NAMA Facility Mitigation Guideline

Guidelines on the GHG mitigation Annex
How to present mitigation figures

February 2022 (updated in October 2022)

Acronyms and Abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
ASP	Applicant Support Partner
BAU	Business as Usual
BE	Baseline Emissions
C	Carbon
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon dioxide equivalent
ER	Emission Reductions
EUR	Euro
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
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
NSP	NAMA Support Project
PE	Project Emissions
PFCs	Perfluorocarbons
REDD	Reducing Emissions from Deforestation and forest Degradation
SF_6	Sulphur hexafluoride
SI	International System of Units
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

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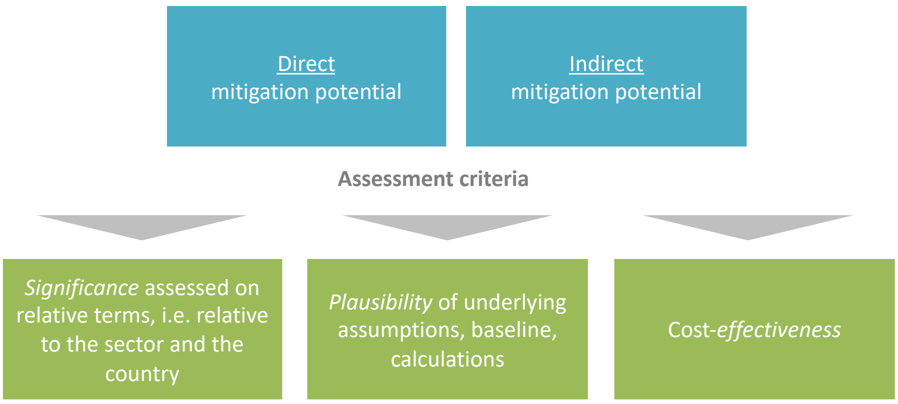
2 Introduction and purpose

NAMA Support Projects (NSPs) are assessed against two criteria: 1) Ambition and 2) Feasibility. Ambitious NSPs are defined by their potential for achieving transformational change, their greenhouse gas (GHG) mitigation potential as well as their potential for the leveraging of public and private finance. In their corresponding Outline or Proposal, Applicants / Applicant Support Partners (ASPs) or NAMA Support Organizations (NSO) respectively (hereinafter referred to as 'user(s)' of the Mitigation Annex should set out how mitigation actions in a certain sector are planned to be implemented. Users are expected to take a conservative approach to the mitigation potential, as the Applicant's / NSP's success will be measured against this initial proposition throughout the assessment and implementation process.

The mitigation potential shows the direct and indirect contribution of an NSP to the decarbonisation targets as defined by the country's Nationally Determined Contribution (NDC). The mitigation potential of the NSP is assessed both in absolute and relative terms in relation to the sector and the country target. In assessing the mitigation potential provided in the Mitigation Annex, the following key criteria are used.

Figure 1: Assessment criteria for NSP mitigation potential



Source: NAMA Facility (2020)

For presenting the estimation of the mitigation potential, users are required to utilize the provided Excel template at different stages of the NAMA facility cycle, namely:

- for Outline Phase as so called '**Annex 6 GHG mitigation potential'**
- for Proposal Phase as so called '**Annex 7 GHG mitigation potential'**

The Mitigation Annex template is part of the application documents that are provided by the NAMA Facility at the respective stage (Annex 6 for Call for Outlines; Annex 7 during the Detailed Preparation Phase and at Proposal Phase). In this guideline both Annexes are referred to as 'the Mitigation Annex'.

Why are there two different Annexes to calculate the mitigation potential of an NSP?

In line with the **two-step approach of the NAMA Facility application process**, there are slight differences in the information required with regards to the mitigation potential of an NSP:

- In the **Outline Phase**, which aims at selecting the most promising and feasible projects, the mitigation potential in terms of direct and indirect contribution of an NSP to the decarbonisation targets as defined by the country's NDC, needs to be plausibly demonstrated. It is assessed on relative terms, i.e., relative to the sector and the country. In some cases, certain information and data may not be available in the same level of detail as in the Proposal Phase.

- In the **Proposal Phase**, the second stage of the application process, support is provided by the NAMA Facility Technical Support Unit for a more detailed preparation of the NSP. In terms of the mitigation potential calculation, this means that a more detailed and elaborated estimation needs to be provided based on the first calculation made in the Outline Phase. Thus, the calculation builds upon the approach and data used in the Outline Phase. It needs to be re-fined and substantiated by e.g., providing a higher level of detail of certain parameters and data.

For both phases, the **Mitigation Annex** is structured in the same way and has the same overall scope. However, as the level of available information for NSPs may be different at Outline and Proposal Phase, the **level of required details of information/data is slightly reduced for the Outline Phase (for Annex 6).** Typically, the general calculation approach can be assumed to be defined already in the Outline Phase, while the level of detail with regard to collection and verification of data as input for the calculation can be expected to be lower at Outline Phase compared to Proposal Phase.

Differences between Outline Phase (Annex 6) and Proposal Phase (Annex 7) in the requirements for the mitigation potential calculation will be highlighted throughout the **NAMA Facility Mitigation Guideline**.

The Mitigation Annex supports the estimation of direct and indirect mitigation impacts from the NSP. This guidance explains the requirements and different sheets included in the Mitigation Annex and provides general instructions on how and why to fill out the Mitigation Annex.

The key objective of the Mitigation Annex and this ***NAMA Facility Mitigation Guideline*** (hereinafter referred to as 'Guideline') is to support the users to transparently elaborate and present the envisaged NSP mitigation potential. Users are encouraged to utilize and follow the Guideline as it can facilitate filling the Mitigation Annex appropriately and can help to avoid common pitfalls when estimating and presenting the mitigation potential of NSPs.

As a first step, chapter 3 of this Guideline introduces ***general principles, definitions and requirements*** applied by the NAMA Facility for best practice presentation of mitigation estimation for NSP Outlines. The following chapter 4 presents ***how to fill out the Mitigation Annex*** with a detailed overview of the different worksheets and how to use them. Chapter 5 discusses the ***relation of the Mitigation Annex to the NSP Outline and other Outline Annexes and relevant NAMA Facility guidelines*** (e.g., the Monitoring and Evaluation Framework). ***Sector specific considerations*** that may be required only for certain sectors or project types are considered in chapter 6, while chapter 7 provides a detailed ***checklist*** that can be used to ensure the proper and complete filling of the Mitigation Annex. The checklist helps users to fill out the Mitigation Annex and to double check if all relevant aspects to derive the mitigation figures are taken into account and all required sections are completed.

Throughout the Guideline, the mandatory requirements for the NSP Proposal Template (Annex 7), recommendations or examples and pitfalls will be presented in the following colours for quick recognition.

