Mitigation Action Facility – Mitigation Guideline for the Project Concept Phase

How to present mitigation figures

June 2023

Acronyms and Abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
ASP	Applicant Support Partner
BAU	Business as Usual
BE	Baseline Emissions
BEB	Battery electric buses
C	Carbon
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon dioxide equivalent
DRE	Decentralised renewable energy
ER	Emissions Reduction
EUR	Euro
EV	Electric vehicle
FC	Financial Cooperation
FCPF	Forest Carbon Partnership Facility
GEF	Global Environment Facility
GHG	Greenhouse Gas
GHGP	Greenhouse Gas Protocol
GS	Gold Standard
ha	Hectare
HFCs	Hydrofluorocarbons
ICE	Internal combustion engine
IPCC	Intergovernmental Panel on Climate Change
kg	Kilogram
kWh	Kilowatt hour
LE	Leakage Emissions
M&E	Monitoring and Evaluation
MAI	Mean Annual Increment
MRV	Measurement, Reporting and Verification
N	Nitrogen
N_2O	Nitrous Oxide
NAMA	Nationally Appropriate Mitigation Actions
NDC	Nationally Determined Contribution
NF_3	Nitrogen trifluoride
OAP	Open Application Platform
PE	Project Emissions

PFCs	Perfluorocarbons
REDD	Reducing Emissions from Deforestation and forest Degradation
SF_6	Sulphur hexafluoride
SI	International System of Units
SMEs	Small- and medium sized enterprises
SOC	Soil organic carbon
TC	Technical Cooperation
tCO_2e	Metric tonnes of carbon dioxide equivalent
tCO_2e/a	Metric tonnes of carbon dioxide equivalent per annum
UBA	German Environmental Agency (German: Umweltbundesamt)
VCS	Verified Carbon Standard

Contents

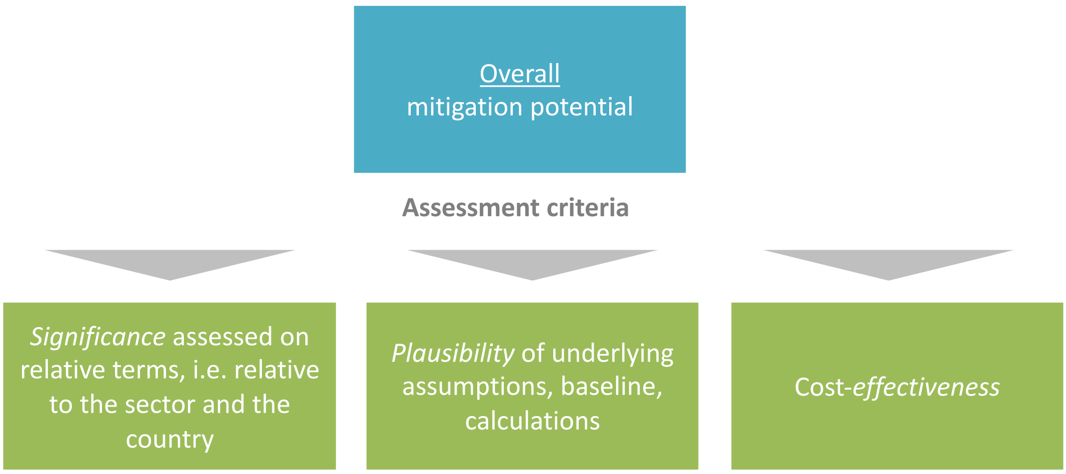
List of figures

List of tables

1 Introduction and purpose

The Project Concept Phase preceding the development of Project Outlines has been introduced with the Mitigation Action Facility Call for Projects 2023 to simplify the initial application process and open the competition to a wider range of potential applicants and partners. The period for submitting Project Concepts lasts for two months. For the presentation of Project Concepts, a standardised web-based questionnaire (Open Application Platform (OAP)) is used inviting applicants to provide details on the envisioned intervention (no Annexes to fill out, but information on the overall idea, rationale, technical and financial support, intended impacts, etc.) guided by the questions that will at a later stage require further, more detailed, elaboration in the Project Outline. The submission of Project Concepts is mandatory to proceed to the next steps in the selection process. All submitted Project Concepts undergo a desk assessment by the TSU. Based on the assessment and recommendation of the TSU, the Board selects up to 25 Project Concepts to proceed to the Project Outline Phase.

The mitigation potential is a key measurement to estimate a project's contribution to the decarbonisation targets as defined by the country's NDC. At the Project Concept Phase, a conservative overall estimate, or a range of achievable greenhouse gas (GHG) emission reductions for the proposed project is to be assessed relative to the sector and the country. In assessing the mitigation potential provided at the Concept Phase, the following key criteria are used:



Source: Based and adapted from Mitigation Action Facility (2023)

Figure 1: Assessment criteria for project's mitigation potential

2 General principles, definitions, and requirements

When estimating the mitigation potential of your Project Concept, please take the following general principles, definitions, and requirements into consideration.

2.1 Distinction of direct and indirect GHG mitigation potential

The Mitigation Action Facility differentiates between direct and indirect GHG mitigation potential. However, at the stage of submitting the Project Concept, Applicants are only required to provide an estimate of the direct GHG mitigation potential which is defined as follows:

Direct GHG emission reductions are achieved by project investments and discrete investments financed or leveraged during the project's implementation period (throughout the entire lifetime of the project). Hence, direct emission reductions are defined ***as mitigation achieved by units or measures (partially) financed or leveraged by the financial cooperation (FC) component of the project*** funding during the project period. The requirements are as follows:

- Units must be installed / measures must be implemented during the project period.
- The timing of the mitigation effect occurs during the project period, 10 years after project end and over technology lifetime (but only for those units installed during project period).

Indirect GHG emission reductions achieved by the project capture emission reductions beyond those related to direct investments, e.g., resulting from technical assistance.

The following illustration summarizes the distinction between the visualised direct and indirect mitigation potential of projects and the different reporting timeframes.

Recommendation: At Project Concept Phase, the Applicants will only be asked to provide estimates on direct emission reductions.

The following illustration summarizes the distinction between the visualised direct and indirect mitigation potential of projects and the different reporting timeframes.

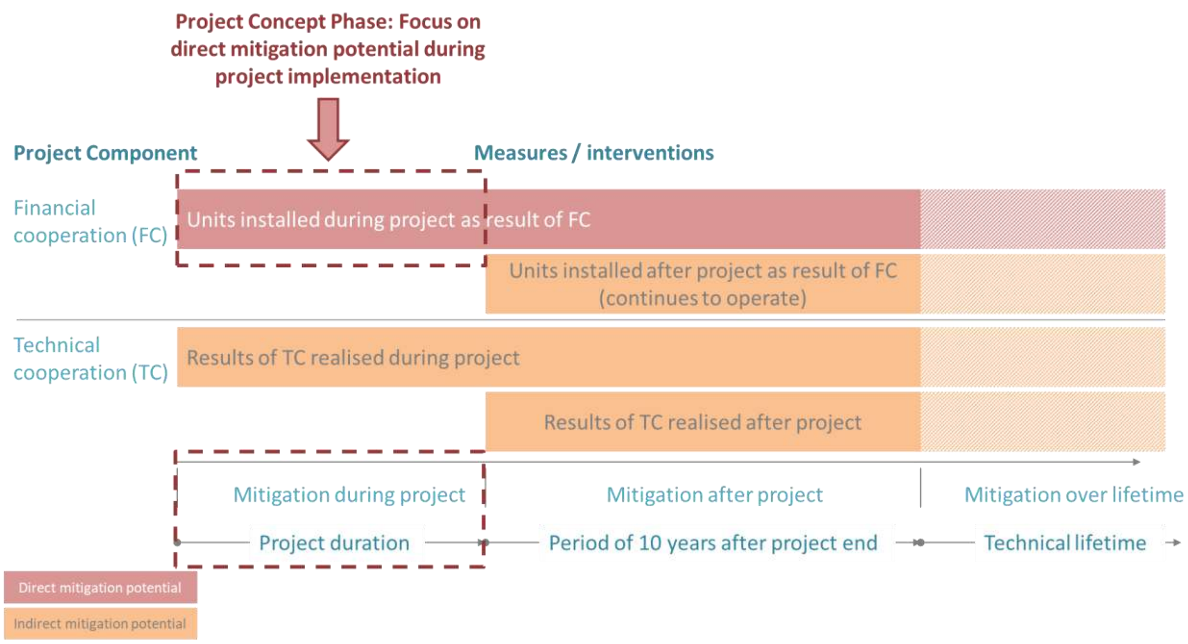


Figure 2: Definition of the direct and indirect GHG mitigation potential

As shown in the figure above, technology units installed during the project as result of the financial component of the project can continue mitigating over a period of 10 years and beyond depending on the lifetime of the underlying technology. For instance, direct emission reductions related to buildings retrofitted during the project implementation phase of 4 years can be counted for an additional 10 years. If the technology lifetime exceeds this period, e.g., 20-year lifetime, the emission reductions should be accumulated accordingly. See example below.

