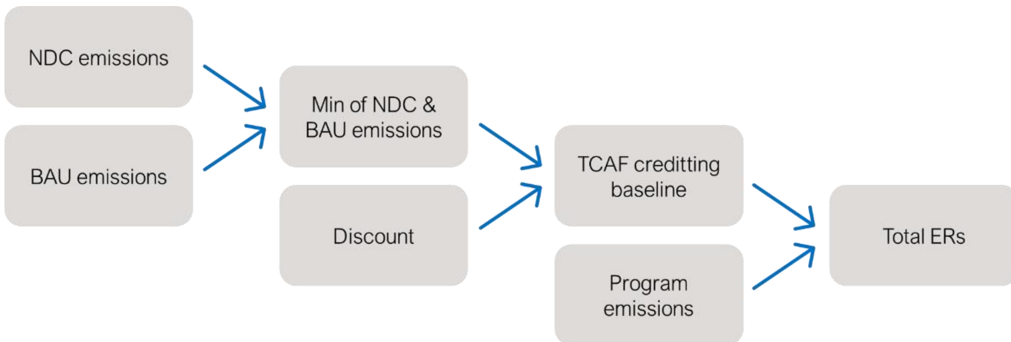
Figure 2. TCAF approach to crediting baseline

4.3 Additionality

TCAF uses a two-layer approach to additionality:

Layer one: Market mechanism takes into account that TCAF operations will follow a market mechanism logic as they are piloting potential new international market mechanisms under Article 6 of the Paris Agreement and seek recognition of the purchased verified emission reductions (VERs) as ITMOs under Article 6. In this approach, additionality is defined as the difference between the crediting threshold determined above ("TCAF baseline") and the project emissions (see process in Figure 3 and illustration in Figure 2). This results in an estimate of the total emission reductions that are additional and beyond the NDC goal.

Operationalization of layer one additionality will therefore be done through systematic assessment of the crediting threshold. As discussed above in baseline setting, instead of taking for granted that NDC targets will lead to emission reductions below BAU, TCAF will establish BAU trajectories on the level of TCAF operations and compare them to NDC targets. TCAF will use the lower of these as a starting point, and then further reduce the baseline to be conservative, resulting in a TCAF crediting baseline that is the crediting threshold. Only emission reductions below this crediting threshold will be credited. As target setting is not static under the Paris Agreement but dynamic – parties are expected to increase their NDC targets and coverage over time – increases in NDC ambition will be reflected in baselines if they occur during TCAF crediting periods.



Note: BAU = business as usual; NDC = nationally determined contribution; Min = minimum; ERs = emission reductions

Figure 3. Process for calculating total emission reductions (layer 1 additionality)

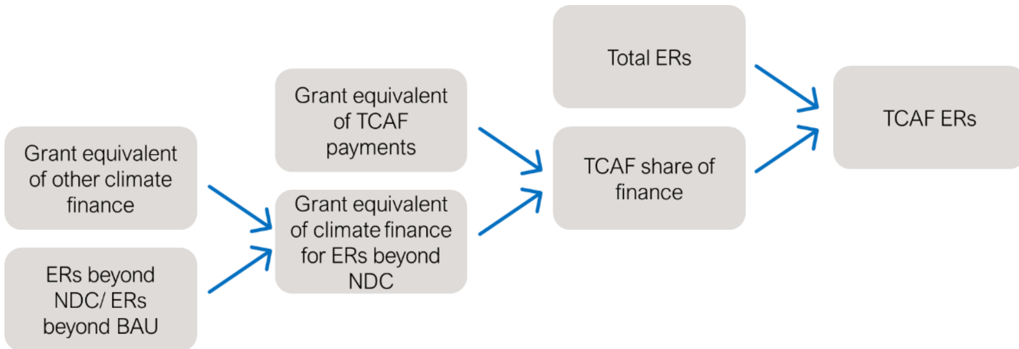
Layer two: Finance mechanism follows a climate finance logic, as TCAF operations are piloting Article 6 mechanisms through providing both climate finance and carbon market payments, and because TCAF operates in an environment where provision of finance other than TCAF funds often plays an important and increasing role in mitigation.

This second layer approach to additionality addresses the attribution of emission reductions to the different streams of climate finance and carbon market payments that support the overall mitigation intervention. The analysis should attribute the total emissions across the financing from TCAF versus other climate finance or carbon market sources (Figure 4). Because climate finance may be used both for supporting the host country to achieve its NDC and going beyond this, the first step is to estimate the share of other climate finance for mitigation beyond the NDC. In this assessment, all climate finance sources are valued at their grant equivalent ("subsidy value") rather than face value.

The resulting estimate of grant equivalent climate finance for mitigation beyond the NDC can then be compared with the net present value of the TCAF ERPA payments, to calculate TCAF's share of the total financing supporting the mitigation intervention.[2] On that basis, the ERs attributable to the TCAF operation will be derived. This will result in the calculation of "TCAF ERs" and ensure that no more emission reductions are attributed to TCAF than what TCAF delivered in international support to the mitigation intervention. This attribution approach has the additional benefit of reflecting the contribution

[2] As an example, if in 2030 the ERs of the program below BAU were 20 $MtCO_2$, and ERs below the NDC were 15 $MtCO_2$, then 75% of the climate finance would be allocated to mitigation beyond the NDC. If the total grant value of climate finance was $100 m, then $75 m would be used for calculating the share of finance from TCAF versus other sources. If the NPV of the of the TCAF ERPA was $40 m, then TCAF could receive 5.2 $MtCO_2$ (($40m / ($40m + $75m)) x 15 $MtCO_2$).

to conditional NDC targets in the crediting approach and increasing economic efficiency of carbon market transactions.[3]



Note: BAU = business as usual; ERs = emission reductions

Figure 4. Process for emission reductions attributable to TCAF (layer 2 additionality)

4.4 Monitoring, reporting and verification

The Paris Agreement establishes a universal system of transparency for MRV, with built-in flexibility taking into account countries' different capacities. The Agreement requires countries to report biennially on the following:

- progress with implementing NDCs;
- progress with the provision and/or receipt of support; and
- identification of capacity building needs.

A gradual strengthening of national MRV systems forms the backdrop for any TCAF MRV. The MRV for the TCAF crediting program will be aligned with national MRV systems to the degree possible (e.g., accounting methodology and computer systems). This way, TCAF can also make a valuable contribution to building national-level MRV capacity. In all cases periodic verification needs to be undertaken by an independent third party. The MRV approach for different types of scaled-up crediting interventions is discussed in more depth in the case studies but may include not only measuring emissions across a sector or jurisdiction but also modelling both the baseline and program emissions using ex-post values for key parameters that influence emissions (e.g., national and sectoral GDP, international fuel prices, and population growth). TCAF programs would require not only MRV of emission reductions, but also transformational change and sustainable development benefits.

4.5 Sustainable development

For this and the final three parameters, their application is explained here and not repeated in the case studies in Part III, so these sections are more detailed than 4.1 to 4.4. All TCAF programs should ensure compliance with the World Bank Environmental and Social Standards (i.e., the safeguards policies at the

[3] See: Fuessler, Juerg, Thomas Kansy, and Randall Spalding-Fecher 'Blending Climate Finance and Carbon Market Mechanisms: Options for the Attribution of Mitigation Outcomes. CPF/TCAF Discussion Paper'. Washington, DC: World Bank, March 2019, and J. Strand (2019), Climate Finance, Carbon Market Mechanisms and Finance "Blending" as Instruments to Support NDC Achievement under the Paris Agreement, World Bank, https://openknowledge.worldbank.org/handle/10986/3197.9.

World Bank) and consistency with United Nations Sustainable Development Goals (UN SDGs). Going beyond a safeguarding approach, each individual TCAF program should define relevant indicators to evaluate progress and the nature of sustainable development (SD) benefits. Possible examples include indicators related to health benefits due to reduced air pollution, from vehicle emissions, positive impacts on disposable income for low-income households through savings on energy bills, and reduced traffic accidents. These indicators will become criteria for program selection as well as for performance monitoring and evaluation of program results over time.

The UN SDGs themselves include a large number of quantitative and qualitative indicators TCAF programs can consider when defining program relevant SD indicators. When selecting indicators for sustainable development, several considerations are important:

- Practicality and synergy with other MRV: Ideally, the monitoring data should be related to the core business or implementation plans for the overall program. As an example, a crediting program that distributes biogas digesters will already track the number of households served. This would contribute directly to SDG indicator 7.1.2, under Goal 7 on energy services, which is "proportion of population with primary reliance on clean fuels and technology". If the same program helped a farmer to sell the bio-slurry from the digesters, this would directly contribute to SDG indicator 2.3.2 "Average income of small-scale food producers, by sex and indigenous status". Of course, such a crediting program might not cover the entire national population, but the indicator could be used within the relevant geographic area targeted.
- Proximity of impact: The more directly linked the crediting intervention and sustainable development impacts are, the easier it will be to measure them credibly, while the opposite will be true for impacts that have complex and multi-step relationships with the intervention. For example, promoting electric vehicles will undoubtedly reduce air pollution in cities, which will, in turn, reduce health impacts from airborne particulates. Demonstrating a quantitative link between the crediting intervention supporting electricity vehicles and a change in human health, however, is a highly complex and expensive task. For this type of development benefit, it may be sufficient to provide the logic for the direction of impact.
- Transaction costs: MRV for GHG emission reductions is already a challenging and costly undertaking, and potentially even more so with scaled-up crediting programs. Adding MRV for sustainable development impacts on an ongoing basis could add even more transaction costs, but it can also provide useful information on the effectiveness of the program and suggest means for improvement. Exploring innovative data collection techniques or using proxies for development impacts is important in managing such transaction costs.

4.6 Avoidance of double counting

Accounting of emission reductions under NDCs is a complex task, as targets are formulated in different ways and may even be accounted for in different units or metrics. Avoiding double counting of emission reductions is one of the foundational principles of Article 6 of the Paris Agreement, as well as other emerging international carbon markets such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). While the detailed procedures for transfers are still under negotiation, the Article 6 rules will ensure that only one country may use ITMOs for the purposes of compliance with its NDC. This will apply to all cooperative mitigation actions under the Paris Agreement, and so is addressed here rather than in the case studies presented in the later sections of this report.

To avoid double counting, the draft guidance for Article 6.2[4] will include the procedure and considerations to be taken for "corresponding adjustments" for any transfers for both countries. In other words, if the transferred mitigation outcomes are used to lower the acquiring country's emissions in its NDC performance reporting (i.e., not its actual national GHG inventory), then this amount must be "added back" to the transferring country's NDC reported emissions. Assuming that the mitigation activity lowers the actual GHG inventory figures of the transferring country, the net result is that the transferring country's reported emissions for NDC compliance are unchanged by the activity. This is illustrated in Figure 5, where the 30 units transferred from the transferring country to the acquiring country are added back to the transferring country's actual emissions when these are reported (i.e., as "adjusted emissions") for NDC compliance.

