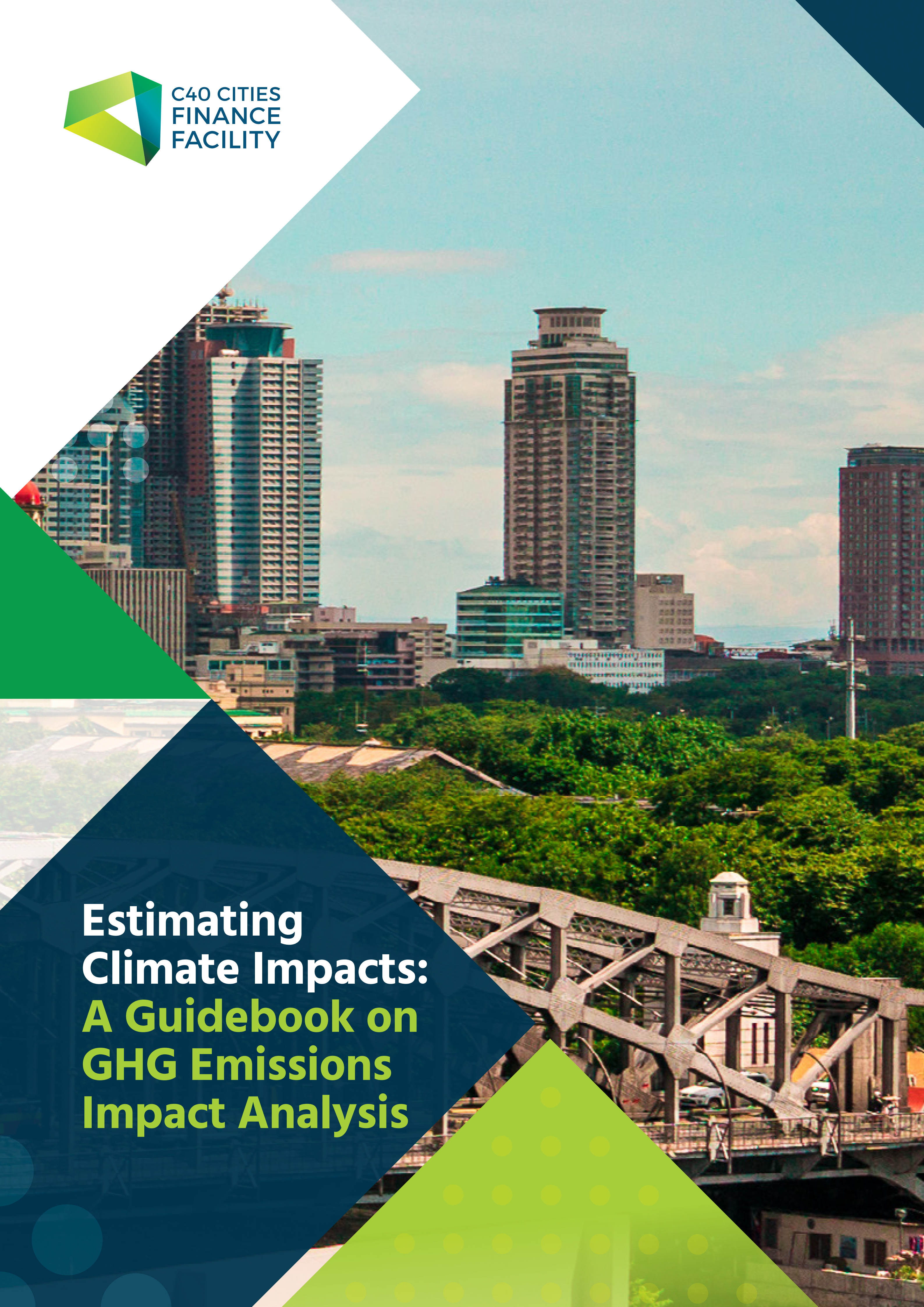
C40 CITIES FINANCE FACILITY



Estimating Climate Impacts: A Guidebook on GHG Emissions Impact Analysis

Contents

About the C40 Cities Finance Facility:

The C40 Cities Finance Facility (CFF) is a collaboration of the C40 Cities Climate Leadership Group and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The CFF supports cities in developing and emerging economies to develop finance-ready projects to reduce emissions to limit the global temperature rise to 1.5°C and strengthen resilience against the impacts of a warming climate. The CFF is funded by the German Federal Ministry for Economic Development and Cooperation (BMZ), the Children's Investment Fund Foundation (CIFF), the Government of the United Kingdom (Department for Business, Energy and Industrial Strategy) and the United States Agency for International Development (USAID).

INTRODUCTION TO PROJECT-LEVEL GREENHOUSE GAS IMPACT ANALYSIS

Introduction

This Guidebook was prepared to provide professionals working on the preparation or implementation of climate change mitigation projects with a detailed understanding of how greenhouse gas (GHG) emission impacts should be considered and calculated.

This Guidebook's objectives are to:

- Describe the accounting principles, concepts and methods related to project-level GHG accounting;
- Describe the basic process for quantifying and reporting GHG impacts resulting from climate finance projects;
- Describe the role of project level impact analysis in climate finance project preparation.

Key Project-level Accounting Terms

The following terms are essential to the understanding of project-level accounting and are used throughout this document.

Project

A project in the context of impact analysis is an activity or combination of activities that is designed to reduce GHG emissions. It can include to any type of practice, policy, programme or other type of intervention implemented by a government, organization or other actor. A project may be a stand-alone effort or a larger initiative that combines multiple sub-projects into an aggregate project.