Mandatory requirements NSP Proposal Template (Annex 7)
Recommendations or examples
Pitfalls to be avoided

Differences in the requirements for Outline Phase (Annex 6) and Proposal Phase (Annex 7) related to certain aspects and elements of the Mitigation Annex will be indicated in the respective sections. The following table provides an overview of the main differences with regard to key aspects and requirements.

Table 1: Overview of main differences between the requirements in the Outline and Proposal Phase

Aspect	Outline Phase (Annex 6)	Proposal Phase (Annex 7)
1. Results		
NSP Information	✓	✓
NSP ID		✓
NSP duration	✓	✓
NSP funding	✓	✓
NSP cost-efficiency	✓	✓
2. Parameters and Assumptions		
List of parameters (transparently filled, incl. justification)	✓	✓
Accuracy		✓
3. Direct mitigation		
Description of - business as usual (BAU) scenario - baseline scenario - NSP boundary	✓	✓
Description of approach/methodology followed for Emission Reduction (ER) calculation	✓	✓
Identification and consideration of leakage emissions, incl. justification	✓	✓
Identification and consideration of rebound effects, incl. justification		✓
Calculation of annual Emission Reductions (ER) and cumulative values over NSP duration, for additional 10 years after project finalisation	✓	✓
Calculation of 'over the technology lifetime'	✓	✓
4. Indirect mitigation		
Description of specifications of indirect mitigation effects	✓	✓
The following requirements only apply if the approach for determining indirect emission reductions is different from the methodology applied for direct emissions methodology		
Description of source of emission reductions and difference to the baseline	✓	✓
Calculation of baseline emissions	✓	✓
Calculation of project emissions	✓	✓
Calculation of leakage emissions	✓	✓

3 General principles, definitions and requirements

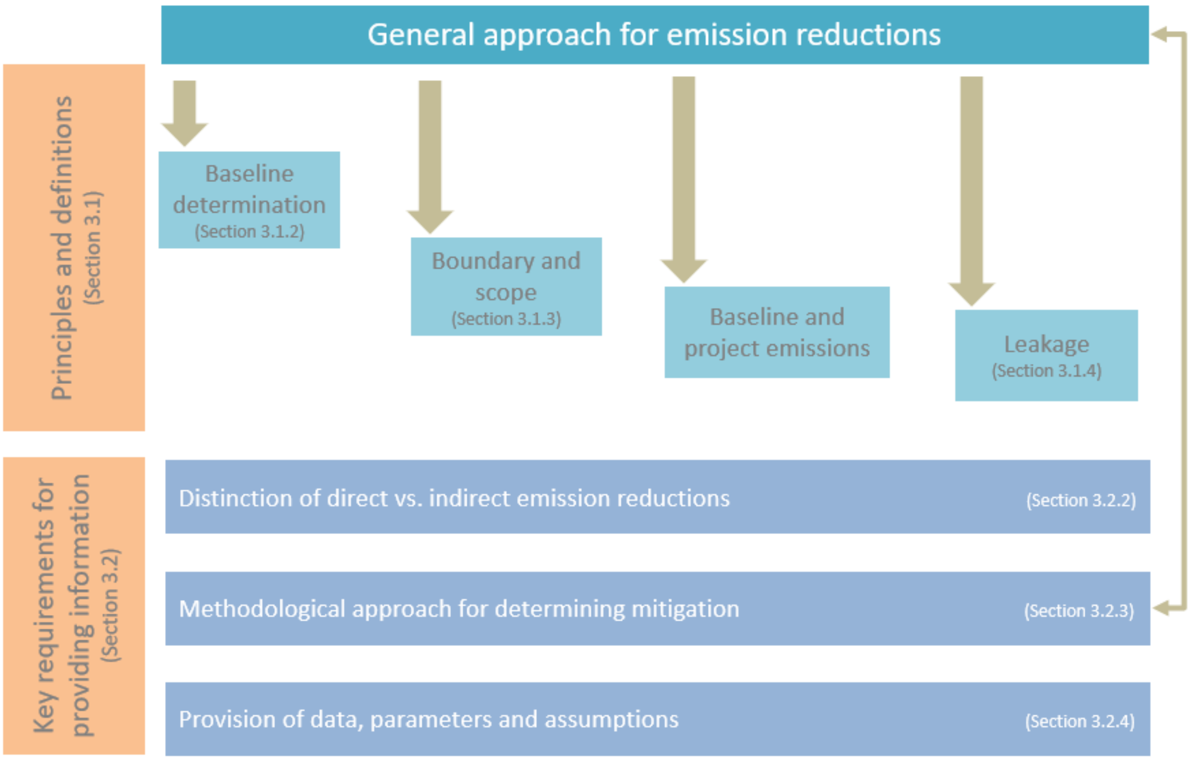
The Mitigation Annex provides 4 sheets in which the estimation for GHG mitigation can be presented (incl. the direct and indirect mitigation potentials). In addition, the Mitigation Annex also includes two sheets that provide guidance:

- One sheet called 'Standards & Methodologies' with further guidance on useful methodologies to be applied for calculating the GHG mitigation potential (see section 4.1 of this Guideline for an overview of worksheets included in the Mitigation Annex).
- One sheet called '0 Checklist' which functions as a cross-check that all mandatory cells are being filled.

The Checklist is linked to the different sheets on which data entries are foreseen and required and checks if all mandatory cells contain data or information. However, this provides no guarantee that the data is sufficient and of in good quality. The differences in the requirements for Outline and Proposal phase (as described in the subsequent chapters) are reflected and indicated in the Checklist. For further information and details on the Checklist, refer to sections 4.4 and 7.

When filling out the Mitigation Annex, please take the following general principles, definitions and requirements into consideration.

Figure 2: Overview of key elements and principles for providing information on mitigation



Source: authors

3.1 General principles and definitions for determining the mitigation potential

NSPs 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 NSP mitigation over the lifetime of the intervention(s). Here the NSP shall distinguish between direct and indirect emission reductions impacts and reflect the general principles and definitions described below.

3.1.1 General approach for emission reductions determination

The calculation of emission reductions achieved by the NSP 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 NSP is based on a comparison between the baseline situation and the situation after the NSP 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 NSP.

$$ER_y = BE_y - PE_y - LE_y \quad \text{Equation (1)}$$

Where:

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)

Mandatory requirements: Calculate the baseline, project and leakage emissions for your NSP 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.

For projects including carbon sequestration, the same equation can be applied. However, any relevant and accountable GHG removals shall be presented as negative emissions in the equations (e.g., -10,000 tCO_2e). See Appendix A1: Agriculture, Forestry and Other Land Use of this Guideline for further details.