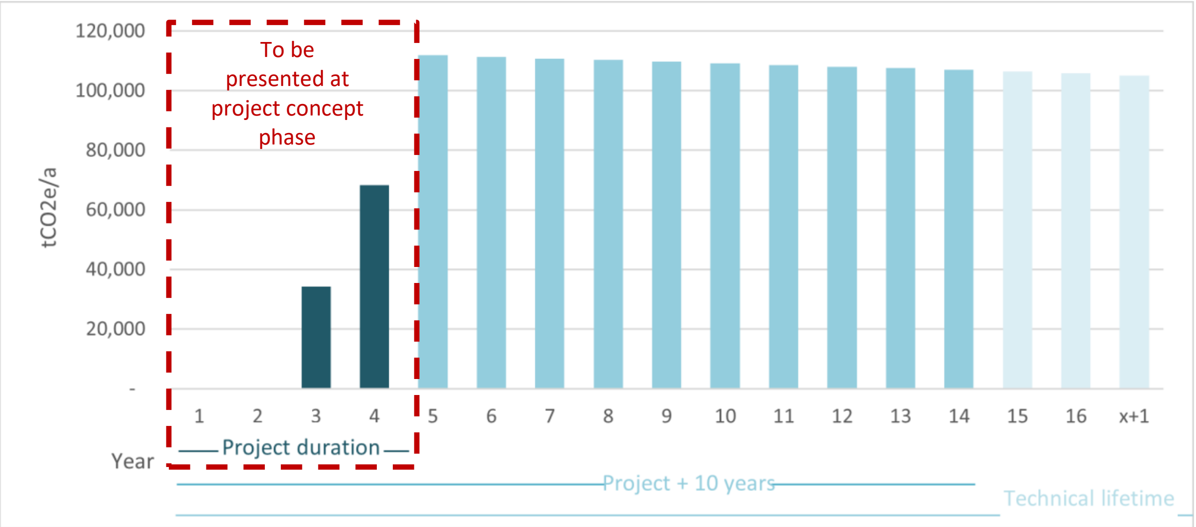


Figure 3: Example of direct emission reductions from a project

Recommendation: At the Project Concept Phase, the Applicants will only be asked for an overall estimate or a range of emission reductions that can be achieved during the project implementation.

2.2 Time period for mitigation estimation

At the concept stage, the Applicants should assess the annual mitigation potential of the project and the cumulative value over the project duration.

2.3 General principles and definitions for determining the mitigation potential

Projects under the Mitigation Action Facility are expected to achieve real emission reductions. The net change in GHG emissions, measured in metric tonnes of carbon dioxide equivalent (tCO_2e), will be estimated relative to the assumed baseline emissions trajectory, and will reflect any abatement results attributable to the project over the lifetime of the intervention(s).

2.3.1 General approach for emission reductions determination

The calculation of emission reductions achieved by the project may vary according to the project type and underlying mitigation measures to be implemented. In general, the quantification of the potential mitigation impact of the project is based on a comparison between the baseline situation and the situation after the project implementation representing the mitigation scenario. Hence, the related emissions for both situations need to be determined. The difference between both, taking into account any leakage effects[1], is the potential emission reductions resulting from the project.

$$ER_y = BE_y - PE_y - LE_y \qquad \textbf{Equation (1)}$$

Where:

[1] Leakage effects are explained in section 2.3.4 of this Guideline.

ER_y	=	Emission reductions in year y (tCO_2)
BE_y	=	Baseline emissions in year y (tCO_2)
PE_y	=	Project emissions in year y (tCO_2)
LE_y	=	Leakage emissions in year y (tCO_2)

Recommendation: To estimate the mitigation potential for the concept phase, Applicants need to estimate: i) baseline emissions, ii) project emissions, iii) leakage emissions for the project based on the GHG emissions in the baseline situation and the project scenario. Follow the detailed procedures provided by this Guideline and relevant standards and methodology(-ies) related to the technology/measure applied.

2.3.2 Defining the baseline scenario

The baseline scenario is the ***reference case for the project***. It is a hypothetical description of what would have most likely occurred in the absence of the project in order to provide (nearly) the same product or service. The baseline scenario is used to estimate baseline emissions.

Generally, the baseline approach as provided and defined by the applied methodology (see also section 2.4.1 of this Guideline) should be followed taking into consideration the following guidance. There are three generic possibilities for the baseline scenario and related emissions that would occur in the absence of the proposed project (as per Clean Development Mechanism (CDM) and GHG Protocol):

- The continuation of current activities, technologies, or practices that, provide the same type, quality and quantity of product or service as the project (Business-as-Usual, BAU), resulting in existing actual or historical emissions, as applicable.
- A benchmark approach, considering for example current activities, technologies or practices that provide the same type, quality and quantity of product or service as the project. Only activities, technologies and practices should be considered that have been undertaken in the previous five years, in similar social, economic, environmental and technological circumstances and whose performance with regard to low emissions is among the top 20 percent of their category with regard to outputs delivered; as an example, a benchmark approach could be chosen for energy efficiency projects that aim at introducing technologies or equipment with a higher energy efficiency than the solutions currently found on the market. Using a benchmark approach helps to identify the technical parameters to be used to establish the baseline scenario and estimate the baseline emissions.
- The emissions from an activity, a technology or practice that represents an economically attractive course of action, taking into account barriers to investment, i.e., implementation of alternative activities, technologies or practices (compared to the project) within a specified geographic area and temporal range that could provide the same product or service as the project. This could include, for example, activities in the transport sector, where certain vehicle types (e.g., private transport or internal combustion engine (ICE) mini-buses) are more economically attractive and expected to increase over the project period (and beyond).

When defining the baseline, identify the scenario that most reasonably represents the situation in which the potential would be in, i.e., a sub-sector such as the building sector, and estimate the anthropogenic GHG emissions by sources that would occur in the absence of the project. In other words, the baseline is defined as the hypothetical situation without the project; hence the baseline emissions (BE) are the emissions that are expected without the project during the given period.

In many cases the 'business-as-usual' (BAU) emissions (i.e., emissions that would occur without any new and additional efforts to reduce them) represents the baseline scenario. The BAU scenario can be estimated *ex-ante* by extrapolating historical GHG emissions or projecting the development of key emissions drivers over the lifetime of the project.

In the same way, it is also possible to project into the future the GHG emissions under the implementation of the project (**project emissions**), i.e., the development under changing circumstances. The difference between the baseline emissions (BE) and the project emissions (PE) provides the ex-ante mitigation estimate.

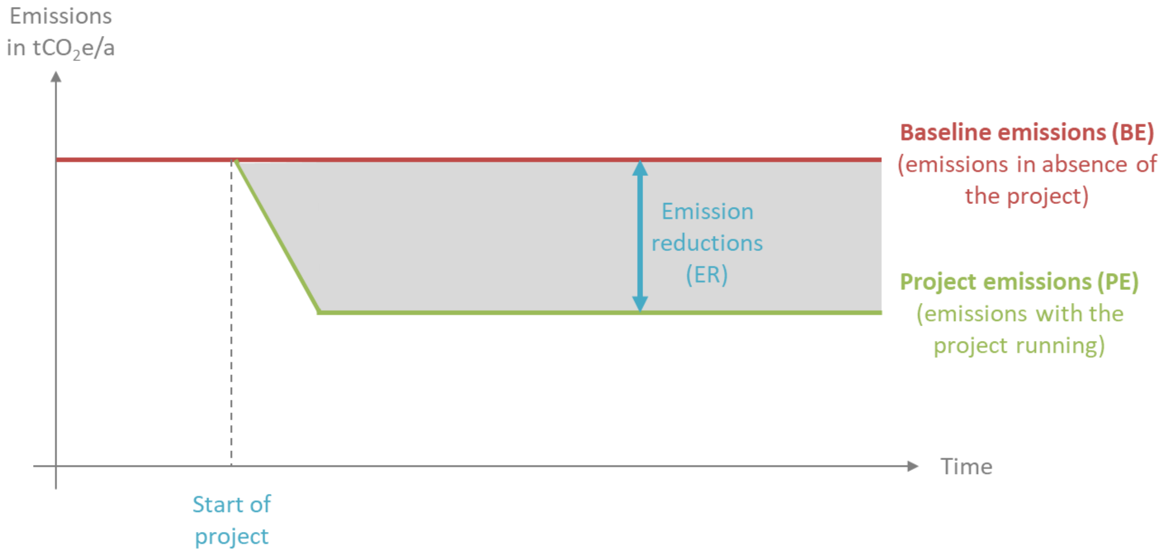


Figure 4: Baseline reference scenario

Recommendation: Choose realistic and conservative assumptions about future development of key parameters (e.g., share of coal-fired power plants in electricity generation), since ex-ante approaches tend to overestimate the effects from mitigation projects. Hence, the Applicant should aim for a realistic take on baseline emissions so that actions taken by government / market are properly accounted for. The conservativeness principle should guide any effort to estimate the emissions magnitude. For instance, it is advisable to use upper-bound estimates, e.g., from default values, for project GHG emissions and lower-bound or zero estimates for baseline emissions.