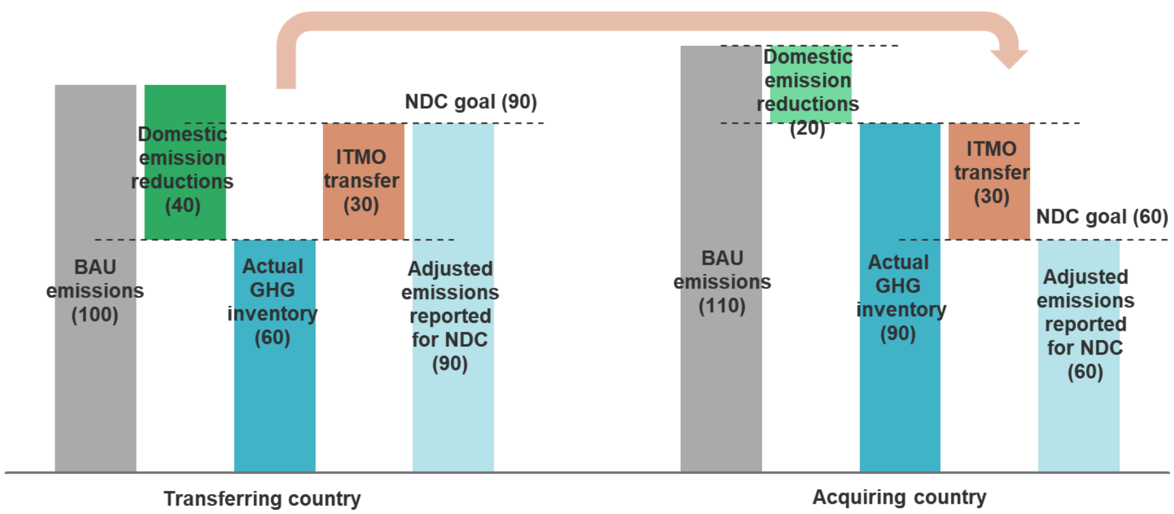


Figure 5. Illustration of corresponding adjustments

Source: Spalding-Fecher, R 2020 "Governance Issues" in "From ERPA to MOPA: Practical Application of Article 6 Guidance to ITMO Transfers" panel, IETA Carbon Market Virtual Pavilion, 12 November 2020. https://www.carbonmarketpav.com/gggi-swedish-energy-agency-sea-panel-discussion

In the figure, if the transferring country's mitigation pledge was to reach 100 units, then it would still achieve its goal after the transfer was complete. If its goal was to reach 70 units, however, then the transfer would mean that it would miss this target. Even though its actual emissions inventory would be lower than this level, reported emissions for NDC compliance would be higher than the pledge. In summary, because of corresponding adjustments, Article 6 transactions cannot help a transferring country move closer to its NDC goal, because the mitigation outcomes can only be used by one country (i.e., in this case, the acquiring country). Of course, a transferring country might utilize Article 6 cooperation to go beyond its mitigation pledges to implement more actions. Because of the corresponding

[4] https://unfccc.int/sites/default/files/resource/DT.CMA2_.i11a.v3_0.pdf.

adjustments, however, it will not receive "credit" for these actions in its NDC reporting – since only one country can account for the mitigation outcomes.

TCAF will address international double counting risks by requiring a commitment of the host country to undertake corresponding adjustments for the part of the TCAF supported emission reductions that is transferred to TCAF as ITMOs and that cannot be used for host country NDC compliance. Understanding that the host country needs to do analytical work to examine its NDC implementation plan, TCAF can provide technical assistance support where required to build the host government's capacity to make an informed decision on corresponding adjustment commitment.

In addition to the risks of double counting at an international level now that all countries have mitigation goals under the Paris Agreement, in scaled-up crediting there is a risk of domestic double counting, for several reasons. These would include double counting of ERs from individual projects (i.e., under project-based crediting mechanisms) that are inside the large scaled-up crediting program, and also situations where the impact of multiple scaled-up crediting programs could overlap (e.g., across sectors or sub-national jurisdictions). Great care must be taken to adequately address these risks, including subtracting any project-based ER crediting inside the boundary of the crediting program from the total ERs to be awarded.

4.7 Safeguarding against regrets

A major concern of prospective host countries under Article 6 is the risk that participation in cooperative approaches could compromise achieving their NDC, due to "overselling" emission reductions. This needs to be mitigated both from a selling-country perspective and from TCAF's perspective, in order to avoid reputational risk. In the broader context, all Parties to the Paris Agreement share the responsibility to meet the ambitious goals of the Agreement, and none would want to take actions that could jeopardize that collective goal. This would need attention at a national level for any prospective host country, regardless of the specific proposed crediting intervention.

The issue of overselling risks is complex, because it involves several different types of risks that require different policy responses. One of the most important is selling ERs at too low a price, which could compromise NDC achievement if remaining mitigation opportunities turn out to be too expensive. Recent research[5] presents a number of strategies for reducing overselling risk, which can be grouped in four broad themes:

- Ensuring that activities that the country intends to use for the NDC are not part of the mitigation activities used for Article 6 cooperation.
- Not transferring all of the mitigation outcomes that are generated from cooperative mitigation actions.
- Using a share of carbon market revenues to support a pool of funds to invest in additional mitigation if necessary.

[5] Spalding-Fecher, Randall, Anik Kohli, Juerg Fuessler, Derik Broekhoff, and Lambert Schneider. 'Practical Strategies to Avoid Overselling'. Stockholm, Sweden: Swedish Energy Agency, 2020. http://www.energimyndigheten.se/globalassets/webb-en/cooperation/practical-strategies-to-avoid-overselling---final-report.pdf.

- Implementing two-part pricing, to separate compensation for the abatement costs of the mitigation intervention from the costs to the country of replacing this mitigation intervention to still be able to meet the NDC goal.

Figure 6 illustrates the two-pricing approach, based on an example strategy for reaching an NDC goal with seven interventions that were selected not only on the basis of cost but also on other political priorities and feasibility – in other words, there could be other low-cost mitigation options not shown here because they faced barriers or did not align with policy priorities. For this particular NDC implementation plan, the abatement cost of intervention B is \$7/tCO_2, which is lower than the marginal cost of meeting the NDC, which is at \$20/tCO_2. An additional payment of \$13/tCO_2 would be needed to ensure that the transferring country could invest in higher-cost options to replace the low-cost option used for the cooperative approach.

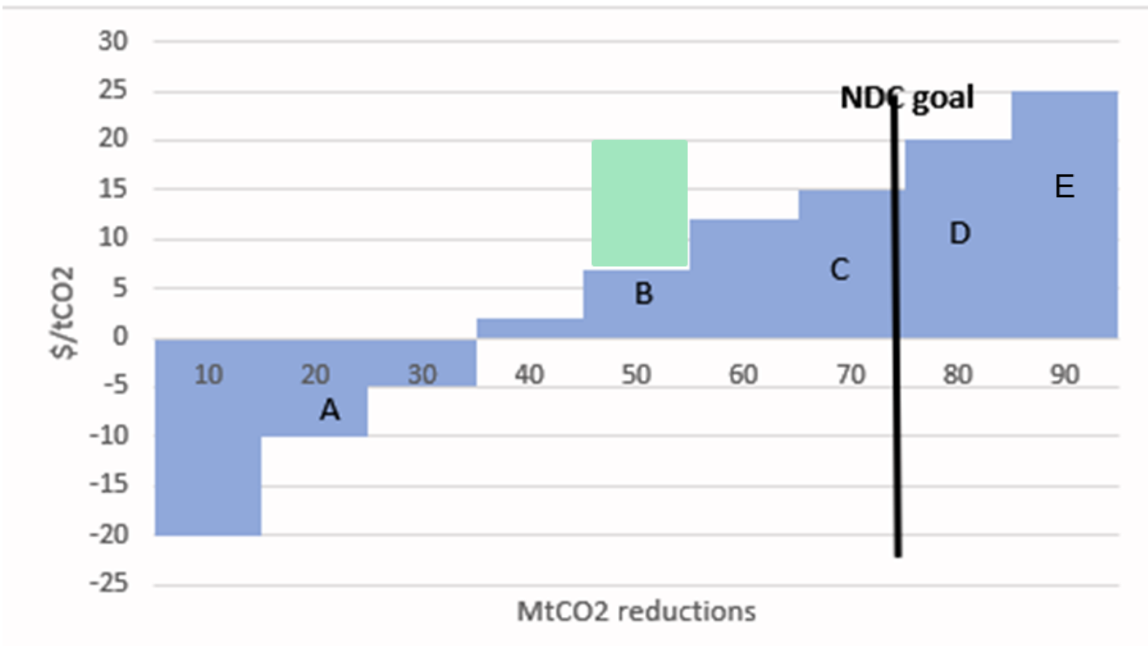


Figure 6. Potential approach for pricing internationally transferred mitigation outcomes for activities selected for NDC goal

Source: Spalding-Fecher et al (2020) Practical Strategies to Avoid Overselling. Stockholm, Sweden: Swedish Energy Agency

In such a case, the ITMO price could have two components:

- Payment to project proponent: The payment would cover the project's abatement cost (\$7/tCO_2).
- Payment to transferring country's government: The payment would cover the gap between the project abatement cost and the marginal cost of meeting the NDC goal (green area, \$13/tCO_2) or even the entirety of the marginal NDC cost, i.e., \$20/tCO_2. It could, in fact, be even higher, to promote long-term mitigation actions and increased NDC ambition in the next cycle, as well as to manage the risk that some of the NDC package interventions would not deliver their full mitigation potential. It would be up to the host country government to decide how to use this revenue to incentivize the necessary mitigation action.

TCAF will require the country selling the ERs to have a mitigation strategy that accounts for the TCAF operation. Such analytical work will require consideration of mitigation potential and mitigation strategy on the national level – depending on the nature of the NDC target potentially broken down to target sectors. TCAF will count as much as possible on work undertaken in this area by the country selling the ERs and related technical assistance received from third parties such as the Partnership for Market Implementation (PMI) or the World Bank Climate Warehouse program. Only in cases where these analyses cannot be provided under existing work programs will TCAF close the gap through its own efforts.

4.8 Crediting period

As with double counting and safeguards against regrets, crediting periods are not addressed in detail in the sectoral blueprint papers and are therefore described more generally here. The earliest that TCAF crediting periods will begin will be the start date of the NDC implementation period, and the latest ending will be the end date of the NDC implementation period. Within these crediting periods TCAF will typically pay for five- to seven-year vintages of emission reductions. This means that the TCAF purchase periods will typically be shorter than the full NDC period for most countries (i.e., ten years) and will also be shorter than the economic or technical life of many of the investments incentivized by the scaled-up crediting program. This is beneficial to the host countries, since even more of the emission reductions that are catalyzed will remain in the host country and contribute toward its NDC goals. It is also important to note that TCAF-creditable mitigation activities can have a start date earlier than the crediting period (i.e., TCAF can credit ERs during the NDC period based on mitigation actions that were implemented before the start of NDC period).

The share of emission reductions purchased by TCAF will vary across operations. Generally, TCAF operations aim for purchase volumes over the full purchase period of an order of magnitude of five million tCO_2.

4.9 Pricing of emission reductions

TCAF will use a two-part pricing approach reflecting its hybrid character: about half of TCAF funds are disbursed as results-based climate finance (RBCF) and the emission reductions paid for with this RBCF will stay in the host country and can be used for the host country's NDC compliance (i.e., these will be RBCF-VERs). The other half of TCAF funds is for acquiring emission reductions that will be transferred out of the host country (i.e., ITMOs) and can no longer be used for its NDC compliance.

Obviously, RBCF-VERs and ITMOs need to be priced differently. What matters for pricing RBCF-VERs is the financial support a program needs for implementation. The RBCF-VER pricing approach can, therefore, stay within the boundary of the concrete TCAF program. For a concrete investment project, RBCF-VER pricing could be based on the incremental cost of a low-carbon investment as compared to a BAU investment or any other measure of a cost gap that needs to be closed.

For scaled-up crediting, RBCF-VER pricing is typically more complex. In the case of policy-based crediting, a different cost concept would need to be used than in the case of individual projects. The cost of implementing a carbon tax, for example, consists of the "deadweight loss" that the new tax causes in the economy as a whole. RBCF pricing of VERs can be informed by such deadweight losses, but the losses need to be determined through complex modelling exercises or conservative estimation. In addition, there are policy costs (e.g., administrative costs, compensation to poorer households) that might need to be considered as well, depending on the concrete case.[6]

In other cases of scaled-up crediting, RBCF-VER pricing might, rather, need to apply a logic of required reward instead of a cost gap logic. This could, for example, be the case for a program incentivizing commercial banks to shift their loan portfolios from brown to green. In the case of energy efficiency measures (which often come at negative cost) it might be the signaling function of pricing that matters. An example is subsidized loans for energy efficiency building rehabilitation, where the discount to the interest rate might need to be large enough to draw attention to a loan offer that comes with energy efficiency requirements for the planned building rehabilitation activity. For these reasons, RBCF-VER pricing for scaled-up crediting is highly program-specific and needs to be analyzed for each case.

Differently from RBCF-VER pricing, ITMO pricing cannot be done within the boundary of the crediting program. Instead, it needs to look at the marginal cost of NDC achievement. Such opportunity cost pricing was illustrated in section 4.7 above, using a marginal abatement cost curve. To get ITMO pricing right, host countries need to have a good understanding of their NDC implementation strategy and the costs of the respective NDC mitigation activities. TCAF may support host countries in this analysis but may also point them to other resources that could support this type of NDC-related analytical work.