3.1.2 Defining the baseline scenario

The baseline scenario is the ***reference case for the NSP***. It is a hypothetical description of what would have most likely occurred in the absence of the NSP 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 3.2.3 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 NSP (as per Clean Development Mechanism (CDM) and GHG Protocol):

- 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 NSP. 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;
- 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 NSP) within a specified

[1] Leakage effects are explained in section 3.1.4 of this Guideline.

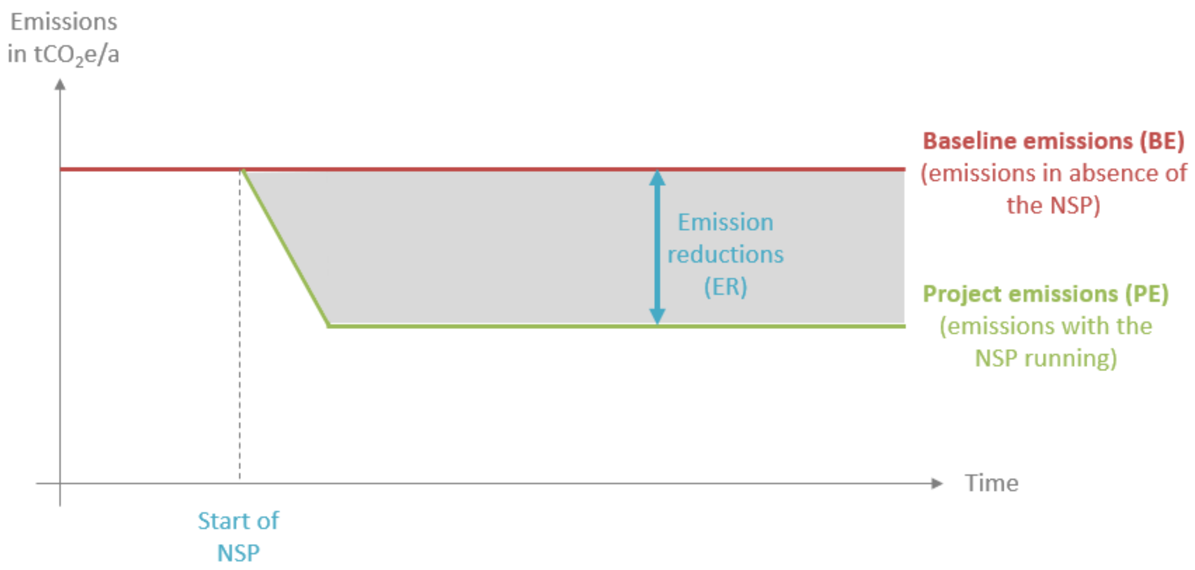
geographic area and temporal range that could provide the same product or service as the NSP; or

- the continuation of current activities, technologies or practices that, provide the same type, quality and quantity of product or service as the NSP (Business-as-Usual, BAU), resulting in existing actual or historical emissions, as applicable.

When defining the baseline, identify the scenario that most reasonably represents the situation in the area of NSP actions, 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 NSP. In other words, the baseline is defined as the hypothetical situation without the NSP; hence the baseline emissions (BE) are the emissions that are expected without the NSP 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 NSP. In the same way, it is also possible to project into the future the GHG emissions under the implementation of the NSP, i.e., the development under changing circumstances. The difference between these two scenarios provides the ex-ante mitigation estimate.

Figure 3: Baseline reference scenario



Source: authors

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. 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 NSP 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 NSP 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 an NSP shall replace or avoid the future use of inefficient appliances, in the baseline scenario without the NSP intervention, the use of conventional (inefficient) appliances will continue to prevail and may even increase due to affordability and economic development. Hence, as a consequence from today's point of view (ex-ante estimation), the baseline emissions under this scenario would increase. In other cases, where, for instance, 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 will take place influencing the plant's operation.

Source: Adapted from Wehner, 2019, p. 19

Some activities, especially in low-income countries such as Least Developed Countries (LDCs), may be implemented in a 'suppressed demand' context. This relates to a situation where a minimum level of basic goods and services is not available due to poverty or non-existence of modern infrastructure (e.g., access to electricity). "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. In the framework of existing carbon markets this is a crucial concept to give countries with low historical emission levels due to suppressed demand, access to carbon market participation while enabling leapfrogging to zero- or low-emission technologies. Under the Clean Development Mechanism (CDM), the concept was established as a baseline approach with normative elements, such as minimum service levels to meet basic human needs. Various methodologies are available under e.g., the CDM and Gold Standard that integrate the concept of suppressed demand. Gold Standard projects that apply a suppressed demand baseline are limited to micro- or small-scale thresholds.

It is important to note that NSPs opting for a suppressed demand context should comprehensively justify the consideration of suppressed demand and clearly indicate it in the GHG emission reduction estimations in the Mitigation Annex, for instance in the description of the baseline scenario (see sections 4.6 and 4.7). Ultimately, a suppressed demand baseline has an impact on monitoring, as emissions are assumed that do not actually occur. Hence, this needs to be taken into account for the development of the M&E plan.

3.1.3 Defining the project boundary and scope

The mitigation assessment and project boundary for the NSP shall encompass the potential emission reductions (ER) related to the NSP measures, technologies and intervention. The project boundary encompasses all emissions of GHG under the control of the project proponent that are significant and reasonably attributable to the NSP activities. The specific project boundary depends on the NSP 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) 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 NSP 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 NSP 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 NSP, 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 3.1.4 of this Guideline regarding leakage).

Potential pitfall: Avoid mixing up direct and indirect emission reductions as per NAMA Facility definition (see section 3.2.2 of this Guideline) and consider the different Scopes of the project boundary as defined above.

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 NSPs 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 and indirect emission reductions by the NAMA Facility shall be taken into consideration (see Figure 4 in section 3.2.2 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 experiences or expert evaluation in the country or region. Alternatively, default values can also be used, e.g., as provided in the CDM Tool to determine the remaining lifetime of equipment, if no specific information on the NSP's 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 NSP interventions. The estimated reduced GHG emissions (direct and indirect emissions) shall cover the cumulative amount of all the ‘Kyoto basket’/Paris Agreement GHGs, which includes all emissions of the following gases:

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

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

3.1.4 Rebound effects and leakage

When estimating the achieved emission reductions, the user shall reflect and report on any rebound effects or carbon leakage (incl. action to reduce both).

Leakage is defined as the increase in emissions outside of the (project) boundary of the NSP 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 NSP 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). This can oftentimes even cancel out the original savings. According to the German Environmental Agency (UBA 2019), the direct rebound effect for space-heating use can be estimated at 10 to 30%. Hence, the actual energy savings may be lower than the projected technically feasible savings. However, the impact of any rebound effect depends on specific conditions and can be reduced through the use of suitable instruments.