Baseline trajectories are typically dynamic (not static), as emissions in a specific sector, sub-sector, geographical area, etc. are expected to shift over time in the absence of the intervention (see text box below). For the determination of baselines, a suitable and conservative method should be used and country / sector-specific, climate-relevant data should be considered.

Recommendation: The baseline emissions always depend on the baseline scenario and which development is considered herein as most appropriate for the underlying interventions (e.g., BAU development, dynamic use and penetration of technologies, fuel type and consumption, efficiency standards etc.). Often the BAU scenario is the baseline scenario, since without the project intervention, required actions towards mitigation in the sector or sub-sector would not be triggered.

Baselines can be projected to be stable over time, or to increase or decrease, subject to the underlying development (dynamic baseline). For example, in case a project shall replace or avoid the future use of inefficient appliances, in the baseline scenario without the project intervention, the use of conventional (inefficient) appliances will continue to prevail and may even increase due to affordability and economic development. Hence, from today's point of view (ex-ante estimation), the baseline emissions under this scenario would increase. Where an existing power plant is operating and likely continues to provide electricity to the grid, the baseline scenario could be rather a BAU development and hence the emissions baseline would be stable, if no other intervention would take place influencing the plant's operation.

Source: Adapted from Wehner, 2019, p. 19

2.3.3 Defining the project boundary and scope

The mitigation assessment and project boundary for the project shall encompass the potential emission reductions (ER) related to the project measures, technologies, and intervention. The project boundary encompasses all emissions of GHG under the control of the Implementation Organisation that are significant and reasonably attributable to the project activities. The specific project boundary depends on the project interventions and technologies and can refer to the operational control or geographical delineation. If the project boundary is difficult to define, the user should consult approved methodologies (e.g., of the CDM or GHG Protocol) relevant and applicable for the project case, for the detailed delineation of the project boundary.

According to the GHG Protocol[2], emissions are divided into three scopes. The estimation of emission reductions achieved by the project is analogously oriented towards the emission sources that are 'owned' or controlled by the project (according to the 'control approach'):

- ***Scope 1***: Emissions reduced directly by project activities (attributable to outputs or under the control of the project).
- ***Scope 2***: Emission reductions caused by project activities through reduced energy consumption (electricity, grid-bound heat, etc.), e.g., in financed and constructed buildings.
- ***Scope 3*** (optional): upstream and downstream emissions (e.g., extraction, production, and transport of purchased goods, services, energy sources, etc., unless included in other categories).

For the determination of emission reductions through the project, emissions from Scope 1 and Scope 2 are to be considered. Emissions or their reduction that cannot be clearly assigned to specific project activities and occur upstream or downstream in the value chain (Scope 3) do not have to be included except for a situation where Scope 3 emissions are significant or the applied methodology is requiring the determination of Scope 3 emissions (see also guidance provided in section 2.3.4 of this Guideline regarding leakage).

It is recommended to follow the definitions of suitable methodologies, e.g. as available under the CDM, to define the specific project boundary. For instance, for projects aiming to implement energy efficiency measures (including savings of electricity and fuel) and/or fuel switching in new or existing buildings, the project boundary is the physical, geographical site of the building(s) and emissions of scope 1 and 2 (electricity consumed) should be taken into account.

When defining the project boundary, the definition of direct emission reductions by the Mitigation Action Facility shall be taken into consideration (see Figure 2 in section 2.1 of this Guideline). Also, define the assumed lifetime of the technology or investment. The lifetime should be derived from manufacturer information on the implemented technology (preferred) or be derived from typical

[2] The Greenhouse Gas Protocol (WRI & WBCSD 2015)

experiences or expert evaluation in the country or region. Alternatively, default values can be used, e.g., as provided in the CDM Tool to determine the remaining lifetime of equipment, if no specific information on the technology is available. The user should document their choice and data used.

The project boundary includes the significant anthropogenic GHG emissions by sources influenced by the project interventions. The estimated reduced GHG emissions shall cover the cumulative amount of all the 'Kyoto basket'/Paris Agreement GHGs, which includes all emissions of the following gases:

- **Carbon dioxide (CO_2)** - **Methane (CH_4)** - **Nitrous oxide (N_2O)**	- **Hydrofluorocarbons (HFCs)** - **Perfluorocarbons (PFCs)** - **Sulphur hexafluoride (SF_6)** - **Nitrogen trifluoride (NF_3)**

2.3.4 Rebound effects and leakage

Recommendation: For the Concept Phase, it is not mandatory to consider leakage or rebound effects. However, if possible, it is recommended to take into account such effects already at an early stage to be able to plan for corrective measures, if necessary.

Leakage is defined as the increase in emissions outside of the (project) boundary of the project mitigation action that results as a consequence of the implementation of that mitigation action. There are generally two categories (as per GHG Protocol):

- One-time effects - Changes in GHG emissions associated with the construction, installation, and establishment or the decommissioning and termination of the project activity.
- Upstream and downstream effects - Recurring changes in GHG emissions associated with inputs to the project activity (upstream) or products from the project activity (downstream), relative to baseline emissions.

For instance, leakage may result from replaced equipment through the project that is continued to be used outside of the project boundary leading to increased emissions. Typical examples are replaced old internal combustion engine vehicles, inefficient electric appliances or cook-stoves that are then used elsewhere. If leakage is a relevant and significant emissions source, corresponding emissions should be addressed in the same level of detail as project emissions.

Rebound effects occur for instance when some of the energy savings achieved by energy efficiency gains are lost due to resulting changes in behaviour, such as increased consumption of goods or services. For example, increased efficiency allows products to be manufactured and services to be performed using fewer resources, and often at a lower cost. This in turn influences purchasing behaviour and product use. A rebound effect occurs when the demand for a service, such as energy services, increases as a result of the decreased cost of the service per unit. For example, the (financial) benefits from energy demand savings due to technical efficiency improvement and hence reductions in GHG emissions may result in an increased energy demand in the same or other areas (e.g., extended operating hours in lighting).

2.4 Key requirements for providing information on the mitigation approach

2.4.1 Methodological approach: How to select an appropriate methodology

Methodologies are methodological tools which address specific aspects of projects and interventions, e.g., to calculate GHG emissions from specific sources. These systematic approaches can be used to determine the amount of emission reductions achieved. They help to define the baseline and will facilitate the monitoring of such mitigation. At Project Concept and Outline Phase, contrary to the Proposal Phase, it is acceptable if no complete methodology is followed. However, users should be aware that the application of approved methodology(ies) is ideal and generally desired, as it can support in the process of defining and calculating the mitigation potential most accurately.

To find a suitable methodology, users should categorise 1) the underlying mitigation activity type and 2) the applied technology type and measure.

By identifying the mitigation activity type, methodologies are selected according to the relevant sectoral scopes and type of mitigation activities, such as renewable energy, low carbon electricity generation, energy efficiency measures, fuel, and feedstock switch, GHG destruction, GHG emissions avoidance, displacement of a more-GHG-intensive output and GHG removal by sinks.

Alternatively, to find a suitable methodology, users can focus on the technology applied under the project. The categorization by technology type usually helps to identify a set of comparable methodologies applicable to the technology that is going to be implemented.

For many sectors and mitigation types (e.g., technologies implemented), during the past years, multiple methodologies for estimating emission reductions have been developed, for instance, under the Clean Development Mechanism (CDM), the Global Environment Facility (GEF), the Gold Standard Foundation (GS), the Greenhouse Gas Protocol (GHGP), VERRA / Verified Carbon Standard (VCS) or the Forest Carbon Partnership Facility (FCPF). These methodologies provide robust practices for estimating ex-ante mitigation potentials. For this reason, these well-established methodologies can be applied as a basis, whenever possible and applicable, for the project mitigation estimation. In addition, the Intergovernmental Panel on Climate Change (IPCC), in particular the Guidelines for National Greenhouse Gas Inventories (2006) or any update or refinement thereof can provide approaches and default values for the calculation of GHG emission reductions.

If no suitable methodology can be identified, the users can propose their own methodological approach or deviation from existing methodologies. It is recommended to provide justification accordingly.

Recommendation: The users should transparently present and follow the applied methodology for estimating the mitigation potential of the project as applicable. For selecting an appropriate methodology, identify the scope and the project boundary of the methodology and assess the suitability and applicability to the project intervention and underlying technologies. As an initial starting point to check the availability of a methodology for a certain technology, the CDM Methodologies Booklet is recommended.