Neither RBCF-VER pricing nor ITMO pricing will be further discussed in the blueprint examples provided below, due to their specificity to concrete program cases and country/NDC circumstances.

6 On pricing emission reductions achieved with a carbon tax see: Strand, J., Supporting Carbon Tax Implementation in Developing Countries Through Results-Based Payments for Emissions Reductions, 2020, https://openknowledge.worldbank.org/handle/10986/34651.

Part III. Application of TCAF core parameters to case study blueprints

The following sections elaborate on six hypothetical case studies (blueprints). For each blueprint, the sections present some of the arguments for transformational change, baseline setting, additionality and MRV. As discussed above, the core parameters for avoiding double counting, safeguarding against regrets and crediting periods are less specific to each type of crediting intervention, so they are only discussed in section 4. Pricing is highly program specific and some general principles only could be discussed earlier in section 4.

The six blueprint cases presented in this Part are outlined in Table 2.

Table 2. Case study blueprints as TCAF examples

	Sectors covered	*Geography*	*Crediting approach*	*Policy instruments*
Strengthening an existing carbon tax	Energy supply and all energy demand sectors	National	Policy-based	Carbon tax
Crediting the transition of a vehicle tax system to a feebate scheme	Transport	National	Policy-based	Feebate
Government subsidies for less emission-intensive fertilizers	Agriculture	Sub-national	Policy-based	Subsidy reform
Jurisdictional crediting for a municipality	All sectors	Sub-national	Jurisdictional	Multiple instruments
Sectoral crediting for renewable power program	Electricity supply	National	Sectoral aggregated	Multiple instruments
Portfolio rewards for commercial banks	Financial (and others indirectly)	National	Policy-based	Incentives for higher share of green vs brown financing

5 Policy-based crediting: strengthening an existing carbon tax

5.1 Project background

TCAF operations could incentivize a country to strengthen an existing carbon tax. The example assumes that a carbon tax is already implemented in a country as part of policy designed to help the country to reach its unconditional NDC, but at different rates in different contexts, at an average low rate of $2/t$CO_2$. Emissions in 2020 would be around 350 MtCO_2/y without any carbon tax, so this would be the BAU scenario. The existing fossil fuel taxes reduce this to 348 MtCO_2/y, which would be the NDC scenario. A higher carbon tax could be expected to reduce emissions by around 10 MtCO_2/y per $10/t$CO_2$ increment, but at a decreasing rate. In this example, TCAF support could contribute to strengthening the carbon tax to $10/t$CO_2$ across all sectors.

5.2 Transformational change

TCAF can support initiatives to implement or strengthen policies which increase the price on GHG emissions. These initiatives must be carefully designed so that the policy is transformative; they must allow modelling of a robust TCAF crediting threshold baseline, and allow the results to be monitored, reported, and verified.

As mentioned in section 4, an initiative can support transformational change towards a decarbonized economy if it contributes to emission reductions of a sufficient size, in a sustainable manner, enables the host country to increase its mitigation ambition, and contributes to the implementation of carbon pricing instruments. A strengthened carbon tax could be well placed to deliver transformational change in accordance with TCAF requirements and would be an example of direct TCAF support for explicit domestic pricing.

As long as the carbon price is high enough, it can incentivize a shift towards low-carbon-emitting alternatives, sufficient to fulfil the TCAF size criteria of over five million tCO_2e over the crediting period of five to seven years. In this example, strengthening the carbon tax from $2/$tCO_2$ to $10/$tCO_2$ could result in emissions reductions up to eight million tCO_2/y, based on the ex-ante modelling approach discussed below.

Carbon taxes are likely to adversely affect some households and enterprises, with resulting negative effects on income distribution or on industrial competitiveness. For the policies to be sustainable over time, it is necessary to overcome political-economic resistance, with a possible need to develop specific transitional plans or compensation schemes for those negatively affected. A TCAF initiative would be required to successfully address these issues. The results-based payments of TCAF will typically remain low or even marginal as compared to fiscal revenues from an increased carbon tax, and they cannot contribute to frontloading such fiscal revenues. In other words, other financial instruments would be needed if funding needs to be spent in the present in anticipation of future fiscal revenues, which results-based payments cannot offer.

Successful implementation of an increased carbon tax based on TCAF support would already be a direct contribution to explicit carbon pricing in the country. Building the MRV for this instrument and addressing the political-economic resistance could also make it easier to further strengthen carbon pricing policies in the future. This could, in turn, allow for increased domestic ambition.

5.3 Baseline setting

Policy crediting requires extensive modelling, both for baseline-setting and for MRV. This is, in part, because the TCAF crediting threshold for policy crediting should consider emissions reductions that reflect the existing mitigation efforts of the host country in absence of TCAF incentives. The basic idea here is to identify the *incremental* impact that crediting might have on the design features of the planned or existing policy. The most straightforward case would be implementing the carbon tax as a direct effect of TCAF support when this policy would not have been implemented as part of the country's NDC implementation plan. However, TCAF support is, in this example, strengthening a policy already enacted in the country (i.e., as one of the NDC policies). The mitigation impact of this policy improvement could, in principle, be credited by calculating the mitigation impact of the original policy design as the baseline (i.e., only crediting the additional reductions beyond what the existing NDC policy would have generated).

Step one in setting a baseline is formulating a qualitative "theory of change". A robust theory of change explains the mechanisms by which the policy impacts emissions. This theory of change is used in the next step to design a quantitative model to estimate emissions in the with- and without-policy scenarios. The theory of change should be more straightforward for an economy-wide carbon tax than for many other types of policy-based crediting, where impact channels are more uncertain or complex to model.

Step two is to define the modelling approach and the scope of modelling, based on each impact in the theory of change. A general equilibrium model which reflects production and consumption of energy flows could be used for this purpose, but other economic modelling tools will be relevant, depending on the specific intervention. This model definition stage should also justify the relevance and accuracy of the modelling tool, particularly in the context of the specific host country.

Step three consists of applying the modelling approach to estimate baseline emissions without the policy (or without the increased stringency of the policy, in the case of increasing an existing carbon tax). This baseline determination must be done on an ex-post basis, but it is also necessary to simulate the with- and without-policy scenarios ex-ante to estimate the mitigation effect of the policy change. The mitigation impact depends critically on economic variables that are difficult to predict and that are outside the boundary of the policy, such as GDP or world market prices for fossil fuels.

As explained in section 4, the TCAF crediting baseline should be the minimum of the unconditional NDC and BAU scenarios, with an additional margin for conservativeness and uncertainty. In the context of this example of strengthening an existing policy, the assumption is that the existing policy represents the NDC pledge and is already below BAU. Applying a small discount for conservativeness to this modelled emissions scenario can therefore yield the TCAF crediting baseline.

Table 3. Ex-ante estimates of total emission reductions from strengthening a carbon tax

Estimated emissions (MtCO_2/year)	*2020*	*2025*	*2030*
BAU emissions (i.e., without any fossil fuel taxes)	350	370	390
Effect of existing fossil fuel taxes in NDC (i.e., \$2/tCO_2)	-2	-2	-2
Unconditional NDC emissions goal (i.e., with impact of \$2/tCO_2 tax)	348	368	388
Minimum of BAU and NDC	348	368	388
Discount for conservativeness and uncertainty		-2	-3
TCAF crediting baseline (minimum of BAU and NDC, less discount)	348	366	385
Modelled program emissions (i.e., with \$10/tCO_2 tax)		358	377
Total emission reductions (\$10 vs \$2/tCO_2)		-8	-8

5.4 Additionality

The layer 1 additionality assessment is shown in Table 3: this is the difference between program emissions and the TCAF crediting baseline, which already incorporates the impact of the NDC and a conservative discount factor. In this example, the estimated total emission reductions are 8 tCO_2/year in 2025 and 2030.

For the layer 2 additionality assessment, the TCAF contribution should be compared to the total climate finance provided to the country in relation to the strengthening of the carbon tax. This is calculated based on the shares of grant-equivalent financing.[7] If the TCAF contribution is estimated at $50M and the country receives other grants of $10M related to the carbon tax policy, 6.7 $MtCO_2$, equivalent to 83% of the emission reductions, would be attributable to TCAF in 2030 (Table 4).

Table 4. Ex-ante estimates of TCAF emission reductions from strengthening a carbon tax

Estimated emissions ($MtCO_2$/year)	*2025*	*2030*
Estimated impact of increased carbon tax ($10 vs $2/$tCO_2$)	-8	-8
Share of financing from TCAF	83%	83%
TCAF emission reductions	-6.7	-6.7

5.5 Monitoring, reporting and verification

As discussed in section 3, in policy-based crediting the emissions for both the baseline and project emissions scenarios are modelled. MRV for policy-based crediting must be based on the modelling approach defined in the baseline setting process above. Key input variables for the modelling are monitored over time, so that both the baseline and project scenario emissions can be recalculated ex-post to reflect actual changes in key economic, social and demographic factors. In each year of the crediting period, emissions with and without the policy are modelled and compared, taking into account other factors such as GDP shocks, international fuel prices or unrelated domestic policies that may affect emissions. Once baseline and project emissions are re-calculated ex-post (i.e., repeating step 3 from the baseline setting section above), including any discounting for conservativeness and uncertainty, the creditable emission reductions can be determined (Table 5). Note that the discount for conservativeness and uncertainty may often be lower in the ex-post assessment because more of the drivers of emissions are known (e.g., 1 $MtCO_2$ in Table 5 versus 2 $MtCO_2$ in Table 4).

Table 5. Ex-post modelling of emissions from a strengthened carbon tax in 2025

Modelled emissions ($MtCO_2$/year)	*2025*
BAU emissions (i.e., without existing fossil fuel taxes)	364
Unconditional NDC emissions goal (i.e., with impact of $2/$tCO_2$ tax)	362
Minimum of BAU and NDC	362
Discount for conservativeness and uncertainty	-1
TCAF crediting baseline	361
Modelled program emissions (i.e., with $10/$tCO_2$ tax)	354
Total emission reductions	-7
Share of emission reductions attributable to TCAF	83%
TCAF emission reductions	-5.8

[7] The detailed approach for calculating the Layer 2 additionality is discussed in Section 4.3.

Importantly, this analysis does not rely on the actual national or sectoral GHG inventory to calculate emission reductions. This is because actual emissions may be affected by factors outside of the crediting program. Nevertheless, actual emissions may be useful to check the plausibility of the results. At a minimum, this step involves comparing emission reductions estimates determined under step 3 with the actual change in sectoral GHG inventory over time. In addition, further indicators should be assessed, such as investment volumes in renewable energies, improvements in energy efficiency. This allows building an opinion on the plausibility of the quantification results from the perspective of observed physical change.

While the example above illustrates crediting of a policy to strengthen a carbon tax, there are several variations of price-based mitigation policies which could also be applicable for TCAF support. Crediting a historic carbon tax and removing fossil fuel subsidies are examples of policies which could use a similar crediting approach, with adaptations to the theory of change and the modelled with- and without-policy scenarios. For the historic carbon tax, the crediting approach would need to consider the impact on the host country's NDC achievement. In other words, if the carbon tax had already been factored into the NDC BAU scenario, then any transferred mitigation outcomes based on the historical carbon tax would have to be replaced with additional mitigation during the NDC period. This would not be the case, however, for emission reductions from the crediting program that are used by the host country (i.e., supported by the RBCF portion of the TCAF funding). For fossil fuel subsidies, the changes in fuel prices could be converted to effective changes in carbon prices, and this could then be modelled similarly to the carbon tax intervention presented in this case study.

6 Policy-based crediting at a sectoral level: implementing a feebate on vehicles

6.1 Project background

This example considers the impact of price-based mitigation policies at a sectoral level. TCAF operations could incentivize a country to shift its vehicle taxation structure to promote electric vehicles. This vehicle feebate combines a tax ("fee") with a subsidy element ("rebate"), so that fossil-fueled vehicles are subject to a net tax while electric vehicles are subsidized. Feebates can be designed as revenue-neutral instruments, such that the change in government revenue would be zero.[8]

The example assumes that a country already has a vehicle tax of $1,000 for each new registration, regardless of vehicle type. Emissions from transport in 2025 in this BAU scenario are modelled to be 143 $MtCO_2$. The country has an unconditional NDC target of reduced emissions from the transport sector, with an absolute target of 142 $MtCO_2$ in 2025.