Recommendation: Managing leakage and potential rebound effects is complex as it requires knowledge about the (future) activities of (diverse) actors within and outside of the project boundaries. Users should conduct a comprehensive assessment and address the following questions:

- What leakage risks / rebound effects have been identified for the proposed project?
- Is leakage or the rebound effect expected as a one-time or as a recurring effect?
- How will leakage or the rebound effect be monitored during project implementation?
- How will leakage or rebound effects be mitigated (e.g., through the choice of the project area or by offering alternative livelihood options)?

- How will leakage or rebound effects be accounted for (e.g., will it be deducted from overall GHG emission reductions/removals)?

If leakage or rebound effects are unlikely to happen, this should be justified by the users.

Mandatory requirements: Report on and estimate any leakage and rebound effects (include corrective actions to prevent both). Also document and justify if no leakage and/or rebound effects are expected.

For the Outline Phase, it is not mandatory to consider rebound effects. This is also reflected in the Checklist on Sheet 0. However, it is recommended to take into account such effects already at an early stage to be able to plan for corrective measures, if necessary.

3.2 Key requirements for providing information on the mitigation approach

3.2.1 Time period for mitigation estimation

The users should assess the annual mitigation potential of the NSP and the cumulative value over the NSP duration. In addition, cumulative values for the period beyond the NSP duration should be estimated. Hence, the following potential emission reductions estimates need to be presented in the Mitigation Annex:

- Annual emission reductions in GHG emissions (in tCO_2e)
- Cumulative value over the duration of the NSP, i.e., accumulated target values until finalisation of the project;
- Cumulative value over a period of 10 years after the end of NSP implementation, and for an additional 10 years after project finalisation;
- Estimation over the lifetime of the technology.

3.2.2 Distinction of direct and indirect GHG mitigation potential

The NAMA Facility differentiates between direct and indirect GHG mitigation potential.

Direct GHG emission reductions are achieved by project investments and discrete investments financed or leveraged during the NSP'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 NSP*** funding during the NSP period. The requirements are as follows:

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

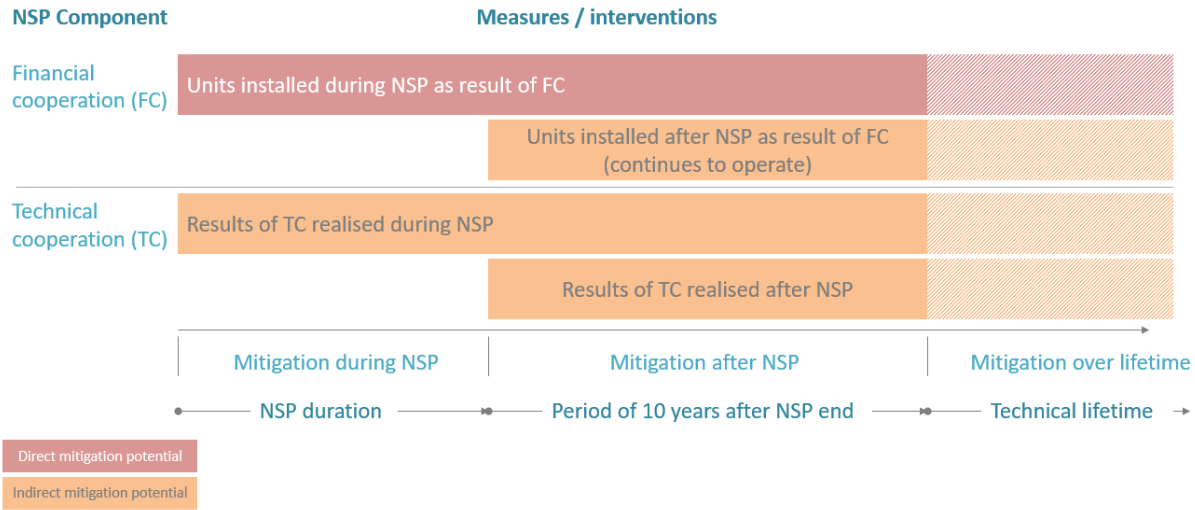
Indirect GHG emission reductions achieved by the NSP capture emission reductions beyond those related to direct investments, e.g., resulting from technical assistance. Hence, potential emission reductions that fall in the following categories are considered indirect emissions:

- Results of technical cooperation (TC) component during and after the NSP period
- Results of financial cooperation (FC) component (but only for units installed / measures implemented after NSP end, as a result of the continuation of the financial mechanism)
- Timing includes:

- Technical cooperation: during NSP period and during period of 10 years after NSP end, (during lifetime: optional)
- Financial cooperation: for units installed after NSP end for period 10 years after NSP end, (during lifetime: optional)

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

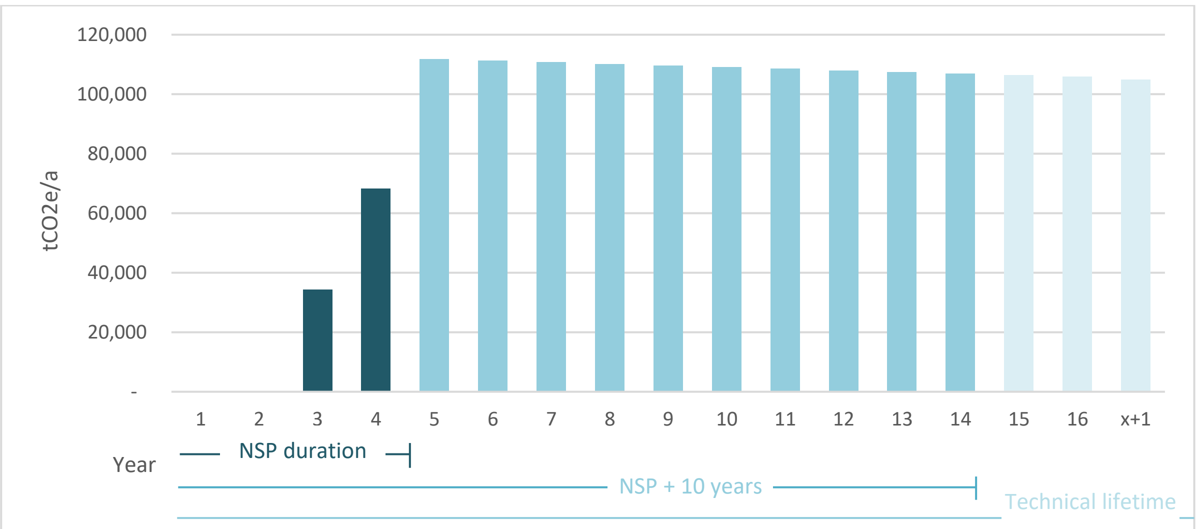
Figure 4: Definition of the direct and indirect GHG mitigation potential



Source: authors

As shown in the figure above, technology units installed during the NSP as result of the financial component of the NSP 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 NSP 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 5: Example of direct emission reductions from NSP



Source: authors

Mandatory requirement(s): Clearly differentiate in the emission reductions calculation between direct and indirect mitigation potential.