It is important to note that the selection of the methodological approach has direct impacts on and affects the monitoring process of the project, which is to be developed for tracking the actual mitigation impacts during project implementation (for further guidance see Mitigation Action Facility Monitoring and Evaluation Framework).

2.4.2 Recommendation on providing data, parameters, and assumptions

For the emission reductions calculation, project-specific data should be used, if available, and conservativeness principles (see recommendation below) are to be applied (i.e., input values and assumptions being based on conservative estimations) to avoid overestimation. The users should use conservative assumptions, values, and procedures when uncertainty is high. Conservative values and assumptions are those that are more likely to underestimate than overestimate GHG reductions. Additional external data sources (e.g., publicly available data from government sources) can be used depending on the specific methodologies employed for the project interventions. Please also consult recommended "Hierarchy of data sources" as presented in the Monitoring and Evaluation Framework for core indicator M1.

Recommendation: In the Project Concept and Outline Phase, in some cases project-specific data may not yet be available. In this case, please use appropriate data and assumptions for substantiating your calculation. Please justify the choice of data and assumptions taken to the extent possible. All key assumptions and calculations shall be **transparent, verifiable,** and **clearly presented**. Applying **conservative and transparent assumptions, methodologies and transparency on data sources** is strongly recommended and honoured in the project selection cycle (this includes presenting accuracy, weaknesses, uncertainties, and lack of data sources). The use of the default emissions factors (see for example section 2.4.1 of this Guideline) enables a conservative estimate.

Please explain and provide all specification of the underlying assumptions and reference data sources (e.g., emissions factors, methodology/calculation approach applied, units, and lifetime of technology) applied.

- Present the assumptions clearly and plausible in a conservative manner;
- Use key parameters and assumptions that are reasonable and robustly sourced;
- Provide assumptions with justification and references;
- Indicate the accuracy of data and parameters (not mandatory in Project Outline Phase);
- If available, make use of project-specific data.

If possible, please make an indication about related uncertainties and risks related to the assumptions and data used.

3 Typical approaches for estimating the emission reduction potential from project activities within the priority sectors

For the following sector activities, the general approach of estimating emission reductions is explained, and references are given to helpful methodologies, tools and sources for default values:

- **Energy** (e.g., renewable energy and energy efficiency)
- **Industry** (e.g., energy efficiency or process emissions)
- **Transport** (e.g., promotion of public transport and e-mobility)

Please consult the definition and scope of each sector as published on the Mitigation Action Facility website (Current Call - Mitigation Action Facility FAQ section, FAQs 4-6).

Each chapter provides a short overview of existing tools and methodologies applicable for the typical mitigation technologies / measures, incl.:

- General calculation approach
- Reference to tools/ methodologies that are commonly used
- Additional links to further reading and information material.

As explained in section 2, the quantification of the mitigation impact in terms of reduction of tCO_2e is based on a comparison between the level of GHG emissions in a **baseline situation** and the level of

GHG emissions in the situation after the implementation of the project's respective mitigation activity representing the **mitigation or project scenario**. The difference between both is the **potential emission reduction** resulting from the project. Hence, the related emissions for both scenarios need to be estimated. In general, the calculation procedure to determine GHG emission reductions follows this universal approach[3]. The emissions reductions achieved by the projects and/or mitigation activities are determined typically as the **difference between the baseline emissions and the emissions after the project/ activity implementation**, taking leakage into consideration if applicable.

To determine the actual parameters and data required for the calculation, the emission sources and the GHGs to be considered per technology need to be identified. Existing carbon market methodologies and standards can be consulted to spot technology-specific emission sources and GHGs, depending on the baseline and project scenario (see 2.4.1).

For determining the related emission reductions (ER) it is recommended to use approved and recognised methodologies (e.g., sourced from the CDM, the GEF, the GS, GHGP, or VCS) considering needed simplification as required and possible.

3.1 Energy sector

The energy sector mainly includes projects that aim at GHG emission reductions in the generation of electricity and heat production, including storage solutions for the energy generated from (renewable) sources. Optimisation of energy use through the introduction of energy efficiency measures would also fall within the scope of the sector. The activities may involve both public and private / commercial sectors.

3.1.1 Typical emission sources for emission reduction activities / measures

Typical options to avoid and reduce GHG emissions from energy-consuming activities in the energy sector comprise:

- Reduction of CO_2 emissions directly caused by fossil fuel-powered energy systems by **using renewable energies.**
- **Energy efficiency measures** to reduce the consumption of consumed electricity and energy.

Typical measures to avoid and reduce these GHG emissions include:

- Improved / energy efficient energy systems
- Promotion of renewable energy for productive uses (e.g., solar pumping)
- Use of decentralised renewable energy (DRE)

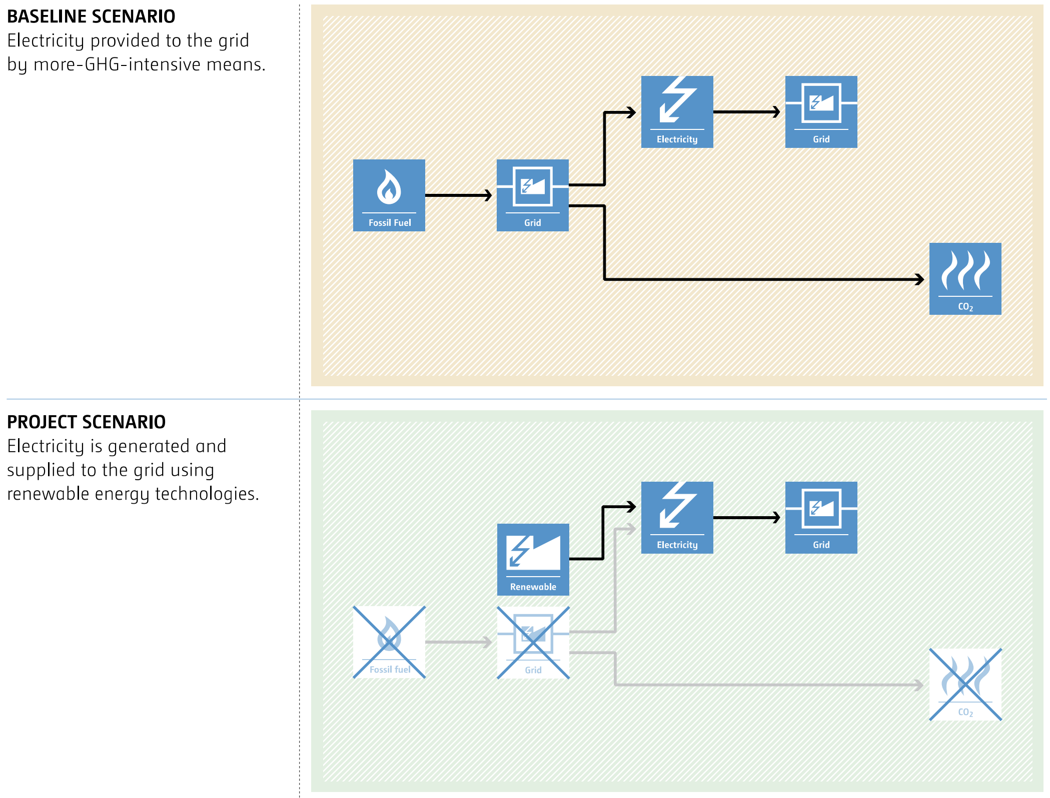
An example for a cross cutting project would be the use of biomass for power and heat generation (combination of the waste / AFOLU with the energy sector).

3.1.2 Typical baseline and project scenario

Under the project renewable electricity generation such as solar, wind or geothermal are implemented are new installations (greenfield) or replacement of existing onsite fossil-fuel-fired generation. They could be used for the direct displacement of more-GHG-intensive service (e.g., refrigeration or lighting) or the electricity generated fed into the national grid. Under the baseline scenario the electricity would be provided by more-GHG-intensive means.

---

[3] For some agriculture, forestry and land use (AFOLU) project, the net GHG removals by sinks are typically calculated and presented as negative (project) GHG emissions.



Source: CDM Methodology Booklet, UNFCCC 2021, AMS-I.D.

Figure 5: Typical baseline and project scenario for Grid connected renewable electricity generation

3.1.3 Calculation of emission reductions

3.1.3.1 Project boundary

The spatial extent of the project boundary typically includes the physical, geographical site of the renewable electricity generating unit(s) and the equipment that uses the electricity produced. For grid connected renewable electricity projects the project boundary includes the project power plant and all power plants connected physically to the electricity system that the project power plant is connected to.

3.1.3.2 Baseline and project emissions

Baseline emissions are calculated based on the fuel consumption of the technology in use or that would have been used to generate the equivalent quantity of energy:

$$BE_y = E_{BL,y}\ x\ EF_{CO2,y}$$

Where

BE_y = Baseline emissions in year y

$E_{BL,y}$ = Energy baseline in year y (kWh) - Quantity of net electricity / energy displaced or reduced as a result of the implementation of the project

$EF_{CO2,y}$ = Emission factor (tCO_2/kWh)

In case of renewable energy, including solar, wind etc. project emissions are deemed zero, i.e., $PE_y = 0$.