TCAF support could contribute to reforming the vehicle tax, changing it to an emission-specific registration tax for light-duty vehicles, including a $7,000 subsidy for each newly registered electric vehicle. The vehicle tax on fossil-fueled vehicles is changed to a sliding scale going from zero tax for low-emitting cars to the highest taxes for the vehicle model classes with the highest CO_2 emissions. This tax scale is fine-tuned,

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8 As an example, see https://theicct.org/blog/staff/actions-speak-louder-words-french-commitment-electric-vehicles.

based on the expected sales of each vehicle model class, so that the overall outcome of the program has a net-zero fiscal impact.

6.2 Transformational change

As mentioned in section 4, an initiative can support transformational change towards a decarbonized economy if it contributes to emission reductions of a sufficient size, in a sustainable manner, enables the host country to increase its ambitions, and contributes to carbon pricing. Indirect carbon pricing through a feebate could be well placed to be able to deliver transformational change in accordance with TCAF requirements.

As long as a feebate is designed to implement a high enough tax/subsidy differential, it can incentivize a shift towards low-carbon-emitting alternatives, sufficient to fulfil the TCAF size criteria. In this example, an analysis of the relationship between the feebate and fuel efficiency of the vehicle might show that the vehicle feebate would be equivalent to a sectoral carbon tax of \$40/tCO_2 and is ex-ante estimated to contribute to emission reductions of up to 2-5 MtCO_2/y beyond the sectoral NDC goal.

Even for households and enterprises that are unable or unwilling to purchase electric vehicles, a feebate system can motivate them to buy a lower-emitting vehicle than they would otherwise have chosen. For the policies to be sustainable over time, it is necessary to overcome political-economic resistance against high taxes on the highest emitting vehicles (e.g., luxury and high-performance vehicles). However, a feebate scheme that converts the capital stock of vehicles from conventional (internal combustion engine, ICE) to electric motors is more likely to be consistent with popular opinion than one which is based purely on fuel price changes through a direct carbon tax. Fuel price increases may be viewed as unfair because they increase people's costs without an inexpensive alternative being available, since those who have already purchased ICE automobiles cannot easily and inexpensively switch to cleaner alternatives.

6.3 Baseline setting

Step one – establishing a theory of change for a feebate scheme – would have to take into account the shift in demand for new ICE and electric vehicles, as well as their impact on fuel consumption. The theory of change must also address emissions from power production associated with increased electricity usage in electric vehicles. Other impact channels which could be relevant are changes in vehicle usage behavior, modal shifts, and effects on the market for used vehicles.

Step two is to define the modelling approach and the scope of modelling, based on each impact in the theory of change. Here, the intervention might only directly affect the transport sector, requiring only modelling of that sector, while considering the power sector emissions factor only as an exogenous input. However, the intervention could also be considered to have a significant effect on other sectors, which would require a broader modelling approach. For policy-based crediting at the sectoral level (i.e., transport sector), both baseline and project emissions would be modelled, to show how the crediting intervention would affect economic activity and, in turn, emissions.

Step three consists of applying the modelling to determine the without-policy baseline. This baseline determination will be revisited on ex-post basis, but it is also necessary to simulate the with- and without-policy scenarios ex-ante to have a first estimate of the mitigation effect of a policy. The mitigation impact depends critically on variables that are difficult to predict and that are outside the boundary of the policy, such as international market prices for electric vehicles and fossil fuels, in addition to power production technologies.

The **TCAF crediting baseline** (crediting threshold) is the lower of BAU and NDC emissions, discounted by reasonable factors to account for uncertainty.

6.4 Additionality

Layer 1 additionality is shown in table 6 as the difference between program emissions and the TCAF crediting baseline, which already incorporates the impact of the NDC and a conservative discount factor. In this example, the estimated total emission reductions are 2 and 5 $MtCO_2$/year in 2025 and 2030. For layer 2 additionality (Table 7), the TCAF financing should be compared to the total climate finance provided to the country in relation to the feebate transport sector policy. This is calculated and attributed based on the shares of grant-equivalent financing. If the TCAF contribution is estimated at $30M and the country receives other grants of $20M related to the feebate, 3 $MtCO_2$, equivalent to 60% of the emission reductions, would be attributable to TCAF in 2030.

Table 6. Ex-ante estimates of total emission reductions from a feebate

Estimated emissions ($MtCO_2$/year)	*2020*	*2025*	*2030*
BAU emissions (i.e., with existing vehicle tax)	143	145	149
Unconditional NDC transport sector emissions goal		142	140
Minimum of BAU and NDC	143	142	140
Discount for conservativeness and uncertainty		-2	-3
TCAF crediting baseline (minimum of BAU and NDC, less discount)		140	137
Modelled program emissions (i.e., with feebate)		138	132
Total emission reductions from feebate		-2	-5

Table 7. Ex-ante estimates of TCAF emission reductions from a feebate

Estimated emissions ($MtCO_2$/year)	*2025*	*2030*
Total emission reductions	-2	-5
Share of financing from TCAF	60%	60%
TCAF emission reductions	-1.2	-3

6.5 Monitoring, reporting and verification

As the crediting is based on ex-post analysis, policy scenario emissions for the sector could be directly observable and the counterfactual BAU has to be modeled. MRV for policy-based crediting must be based on the modelling approach defined in the baseline-setting phase. Since the baseline should be re-calculated on an ex-post basis, the variables defined under steps 2 and 3 above need to be monitored over time. The baseline must be modelled again ex-post, based on the observed input variables (Table 8). If the NDC goal is related to BAU (e.g., a percentage reduction from BAU), then the NDC sector emissions goal may also be different ex-post. Emissions with and without the feebate impact on the transport sector are modelled and compared, taking into account other factors such as GDP shocks, international prices, and other policies or regulations that impact new light-duty vehicle emissions, etc. Once baseline and project emissions are calculated ex-post (i.e., repeating step 3 from the baseline setting section above), including any discounting for conservativeness and uncertainty, the creditable emission reductions can be determined.

Table 8. Ex-post modelling of emission reductions from a feebate in 2030

Modelled emissions ($MtCO_2$/year)	2030
BAU emissions (i.e., without feebate)	147
Unconditional NDC transport sector emissions goal	140
Minimum of BAU and NDC	140
Discount for conservativeness and uncertainty	-2
TCAF crediting baseline	138
Modelled program emissions (i.e., with feebate)	132
Total emission reductions	-6
Share of financing from TCAF	60%
TCAF emission reductions	-3.6

While the example above illustrates crediting a feebate policy for vehicles, there are several variations of other transport sector policies which could be applicable for TCAF support. Examples include pricing policies that increase the variable cost of vehicle operations, and non-pricing policies such as strict emission standards for new vehicles. Importantly, the modelling approach would have to be adapted for each of these variations to ensure that relevant impact channels are captured.

7 Policy-based crediting at a sectoral level: climate smart agriculture

7.1 Project background

Policy-based crediting at the sectoral level could also be used as an approach to support subsidy reform in agriculture. An example of direct support to implicit carbon pricing policy is a policy that subsidizes low-carbon fertilizers. The context for this sectoral policy is a country with an NDC pledge to an economy-wide unconditional 20% reduction of its projected 2030 GHG emissions, compared to a BAU scenario. The agriculture sector is within the scope of the NDC goal. The blueprint involves support to a smart fertilizer subsidy scheme in line with existing national and provincial agricultural policies. While the national goals for the agriculture sector include increasing crop-yields and farmer profitability, as well as increased efficiency of agricultural input use, the existing schemes for a fertilizer subsidy drive an imbalanced use of fertilizers. When 75% of fertilizer used in the region is urea, this imbalance causes nutrient imbalance, limits crop-yield and raises production costs. The high share of urea used also results in higher GHG emissions per unit, since urea has a high nitrogen content and is produced with energy-intensive methods.

The policy crediting approach from TCAF could incentivize reform of the fertilizer subsidies, with potential to both increase productivity and reduce emissions. The reform involves using electronic vouchers targeted at small farmers, to provide direct support to certain fertilizers, which then affects the agricultural producer incentives.

7.2 Transformational change

Balanced fertilizer usage has a high potential to reduce emissions while maintaining and enhancing production. To achieve emission reductions at scale to fulfil TCAF requirements, the initiative would have to change the behavior of a large number of small farmers. For example, a program that reached 200,000 small farmers targeted for receiving e-voucher subsidies could achieve the desired scale of emissions reductions.

When assessing the transformational change of policy crediting at a sectoral level, it is also necessary to consider sectoral priorities. For agriculture sector policy makers, emissions reductions are not likely the main driving force for policy change as they value the contributions of large-scale mitigation programs to food security, employment, export earnings, resilience to climate risks or ecosystem services. Ensuring synergies between mitigation programs and key agriculture sector objectives is, therefore, critical to achieving sustainability over time.

Given the early stage of progress in integrating agriculture and climate change policy objectives in many countries, TCAF support may have transformational impact on national capacity to identify and deliver policy measures, and to contribute to development of domestic carbon pricing policies.

Successful upscaling and long-term adoption of climate smart agriculture (CSA) technologies are likely when:

- technologies have been tested, adapted and validated in the target production systems or regions;
- the evidence for strong benefits of farmer adoption is clear;
- stakeholders involved in CSA technology promotion (e.g., public or private extension services, input suppliers, rural financial institutions, farmer organizations) have demonstrated capacities for delivery at large scale; and
- policy measures and mechanisms have been successfully piloted.

Since TCAF programs may target specific sub-sectors or regions, in-depth assessment is required to assess the suitability of the CSA approaches with high potential.

7.3 Baseline setting

In this policy-based crediting example, the mitigation impact of the policy to substitute fertilizer is determined by modelling both the baseline and the program scenario, with the only change in the two modelling exercises being the introduction of the crediting intervention (the fertilizer subsidy reform). In-depth analysis would be required to establish the baseline with clear boundaries and scope (e.g., whether emissions associated with fertilizer production are included).

As in all policy-based crediting, **step one** is to establish a theory of change. A theory of change for TCAF support is presented below (Figure 7). The subsidy to fertilizers (other than urea) changes the relative price of fertilizers, leading to partial substitution of urea with low-emission intensive fertilizer categories. This would reduce GHG emissions, as well as increase crop yields and reduce production costs. The theory of change must also address whether TCAF support would have a significant impact outside the agricultural sector and/or outside the region.

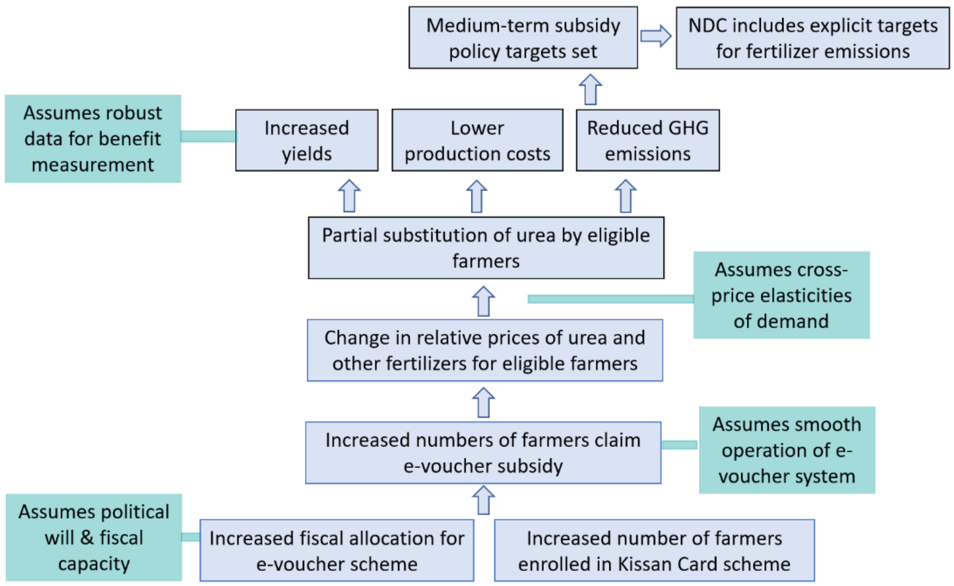


Figure 7. Theory of change for e-voucher subsidy intervention

Step two is to define the modelling approach and the scope of the modelling. Quantifying the GHG benefits of urea fertilizer substitution requires a novel, policy-specific GHG quantification methodology in which substitution rates are estimated using empirically derived cross-price elasticities for potash and urea fertilizers, and emission factors for each fertilizer type. The boundaries of the emissions should be carefully assessed, e.g., if and how emissions from industrial production of fertilizer are to be included in the model, or if and how effects on other sectors/regions are addressed.