Project Activity

A project activity is an intervention that when implemented impacts GHG emissions. Activities normally include changes to technologies, systems, or behaviors. The GHG emissions reduction potential of a project is evaluated by examining the impacts of each component activity. Such activities can result in direct or indirect GHG emission impacts.

GHG Source

A GHG source is any technology, system or process that releases GHG emissions into the atmosphere. Examples include fuel combustion for energy generation or transport, waste systems or industrial processes. Emissions sinks such as natural or engineered sequestration also can exist.

Project Scope

Scope defines the extent of the project being analyzed. Scope specifies the infrastructure, system or behavior that the project aims to change, the geographic area and/or population impacted, and the time scale involved.

Baseline Scenario

The baseline scenario describes what would could be expected to occur in the absence of project implementation and is used to estimate baseline emissions. In reality defining baseline scenarios can be challenging as multiple future conditions are likely possible. Depending on the level of rigor required, an analysis may include a single baseline or multiple baselines to evaluate alternative future conditions. A simplified approach to baseline scenarios can be used if considered acceptable for specific purposes. This simplified approach is deemed appropriate for project preparation, early stage estimates and pre-investment purposes and mainly assumes the continuation of current activities, technologies, or practices that, where relevant, provide the same type, quality, and quantity of product or service as the project.

Baseline Emission

Baseline emissions are the emissions associated with the baseline scenario. GHG reductions for the project are evaluated relative to this level of emissions.

Project Scenario

The project scenario describes the changes made by the project to existing activities, technologies or practices. The project boundary, timeframe and scope of analysis should however remain the same as the baseline scenario. Parameters affected by implementation are considered project variables. Other non-project influenced parameters should stay the same as those used in the baseline scenario.

Project Emission

Project emissions are the emissions associated with the project scenario. Project GHG reductions are quantified by evaluating the difference between the baseline emissions and the project emissions. Project emissions can be analyzed prior to implementation (ex-ante analysis) or after implementation (ex-post analysis) or as part of monitoring efforts during implementation.

Project-level Impact Analysis Principles

The principles presented in this section are essential to conducting consistent quantification and reporting of project-level GHG impacts. The application of these principles will help ensure the development of robust and credible estimates, which are required as part of climate project preparation processes.

Rigorous Methodology

The use of robust methodologies is essential to ensure quality evaluations and consistent application of these methods allows for meaningful comparisons of emissions across multiple projects and over time.

There are several internationally recognized sources of emission estimation methodologies that can be used when designing a project analysis including the United Nations' Clean Development Mechanism Methodologies (CDM), the Gold Standard for the Global Goals, the Verified Carbon Standard (VCS) and others. C40 uses quantification methods that are adapted from and compatible with these established practices. See the section on additional resources at the end of this document for more information on these standards and their application.

Context Specificity of Data

Data used in GHG impact assessments need to be specific to project's context, conditions and boundary. Most readily available data exists at a scale not consistent with the project area. While these coarse data are acceptable for some types of analysis (e.g. community-wide reduction strategy evaluation and selection), higher resolution (more accurate) data is required to properly evaluate the impacts of a climate mitigation project. Ensuring that the data used reflect the project extent, characteristics and the conditions within that area is an important aspect of conducting high quality impact analyses.

Robust Sources

It is important to use high quality data and assumptions in project evaluations and to clearly identify the source of the information. Additionally, any uncertainty about the appropriateness or quality of the data or assumptions used must be discussed. Transparency regarding sources and uncertainty is essential to allow reviewers to gauge the reliability of the estimations. Such information must be disclosed and recorded in a clear and understandable manner based on documentation and archives. When certain challenging types of project-level data are not available, alternative data can be considered as long as the project team clearly documents the limitations of the data, the rationale for using the alternative and why the barriers to using the higher quality information could not be easily overcome.

Assumption Consistency

When comparing alternative baseline or project scenarios within the context of a single project analysis, care should be taken to ensure that the project boundary, timeframe and the scope of analysis are consistently applied. The assumptions that vary between the scenarios should be clearly identified and rationale for the variability should be documented. Likewise, in the context of comparing multiple projects the analyses should attempt to apply similar scopes of analysis. Any variation or specific exclusions have to be disclosed and justified. High degrees of variability in the scopes of analysis between projects can lead to incompatible cross-project comparisons and should be avoided.

Conservative Values

Analyses should neither overestimate nor underestimate the emissions reductions potential of a project. Unfortunately, this is not always possible due to the fact that many uncertainties exist in project level analysis. While uncertainties can be reduced as far as practicable, some level of uncertainty will remain.

Where data and other assumptions are uncertain and where the cost of reducing uncertainty is not worth the increase in accuracy, conservative assumptions and values should be used. Conservative values and assumptions are those that are more likely to underestimate than overestimate GHG reductions. While a sensitivity analysis[1] can be used to evaluate the impact of parameter uncertainty and the range of performance can be demonstrated, the final reported estimate needs to be conservative.

The baseline scenario describes what would could be expected to occur in the absence of project implementation and is used to estimate baseline emissions. In reality defining baseline scenarios can be challenging as multiple future conditions are possible.

1 - Sensitivity analysis is a method that determines how output values are affected based on changes in other variables known as input variables. It is often applied when there is uncertainty regarding an input's value and the analysis wishes to observe the range of impact that variable could have on the results.

GHG Accounting and Reporting Process

The following section describes the stages of the process needed to carry out project-level GHG accounting.