3.1.4 Key parameters required, relevant default values and reference source

For calculating the emission reduction from renewable power projects, such as the solar power, the following parameters are required. Potential default values are listed in Table 2.

Table 1: Typical parameters to estimated emission reduction from EE/RE projects

	Parameter	Unit	Value / source
	Number of renewable energy facilities installed	No.	Project data
Energy-related emissions	$E_{BL,y}$ - Energy baseline per project facility (generation or consumption)	kWh	Measured or historical figures
	$EF_{CO2,y}$ - Emission factor of baseline energy source (*diesel generator* or electricity grid)	tCO_2e/kWh	For grid connected projects: Harmonized IFI Default Grid Factors 2021 v3.2, combined margin for energy consumption. Off-grid: If no project-specific data is available, a default value of 0.8 kg CO_2e/kWh for diesel generation units may be used.

The following table provides an overview of typical and useful default values for estimating the baseline and project emission from energy efficiency and renewable energy projects.

Table 2: Tools / references for mitigation estimation of energy projects

Parameter	Value and Unit	Source
Energy efficiency		
Emission factor for diesel generators (per MWh electricity generated)	0.8 tCO_2/MWh (>15 kW and at least 50% load factor)	CDM TOOL33 Methodological tool: Default values for common parameters Version 02.0
Emission factor electricity grid for the specific country (energy efficiency / electricity consumption)	xxx tCO_2/MWh	Harmonized IFI Default Grid Factors 2021 v3.2, combined margin for energy consumption
Transmission and distribution losses (for conservativeness distinguished between project and baseline energy consumption)	20% for project or leakage electricity consumption; 3% for baseline electricity consumption	CDM TOOL05 Methodological tool Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Version 03.0
Renewable energy electricity generation, e.g., solar, wind, geothermal		
Emission factor electricity	xxx tCO_2/MWh	Harmonized IFI Default Grid Factors 2021 v3.2, combined margin for

Parameter	Value and Unit	Source
		intermittent energy generation
Capacity factors for estimating the energy yield, i.e., energy generation	Default values: Wind: 0.29 PV: 0.16 Hydro: 0.45 Biomass: 0.68 Ocean, Wave/ Tidal: 0.25 Geothermal: 0.75 Databases for energy yields: • Global Solar Atlas • Global Wind Atlas	CDM-SSC WG Thirty-third meeting Report Annex 6 "Information Note on Guidelines for the demonstration of additionality of microscale project activities"
Global Warming Potential (GWP)		
GWP of refrigerants, of applicable, e.g. for exchange of ACs or chillers.	See tables of source for Substances controlled by the Montreal Protocol / Kigali amendment, e.g., hydrofluorocarbons (HFCs). Use values of IPCC AR5.	GHG Protocol Global Warming Potential Values based on IPCC values, IPCC Fifth Assessment Report, 2014 (AR5).

For energy-related projects it is recommended to consult the CDM Tool 33 for further default values depending on the project context. The tool currently provides default values for following parameters:

- CO_2 emission factor for diesel generating system used for off-grid power generation purposes;
- CO_2 emission factor for kerosene used for lighting applications;
- Wood-to-charcoal conversion factor;
- Average annual consumption of woody biomass per person for cooking;
- Fraction of non-renewable biomass;
- Efficiency of pre-project cooking device.

3.2 Industry sector

The industrial sector would encompass interventions in the heavy (e.g., construction, cement, chemicals, metals) and light industry (e.g., consumer goods, fashion, retail). Interventions such as optimisation of resource use, innovation on industrial processes and product use (IPPU), introduction of near-zero-emission technologies, etc. aiming at GHG emission reductions can target any type of enterprise – small- and medium sized enterprises (SMEs), large companies or even clusters. Projects targeting energy efficiency and / or energy generation in the industrial sector will be considered as cross-sectoral linked to two priority sectors (energy and industry) of the Mitigation Action Facility.

3.2.1 Typical emission sources for emission reduction activities / measures

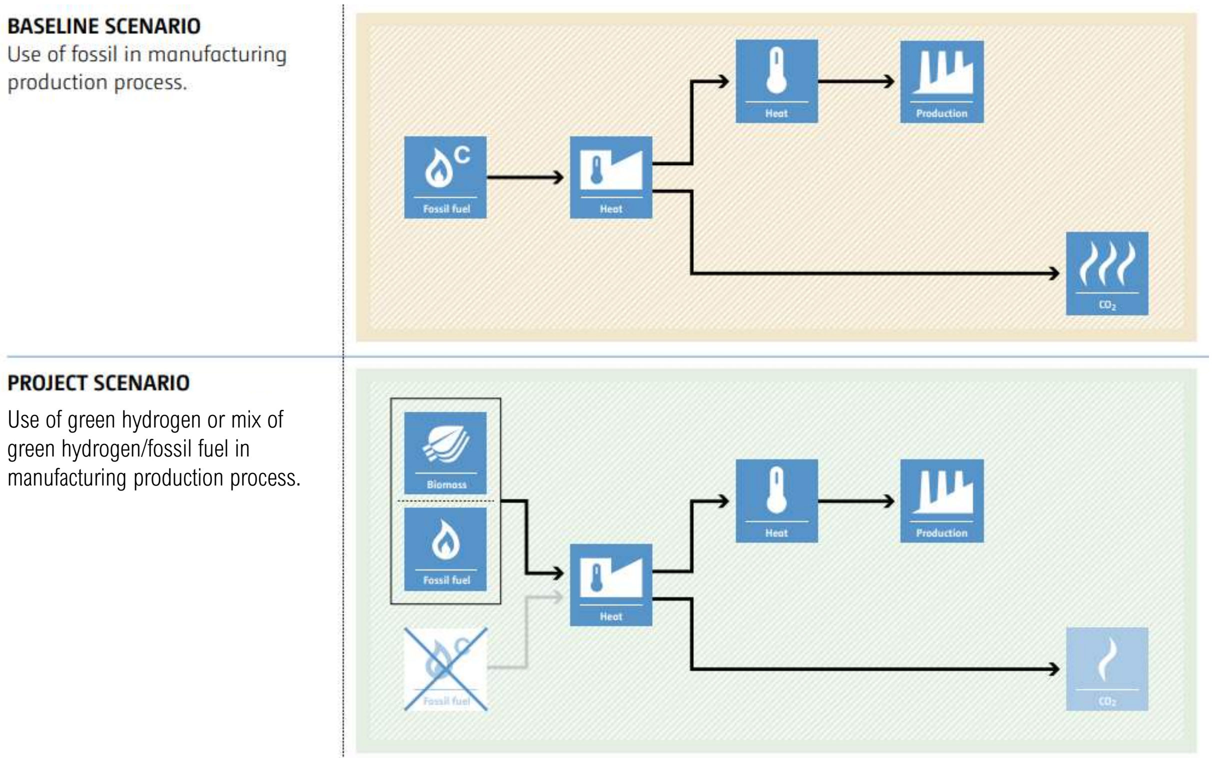
Typical options to avoid and reduce GHG emissions in the industry sector comprise interventions in the heavy (construction, cement, chemical, metals) and light industry (e.g., consumer goods, fashion, retail), such as:

- Improved / energy efficient measures to reduce the consumption of electricity and energy
- Introduction of net-zero-emission technologies
- Optimisation of resource use
- Innovation of industrial processes and product use

3.2.2 Typical baseline and project scenario

Using steel production as an example, alternative production technologies and fuel alternatives could be introduced in the steel production process to replace fossil fuels used in the baseline scenario such as natural gas and petroleum coke. Fuel alternatives include green hydrogen produced with renewable energies (green hydrogen) or biomass. Moreover, the feedstock and production process for steel can be modified, by increasingly using scrap and hydrogen-based direct-reduced iron. And lastly, energy efficiency measures, such as waste heat recovery in combined cycle electricity generation to make use of waste gas, can lead to emission reductions in the project scenario.

In the subsequent example, the replacement of fossil fuel by green hydrogen is illustrated. Under the baseline scenario the utilization of bunker oil is the main source of emissions. The project scenario assumes the replacement of bunker oil burners by steel heating LPG-hydrogen burners.



Source: CDM Methodology Booklet, UNFCCC 2021, AMS-III.AS. (adapted)

Figure 6: Typical baseline and project scenario for fuel switch in manufacturing production process

3.2.3 Calculation of emission reductions

3.2.3.1 Project boundary

The project boundary is the physical, geographical site where the switching of energy sources takes place. It includes all installations, processes or equipment affected by the switching.