Step three consists of applying the modelling to determine the without-policy baseline for agriculture sector emissions in the region. Since the fertilizer subsidy is already in place in this example, the existing subsidy scheme is modelled in the without-policy baseline. It is also necessary to simulate the with- and without-policy scenarios ex-ante to have a first estimate of the mitigation effect of a policy. The mitigation impact depends critically on variables that are difficult to predict and that are outside the boundary of the policy, and these should be modelled in as exogenous variables for ex-post analysis.

The TCAF baseline (crediting threshold) is based on this counterfactual baseline, but further discounted by reasonable factors to account for uncertainty.

Table 9. Ex-ante estimates of total emission reductions from fertilizer subsidy reform.

Estimated emissions ($MtCO_2$/year)	*2020*	*2025*	*2030*
BAU agriculture sector emissions in region (i.e., with existing fertilizer subsidy)	10	11	12
Unconditional NDC agriculture sector emissions goal	10	12	14
Minimum of BAU and NDC	10	11	12
Discount for conservativeness and uncertainty		-0.5	-1
TCAF crediting baseline		10.5	11
Modelled program emissions (i.e., with subsidy reform)		10	9
Total emission reductions		-0.5	-2

7.4 Additionality

Layer 1 additionality is already shown in Table 9. This is the difference between program emissions and the TCAF crediting baseline, which already incorporates the impact of the NDC and a conservative discount factor. In this example, the estimated layer 1 additional emission reductions are 0.5 and 2 $MtCO_2$/year in 2025 and 2030, respectively. We assume no other international climate or carbon finance for this case study, so that 100% of the emissions reductions are attributable to TCAF (Table 10).

Table 10. Ex-ante estimates of TCAF emission reductions from fertilizer subsidy reform

Estimated emissions ($MtCO_2$/year)	*2025*	*2030*
Estimated impact of subsidy reform	-0.5	-2
Share of financing from TCAF	100%	100%
TCAF emission reductions	-0.5	-2

7.5 Monitoring, reporting, and verification

As discussed in section 3, in policy-based crediting the emissions for both the baseline and project emissions scenarios are modelled. MRV for policy-based crediting must be based on the modelling approach defined in the baseline setting process. Key input variables for the modelling are monitored over time, so that both the baseline and the project scenario emissions can be recalculated ex-post to reflect actual changes in key economic, social and demographic factors. In each year of the crediting period, emissions with and without the policy are modelled and compared, considering other factors that may affect emissions. Once baseline and project emissions are re-calculated ex-post (i.e., repeating step 3 from the baseline setting section above), including any discounting for conservativeness and uncertainty, the creditable emission reductions can be determined (Table 11).

Table 11. Ex-post modelling of emission reductions from fertilizer subsidy reform in 2030

Modelled emissions ($MtCO_2$/year)	*2030*
BAU emissions (i.e., with existing fertilizer subsidy)	12
Unconditional NDC agricultural sector emissions goal	14
Minimum of BAU and NDC	12
Discount for conservativeness and uncertainty	-1
TCAF crediting baseline	11
Modelled program emissions (i.e., with voucher scheme)	8.5
Total emission reductions	-2.5
Share of emission reductions attributable to TCAF	100%
TCAF emission reductions	-2.5

For illustration purpose, the difference of the ex-post modelled program emission and the ex-ante modelled program emission arises because the implementation results ex-post monitored differ from the expected implementation results ex-ante planned, with more households adopting the e-voucher scheme. This highlights that the modelling approach for policy crediting would also require ex-post monitoring to assess the policy implementation progress on the ground and inform further policy actions.

While the example above illustrates crediting of policy reform for fertilizer subsidies, other types of agricultural policies could also be eligible for TCAF support. Other intervention policies could be related to livestock management or cropping systems and would then require a suitable approach to model the relevant impact channels of the policy.

8 Jurisdictional crediting for a large city

8.1 Project background

In this blueprint, TCAF operations could incentivize emissions reduction in a large city. This illustrates how TCAF funding could apply a jurisdictional crediting approach to emission reduction initiatives in cities. We assume that a country, in its NDC, has committed to an economy-wide emission reduction of 1.5% compared to a BAU scenario. Conditional on international assistance, it could increase its emissions target to 14%. The city has higher ambitions, with aims to become carbon-neutral by 2050 and to reduce emissions by 40% in 2030 compared to a BAU scenario. These emission reductions are primarily from electricity generation, buildings, and transport sectors. Some international finance is already in place, but the municipality requires additional support to achieve this target.

The city's business as usual emissions are expected to increase from 7.4 million tons of CO_2 in 2014 to 13.6 Mt CO_2 in 2030, due to high population growth. International climate finance support of $20M is already considered in the city's current plans. Assuming that the country's unconditional target of 1.5% is applied, the city can achieve this with a combination of these and its own resources. As there are many activities involved, in different sectors, the crediting framework that is applicable is jurisdictional crediting.

8.2 Transformational change

Jurisdictional crediting can contribute to the necessary transformational change towards a decarbonized economy to qualify for TCAF support under certain circumstances. With over 100 cities projected to have a population of five million or above by 2030, urban crediting has the potential to achieve large emission reductions. In this hypothetical example of jurisdictional crediting, TCAF operations could contribute to reductions of 500,000 tCO_2/y in 2025, rising to 3.8 million tCO_2/y by 2030, and would therefore fulfil the size criteria.

While explicit carbon pricing policies such as taxes are set at a national level, city policies can contribute to implicit carbon pricing policies. In this example, TCAF support could incentivize scale-up of existing programs, accelerate introduction dates, and increase penetration rates. Many of these policies involve putting an implicit price on carbon, while other policies would take a regulatory approach. By supporting cities that have more ambitious targets than their national governments, successful TCAF operations could enable the country to increase its domestic emissions-reduction ambition over time.

It is important that emission reductions are sustainable over time, and that the policies enacted with TCAF have broad political support and social acceptance. One advantage of jurisdictional crediting is that the cities would have the flexibility to adjust their policy mix over time, as long as the emission reductions realized are within the boundaries of the TCAF operations.

8.3 Baseline setting

For jurisdictional crediting, a jurisdiction-wide baseline must be defined. The boundary must be determined based on the physical boundaries of the sub-national jurisdiction. Furthermore, it is necessary to clarify if certain indirect emissions outside of this boundary are included, such as energy generation or waste disposal. In most cases, the baseline emissions for a city would be fixed prior to the crediting intervention, based on agreed indicators, and not adjusted ex post.[9] The crediting baseline would then become a fixed target against which emission reductions are measured.

The jurisdiction baseline may reflect the city's current and historical GHG emissions inventory as well as future growth that is in line with the country's NDC baseline scenario, while the city's goals could be to reduce emissions well below what would happen because of the NDC.[10] This baseline can be defined, using a modelling approach based on existing policies, to project historical emission trends into the future, while taking into account the boundary and scope of the TCAF intervention. In the example, emissions in the business as usual scenario are 7.4 million tons of CO_2 in 2014, increasing to 13.6 Mt CO_2 in 2030. The unconditional NDC of the country states an emission reduction of 1.5% in 2030 compared to a BAU scenario. To determine the unconditional NDC baseline, it is assumed that the 1.5% reduction is applied to the city's BAU trajectory, which is 13.4 $MtCO_2$ in 2030. The TCAF baseline crediting threshold is therefore based on the emissions inventory baseline, discounted by a factor to account for uncertainty and conservativeness.

9 However, it is also possible to define a project with a dynamic baseline, where emission inventories are modified ex-post based on an agreed adjustment factor, to reflect relevant drivers of changes and growth within the city.

10 Other methods to establish a baseline for jurisdictional crediting can also be used: e.g., a baseline set based on performance standards, representing a certain rate of emission reductions that are expected from particular activities or technologies.

8.4 Additionality

Layer 1 additionality is shown in **Error! Reference source not found.** table 12: this is the difference between program emissions and the TCAF crediting baseline, which already incorporates the impact of the NDC and a conservative discount factor. In this example, the estimated layer 1 additional emission reductions are 0.5 and 3.5 $MtCO_2$/y in 2025 and 2030, respectively.

Table 12. Ex-ante estimates of total emission reductions from jurisdictional crediting in a city

Estimated emissions ($MtCO_2$/year)	*2020*	*2025*	*2030*
BAU emissions	8.4	11.17	13.6
Unconditional NDC emissions goal (i.e., with 1.5% reduction)	8.4	11	13.4
Minimum of BAU and NDC	8.4	11	13.4
Discount for conservativeness and uncertainty		-0.5	-0.5
TCAF crediting baseline	8.4	10.5	12.9
Program emissions (i.e., TCAF support)		9.5	9.4
Total emission reductions		-1	-3.5

For layer 2 additionality, the TCAF financing should be compared to the total climate finance and carbon finance provided in relation to the jurisdiction. This is calculated and attributed by the shares of financing. If the TCAF contribution is estimated at $30M and the jurisdiction receives other grants of $20M related to climate or carbon finance, 2.1 $MtCO_2$, equivalent to 60% of the emission reductions, would be attributable to TCAF in 2030 (Table 13).

Table 13. Ex-ante estimates of TCAF emission reductions from jurisdictional crediting in a city

Estimated emissions ($MtCO_2$/year)	*2025*	*2030*
Total emission reductions	-1	-3.5
Share of financing from TCAF	60%	60%
TCAF emission reductions	-0.6	-2.1

8.5 Monitoring, reporting, and verification

TCAF's MRV should be aligned with national MRV systems (accounting methodology, computer systems, etc.) to the degree possible. This way TCAF can also make a valuable contribution to building national-level MRV capacity. In jurisdictional crediting, MRV of mitigation effects will depend on measuring changes in inventory of emissions in specific geographical boundary (along with any relevant indirect emissions) across the crediting period.

Since many metropolitan areas lack an overarching framework for collaboration across municipal boundaries, it may be difficult to adequately monitor the activities included in the metropolitan inventory. In this case, discount for uncertainty and conservatives should include an assessment of inventory uncertainty. Uncertainty can be reduced by improving the city GHG inventory process and increasing the quality of data collection.

In the example case, an ex-ante comparison of the city's actual versus projected BAU emissions resulted in an overall inventory-weighted discount of 0.5 $MtCO_2$. For ex-post TCAF crediting, this analysis would need to be repeated to determine the overall discount. In the example, this ex-post discount is 0.3 Mt CO_2 due to a new uncertainty analysis (Table 14).

Table 14. Ex-post emission reduction calculations for a jurisdictional crediting program in 2030

Ex-post emissions ($MtCO_2$/year)	2030
BAU emissions	13.6
Unconditional NDC emissions goal (i.e., with 1.5% reduction)	13.4
Minimum of BAU and NDC	13.4
Discount for conservativeness and uncertainty	-0.3
TCAF crediting baseline	13.1
Actual emissions	9.1
Total emission reductions	-4
Share of financing from TCAF	60%
TCAF emission reductions	-2.4

The above example illustrates the jurisdictional crediting approach applied to an urban area, which allows for flexibility with regard to the different intervention types used to achieve to achieve the credited emission reductions. However, other types of baselines for jurisdictional crediting can also be used for TCAF crediting, such as dynamic baselines adjusted for population growth, or baselines based on performance standards.

9 Sectoral aggregated crediting for a renewable power program

9.1 Project background

This blueprint is for scaled-up crediting to support grid-connected renewable power generation. This crediting program could promote renewable electricity generation with the support of TCAF and demonstrate the application and piloting of some key design elements of scaled-up crediting activities. The program would apply a sectoral aggregated crediting approach (i.e., for the entire power sector) to calculate the emission reductions and develop a methodology to MRV the generation of emission reductions. Operating at the sector level can facilitate better planning and monitoring of implementation arrangements. In addition, the cooperative program would help reduce the host country's dependence on fossil fuels, systematically communicate its achievements on climate change, and strategically apply for international support.