Project Definition

A complete and precise definition of the project is needed to carry out the GHG assessment and report the results in a transparent manner. As a very first step the project objectives are stated and basic project details (e.g. project type, geography, timing) need to be defined. As part of this process it needs to be decided whether the project is a single implementation effort or a package of implementation efforts. Finally, the specific intervention details (e.g. types of technology, site context, etc.) of the project need to be clearly defined.

Within the project definition stage, the following information should be determined and documented:

- Objectives: The impacts to be achieved by the project (including systems improvements, GHG reductions and other community benefits)
- Type of action: The type of policy or action including the baseline and project technologies or systems
- Geographical coverage: The jurisdiction or geographical area where the action is implemented
- Status: If action is planned, in adoption stage or already implemented
- Body of implementation: Which organization is responsible for implementing the project
- Period of implementation: Period between the date the project begins and the date it ends
- Assessment period: The period over which the GHG effects resulting from the project will be monitored
- Type of assessment: Whether the GHG assessment is ex ante, ex post or rolling monitoring

An additional step that should be performed in this phase is the evaluation of project alternatives that consider different implementation details such as other technologies, locations or extents. The aim of this step is to identify and consider options that could increase the level of GHG reductions associated with the investment. To do this, the project team needs to consider modifications to the proposal and designs that may perform better than other the original concept.

Assessment Boundary Definition

Defining the boundary of an impact assessment involves identifying the GHG effects associated with each individual project activity. GHG effects can be categorized as primary or secondary effects. Primary GHG effects are the intended direct emissions impacts resulting from the implementation of a project. Secondary effects are indirect impacts that result from implementation but are not the primary intent of the project. These can include on-going (e.g. operational) or one-time (e.g. construction) direct emissions, upstream and downstream (e.g. product life cycle) emissions or unintended effects. Secondary effects can reduce emissions or increase emissions.

All primary effects of a project must be included in the assessment boundary. Secondary effects are also to be included if they are determined to be significant. The GHG assessment boundary also defines the assessment period - the period of time over which the GHG effects resulting from the action or policy are assessed.

The assessment boundary definition process includes the following steps:

- Identification all potential primary and significant secondary GHG effects
- Definition of a causal chain map
- Definition of the GHG emissions assessment boundary

GHG Effects Identification

In order to estimate the GHG effects of a project, cities must first understand what the effects for each project activity are. The effects can be changes in technology, systems, processes, practices or behavior resulting from a project. The effects can be intentional or unintentional, occur in the short or long term, occur within or outside the limits of the implementation of jurisdiction.

The first step is to identify the primary effects of each activity and then identify secondary effects. The primary effect is usually easy to identify as it is the key aim of the mitigation project. For example, an electric bus procurement project is intended to reduce of diesel bus (the baseline technology) fuel combustion and related emissions.

Identifying the list of secondary effects is typically more complicated as defining the scope and the significance of the effects can be challenging. The most straight forward secondary effects include emissions related to the new activities (e.g. technologies or systems) used in the project scenario. Continuing the electric bus procurement example above, this would include the electricity consumption from the new buses and the emissions related to electricity generation and transmission. Other secondary emissions could include upstream diesel fuel production related emissions (baseline scenario) and electric bus battery production emissions.

Once the list of secondary effects is developed, then the evaluation process will need to determine the level of significance of each. This again can be a complicated process depending on the effects identified. A variety of techniques can be used to identify the significance of effects and include detailed evaluations, rapid estimations or the use of existing literature. Due to the level of effort and cost involved in carrying out detailed evaluations, few assessments use this approach at the secondary effect identification stage. More common techniques include emission factor analysis, 'back-of the envelope' estimates and review of existing academic, market or agency documents that evaluate the relative magnitude difference of various technologies. Studies on the lifecycle impacts of various technologies can be especially helpful in this effort.

Causal Chain Development

A very helpful tool for defining a GHG assessment boundary is the causal chain. A causal chain is a conceptual diagram that outlines the process by which the project generates GHG impacts. It depicts the interconnected series of causes and effects. The assessment team maps out the steps of how a project will effect on-the-ground activity, activity intensities and GHG emission intensities. The causal chain helps in the identification process of the GHG assessment boundaries by:

- Identifying previously unidentified GHG effects
- Visually showing how a project leads to changes in emissions
- Communicating complexity of the project to groups involved in project evaluation

A typical causal chain conceptual diagram consists of the elements represented in Figure 1: inputs (or resources), activities involved in the implementation, intermediate effects resulting from the project activities and the resulting relevant and insignificant GHG effects.

Assessment Boundary

After GHG effect identification and development and review of the casual chains, the formal assessment boundary for the evaluation can be defined. The defined boundary will outline the scope of the analysis in terms of what are the project activities, the types and range of GHG emission effects per activity, and the timeframes included in the evaluation. It will also describe the rationale for including and excluding GHG effects including a discussion of how significance and magnitude was determined and what barriers to evaluation exist.