3.2.3.2 Baseline and project emissions

The baseline refers to the historical fossil fuel consumption associated with the processes affected by the project activity. To calculate the baseline emissions, the average of the immediately prior three-year historical fossil fuel consumption data, for the existing facility, is used to determine an average annual baseline fossil fuel consumption value. Similarly, prior three-year historical production data (excluding abnormal years) for the existing facility, is used to determine an average annual historical baseline output production rate.

$$BE_y = P_{prod,y} \, x \, EF_{CO2,BL}$$

Where:

BE_y	= The baseline emissions from fossil fuels displaced by the project activity in t CO_2e in year y
$EF_{CO2,BL}$	= The baseline specific emission factor in tCO_2/kg or m^3
$P_{prod,y}$	= The annual net production of the facility in year y, in kg or m^3

The project emissions can be calculated as follows:

$$PE_y = PE_{fossilfuel,y}$$

Where:

PE_y	= Project emissions in year y (t CO_2)
$PE_{fossilfuel,y}$	= Project emissions due to fossil fuel consumption in year y (t CO_2)

In case of completely switching to green hydrogen, project emissions are deemed zero, i.e., $PE_y = 0$, in case no long-distance transportation using fossil fuels (e.g., in vessels) is needed.

3.2.4 Key parameters required, relevant default values and reference source

For calculating the emission reduction from fuel switch projects in industry sector projects, such as the replacement of fossil fuel by green hydrogen, the following parameters are required.

Table 3: Typical parameters to estimated emission reduction from industry sector projects

	Parameter	Unit	Value / source
	The annual net project production of the process in year y	tonnes/year	Project data, historical figures
Energy/fuel-related emissions	$EF_{CO2,FF,y}$ - CO_2 emission factor for the fossil fuel	t CO_2e/GJ	IPCC default values
	$FC_{PJ,y}$ - Quantity of fossil fuel combusted in year y	Kg/m^3	Measured or historical figures
	NCV_y - Net calorific value of fossil fuel	GJ/mass	IPCC default values

Table 4 provides an overview of typical and useful default values for estimating the baseline and project emission from industry sector projects.

Table 4: Overview of default values for industry sector projects

Parameter	Value and Unit	Source
Energy efficiency		
Emission factor electricity grid for the specific country (energy efficiency / electricity consumption)	xxx tCO_2/MWh	Harmonized IFI Default Grid Factors 2021 v3.2, combined margin for energy consumption
Transmission and distribution losses (for conservativeness distinguished between project and baseline energy consumption)	20% for project or leakage electricity consumption; 3% for baseline electricity consumption	CDM TOOL05 Methodological tool Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Version 03.0
Energy/fuel-related emissions		
$EF_{CO2,FF,y}$ - CO_2 emission factor for the fossil fuel	XXX t CO_2e/GJ	IPCC default values
NCV_y - Net calorific value of fossil fuel	XXX GJ/mass	**IPCC default values**

3.3 Transport sector

The transport sector covers projects aiming at GHG emission reductions in land, sea, and air transport. Land (road) transport includes solutions ranging from the deployment of zero emission vehicles to the development and harmonisation of charging infrastructure as well as interventions along the electric vehicle (EV) / EV batteries supply chain. Further, expansion of rail network and infrastructure, including public transport, can offer a climate-neutral alternative to individual (road) transport. Sea and air transport also present opportunities for the coordinated deployment of zero emission charging or refuelling infrastructure, e.g., along the major international routes. The mitigation measures can also aim at achieving carbon neutrality in ports / airports.

3.3.1 Typical emission sources for emission reduction activities / measures

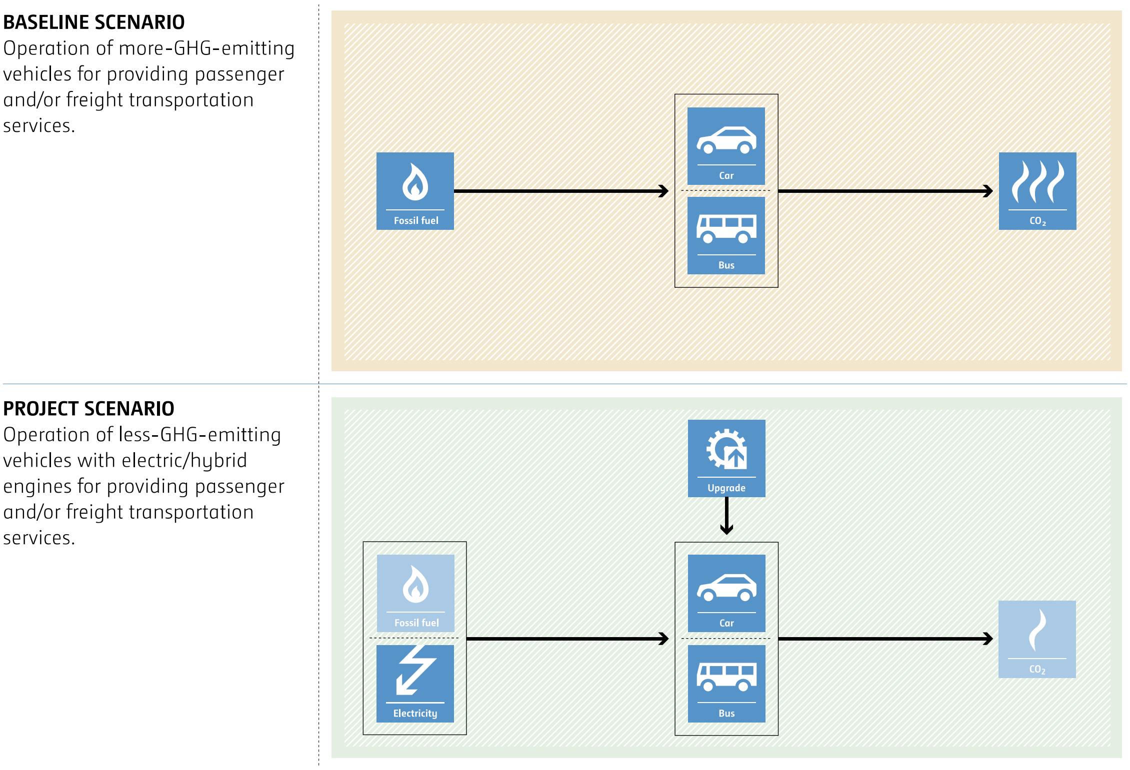
Mitigation of GHG emissions could be achieved through:

- Financed use of EVs (such as battery electric buses (BEB) and other EV, including corresponding infrastructure in the countries; and
- Through induced model shift from individual transport to public transport.

In the following the example of introducing EV is used for illustrating the typical emission reduction calculation approach.

3.3.2 Typical baseline and project scenario

Under the baseline scenario comparable internal combustion engine (ICE) vehicles would be used to provide the same transportation service of the project vehicles. Under the project scenario ICEs will be replaced by EV vehicles.



Source: CDM Methodology Booklet, UNFCCC 2021, AMS-III.C.

Figure 7: Baseline and Project scenario for EVs introduction

3.3.3 Calculation of emission reductions

3.3.3.1 Project boundary

The project boundary for the introduction of EVs comprises of:

a) The vehicles of the project or sub-projects;

b) The geographic boundaries where the project activity vehicles are operated, i.e., the city or province or the whole country.

c) The providers of the charging service to the project vehicles, including the charging equipment and stations of the project activities vehicle, electric supply sources (i.e., the national grid) and other ancillary facilities.

The project accounts for the reduction of GHG emissions of the financed EVs as a result of replacing ICE vehicles with EVs.

3.3.3.2 Baseline and Project emissions

The **baseline emissions** are calculated based on the unit of service provided by the project vehicles (travelled distance) times the emission factor for the baseline vehicle to provide the same unit of service as per the equation below:

$$BE_y = \sum_i EF_{BL,km,i} \times DD_{i,y} \times N_{i,y} \times 10^{-6} \qquad \text{Equation (2)}$$

Where:

BE_y = Total baseline emissions in year *y* (t CO_2)

$EF_{BL,km,i}$ = Emission factor per kilometre for baseline vehicle category *i* (g CO_2/km)

$DD_{i,y}$ = Annual average distance travelled by project vehicle category *i* in the year *y* (km)

$N_{i,y}$ = Number of operational project vehicles in category *i* in year *y*

Project emissions include the electricity consumption associated with the operation of project vehicles (EVs only) and is calculated using distance travelled by project vehicles:

$$PE_y = \sum_i EF_{PJ,km,i,y} \times DD_{i,y} \times N_{i,y}$$ Equation (3)

Where:

PE_y = Total project emissions in year *y* (t CO_2)

$EF_{PJ,km,i,y}$ = Emission factor per kilometre travelled by the project vehicle type *i* (tCO_2/km)

$N_{i,y}$ = Number of operational project vehicles in category *i* in year *y*

$DD_{i,y}$ = Annual average distance travelled by the project vehicle category *i* in the year *y* (km)

There is no leakage expected from the project activities if the project will replace the purchase of new ICE vehicles. If the vehicle replaced by the project will be further operated outside of the project boundary, the related emission should be accounted for as leakage using the same calculation as for the project emissions.