3.2.3 Methodological approach: How to select an appropriate methodology

Methodologies are methodological tools which address specific aspects of projects and interventions, e.g., to calculate greenhouse gas (GHG) emissions from specific sources. These systematic approaches can be used in order to determine the amount of emission reductions achieved. They help to define the baseline and will facilitate the monitoring of such mitigation. At NSP Outline 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.

In order 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 NSP. 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 NSP 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.

Mandatory requirements: The users should transparently present and follow the applied methodology for estimating the mitigation potential of the NSP 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 NSP 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 NSP, which is to be developed for tracking the actual mitigation impacts during NSP implementation (for further guidance see NAMA Facility Monitoring and

Evaluation Framework). Therefore, it is recommendable to consider the monitoring process and the M&E framework when selecting the methodological approach for calculating the GHG emission reductions.

3.2.4 Key requirements 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 NSP interventions. Please also consult recommended “Hierarchy of data sources” as presented in the Monitoring and Evaluation Framework for core indicator M1. However, in the 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.

Recommendation: An important aspect of data use, e.g., for establishing the BAU scenario, is using *conservative* estimates. That means that the emission reductions estimate should be on the lower rather than the higher end. The choice of approach, assumptions, methodology, parameters, data sources and key factors for calculating the emission reductions should result in a *conservative* estimate taking account of uncertainties. Each possible uncertainty embedded in the estimation needs to be evaluated. The use of the default emissions factors (see for example section 3.2.3 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 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.

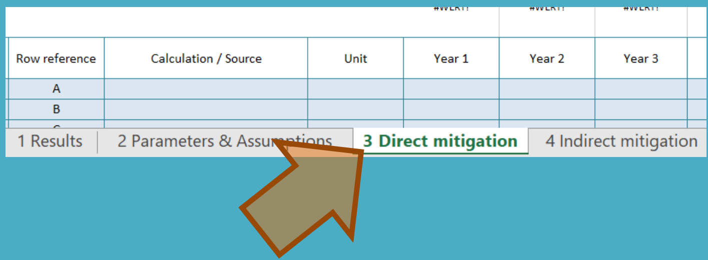
Mandatory requirements: All assumptions and calculations shall be **transparent, verifiable** and **clearly presented** in the Mitigation Annex. Applying **conservative and transparent assumptions, methodologies and transparency on data sources** is strongly recommended and honoured in the project selection cycle (this includes presenting accuracy, weaknesses, uncertainties and lack of data sources).

The following section illustrates how the general principles, definitions and requirements are applied in filling out the Mitigation Annex.

4 How to fill out the Mitigation Annex: GHG mitigation potential

This section will describe in more detail appropriate use and filling out of the Mitigation Annex. It is highly recommended to read chapter 3 of this Guideline first in order to be familiar with the general principles and definitions. In addition, consultation of the Glossary of this Guideline will help to ensure a good quality of the Mitigation Annex. Please consider the following general instructions.

1 Some of the worksheets have numbers on the respective tab. Only the sheets with numbers 1-4 contain cells that have to be filled in. The other sheets provide guidance and explanations on how to fill in the Mitigation Annex.



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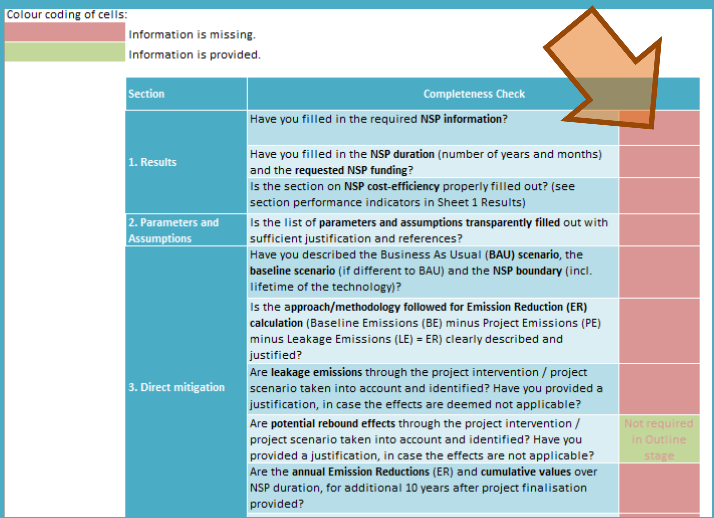
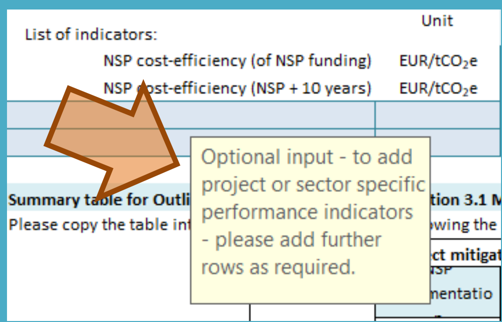


Sheet 0 includes a Checklist which runs an automatic completeness check that all mandatory cells ('must have' information) are filled out in each sheet. The Checklist is linked to the individual sheets.

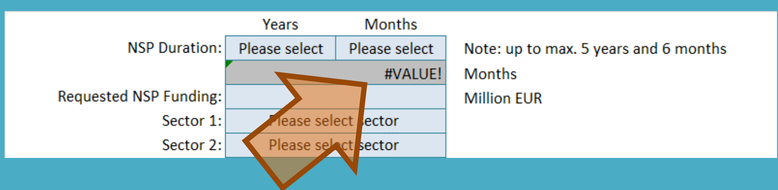
For some aspects, the check list differs between Outline Phase (Annex 6) and Proposal Phase (Annex 7).

'Must have' information is listed at the top of each section on the relevant sheets.

3 Most of the cells offer additional guidance: If you click into a cell, an input message will show up, if available.



4 If you start with the blank template, some of the pre-filled formulas may show errors. As soon as you have filled the related required information (e.g., NSP duration), the formulas will show corresponding values.



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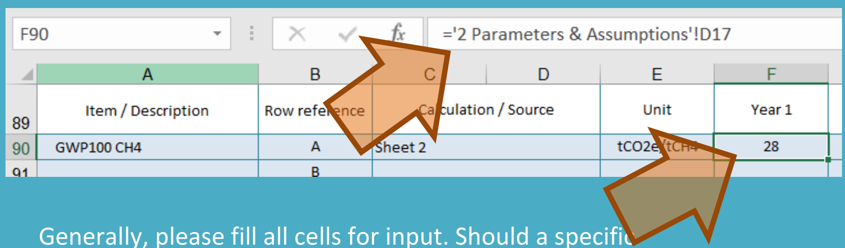
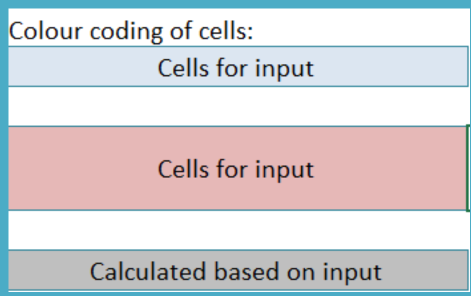


Always use formulas with cell references for enabling traceability (e.g., =D17+A20).