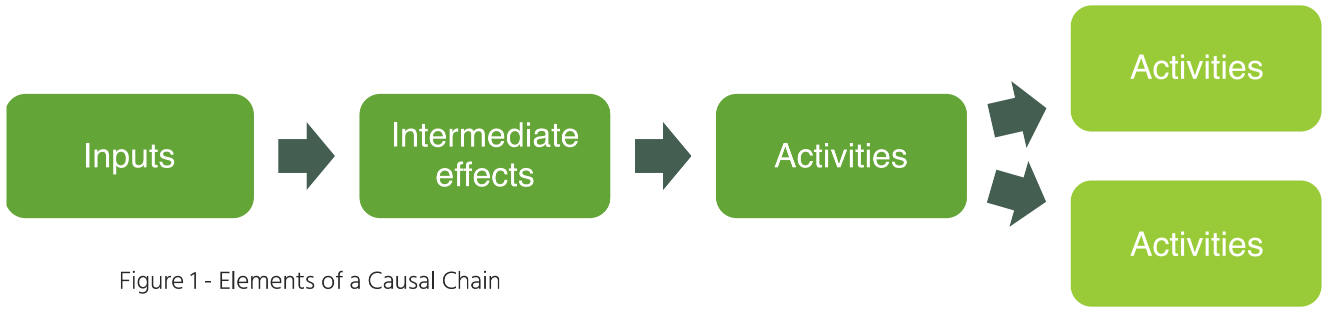


Figure 1 - Elements of a Causal Chain

Defining the Baseline Scenario

In project-level accounting, GHG reductions are quantified against a baseline scenario[2]. The baseline scenario is the reference case representing the conditions most likely to occur in the absence of the assessed project.

Multiple baselines can exist, especially in the context of ex ante analyses. Possible baselines (frequently referred to as baseline candidates) can be identified by thinking broadly about the various alternative future conditions that could provide a comparable product or service to the project activity. To identify the most useful baseline, the following questions can help in this effort:

- What existing or alternative new technologies, practices, or systems would exist in the future if project implementation did not occur?
- Are there external regulatory, market, technological or cultural conditions that would likely influence any relevant aspect of the baseline activity?

The baseline scenario could involve continuation of existing technologies and practices, adoption of completely different technologies or practices or different levels of implementation of the same technologies or practices involved in the project activity.

The first step in selecting a baseline scenario is to review the various parameters used in the emissions impact analysis and identify base year values and other conditions. Once the base year values have been determined, the next step is to project how each parameter is likely to change in the absence of the action being implemented, considering all drivers that are expected to have a significant impact on emissions.

Two types of drivers exist:

1. Policy drivers - Other policies, actions and projects expected to affect the relevant emission sources;
2. Non policy drivers - Other conditions, such as market forces or socio-economic factors that are expected to affect the relevant emission sources and sinks, which could include:
    - Economic activity: GDP changes, structural changes in economic sectors, household income;
    - Costs: Price of energy, commodities, services and technologies;
    - Population: Demographic changes (size, composition and spatial distribution);
    - Consumer preferences: Changes in practices, adoption of new technologies;
    - Environment: Heating degree days, hydrological conditions.

For each driver that could create a significant impact, the assessment should document the type of driver, how the driver is likely to change the parameter(s) and the sources of information and rationale that support the value used. If high levels of uncertainty exist regarding how a significant parameter will change, then multiple baselines may need to be evaluated.

2 - Ex ante evaluations use a forward-looking baseline and ex post evaluations use a backward-looking baseline.

Estimating Baseline Emissions

Except in specific cases, such as continuous emission monitoring in power plants, emissions cannot be directly monitored and have to be modelled. Generally, GHG emissions are calculated using the following equation:

GHG Emissions=Activity Data ×Emission Factor

Baseline emissions are therefore calculated by applying an emission factor to the amount of activity related to a technology, system, product or service over a certain period of time. For the purposes of project-level impact modelling, bottom-up analysis methods are used. Bottom-up methods use detailed project data to estimate activity and emissions factors.

Baseline emission rates may be dynamic or static: static baseline emission rates do not change over time, while dynamic baseline emission rates change over time. A static baseline emission rate is most appropriate for GHG projects that are substituting for existing plants or technologies where it can be reasonably assumed that basic operating parameters will not change over a certain time period. In contrast, dynamic baseline emission rates are better suited to GHG projects that are part of a system that changes significantly over time, such as grid's electricity sources or a community transport system.

Defining the Project Scenario

In addition to defining the baseline scenario, a GHG assessment also needs to define the GHG emissions related to the implementation of the project and its component activities. Defining the project scenario and evaluating its GHG impacts is relatively easy to define in the context of an ex post analysis. It is more challenging when an ex ante analysis is being conducted as the assessment needs to define a forward-looking project scenario which includes many assumptions about what will happen in the future.

Estimating Project Emissions

Similar to development of the baseline emission estimate, project emissions can be evaluated through direct measurements of project activity (e.g. the metered amount of electricity generated from a photovoltaic system) or, through indirect estimates of activity (e.g. modelled photovoltaic system generation).

Both direct and indirect measurements are subject to uncertainties. The relative accuracy of the analysis depends on the instruments used (for direct measurement), the quality of the data collected and the assumptions underlying the calculations. All data uncertainties should be fully described and explained, and any calculation assumptions should also be disclosed and discussed. If uncertainties are identified, then the project assessment should attempt to follow the principle of conservativeness and select parameter values that underestimate rather than overestimate GHG reductions.

Data Definition

Identifying data sources is an important step of the GHG assessment process. An impact analysis is only as good as the data used as input; therefore, this step is crucial in order to produce robust estimate. Sources of data that are both temporally and geographically specific to the studied project are preferred. Whenever it is not viable to obtain project-specific parameters, use of alternative data are valid, as long as the methodology of estimation and the assumptions considered are correctly reported and documented (e.g. proxy data, scaling, sampling).