For this example, the host country has sector-specific NDC goals, including an unconditional pledge to reduce power sector emissions by 5% relative to BAU by 2030, with another 15% conditional reduction possible with international support. Expanding renewable power would also support a national policy goal to increase the share of electricity non-conventional renewable energy (i.e., excluding large hydropower) to 20%, up from around 10% in 2015. The program could include a wide array of specific incentives and technical assistance including:

- developing tools and technological measures related to grid integration and technology promotion;
- developing new and innovative business models, particularly to support local commercial banks in providing lending and to access concessional financing from MDBs to de-risk the energy infrastructure projects;
- identifying opportunities to reduce emissions at a cost that is commensurate with the carbon pricing ($/t$CO_2$) and implement those measures.

9.2 Transformational change

The crediting program has the potential to fundamentally change the power sector in the host country, and this could be assessed using some of the TCAF indicators:

- **Size**: Preliminary estimates are that the program could generate more than 1.5 MtCO_2 in emission reductions just up to 2025, with increasing volumes after that time as well.
- **Sustainability**: Dramatically scaling-up renewable energy investment and the related investment in grid integration will bring the industry closer to financial sustainability without ongoing concessional financing. Because the program will address policies and other non-financial barriers as well, this supports long-term shifts in investment.
- **Raising ambition**: Not only will investments catalysed by the crediting program start to "lock in" low-carbon power generation in the sector for the long term, but the program's role in strengthening domestic capacities will support long-term policy planning and programming and required MRV capacity. All of these efforts help to increase the future ambition of mitigation goals in the sector and country.
- **Carbon pricing**: The host country could be considering a number of different domestic carbon pricing options, including a domestic crediting scheme. A scaled-up crediting program would therefore support the country in exploring international carbon markets under the Paris Agreement and provide both early experience and motivation for further engagement in carbon pricing.

9.3 Baseline setting

As discussed in section 3, the unique feature of sectoral aggregated crediting is a fixed baseline ex-ante for the entire sector and comparing this with measured sectoral emissions ex-post (i.e., as opposed to the modelling of baseline and project emissions described in the policy crediting case studies). For this crediting program example, the emissions in all scenarios were related to the quantity of renewable power generation projected and then actually achieved each year. In other words, emissions for the entire power sector are reported and any increases in renewable power generation would displace existing and planned fossil fuel generation. This analysis could build on the modelling efforts from the energy ministry, national utility or independent system operator for a long-term power expansion plan. This would be particularly useful where the same power plans were used as the basis for the NDC pledge in the sector. The example calculations are illustrated in Table 15, in terms of both annual renewable energy generation (excluding large hydro) and total power sector emissions (i.e., including coal- and gas-fired power). Because the NDC goal is below the BAU officially estimated for the sector, this is used – after a small discount for uncertainty – as the TCAF crediting baseline. The projected RE generation in 2020 and 2025 therefore provides an ex-ante estimate of emission reductions from the crediting program.

Table 15. Ex-ante emissions total emission reductions from a sectoral crediting program

	RE generation (GWh)		Emissions ($MtCO_2$)	
	2020	2025	2020	2025
BAU scenario	1,500	1,600	12.7	18.6
Unconditional NDC (i.e., using RE to achieve this)	2,000	2,300	12.2	17.9
Minimum emissions of BAU and NDC			12.2	17.9
Discount for conservativeness and uncertainty			-0.1	-0.1
TCAF crediting baseline			12.1	17.8
Program scenario	3,400	5,000	11.2	16.0
Total emission reductions			-0.9	-1.8

9.4 Additionality

Layer 1 additionality is shown in Table 15: this is the difference between program scenario emissions and the TCAF crediting baseline, which already incorporates the impact of the NDC and a conservative discount factor. In this example, the estimated total emission reductions are 1.8 $MtCO_2$ in 2025. For layer 2 additionality, the TCAF financing should be compared to the total climate finance and carbon finance provided to the country for renewable power development. This is calculated and attributed by the shares of financing. If the TCAF contribution is estimated at $20M and the country receives other grants of $5M to support renewable energy investment, then 80% of these emission reductions (i.e., 1.44 $MtCO_2$) would be attributable to TCAF (Table 16).

Table 16. Ex-ante emissions of TCAF emission reductions from a sectoral crediting program

	Emissions ($MtCO_2$)	
	2020	2025
Total emission reductions	-0.9	-1.8
Share of financing from TCAF	80%	80%
TCAF emission reductions	-0.72	-1.44

9.5 Monitoring, reporting and verification

Unlike policy-based crediting, for sectoral crediting the MRV process collects data on actual ex-post emissions, in this case at the sectoral level. In the power sector, for example, this could be data on fossil fuel consumption in all grid-connected plants, as well as fuel characteristics. Actual emissions could then be compared to the TCAF crediting baseline to calculate emission reductions, as shown in Table 17. In this illustration, measured program emissions are higher than originally projected, so that the creditable emission reductions are lower. This could be because of other factors affecting the performance of the power sector (e.g., increased efficiency at fossil fuel-based plants) or even a change in overall electricity demand (i.e., lower than expected demand growth).

Table 17. Ex-post assessment of emissions reductions from a sectoral crediting program in 2025

Emissions ($MtCO_2$/year)	*2025*
TCAF crediting baseline (fixed ex-ante**)**	17.8
Measured program emissions	16.5
Total emission reductions	-1.3
Share of financing from TCAF	80%
TCAF emission reductions	-1.04

To address some of the uncertainties in total sector emissions, the TCAF program will propose crediting based on incremental RE generation beyond baseline levels, rather than changes in total power sector emissions. Referring back to Table 15, the achievements of the program could be represented by incremental RE generation beyond the 2300 GWh in 2025 needed to reach the NDC goal (i.e., the lower emissions scenario is the one with higher RE generation, since this displaced fossil fuel generation). The measured program parameter could then be total RE generation under the program, rather than total sector emissions. A grid emission factor (tCO_2/MWh) that reflects what is replaced by the RE generation could then be used to convert this incremental RE generation into creditable emission reductions. Some of these emission reductions (i.e., the RBCF component of TCAF funding) could then be used to support the country in moving towards their conditional NDC goal, while the remaining could be converted to ITMOs.

While the above example illustrates a sectoral aggregated crediting approach for the power sector, the approach could also be relevant for other sectors (e.g., industry) or subsectors (e.g., cement).

10 Policy-based crediting for the financial sector: rewarding green investment portfolios

10.1 Project background

TCAF operations could incentivize a country to implement a policy of rewarding the lending portfolios of commercial banks according to their “greenness”. The basic idea of portfolio rewards for commercial lenders is to provide a results-based payment for the achievement of a portfolio-level green lending target. For example, a commercial bank commits to increase the share of loans for green projects in its overall lending portfolio from currently 10% to 25% over the next five years. If the target of 25% is achieved, then the government could pay the bank a monetary reward. This policy could be indirectly financed through carbon crediting.

While TCAF would use verified emission reductions as a disbursement indicator to the government, the country could use carbon footprinting of commercial banks’ portfolios as an indicator for payments to the individual banks, based on calculated emission footprints or even the share of green versus brown investments (i.e., the government would not have to use an emissions indicator).

10.2 Transformational change

Examples of the potential for transformational changes include the following:

- **Size**: Because this intervention would cover most of the financial sector, it would also indirectly influence investment across the economy, with potentially large emission reductions impacts.
- **Sustainability**: The instrument could ensure continued change over time by reducing the financial barriers of green investment financing across the entire economy.
- **Raising ambition**: Building the MRV for this instrument with improved carbon footprinting for financial institutions and their loan recipients could also increase awareness within companies. This could, in turn, allow for increased domestic ambition.
- **Carbon pricing**: Successful implementation of portfolio rewards would contribute to indirect carbon pricing in the country, including internal carbon pricing in banks.

10.3 Baseline setting

Step one is to establish a theory of change for a portfolio rewards scheme that would have to take into account, among other things, the altered financing costs of "green" and "brown" activities. Furthermore, the theory of change would have to explain how the intervention leads to emissions reduction in the real economy.

Step two is to define the modelling approach and the scope of modelling, based on each impact channel in the theory of change. A sophisticated model (e.g., general equilibrium) which estimates financial flows as well as production and consumption of energy flows would be necessary. This model definition stage should also justify the relevance and accuracy of the modelling tool, particularly in the context of the specific host country. In addition, the scope of coverage must be broad enough to avoid leakage (e.g., lenders under the program simply trading some of their portfolio with lenders outside the program).

Step three consists of applying the modelling to determine the without-policy baseline (i.e., without any support for portfolio rewards, and therefore higher financing costs for green projects). This baseline would be revisited on an ex-post basis. Simulating the with- and without-policy scenarios ex-ante will provide a first estimate of the mitigation effect of a crediting intervention. The mitigation impact depends critically on variables that are difficult to predict, such as the future prices of fossil fuels and costs of "green" technologies, in addition to other climate mitigation measures that are outside of the scope of the policy.

As with all interventions, the **TCAF crediting baseline** (crediting threshold) is the lower of BAU and NDC emissions, discounted by reasonable factors to account for uncertainty.

Table 18. Ex-ante estimates of total emission reductions from implementing a portfolio reward scheme

Estimated emissions ($MtCO_2$/year)	*2020*	*2025*	*2030*
BAU emissions (i.e., without portfolio rewards)	100	110	120
Unconditional NDC emissions goal	100	95	90
Minimum of BAU and NDC	100	95	90
Discount for conservativeness and uncertainty		-2	-3
TCAF crediting baseline (minimum of BAU and NDC, less discount)	100	93	87
Modelled program emissions (i.e., with portfolio rewards and lower financial costs for green investment projects)		90	85
Total emission reductions		-3	-2

10.4 Additionality

The layer 1 additionality assessment is shown in Table 18. This is the difference between program emissions and the TCAF crediting baseline, which already incorporates the impact of the NDC and a conservative discount factor. In this example, the estimated total emission reductions are 3 $MtCO_2$/y in 2025 and 2 $MtCO_2$/y in 2030.

For the layer 2 additionality assessment, the TCAF contribution should be compared to the total climate finance provided to the country in relation to the portfolio rewards scheme. This is calculated based on the shares of grant-equivalent financing. If the TCAF contribution is estimated at $50M and the country receives other grants of $10M related to the portfolio rewards scheme, 1.7 $MtCO_2$, equivalent to 83% of the emission reductions, would be attributable to TCAF in 2030 (Table 19).

Table 19. Ex-ante estimates of TCAF emission reductions from a portfolio reward scheme

Estimated emissions ($MtCO_2$/year)	*2025*	*2030*
Estimated impact of portfolio reward scheme	-3	-2
Share of financing from TCAF	83%	83%
TCAF emission reductions	-2.5	-1.7

10.5 Monitoring, reporting and verification

As discussed in section 3, in policy-based crediting the emissions for both the baseline and project emissions scenarios are modelled. MRV for policy-based crediting must be based on the modelling approach defined in the baseline setting process above. Key input variables for the modelling are monitored over time, so that both the baseline and project scenario emissions can be recalculated ex-post to reflect actual changes in key economic, social and demographic factors. In each year of the crediting period, emissions with and without the policy are modelled and compared, taking into account other factors such as GDP shocks, technology prices, international fuel prices or unrelated domestic policies that may affect emissions. Once baseline and project emissions are re-calculated ex-post (i.e., repeating step 3 from the baseline setting section above), including any discounting for conservativeness and uncertainty, the creditable emission reductions can be determined (Table 20). Note that in this example the ex-post estimate of BAU emissions is lower than the ex-ante projections (e.g., economic growth was slower than expected).

Table 20. Ex-post modelling of emission reductions from a portfolio reward scheme

Modelled emissions ($MtCO_2$/year)	2030
BAU emissions (i.e., without portfolio rewards)	115
Unconditional NDC emissions goal	87
Minimum of BAU and NDC	87
Discount for conservativeness and uncertainty	-2
TCAF crediting baseline	85
Modelled program emissions (i.e., with portfolio rewards)	83
Total emission reductions	-2
Share of emission reductions attributable to TCAF	83%
TCAF emission reductions	1.7

Importantly, this analysis does not rely on the actual national GHG inventory, or the total share of "green" lending in the portfolio to calculate emission reductions. This is because actual emissions and the portfolio share may be affected by other factors outside of the crediting program. Nevertheless, actual emissions, and the actual portfolio share, may be useful to check the plausibility of the results.