6 Generally, please fill all cells for input. Should a specific section (e.g., rebound effect) not be applicable to the specific NSP, please state so accordingly and provide a justification why it is not applicable.

Cells that require mandatory information and must be filled in (minimum required cells to be filled) are red. The background colour of the cells changes to standard blue once the cells are being filled.

Cells with pre-filled formulas should not be changed except the specific circumstances of the NSP requires to do so. Such changes should be identified and explained in Annex 6 accordingly.



7

Provide appropriate reference to external documents and data used. This includes at least: Author(s), Title of document, Year of publication, Web-Link (if available).

4.1 General structure of the Mitigation Annex

The general structure of the Mitigation Annex is presented below. Some of the sheets can be copied multiple times. This can be useful for example, if the NSP covers different technologies or sectors (e.g., an NSP implementing measures in agriculture and energy).

Figure 6: General structure of the Mitigation Annex

Introduction	Explains how to use and fill the Mitigaion Annex. It contains a short explanation of all relevant and recurring terminology.
0 Checklist	Includes a Checklist which automatically verifies if the mandatory cells ('must have' information) are filled. It is linked to the individual sheets which in turn contain specific checklists at the top of the sheets.
1 Results	Presents the results based on the inputs on the various sheets of the Mitigation Annex and basic information about the project (country, duration, etc.)
2 Parameter and Assumptions	Collects all parameters and assumptions used to derive the mitigation potential. Sheet can be copied multiple times if needed in order to present for example different types of mitigation measures.
3 Direct mitigation	Calculates the **direct** mitigation potential of the NSP. Sheet can be copied multiple times if needed in order to present for example different types of mitigation measures.
4 Indirect mitigation	Calculates the **indirect** mitigation potential of the NSP. Sheet can be copied multiple times if needed in order to present for example different types of mitigation measures.
Standards & Methodologies	Provides various potential sources for GHG accounting methodologies.

Source: authors

It is also possible to add further sheets in the Mitigation Annex, as required, to provide additional, more complex calculations (e.g., auxiliary calculations) or additional data and information. Additional sheets should be named appropriately and be well-structured to allow the NAMA Facility to easily access and understand the additional information. Data and information from such additional sheets that is used on Sheets 1 to 4 of the Mitigation Annex should be integrated by formulas using cell references as explained in the text box above.

4.2 Sheet: Introduction

Sheet: Introduction explains the structure of the Mitigation Annex and provides guidance on how to fill it out. A cell colour code to indicate cells for user inputs is introduced, as shown in the text box above. Please read it once before you start filling out the Mitigation Annex. References to key sources and relevant sections of the Guideline are provided in the introduction sheet.

4.3 Sheet 0: Checklist

Sheet 0 integrates a Checklist which functions as completeness check to verify that all mandatory cells are filled. It links to each sheet (sheets 1-4) and the required information respective elements. The individual sheets contain sheet specific checklists that can be found at the top of each sheet.

The Checklist follows a simple and straightforward colour coding:

- Red = information is missing
- Green = information is provided

(red)	Information is missing.
(green)	Information is provided.

In some cases, several cells need to be filled so that the checklist for a particular piece of data turns green (e.g., on *Sheet 3: Direct mitigation*: description of BAU scenario, baseline scenario and NSP boundary).

The Checklist(s) does not validate the quality nor the accuracy of the data and information provided and therefore does not provide a guarantee that the data entered is sufficient.

Differences between mandatory requirements for Outline Phase (Annex 6) and Proposal Phase (Annex 7) are reflected and clearly indicated in the Checklist.

3. Direct mitigation	Are **leakage emissions** through the project intervention / project scenario taken into account and identified? Have you provided a justification, in case the effects are deemed not applicable?	
	Are **potential rebound effects** through the project intervention / project scenario taken into account and identified? Have you provided a justification, in case the effects are not applicable?	Not required in Outline stage

For indirect mitigation, it has to be indicated on *Sheet 4: Indirect mitigation* whether the approach for determining emission reduction is the same as for direct mitigation (see *Sheet 3: Direct mitigation*). This information cannot be selected on *Sheet 0: Checklist*.

4. Indirect mitigation	Are the **specifications of indirect mitigation effects** that are triggered or influenced by the NSP described (quantify if possible)?		
	Is the **approach** for determining indirect emission reductions different from the methodology applied for direct emissions	Yes	
	Are **sources of indirect Emission Reductions (ER)** and **difference to the baseline** clearly described?		*If No is selected above, then this checklist item is not valid.*
	Have you determined the **baseline emissions** accordingly?		
	Have you determined the **project emissions** accordingly?		
	Have you determined the **leakage emissions** accordingly?		

4.4 Sheet 1: Results

Sheet 1: Results will present the final mitigation potential once all relevant sections of the Mitigation Annex are filled out. To start with the Mitigation Annex, please fill in the cells on NSP information and the section on NSP duration. You may then continue first with Sheets 2 to 4. Once all sections are elaborated, please revisit *Sheet 1: Results* and fill the following sections considering the following guidance:

Table 2: Specific guidance for Sheet 1: Results

Section / cells	Description / guidance
Complete-ness Check	Have you filled in the required NSP information? Have you filled in the NSP duration and the requested NSP funding? Is the section on NSP cost-efficiency properly filled out?
NSP information	Fill in project-specific information such as country, project title, applicant, date and version. For Proposal Phase, the NSP ID needs to be provided (not required for Outline Phase).
Direct GHG mitigation potential	Formulas are pre-filled to calculate the mitigation potential during NSP duration, 10 years after NSP end and for technology lifetime. In most cases these formulas are sufficient to display the mitigation potential of the NSP. However, in case the specific circumstances of an NSP would require adjusting, this is possible. If required, please use formulas with cell references and do not just copy values into the cells. *Example:*

	Unit	NSP implementation	10 years after NSP end	Technology lifetime
Annual average mitigation potential	tCO_2e/a	35,217	109,131	109,694
Total mitigation potential over period	tCO_2e	158,474	1,091,311	2,193,871

Indirect GHG mitigation potential

See above (i.e., same steps as for direct GHG mitigation potential)

Performance indicators

The cost efficiency indicators (NSP, 10 years after NSP end and NSP + 10 years) are mandatory for filling the Mitigation Annex. NSP are encouraged to propose further key performance indicators as applicable to their interventions (e.g., emission reductions (removals) per hectare forest area or in the transport sector emissions per passenger kilometre for a certain mode of transport (gCO_2/km)). As before, formulas should not be changed except if the specific NSP requires to do so. Any changes or adjustments made should be reported and justified (e.g., in a comment).