Data can be collected from a variety of sources, as long as they conform to the principles of project level accounting. Some data sources could include:

- Review of literature from previous studies with similar contexts and circumstances
- Consultations, surveys, or panels with relevant experts and stakeholders
- Review of regulations, authority statutes, development of plans, analysis of regulatory impacts, environmental impact assessments or economic studies
- Sector-specific guide or methodology
- Expert judgement

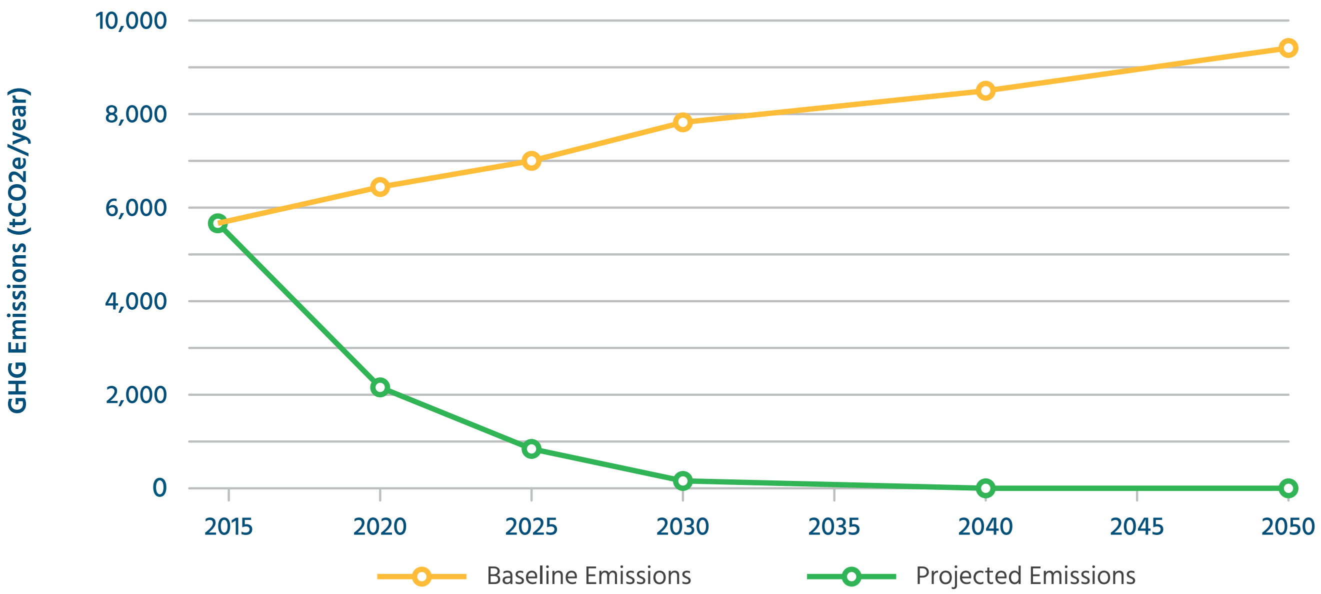


Figure 2 - Comparison of baseline scenario and project scenario to identify GHG reductions

Quantifying GHG Reductions

Emission reductions are calculated using the following formula:

GHG reductions=Baseline Emissions-Project Emissions

Figure 2 shows an example of the comparison between baseline and project emissions. GHG reductions can be represented by the distance between the two lines for any year. When completing the emission reduction estimate it is important to ensure that the assessment boundary in terms of the scope of project activities and timeframes are identical in the two scenarios.

Reporting and Assessing Uncertainty of GHG Reductions

When reporting a GHG assessment, the final step is to produce a formal uncertainty assessment. This is a procedure to quantify or qualify sources of uncertainty in a GHG assessment.

Assessing uncertainty can help user identify areas for further improvement, improve the quality of evaluation and increase confidence in results.

There are different types of uncertainties that could be considered:

- Uncertainty of parameters: Uncertainty associated with parameter values, for example: activity data, emission factor data and assumptions for emissions.
- Scenario uncertainty: Variation in calculated emissions due to methodological options
- Model uncertainty: Limitations on the ability of the model approach, equations or algorithms to reflect reality

Where uncertainty is significant, lower and upper bounds or confidence intervals for all measurements should be identified.

Data Quality	Methods of estimation	Assumptions about parameter drivers	Data sources
Low	Low precision meth-ods	Most are assumed to be static or linear extrapolations of historical trends	International default values
Medium	Medium precision methods	Combination	National average values
High	High precision methods	Most are assumed to be dynamic and estimated on the basis of detailed models	Specific data from the jurisdiction or project area

Table 1 - Uncertainty of parameters

In ex ante analysis, scenarios are designed to reflect what is considered probable in terms of future trends, however there is always some degree of uncertainty regarding any baseline or project scenario. For example, rapid population or economic growth, absorption of new technologies, displacement of the modes of transport, etc. could all have considerable effects of a project's ability to reduce emissions.

Given these uncertainties, a GHG assessment should consider developing a range of scenarios. This can also help to understand the distribution of possible outcomes in terms of emissions and identify through discussion what might be considered the most likely scenario.

These multiple scenarios should be combined into sensitivity analysis which can be used to illustrate the variation in the assumptions parameters and the effect on overall results. In a sensitivity analysis, the value of key parameters must be adjusted to determine the variations in impact on results.

The report phase refers to the processing and presentation of the measured information in a transparent and standardized manner. The reporting should be guided by the formal communication mechanisms recognized internationally.

An international report framework allows for scalability at the sectoral, national and international level of the impact and GHG reduction.