3.3.4 Key parameters required, relevant default values and reference source

For calculating the emission reduction for projects in the transport sector, such as the promotion of EV or the enhanced use of public transport modes, the following parameters are typically required:

Promotion of EV vehicles:

- **Emission factor per kilometre** for ICE baseline vehicles (tCO_2/km)
- **Grid emission factor** for electricity consumption of EVs (tCO_2/kWh)
- **Number** of electric vehicles operated under the project ($N_{i,y}$)
- Annual average **distance driven** by project vehicles ($DD_{i,y}$)
- **Electricity consumed** by all project vehicles to determine specific electricity consumption per km

Promotion of public transport modes:

- Baseline **distance and transport mode**, which could be obtained through a comprehensive survey involving the users of the project transport system
- **Occupancy rates** and **travelled distances** of different transport modes
- **Specific fuel consumption** (City (local measurements); National defaults; International defaults (IPCC); Design data for relevant vehicle categories)
- Net calorific value, fuel emission factor, emission factors
- The **number of passengers** transported in the project; % of people shifted from a specific mode

- **Specific fuel consumption**, **occupancy rates** and **travelled distances** of different transport modes as well as the speed of vehicles on affected roads

Potential default values that can be used for the estimation are listed in Table 5.

Table 5: Tools / references for mitigation estimation of transport projects

	Parameter	Unit	Value / source
EVs	Emission factor per kilometre for baseline vehicle category *i* (g CO_2/km)	g CO2/km	In decreasing order of preference: 1.Local measured data (studies, e.g., performed by universities, other institutions or ordered by project proponent); 2.National or international data from studies; 3.IPCC default values for the respective vehicle categories (latest IPCC report); 4.Design data for relevant vehicle categories; 5.Globally applicable default values.
	Specific fuel consumption of vehicle category i using fuel type n in year	Mass or volume units of fuel/km	
	Specific electricity consumption of vehicle category i using electricity in year x	kWh/km	
	Emission factor electricity grid (energy efficiency / electricity consumption)	xxx tCO_2/MWh	Harmonized IFI Default Grid Factors 2021 v3.2, combined margin for energy consumption
Public transport	Public transport patronage per annum, i.e., total number of passengers transported per annum in year x	passenger/year	Official statistics or data obtained from the system operator, electronic ticketing system or any other official records. Local/ National Public Transport System
	Average trip distance travelled by public transport passengers in year x	km	Survey of the passengers about the entry and exit stations in the project public transport system and noting electricity-based or road-based vehicle category i each surveyed passenger used prior to shifting to the project system. Official statistics or data obtained from the system operator. Local/ National Public Transport System
	Share of passengers who shifted from electricity-based or road-based vehicle category i	%	Survey of the passengers asking about electricity-based or road-based vehicle category i each surveyed passenger used prior to shifting to the project system and noting the entry and exit stations in the project system (Di,y). Official statistics or data obtained from the system operator. Local/ National Public Transport System

4 List of reference documents

The Greenhouse Gas Protocol (2005), The GHG Protocol for Project Accounting, World Resources Institute / World Business Council For Sustainable Development. Retrieved from here.

The Greenhouse Gas Protocol (2006), The Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting Retrieved from here (referred to as GHG Protocol LULUCF Guidance).

The Greenhouse Gas Protocol (2015): A Corporate Accounting and Reporting Standard, World Resources Institute / World Business Council For Sustainable Development. Retrieved from here.

Intergovernmental Panel on Climate Change (IPCC) (2006), 2006 IPCC Guidelines for National Greenhouse Gas Inventories (referred to as the 2006 IPCC Guidelines).

Intergovernmental Panel on Climate Change (IPCC) (2014), Climate Change 2014: Mitigation of Climate Change. Working Group III Contribution to the IPCC Fifth Assessment Report. Chapter 11: Agriculture, Forestry and Other Land Use (AFOLU). Retrieved from here (referred to as IPCC AFOLU Guideline).

Mitigation Action Facility (2023), General Information Document (GID) – Call for Projects 2023. Retrieved from here.

Mitigation Action Facility (2020), Monitoring and Evaluation Framework. Retrieved from here.

Umweltbundesamt (German Environment Agency) (2019): Rebound effects. Retrieved from here.

UNFCCC CDM methodologies and methodical tools. Retrieved from here.

Wehner, Stefan (2019), District Energy Projects: MRV Framework Guidance, UN Environment District Energy in Cities Initiative. September 2019. Retrieved from here.

Appendix A: Glossary

Please consult also the general Mitigation Action Facility Glossary available at the Mitigation Action Facility website.

Accuracy within this template shall be evaluated as precision (relative error margin in %) based on a 90% confidence interval.

Baseline scenarios - Projections of greenhouse gas emissions and their key drivers as they might evolve in a future in which no explicit actions are taken to reduce greenhouse gas emissions.

Business-As-Usual (BAU) Scenario - A reference case that represents future events or conditions that are most likely to occur as a result of implemented and adopted policies and actions. It represents therefore an emission level that would occur without any new and additional efforts to reduce emissions. It is sometimes used as an alternative term for 'baseline scenario'. However, in this Guideline we understand the BAU as on option to define the baseline scenario.

Baseline emissions - The GHG emissions that would occur in the baseline scenario.

Direct mitigation potential - achieved by project investments and discrete investments financed or leveraged during the project's supervised implementation period (throughout the entire lifetime of the project). Hence, direct emission reductions are defined as mitigation achieved by units or measures (partially) financed or leveraged by the financial cooperation (FC) component of the project funding during the project period:

- Units must be installed / measures must be implemented during project period
- Timing of mitigation effect: during project period, during period of 10 years after project end and over technology lifetime (but only for those units installed during project period)

Dynamic baseline scenario - A baseline scenario that is recalculated based on changes in emissions drivers.

Emissions factor - A carbon intensity factor that converts activity data into greenhouse gas emissions data.

Leakage - An increase in emissions outside of the boundary of a mitigation action that results as a consequence of the implementation of that mitigation action.

Mitigation - Human intervention to reduce the sources or enhance the sinks of GHG. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other 'sinks' to remove greater amounts of CO_2 from the atmosphere.

Mitigation / project scenario - A mitigation scenario represents future GHG emissions with the assumption of the introduction of certain policies and measures reducing GHG emissions as a result of the project with respect to some baseline (or reference) scenarios.

Monitoring - Collecting and archiving all data necessary for determining the baseline, and for measuring anthropogenic emissions by sources of GHGs within the project boundary, and leakage, as applicable.

Parameter - A variable that is part of an equation used to estimate emissions. For example, 'emissions per head of cattle' and 'quantity of livestock' are both parameters in the equation '1.5 kg CO_2e/ head of cattle × 100 head = 150 kg CO_2e'

Project boundary - Physical delineation and/or geographical area of the project and the specification of GHGs and sources under the control of the project participants that are significant and reasonably attributable to the project, in accordance with the applied.

Rebound effect / Spill-over effects - Reverberations caused by actions taken to cut greenhouse-gas emissions. For example, emission reductions could lower demand for oil and thus international oil prices, leading to more use of oil and greater emissions in other areas, partially offsetting the original cuts.

Scope - Defines the operational boundaries in relation to indirect and direct GHG emissions.

Sink - Any process, activity or mechanism which removes a GHG, an aerosol or a precursor of a GHG from the atmosphere. Forests and other vegetation are considered sinks because they remove carbon dioxide through photosynthesis.

Suppressed demand - refers to a situation where current levels of access to services are inadequate for basic human needs – termed "Minimum Service Levels". The emission reduction calculation approach follows the underlying assumption that emissions would occur under the baseline scenario according to the minimum service level required for ensuring basic human needs, and that does not exist at present in the project context.

Technical lifetime - The total time for which the equipment is technically designed to operate from its first commissioning. The technical lifetime is expressed in years or hours of operation.

Technology/Measure - A broad class of GHG emission reductions activities possessing common features, for example, fuel and feedstock switch, switch of technology with or without change of energy source (including energy-efficiency improvement), methane destruction and methane formation avoidance.

Appendix B: Overview of possible resources and guidance for determination of the mitigation potential

Overview of possible resources and guidance for determination of the mitigation potential

In the following, references to useful guidance and methodologies that can be used for the calculation of GHG emission reductions are listed. No information to be filled. The list is only providing recommendation and orientation regarding available standards. There is no claim to completeness. Standards, guidance, methodologies etc. are listed in alphabetical order.
Please also read the Monitoring and Evaluation Framework of the Mitigation Action Facility. The Mitigation Annex will be used as basis for annual reporting in the context of the M&E Framework. Therefore, the selection of the underlying approach and parameters to calculate emission reductions should always consider the applicability and relevance for the project's M&E Plan. Please refer to the Mitigation Action Facility Monitoring and Evaluation Framework for further information and requirements for reporting of GHG emission reductions under core indicator M1.