Example:

List of indicators:	Unit	NSP implementation	10 years after NSP end	Technology lifetime
NSP cost-efficiency (of NSP funding)	tCO_2e/ EUR	76	11	5
NSP cost-efficiency (NSP + 10 years)	tCO_2e/ EUR	10		

Summary table for Outline/ Proposal

The summary table presented should be copied into the NSP Outline or NSP Proposal document. As before, formulas should not be changed except the specific NSP requires to do so. Any changes or adjustments made should be reported and justified (e.g., in a comment).

Example (extract):

	Direct mitigation potential		Indirect mitigation potential	
	NSP Implementation	10 years after NSP end	NSP Implementation	10 years after NSP end
	tCO_2e/a	tCO_2e/a	tCO_2e/a	tCO_2e/a
Year 1	0			
Year 2	0			
Year 3	34,291			
Year 4	68,239			
Year 5	55,944	55,944		9,324

Source: authors

4.5 Sheet 2: Parameters & Assumptions

Sheet 2: Parameters & Assumptions is used to collect all parameters and assumptions used for the determination of the mitigation potential. As such, calculations on Sheets 3 and 4 should use formulas with cell references to this sheet. This will also help the users if later on changes in the input parameters are required, as they can then be easily found on this sheet. The assumed lifetime for the technologies implemented under the NSP is mandatory to be defined on this sheet. When filling out *Sheet 2*, please take into consideration the following guidance.

Mandatory requirements: All assumptions and calculations shall be **transparent, verifiable** and **clearly presented** in the Mitigation Annex. 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).

Table 3: Specific guidance for Sheet 2: Parameters & Assumptions

Section / cells	**Description / guidance**
Complete-ness check	Is the list of parameters and assumptions transparently filled out with sufficient justification and references?
Name (of the parameter)	Please name each parameter with a unique name and use this name throughout the Mitigation Annex (i.e., also in further descriptions as filled in the different sections of the Mitigation Annex as applicable). As soon as the first cell is being filled, the entire row turns red. Once the required data is provided, the cells turn blue again. *Example:* Specific thermal energy demand (baseline)
Unit	Please specify the unit of each parameter used. SI units should be used as a preference. *Example:* **Unit** kWh/m²
Value	The value of each parameter should be defined on this sheet. From here, the value can be further used in the Mitigation Annex by formulas using cell reference. *Example:* **Value** 280
Description	Please explain the parameter in more detail. Abbreviations should only be used after first introducing the full name, e.g., 'Mean Annual Increment (MAI)' *Example:* **Description / Comment** Baseline thermal energy demand per square meter
Source	Please specify the source of the parameter and its value. Consider further instruction regarding identification of sources used as presented in the text box above. Peer-reviewed publicly available data should be used if available. Government data may also be used. Generally, most recent available data should be taken into consideration (e.g., from past 3 years). There is no clear cut-off date in terms of outdated data as this is also dependent on the dynamics related to a specific parameter. As such, for data from more than 3 years ago, users should justify why the data is still valid. *Example:* Energy Efficiency Study, 2019, See Appendix 1, p. 5

Section / cells	Description / guidance
Accuracy	While the NAMA Facility will not require a fully elaborated error propagation, it is still important to have a rough understanding of the accuracy of the parameters used. Therefore, please estimate the approximate accuracy. This is not mandatory for Outline Phase. *Example:* medium: +/-15% This would indicate for example that an expected energy generation value of 1,000 kWh would result in the range 850 to 1,150 kWh.
Justification/ uncertainties	Please add a justification or explanation on the data used for the emission reductions calculation, e.g., why certain data is selected and/or considered appropriate. Example: **Justification/ uncertainties** Project-specific data obtained through energy audit and metering of thermal energy consumption

Source: authors

The sheet may be copied multiple times to structure the Annex 6 into different components (i.e., different mitigation measures). If this is done, please identify the related component in Row 22 of the sheet.

Example:

Component (if applicable):	Thermal and electric energy

In a similar way, *Sheet 3: Direct mitigation* and *Sheet 4: Indirect mitigation* would be copied accordingly.

4.6 Sheet 3: Direct mitigation

Sheet 3: Direct mitigation is the main sheet on which the mitigation potential is presented. It includes sections for explanation and calculation.

Mandatory requirements:

Describe the **BAU and baseline scenario**, **NSP boundary** and the **methodology/ approach** used to calculate the emission reductions.

Calculate the **annual emission reductions**, the **cumulative values over NSP duration** and for **additional 10 years after project finalisation** as well as the emission reductions **over the technology lifetime**.

Report on and estimate any **leakage and rebound effects** (include corrective action to prevent both). Also document and justify if no leakage and/or rebound effects are expected. Insert assumptions and justification for **risks and accuracy**. With regard to the latter, a sensitivity analysis is recommended for high uncertainties and low accuracy.

Table 4: Specific guidance for Sheet 3: Direct mitigation

Section / cells	Description / guidance
Complete-ness check	Have you described the Business As Usual (BAU) scenario, the baseline scenario (if different to BAU) and the NSP boundary (incl. lifetime of the technology)? Is the approach/methodology followed for Emission Reduction (ER) calculation clearly described and justified? Are the annual Emission Reductions (ER) and cumulative values over NSP duration, for additional 10 years after project finalisation provided? Are leakage emissions through the project intervention / project scenario taken into account and identified? Have you provided a justification, in case the effects are deemed not applicable? Are potential rebound effects through the project intervention / project scenario taken into account and identified? Please provide justification, in case the effects are not applicable? Is 'over the technology lifetime' calculated?
Description of the mitigation potential	Please describe the general mitigation potential and the approach for its determination, e.g., incl. related mitigation technology/intervention in its technical parameters, e.g., size, volume, lifetime and its operational output (e.g., number of kWh produced per year, development of efficiency and replacements throughout the lifetime). Please give reference to any methodology (e.g., Clean Development Mechanism) applied (see also information related to Sheet 5 below) and present the key steps and calculations of the methodology (See also section 3.2.3 of this Guideline).
Description of the project boundary	Please fill in the description of the project boundary (see chapter 3 and the Glossary of this Guideline for further explanation).
Baseline emissions	In this section, the BAU scenario has to be described. If the applied baseline scenario (i.e., the scenario used in the calculation of baseline emissions (see chapter 3 and the Glossary of this Guideline for further explanation) is different from the BAU scenario, this should be identified and explained in the corresponding section.
Calculation table for baseline emissions	In order to incorporate the parameters as filled in Sheet 2, please use formulas with cell references. The table provides sections for calculation of emissions during NSP implementation, 10 years after NSP end and thereafter including in Columns W and X a section covering technology lifetime. It is important to identify in each row of the calculation table the description of what is calculated in the row, the calculation approach or source used and the unit of the values presented. With the row reference, users can refer to other rows while explaining the calculation (e.g., Row A x B). Users must use formulas with cell references as applicable to allow the NAMA Facility to understand the calculations. *Example (see example Annex 6 for Energy Efficiency projects[3]):*

[3] Please see chapter 6 of this Guideline to access the example.