It is extremely important to ensure that reports are made in accordance with guidelines. Doing this is to carry out the compilation of the base information, activity data and assumptions identified for the monitoring, following the accounting principles and quality standards established. In this way, quality and transparency are maintained, the report is in line with the criteria established for emissions estimates and double counting or overlapping between initiatives similar to the project is avoided.

Quality Assurance & Verification

Quality assurance and verification are two related but distinct aspect of project impact assessments that both aim to ensure the integrity of the analysis and results.

Quality Assessment (QA) measures are necessary to ensure that data related to GHG emissions are reliable. This quality assurance procedure encompasses a variety of activities, including site audits, central data control, methodology review and results coherence checks. In general, QA should focus primarily on data collection activities, and secondarily on data processing and storage. The credentials of any parties responsible for monitoring should be documented.

In addition, the data quality assurance process should:

• ensure data have been properly entered into data templates, forms, or software; and

• assess calculation results to ensure data have been properly conducted.

Verification on the other hand is an independent and documented process carried out by a third party in which the methodology and the process of emission reductions evaluation are verified. This process involves the review of GHG inventories, GHG baseline and project emissions and compliance with GHG accounting principles, and its results must be made public.

Verification establishes if the GHG assessment lies within the mechanisms and methodologies pre-established for coherency and robustness. The verification of an assessment must guarantee and validate the accuracy, granularity, rigorousness, consistency, exhaustiveness and transparency of the estimates, of the methodology and of the documentation and data associated with the project.

The verification should consider each aspect of the assessment, the output report and the supporting documents. Primary objective of the verification are to:

- Ensure compliance with the pre-established assessment requirements;
- Confirm if the sources of data and other information (e.g. surveys conducted and primary databases, etc.) are identified and properly cited;
- Ensure that evidence and rationale is provided to support any assumptions made;
- Identify temporal variations in activity data and emission factors that may exist;
- Guarantee that the methodologies for the emissions estimates are rigorous and replicable;
- Make sure that major sources of uncertainty associated with the activity data, emission factors and other parameters are identified and discussed;
- Provide evidence that the assessment complies with project level accounting principles (e.g. avoidance double counting, inclusion of possible leakage).

PURPOSE AND APPLICATION OF PROJECT-LEVEL ANALYSIS

Summary of IFIs Framework

Since the Paris agreement, the volume of climate financing has increased enormously, posing questions on how to ensure that the estimates of the investments' GHG reduction impact are performed in a transparent, accurate and comparable manner.

A project-level GHG assessment that ensure transparency, accuracy and comparability of analogous climate actions, can be certified only when harmonizing standards, that cover a broad range of economic sectors, are available to meet the expectations of the climate investors, who are looking for a trustful quantification and reporting of the GHG emissions savings of their financial contribution.

Common principles for GHG accounting, supported by credible, robust and widely accepted standards were needed for harmonizing GHG emissions accounting to assess climate investments made by public and private sectors, institutional investors, issuers of green bond and the capital market.

The wide range of standards and norms previously available creates confusion among climate investors, which urgently need to reduce the variance in GHG reporting. A standardization of GHG assessments is required by focusing on the development of joint guidance.

Fortunately, a group of International Financial Institutions (IFIs), recognized the need for action and began developing best practices for the reporting of environmental and climate change impacts.

The Working Group of the International Financial Institutions (IFI Working Group) is composed by multilateral development banks such as the Agence Française de Développement, the Asian Development Bank, the European Bank for Reconstruction and Development, the European Investment Bank, the Inter-American Development Bank, the International Finance Corporation, the KFW Development Bank, the Nordic Environment Finance Corporation and the World Bank Group.

In November 2012 the IFI Working Group agreed to the so called "International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting" which is a set of principles on policy commitment, methodology, and reporting whose adherence are at the basis of a harmonized approach to project-level GHG accounting.

The purpose of the framework is to establish minimum requirements, all of which can be optionally exceed with additional considerations and reporting, for ensuring a correct project-level GHG accounting and the overall potential and specific technical aspects of moving toward a joint methodology.

It is critically important to ensure that the harmonized standards result in robustness, comparability and consistency among projects but also that are simple to use and recognize the different scopes and geographical coverage of each project.

IFIs recognize that using a harmonized approach increases the robustness of the assessment of the climate impact of investments by allowing for meaningful comparisons between project's GHG emissions estimates and sets good-practice examples facilitating the sharing of experience and lesson-learnt, while providing enough flexibility linked to data quality.