11 Conclusions

This report has provided an overview of the different TCAF crediting approaches and illustrations of what scaled-up carbon crediting supported by TCAF could look like in practice in different sectors, based on the TCAF core parameters. The examples show the significant potential to "scale-up" the impact of international carbon crediting in the next generation of carbon markets and climate finance to increase global ambition. At the same, the examples are only a starting point, and many more opportunities for carbon crediting at scale are possible.

Developing new international carbon crediting programs at scale will require new technical and methodological approaches in addition, to capture the range of sectoral, jurisdictional, and policy mitigation opportunities. This will require more use of economic modelling to, for example, understand how higher-level policy changes affect emissions across the host country economy, instead of relying on physical measurement of emissions or related activity data at specific project sites. While setting up these tools and new MRV approaches will require effort upfront, once they are agreed the ongoing MRV could be less expensive (e.g., with no site visits required). A caveat would be that some safeguards will be needed for these new approaches to ensure that, for example, there is no crediting for declines in overall economic activity.

What is entirely new for this generation of international crediting is the requirement for corresponding adjustments to avoid double counting. TCAF's hybrid model means that only a portion of the program emission reductions will be converted to ITMOs, but for those transfers TCAF will need to require corresponding adjustments. This means also that host countries must understand and manage their risk of overselling ITMOs and must also price ITMO sales to support their strategy for NDC compliance. This is a new challenge for host country governments – one that will exist regardless of the detailed outcomes of the Article 6 negotiations – and one that will require additional technical capacity and coordination across sectors and ministries.

TCAF can be a partner in addressing the challenges and opportunities of the next generation of international carbon crediting, through both piloting concrete operations and supporting host countries in building their understanding and capacity to navigate the new environment of Paris Agreement crediting. There is a need for experience "on the ground" with pilot activities across a range of sectors to understand practicalities of new approaches to baselines, additionality and MRV. TCAF can support such experience while building capacity in host countries, with programs that support NDC achievement while also support future ambition raising.

Annex A Examples of sectors, geographies, and project types for scaled-up crediting

This report builds on analysis from six sectoral crediting papers, which are briefly summarized here and available on request from TCAF. Table 21 provides an overview of the crediting examples discussed in the sectoral papers.

Table 21. Overview of examples presented in sectoral blueprint papers

Mitigation intervention examples	Sectors covered
Price based mitigation policies	
Strengthening an existing carbon tax	Energy supply and all energy demand sectors
Crediting of a historic energy subsidy reform	Energy supply and all energy demand sectors
Crediting the transition of a vehicle tax system to a feebate scheme	Transport
Crediting of a new mid-stream carbon tax with output-based rebating	Energy Supply (power generation subsector)
Urban crediting	
Jurisdictional crediting for a municipality	All sectors
Energy efficiency	
Sustainable cooling in buildings	Buildings
Energy saving measures and emission reductions in the industrial sector	Industry
Climate smart agriculture	
Regional government subsidies for less emission-intensive fertilizers	Agriculture
Private sector financing of dairy advisory services	Agriculture
Support for demonstrating agriculture offsets in an ETS	Agriculture
Floor price for grassland offsets in an ETS	Agriculture
Transport	
Examples still under development, but PBMP paper includes transport sector vehicle feebate scheme	
Financial	
Support for a public green bank	Cross-sectoral
Portfolio rewards to commercial banks	Cross-sectoral
A sectoral soft loan program for green buildings	Buildings
Innovative financial engineering of accelerating retirement of coal power plants	Energy Supply (power generation subsector)

1. Price-based mitigation policies

Priced-Based Mitigation Policies (PBMP) change the relative price of economic activities, such as carbon taxes, feebates (combination of tax and rebates), and the removal of fossil fuel subsidies. While a standard carbon tax is a tax on the use of fuel according to carbon content, other price-based mitigation policies can change the incentives on investments and purchases of equipment. These policies are relevant in a wide range of sectors, and the scope spans from economy-wide (e.g., a general carbon tax) to sector-specific (e.g., a feebate to promote a certain type of vehicles).

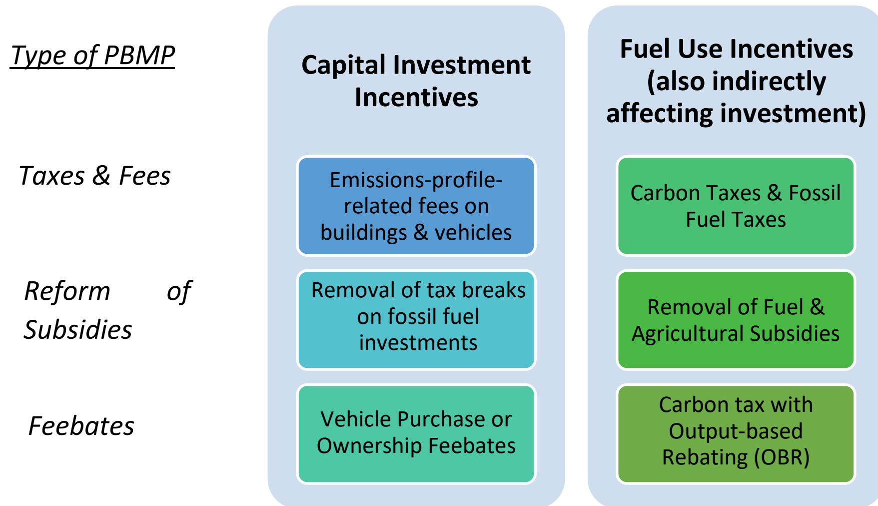


Figure 8. Examples of different types of price mitigation policies

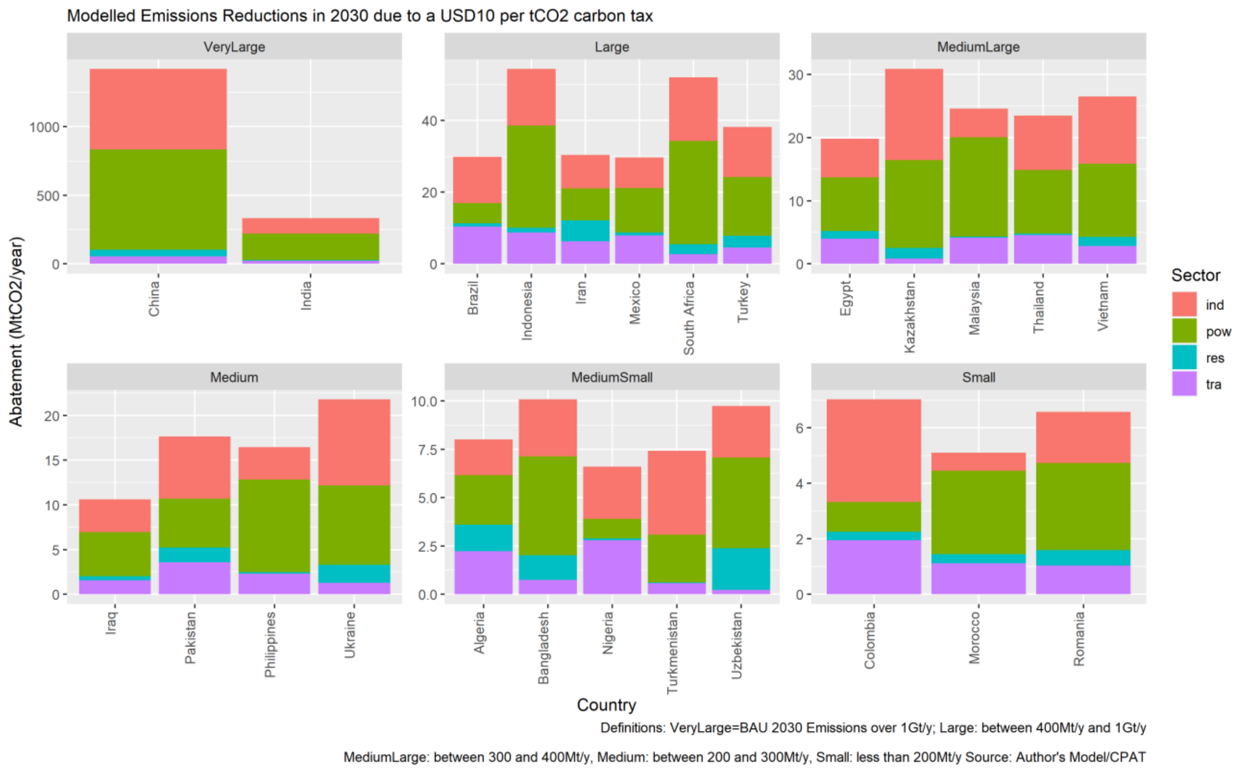
In developing countries, carbon pricing through carbon taxes is relatively uncommon, and carbon taxes that have been implemented are at a relatively low rate. Ukraine, Mexico, Chile, Colombia, Argentina and South Africa have carbon taxes in the \$1–10/tCO_2 range.[11]

Table 22. Carbon taxes in developing countries

	Year implemented	*Emission coverage*	*Tax rate (\$/tCO_2)*
Argentina	2018	20%	6
Chile	2017	39%	5
Colombia	2017	24%	5
Mexico	2014	46%	<=3
South Africa	2019	80%	9
Ukraine	2011	71%	<1

Different types of price-based mitigation policies can be implemented in the vast majority of sectors and promote a wide range of different mitigation measures. They therefore have a potential to make a major contribution to mitigating climate change, as illustrated in **Error! Reference source not found.** figure 9.

11 World Bank Group, *State and Trends of Carbon Pricing 2020* (Washington, DC.: The World Bank,May 2020)https://openknowledge.worldbank.org/handle/10986/33809.



Note: Sector abbreviation key: ind = industrial sector, pow = power, res = residential, tra = transport.

Figure 9. Emission reduction potential from a carbon tax by sector and country, grouped by country size

Significant emissions mitigation does, however, require a sufficiently high explicit or implicit carbon price level. In addition, since price-based mitigation policies change the relative prices of goods and services, it is necessary to assess how to manage undesirable effects, such as undesirable distributional impacts and reduced international competitiveness. To achieve this, political economy and transitional concerns must be carefully considered in policy design. Awareness and understanding, sufficient political support, and administrative capacity will all be key elements that will drive the viability and effectiveness of these interventions.

2. Financial sector

While greenhouse gas emissions are primarily generated in the real economy, through producing goods and services, most of these activities rely on services provided by the financial sector. Financial sector activities that lead to climate change mitigation in the real economy can qualify for TCAF support and have the potential to leverage TCAF financing into much larger economy-wide emission reductions.

There are several possible financial sector barriers and imperfections which could impede green investments and favor brown investments, e.g., funding constraints or distorted pricing of financial products. Besides overcoming financial sector barriers and imperfections, crediting interventions in the financial sector can be used by the public sector including governments and public finance providers to support clean investments in the real economy to address barriers and imperfections there.

There is a range of possible public interventions, which could form the basis for crediting interventions, to address financial sector barriers and imperfections and/or to use financial sector interventions to address barriers and imperfections in the real economy (Table 23). Each policy type and intervention can impact the real economy through one or more different channels. The five main impact channels for financial sector interventions are:

- increase in green lending capacity;
- decrease in brown lending capacity;
- increase in financing costs of brown investments;
- decrease in financing costs of green investments; and
- indirect effects through acceleration of green finance innovation, increase in knowledge, motivational effects due to adoption of green lending targets etc.