Clean Development Mechanism (CDM) - Methodologies and tools

The Clean Development Mechanism (CDM) requires the application of a baseline and monitoring methodology in order to determine the amount of Certified Emission Reductions (CERs) generated by a mitigation CDM project activity in a host country. The Methodology Booklet gives a overview of all currently recognised CDM methods. The methods are categorised by sector and type of GHG reduction, as well as by the technology or measure implemented. The methods cover large and small CDM projects and forest projects. Methodologies are often very detailed, which requires sufficient efforts and time for projects which do not wish to generate certificates. Hence, the adaption and simplification of the respective methodology to the project scope could be necessary (with justification) . Methodologies are classified into five categories:

- Methodologies for large-scale CDM project activities;
- Methodologies for small-scale CDM project activities;
- Methodologies for large-scale afforestation and reforestation (A/R) CDM project activities;
- Methodologies for small-scale A/R CDM project activities;

Methodologies often refer to methodological tools, which address specific aspects of the project activity, e.g. to calculate Greenhouse Gas (GHG) emissions from specific sources.
Default values available: e.g. Standardised Baselines for different sectors and countries, e.g. power, waste, cookstoves. Default values in different methodologies and tools, e.g. emission factors for captive power and mini-grids, efficiency for power plant (conventional and renewable) etc.

CDM main webpage | CDM Methodologies and Tools | CDM Methodology Booklet | CDM Standardised Baselines

Forest Carbon Partnership Facility (FCPF)

The Forest Carbon Partnership Facility (FCPF) is a global partnership of governments, businesses, civil society, and Indigenous Peoples focused on reducing emissions from deforestation and forest degradation, forest carbon stock conservation, the sustainable management of forests, and the enhancement of forest carbon stocks in developing countries, activities commonly referred to as REDD+. The FCPF has created a normative framework for REDD+ readiness and provides a robust platform for information exchange and knowledge sharing on a wide range of REDD+ design and implementation issues.
There is a full range of guidelines, templates and foundational documents for the FCPF Readiness and Carbon Funds, including the FCPF Charter and Rules of Procedure, the Facility's Monitoring and Evaluation Framework.
Default values available: The Buffer Guidelines of the FCPF provide in section 5 with Conservativeness Factors and in section 6 a Tool for determining non-permanence. Both are recommended to be considered for forestry project.

FCPF main webpage | FCPF Requirements and Templates | FCPF Buffer Guidelines

Global Environment Facility (GEF) - Manual for Calculating the GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects, 2008

Projects for promoting renewable energies and energy efficiency, both in the "GHG reduction" target area as well as "mitigative capacity".
The method examines the GHG reductions of GEF projects. The projects can work in the areas of capacity development, technical assistance and advice in the development or adaptation of climate-friendly energy policies. Many GEF projects do not reduce any greenhouse gases on the level of their direct project result, but rather indirectly contribute to GHG reduction. The GHG reduction contribution is determined for GEF according to the following three categories:
a) Direct contribution: This contribution corresponds to the direct climate result by concrete investments in technologies or methods for improving the energy use (determined with the CDM methods)
b) Direct "Post Project" contribution: The contribution is quantified by setting up a "turnover" factor, which also causes GHG reduction after the actual project has ended, for example, by providing a suitable financing mechanism.
c) Indirect contribution: Efforts are being made to quantify the contribution of capacity development by determining a "repetition factor".
The methods of direct post-project contributions and the indirect contributions only facilitate a rough estimation. They can be used as a comparison method to the weighting method for barriers to targets suggested in this sourcebook to determine the indirect climate result.

	Main sectoral applicability						Main applicability and specific guidance				
	Agriculture	Energy Efficiency	Forestry	Renewable Energy	Transport	Waste	Direct mitigation	Indirect mitigation	Accuracy	Rebound effects	Default values
Clean Development Mechanism (CDM)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Forest Carbon Partnership Facility (FCPF)			✓								✓
Global Environment Facility (GEF)		✓		✓			✓	✓			

Source: Mitigation Action Facility, 2022, Ambition Initiative – Round Two- Outline Annex 6 GHG mitigation potential

Global Environment Facility (GEF) - Manual for Calculating GHG Benefits of GEF Transportation Projects, 2011

This new Manual provides the first methodology designed specifically for projects in the transportation sector. It follows the general framework, terminology, and principles of those earlier GEF modules. The GEF models are designed to develop ex- ante estimations of the GHG impacts of transport interventions (projects) as accurately as possible, without requiring data so exacting that it discourages investment in the sector. The methodology provides uniformity in the calculations and assumptions used to estimate the GHG impact over a very diverse array of potential projects. These include projects that:

- Improve the efficiency of transportation vehicles and fuels;
- Improve public and non-motorized transportation modes;
- Price and manage transport systems more efficiently;
- Train drivers in eco-driving;
- Package multiple strategies as comprehensive, integrated implementation packages.

GEF main webpage | Manual for Calculating GHG Benefits of GEF Transportation Projects

				✓		✓				

Gold Standard Foundation (GS) - Gold Standard Methodologies

Gold Standard helps accelerate progress toward the Paris Agreement and the Sustainable Development Goals through high-impact assets that represent the greatest environmental integrity and contributions to sustainable development. The GS provides methodologies for quantifying the environmental / climate impact for the voluntary carbon market. In addition to CDM methods, GS also granted other methods for the voluntary market, particularly for the energy, waste, agricultural sector.

Gold Standard main webpage | Gold Standard - Standard Documents / SDG Impact Quantification /

✓	✓	✓	✓	✓	✓	✓		✓	✓	

Greenhouse Gas Protocol for Project Accounting – Greenhouse Gas Protocol

GHG Protocol establishes comprehensive global standardized frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions. GHG Protocol supplies a wide range of greenhouse gas accounting standards: The standards are designed to provide a framework for businesses, governments, and other entities to measure and report their greenhouse gas emissions in ways that support their missions and goals. There are different resources for navigating GHG Protocol tools:

- Cross-sector tools: Applicable to many industries and businesses regardless of sector.
- Country-specific tools: Customized for particular developing countries.
- Sector-specific tools: Principally designed for the specific sector or industry listed, though they may be applicable to other situations.
- Tools for countries and cities: These tools help countries and cities track progress toward their climate goals.

The protocol provides a good overview of concepts and principles of GHG measurement and of the background and political discussions around the topic. The main section presents clear requirements for accounting, monitoring and reporting. These are then explained in detail and provided with concrete step-by-step recommendations. The protocol helps, among other things, when selecting and calculating a meaningful baseline (for example static vs. dynamic baseline approach), determining and analysing primary or secondary effects (intended and unintended GHG effects), the baseline estimate period, additionality, barriers to implementation, uncertainties and legal provisions and the performance of an investment analysis for calculating the net benefit of the project. The Greenhouse Gas Protocol Initiative supplies the separate Corporate Standard for quantifying emissions that are caused by organisations or companies.

The protocol is particularly suitable for background information before sector-specific guidelines (e.g. waste calculator) are used.

It is also very helpful as a practical recommendation for projects that are referred to in the protocol as examples, as it shows concrete procedures for assessing the GHG reduction.

GHG Protocol main website | GHG Protocol for Project Accounting | GHG Protocol Policy and Action Standard | Variety of sector-specific calculation tools

✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Intergovernmental Panel on Climate Change (IPCC) - Guidelines for National Greenhouse Gas Inventories, 2006

The guidelines give instructions on how to estimate man-made generated GHG emissions at a national level in a structured manner. Volume 1 describes the basic steps for developing data studies in the field of GHGs. Volumes 2-5 contain specific requirements and procedures for the following sectors: energy, industrial processes and the use of products, agriculture and forestry as well as other land use and waste.

The IPCC Guidelines for National Greenhouse Gas Inventories are actually intended for estimating GHG reduction at a national level, but also give very good cross-sector advice and standards and a good overview of sector-specific methods.

Default values available: As the IPCC sets the standards internationally, these methods are extremely suitable for use as guidelines for individual calculations. It in particular provides relevant default values for energy intensity and carbon factors of different fuel types.

IPCC main webpage | Guidelines for National Greenhouse Gas Inventories, 2006

✓	✓	✓	✓	✓	✓	✓		✓		✓

VERRA (VCS)

The VCS Program is the world's most widely used voluntary GHG program. The VCS Standard lays out the rules and requirements which all projects must follow in order to be certified. Methodologies set out detailed procedures for quantifying the real greenhouse gas (GHG) benefits of a project and provide guidance to help project developers determine project boundaries, set baselines, assess additionality and ultimately quantify the GHG emissions that were reduced or removed.

VERRA website | VCS Methodologies

✓	✓	✓	✓	✓	✓	✓		✓	✓	

Source: Mitigation Action Facility, 2022, Ambition Initiative – Round Two- Outline Annex 6 GHG mitigation potential