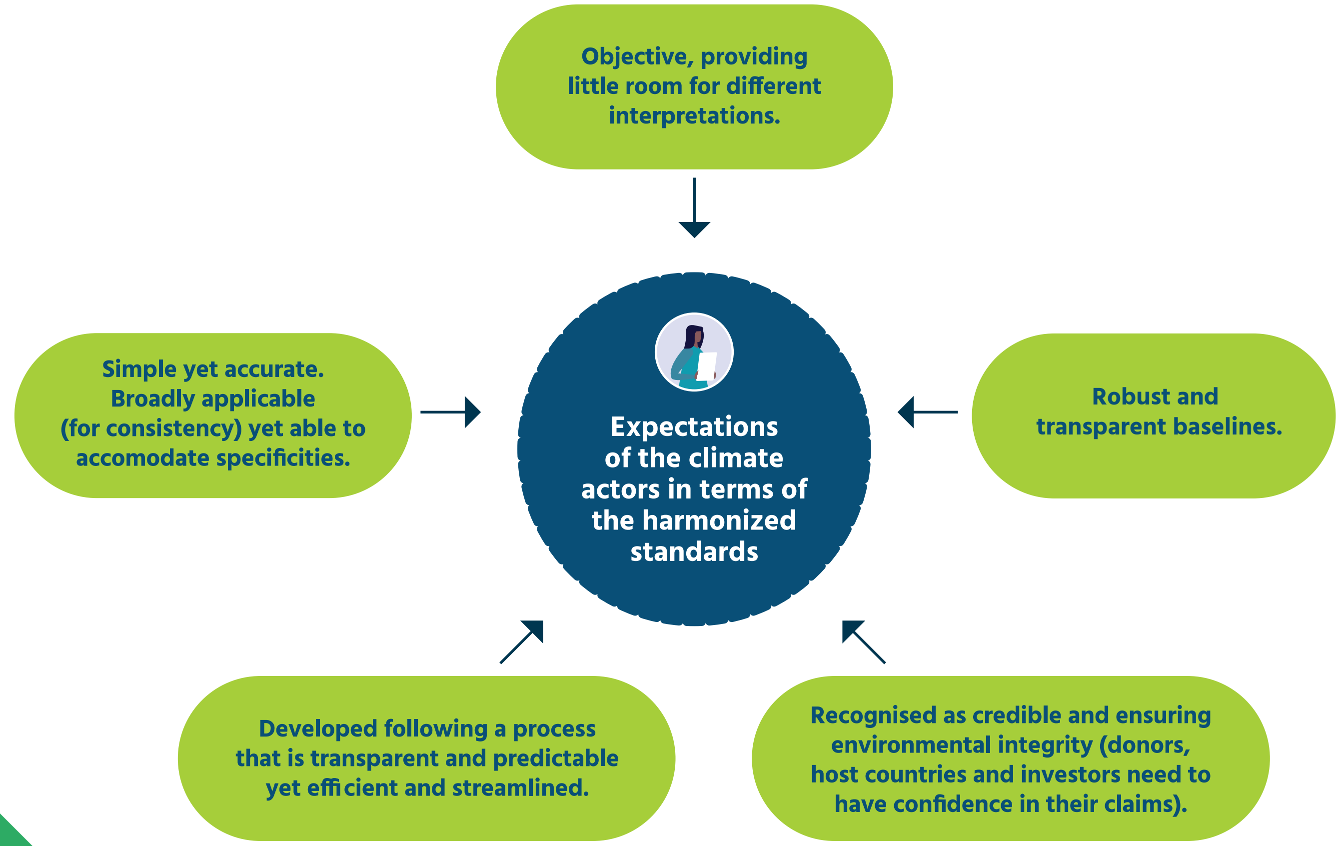
The application of IFIs harmonized standards, which are at the basis of the project-level accounting principles described in previous sections, will help make worldwide GHG accounting estimates comparable, transparent, and more cost-effective.

The agreed principles of IFIs on GHG accounting are:

- Policy commitment: each of the IFIs is committed to accounting for the GHG emissions of direct investment projects that they finance
- Screening: IFIs shall screen each proposed direct investment project for likely significant GHG emissions and establish the minimum criteria for screening
- Methodology: IFIs shall base the GHG accounting of a project on established methodologies such as the Clean Development Mechanism methodology. Definitions and assumptions shall be recorded and made transparent
- GHG Emission Accounting:
- IFIs will estimate the absolute GHG emissions that a project is expected to produce on an annual basis once it is at normal operating capacity.
- The project boundary for GHG accounting should include all activities, facilities or infrastructure that the IFI is financing.
- GHG emissions reductions will be assessed against a baseline scenario, which may be a "without project" scenario or an "alternative scenario".
- Reporting: IFIs shall report on the GHG emissions of mitigation projects in a transparent manner, with optional additional yearly aggregate net portfolio wide GHG emissions
- Further Cooperation: IFIs are committed to share learning in the area of GHG accounting and work to establish a mechanism for data sharing and peer review of their GHG accounting.

The sectors in which the IFI Working Group has mostly focused its effort in are energy and transport, two of the main areas for GHG reduction potential.

By following the standards and guidelines proposed by the International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting every stakeholder involved in a climate change mitigation project will be benefitting from wide coverage comparability to inform their decision-making related to project finance.



Project Financing

Achieving the Sustainable Development Goal (SDGs), fulfilling the National Determined Contributions (NDCs) or delivering on sub-national governments ambitious Climate Action Plans (CAPs) requires a substantial transition away from existing practices fossil fuel intensive practices towards sustainable, low-carbon infrastructure development.

Relying on existing financial reserves or grants alone is not sufficient to deliver the scale of sustainable infrastructure projects that is necessary to fulfil these commitments. To meet these commitments by developing and implementing a continuous pipeline of sustainable infrastructure projects, there is a strong need for government entities to both tap into new financing sources to deliver these commitments and reconsider their existing financial flows.

Having robust project-level GHG impacts estimates are an essential part of being able to build the case for and access the scale of financing needed for this transition.

Developing the Business case

The purpose of the business case is to evaluate the costs, benefits and risks of a proposed intervention compared to the baseline, building a case for why the benefits of a project outweigh the costs (often financial) and thus should be implemented. When a portfolio of infrastructure interventions is available, but capacity (technical, administrative or financial) is limited to implement them all, a robust estimate of benefits and costs can also support the prioritisation of interventions to those which will have the most impact.