Table 23. Policy types and interventions in the financial sector

Policy type	*Mitigation intervention example*	*Impact channel*
Institutional support	Increase public capitalization or providing state guarantees for green banks Green financial infrastructure, such as establishment of microfinance institutions.	Increase in green lending capacity, Decrease in financing costs of green investments
	Portfolio rewards for green lending targets	Decrease in financing costs of green investments
Regulation	Mandatory climate risk assessments	Increase in financing costs of brown investments
Blended finance	Lowering interest rates (soft loans) Reduce risks through guarantees	Increase in green lending capacity, Decrease in financing costs of green investments
Innovative financial engineering	Green bonds Financial engineering	Indirect effects through acceleration of green finance innovation
Climate intelligence	Climate training for loan officers or climate risk tools	Indirect effects through increase in knowledge

3. Urban crediting

Urban areas account for about two thirds of global energy consumption and represent more than 70% of GHG emissions. Some of the emissions sources are under the direct control of municipal or city authorities (such as public buildings and street lighting) while others (such as industry) they may influence. With a strong tendency towards urbanization, especially in developing countries, emissions are expected to rapidly increase in cities. At the same time, many cities have higher ambitions than the national governments have stated in their NDCs. Cities can have a large impact on emissions both directly through energy usage but also indirectly through consumption of products and services which result in emissions outside the municipal boundaries. The high rate of urbanization in many regions of the world provides opportunities to implement policies and measures at a local level with cost-effective mitigation impacts.

The sectoral blueprint on urban crediting focuses on policies and measures that can be implemented on a local or regional level. The blueprint's cross-sectorial approach covers the sectors within a jurisdiction, most commonly buildings, industry, and transport. Most NDCs of developing countries do not include specific city-level emission reduction targets, as they were developed along a sectorial basis without consideration of the city level mitigation potential.

The scope of the urban crediting blueprint covers emissions from all sectors within a jurisdictional boundary. However, certain measures which have effects beyond the jurisdictional boundary may also be included under some initiatives, e.g., emission reductions from power production or measures to reduce emissions from waste. Examples of measures discussed in the paper are sustainable housing, electric buses, waste-to-energy initiatives, land-use planning, densification of city core areas, and renewable energy initiatives.

The institutional and governance structures of cities vary widely, leading to different levels of control over the activities that cause GHG emissions and allowing the cities to adopt different roles such as:

- municipal regulatory authority, imposing local regulations;
- provider of subsidies or municipal funds; or
- owner and provider of public, buildings, infrastructure, and services.

Table 24 presents a list of different interventions available at the municipal level, structured by policy type and sector.

Table 24. Policy types and interventions at a municipal level

Policy type	*Sector*	*Mitigation intervention examples*
Economic instruments	Transport	Congestion pricing
	Commercial buildings	Subsidies for solar power generation
	Residential buildings	Subsidies for cool roofs
	Industry	Funding for enegy efficiency measures
	Transport	Subsidies for electric vehicle charging infrastructure
	Water	Solar hot water program
Regulatory	Buildings	Mandatory building energy efficiency codes for new buildings
	Power	Energy Performance Contracting
	Transport	Transportation congestion management
	Water	Promote water demand restrictions
Information	Power	Create a solar map to promote renewables in the city

Policy type	Sector	Mitigation intervention examples
Public	District heating	Upgrading, cogeneration
	Lighting	Public light audit and updating program
	Municipal buildings	Benchmarking and retrofit programs
	Planning and development	Create an energy efficiency strategy and action plan
	Power	Explore renewables
	Transport	Public transportation development, bike sharing system
	Waste	Programs for waste sorting, waste incineration
	Water	Improve performance and efficiency

4. Climate-smart agriculture

Climate smart agriculture (CSA) focuses on emissions from and associated with agricultural production. There is a potential for introducing farming practices that reduce GHG emissions while increasing agricultural productivity. The scope of the climate-smart is primarily on emissions from the agriculture sector, but the scope can also include emissions in other sectors upstream (e.g., emissions from energy and production of fertilizer) or downstream (e.g., transport and processing of agricultural products).

The core interventions for CSA have significant global technical potential for emissions reduction. These are: improved rice paddy management (262 $MtCO_2/y$), soil carbon sequestration in other cropping systems (411 $MtCO_2/y$), grazing systems (295 $MtCO_2/y$), animal management (880 $MtCO_2/y$), nitrogen management (700 $MtCO_2/y$) and agroforestry (3080 $MtCO_2/y$). In addition, reducing food loss and waste and fossil fuel energy use in agri-food supply chains also has a potential for reducing emissions (Table 25).

Table 25. Global technical potential of CSA practices

Production system	Mitigation intervention examples
Paddy rice	Water and residue management, Nitrogen fertilizer application
Grassland and livestock	Grassland management, Nitrogen fertilizer application, Animal feeding, breeding and health, Manure composting/ anaerobic digestion
Agroforestry and silvo-pastoral systems	Agroforestry, Integration of tree and livestock systems
Nitrogen management	Nitrogen application management (i.e., rate, timing, type, amount, placement) precision agriculture; laser leveling
Other crops	Cover crops, nitrogen fertilizer application
Agroforestry in cropping systems	Agroforestry, nitrogen fertilizer application
Food supply chain	Food loss and waste, energy, bioenergy

So far, few countries have specific mitigation targets for the agriculture sector, and very few have targets for specific sub-sectors. This opens up several possibilities for setting program-specific BAU scenarios and crediting thresholds in consideration of a country's unconditional target.

5. Energy efficiency in buildings and industry

Buildings and industry represent the two largest energy consumption sectors globally, representing 30% and 29% of total final consumption. The "Buildings" category includes all energy consumption (appliances, lighting etc.) within the building envelope. Energy efficiency can be one of the lowest-cost options to reduce emissions and is a critical part of the policy mix needed for governments to achieve their NDCs under the Paris Agreement. Despite the considerable potential for energy efficiency to contribute to emissions reductions, many barriers to investment need to be resolved. The efforts required to implement energy efficiency measures differ, and while implementation of some measures is expected in baseline scenarios, others are unlikely to happen without a significant change from the current system or technological breakthroughs. Results-based payments could contribute to implementing more ambitious energy efficiency measures, primarily in industry, lighting, appliances, building insulation, heating, ventilation, and air conditioning. Different types of instruments can be used to promote energy efficiency, including regulatory instruments such as energy performance standards, economic instruments such as energy taxes or subsidies, or supportive initiatives such as training or partnerships (**Error! Reference source not found.**).

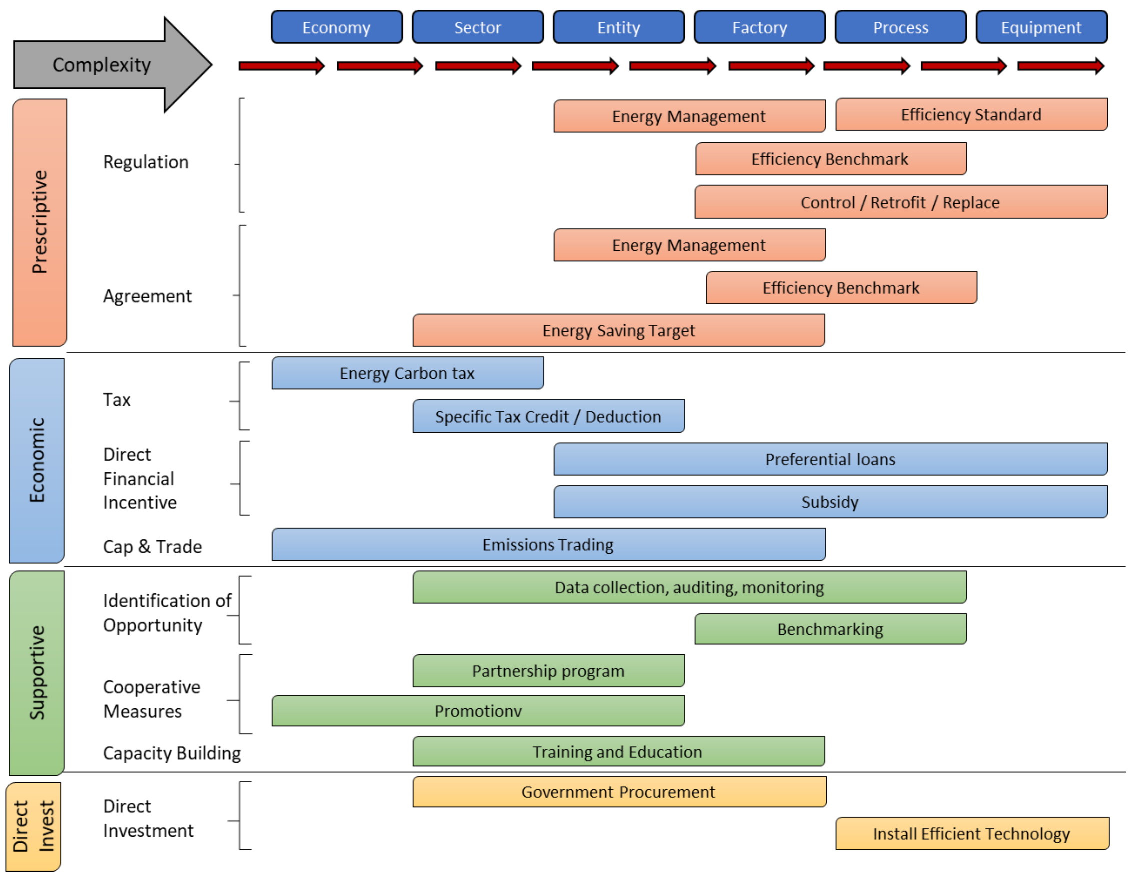


Figure 10. Instruments promoting energy efficiency

6. Transport sector

Of the 160 NDCs covering 187 countries,[12] 75% identify transport as a mitigation source, and 65% propose transport-specific measures, with 9% having a transport sector emission reduction target. Transport emissions are likely to increase faster than emissions from other energy end-use energy sectors, from the current levels of 8 Gt CO_2/y in 2015 to around 12 Gt CO_2/y by 2050.[13] Rising income in developing countries, together with infrastructure development, is leading to increasing personal mobility and a rising private vehicle population. A similar situation exists for freight, where worldwide on-road freight traffic has been closely coupled to GDP growth, with a certain decoupling being evident in Europe and some other countries. The IPCC AR5 concludes that the continuing growth in passenger and freight activity could outweigh all mitigation measures unless transport emissions can be strongly decoupled from GDP growth.

The transport sector requires increasing attention to achieve the needed GHG mitigation, but also presents a high level of complexity for GHG emission reductions. Alternative transportation modes or technologies can require large investments in infrastructure (e.g., mass public transport projects) or implementing new cleaner technologies (e.g., electric vehicles) with higher investment costs. Additionally, some transport measures are perceived to negatively affect a large share of the population, requiring changes in habits (such as foregoing the use of private vehicles in favor of public transport, and parking restrictions). TCAF could have an important role to play in helping to overcome barriers to effective policy implementation and operation, as well as reducing the perceived risk to investors/early adopters. Pricing policies to increase the cost of owning and operating passenger vehicles are important, as well as non-pricing policies and other interventions which promote shifts to other types of transportation (Table 26).

Table 26. Transport policy types and potential mitigation interventions

Policy type	*Mitigation intervention examples*
Pricing policies that increase the variable cost of operation of vehicles	Reduce fuel subsidies Increase tax on fuels Carbon taxes Road tolls and time-of-day pricing Congestion or low emission zone charging Parking restrictions and pricing Distance-based vehicle insurance and registration fees
Pricing policies that increase the fixed cost of ownership of vehicle	Vehicle import duty Vehicle feebate based on emissions Vehicle special sales tax
Pricing policies that promote more efficient transport mode	Vehicle registration fees based on emissions

[12] The number of NDCs is smaller because the European Union submits one NDC that covers all 27 member countries.

[13] IPCC Fifth Assessment Report (AR5), Mitigation of Climate Change, Chapter 8 https://www.ipcc.ch/report/ar5/wg3/.

Policy type	*Mitigation intervention examples*
Non-pricing policies and other interventions	Mass-transit fare reform and integration
	Strict efficiency and emission standards for new vehicles
	Introducing low-emission vehicles to commercial vehicle fleet
	Reduce max age of in-use vehicles
	Use of biofuels in all vehicles
	Development of intermodal hubs for freight
	Development of rail links
	Model shift of freight from road to rail
	Model shift of freight from road to waterways
	Formalize and improve standard bus services
	Development of BRT lines
	Intelligent transport systems
	Development of metro lines
	Cycling and pedestrian infrastructure
	Electric vehicle charging infrastructure
	Vehicle quota systems
	Transit-oriented urban planning