Benefits that may be used in a business case include:

- Local and/or regional air quality improvements
- Premature deaths averted
- The number of temporary or permeant jobs created.
- A reduction in travel time
- Providing underserved communities with better opportunities or access to the economy
- Reduction in the GHG emissions that are produced
- Better resilience to extreme weather often amplified by climate change
- Additional revenue streams

Some of these above benefits lend themselves well to providing quantifiable tangible benefits, with the existence of rigorous methodologies that are well established in the practitioner community, such as the estimation of GHG emission reductions, whereas others are much less robust. Typically, quantification of these benefits is an important measure to allow a better comparison against costs, which are generally quantitative (financial) in nature. Attaching a monetary cost of these benefits, for example by integrating the social cost of carbon (integrating the marginal cost of the impacts caused by emitting CO2), is a method used by some to mitigate the market failure of excluding the effects of climate change in decision making. However, methodologies to evaluate the social cost of carbon are exceptionally variable and produce inconsistent results.

Accessing grant based (non-refundable) capital

Grant based capital is an essential method of financing for projects which do not have a clear revenue stream, which includes the majority of adaptation projects or cycling infrastructure, because the requirements for many debt-based financing instruments are to have a clear guarantee for how this can be repaid. Further, many sub-national entities do not have the power to issue debt-based financing instruments at all and thus are dependent on grants, their municipal allocations and their budget reserves.

Financial transfers from national or supra-national (such as the European Union) government bodies to sub-national governments are a common practice around the world to cover both typical operational expenditure in municipal budgets but also to facilitate the implementation of essential infrastructure developments. These typically meet a strategic need, such as contributing to their Nationally Determined Contributions (NDC's) or similar, but these benefits will likely need to be demonstrated.

For governments located in Overseas Development Aid (ODA) recipient countries - as determined by the Development Assistance Committee (DAC) of the OECD – international grant funds are also increasingly available through bi-lateral donor aid, philanthropic organisations or mechanisms such as the UN's Adaptation Fund or Green Climate Fund (GCF). These funds will typically only be available for projects that demonstrate significant social or environmental benefits, such as providing better gender equity or substantial climate benefits. As such, quantification of these benefits through internationally recognized methodologies is essential in order to receive grant-based financing from these organisations. Smaller grants (in cash or in-kind) are frequently available in ODA recipient countries through (inter)national development banks, bilateral donor aid or philanthropic funds for the delivery of technical assistance to further plan sustainable infrastructure projects and identify high quality data to analyse the benefits, a necessity for unlocking further funds.

Accessing debt or loan-based (refundable) capital

While many sub-national governments may not be able to access debt or loan-based capital, it is likely that this will be one of the most significant avenues to finance investment in necessary sustainable infrastructure. While accessing this type of capital is primarily dependent on the strength of the financial model and ability to repay the loan, some private and public lenders are able to provide preferential repayment terms for projects which demonstrate that they contribute to wider benefits such the Sustainable Development Goals (SDGs) or similar.

An example, which is increasingly being used by sub-national authorities, is the issuance of green bonds, a financial instrument which is very similar to that of a typical bond but needs to demonstrate environmental benefits. With green bonds, capital providers in some cases have been willing to take a smaller return on their investment than more traditional forms of municipal bond because of the benefit to wider society, further, because of these wider benefits, mechanisms such as green bonds may attract more or different capital providers. However, issuing a green bond will require very clear estimates of long term GHG emissions savings and will almost always have higher transaction costs (similar to social bonds or sustainability linked bonds) due to the need to monitor and evaluate the environmental impact relative to the expected impact over the lifetime of the of the bond, requiring bond issuers to have followed all the principles to develop reputable estimates.

Similarly, other capital providers such as (inter)national development banks may issue concessionary lending rates or provide concessions/guarantees to facilitate the implementation of higher risk projects which have demonstratable environmental benefits and align with wider sustainable development goals for the country or region.

Other Resources

This document is intended for summarizing and simplifying the process and objectives of project-level analysis. The guidance provided is sufficient for project preparation, early stage estimates and pre-investment purposes. Important concepts such as additionality, leakage and multiple baseline scenario comparisons were not exhaustively discussed, and further guidance will be needed for a complete assessment aimed at earning certified emission reduction credits or green financing.

In the case where the objective of the reader is to perform a GHG assessment for green investment purposes we recommend exploring more detailed and exhaustive resources from accredited sources such as UNEP Risø Center (URC) and World Resource Institute (WRI).

The URC guidebook takes the reader through the processes of developing baseline and baseline methodology, and approval of new baseline methodologies. It also presents indicative methodologies for small scale CDM projects and examples of approved methodologies for project specific baselines. Furthermore, it describes the process of developing baseline for land use and land use change (LULUCF) CDM projects.

The WRI guidebook Project Protocol is written for project developers, initiatives administrator and third-party verifiers for such GHG projects. It is a very detailed guide on project-level GHG accounting, reporting and legal requirements.

The user is advised to refer to these documents for the detailed accounting and reporting of GHG projects mitigation impacts satisfying international standards and green investment requirements.

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Acknowledgements

This report was written by Oliver Walker of the C40 Cities Finance Facility and Laura Frassine and Antoine Jaillet of the C40 Cities Climate Leadership Group. Others who provided suggestions on the structure and content of this report include Culley Thomas & Anelise Rosa.

Suggested citation: C40 Cities Finance Facility (2021). 'Estimating Climate Impacts: A guidebook on GHG Emission Impact Analysis.'

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Photo Credit - Eric William M. Sandiego

Funding partners:

Federal Ministry for Economic Cooperation and Development

CHILDREN'S INVESTMENT FUND FOUNDATION

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Implementing agencies:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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