Section / cells	Description / guidance

				NSP implementation	NSP implementation	NSP implementation	NSP implementation		W	X
									Over technology lifetime	
Item / Description	Row reference	Calculation / Source	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Annual	Total
Accumulated number of buildings (4 storeys) to be retrofitted	A	NSP implementation plan	No.			75	150	300		
Thermal energy consumption before EE measures	B	See 2 Parameters & assumptions	MWh_t/a			470	470	470		
Electricity consumption before EE measures	C	See 2 Parameters & assumptions	MWh_e/a			36	36	36		
Accumulated number of buildings (10 storeys) to be retrofitted	D	NSP implementation plan	No.			50	100	150		
Thermal energy consumption before EE measures	E	See 2 Parameters & assumptions	MWh_t/a			1680	1680	1680		
Electricity consumption before EE measures	F	See 2 Parameters & assumptions	MWh_e/a			128	128	128		
Central heating emission factor (current system)	G	See 2 Parameters & assumptions	tCO_2/MWh_t	0.40	0.40	0.40	0.39	0.39		
GEF_{grid}	H	See 2 Parameters & assumptions	tCO_2/MWh_{el}	0.65	0.65	0.64	0.64	0.64		
Baseline emissions (BE)		A*(B*G+C*H)+D*(E*G+F*H)	tCO_2e	-	-	53,170	105,808	173,493	-	-
									tCO_2e/a	tCO_2e

TSU:
Please link input parameters to sheet "2 Parameters & Assumptions" if possible/applicable as done here.

Project emissions (PE)	Project emissions (see chapter 3 and the Glossary of this Guideline for further explanation) have to be explained (which sources of project emissions exist) and calculated. The same guidance as provided for the calculation table of baseline emissions applies.
Leakage emissions (LE)	Leakage emissions (see section 3 and the Glossary of this Guideline for further explanation) have to be explained (which sources of project emissions exist) and calculated. The same guidance as provided for the calculation table of baseline emissions applies. Users can select pre-defined answers from a dropdown menu and provide a more detailed explanation in the box below. If no leakage emissions are considered, a justification would be required for not considering leakage emissions.
Emission reductions (ER)	The emission reductions are calculated as per a standard approach applied in most standards or methodologies (see chapter 3 and the Glossary of this Guideline for further explanation). As such, the pre-defined formulas would be sufficient for most NSPs. Should the specific circumstances of an NSP require editing of the formulas, this can be done and would need to be justified. As mentioned before, formulas with cell reference are to be used (not only providing or copying in values).
Overall accuracy	As explained above in section 4.5 above, the NAMA Facility will not require a fully elaborated error propagation. Still, it is important to have a rough understanding of the accuracy of the mitigation potential determined on Sheet 3. Therefore, please give an approximate estimation (see cell with dropdown list) and add an explanation accordingly.
Risks	Any NSP is expected to be affected by risks so that the estimated mitigation potential will not materialise as expected. Please evaluate the pre-defined risks with corresponding cells with dropdown lists and specify any NSP-specific risks, again with level from dropdown list. Please add further explanation on such risks in the related cells. It might be helpful to cross-check the identified risks with the indications and assumptions made in the NSP Log-frame (Annex 2).
Rebound effect	Rebound effects (see chapter 3 and the Glossary of this Guideline for further explanation) have to be described and estimated in their level (see cell with dropdown list). NSPs that do not expect rebound effects still have to state this and justify the same.

Source: authors

4.7 Sheet 4: Indirect mitigation

Sheet 4: Indirect mitigation is structured in the same way as *Sheet 3: Direct mitigation*. As the approach for determination of the indirect mitigation might differ from the direct mitigation, the sheet offers generally the same sections as Sheet 3 to describe the approach. Likewise, the guidance presented in section 4.6 above applies. Should the approach for direct and indirect mitigation be the same, the description for the indirect mitigation does not need to be repeated. Users can select from a dropdown list, if the approach is different from the methodology applied for direct emissions or if it is the same. Correspondingly, it needs to be stated in related cells "Same as described under direct mitigation potential" or, if it differs, the specific approach needs to be described. The selection has implications on the completeness check and Checklist. If the user applies a different approach and selects the corresponding answer in the dropdown list, sections on

- approach,
- BAU scenario,
- baseline scenario and
- project and leakage emissions

need to be filled (only if approach differs; otherwise leave blank)

However, independently from the question if the same approach is used as for direct mitigation, calculations still have to be defined and selected in related calculation tables. For the indirect potential, determination of accuracy, risks and rebound effects is not mandatory.

4.8 Sheet: Standards & Methodologies

Sheet: Standards & Methodologies references useful guidance and methodologies that can be used for the calculation of GHG emission reductions (see also chapter 3 and specifically section 3.2.3 of this Guideline for further information on the selection of methodologies). No information needs to be filled by the users in this sheet. The list is only providing recommendations and orientation regarding available methodologies and standards[4]. There is no claim to completeness. Other appropriate methodologies and standards can be used as well. Generally, the NAMA Facility is not asking to apply a specific methodology or standard or would prefer one standard over another. However, applied methodologies should ensure the key principles of determination of mitigation as presented in Table 5 below are recognised. The same principles are required to be followed if no existing methodology can be applied and the users suggest their own approach or an approach based on an adjusted existing methodology. It should be noted that it is recommended to apply existing methodologies as far as available and applicable.

Table 5: Key principles for the determination of the mitigation potential

Principle	Description
Accuracy	The data and parameters used to determine the mitigation potential should be most precise as possible and with the least uncertainty.
Completeness	The determination of the mitigation potential should include all relevant GHG sources and sinks.

[4] We refer in this guideline to 'methodology' as the document defining the approach for the calculation of the mitigation potential, while 'standard' would refer to the scheme or programme such as CDM, Gold Standard, Verified Carbon Standard, IPCC, etc. However, the terms 'methodology' and 'standard' might be used differently under different schemes or programmes.

Principle	Description
Conservativeness	All the estimates should be made following a conservative approach, especially in situations when estimations made have high levels of uncertainty.
Consistency	At least within the NSP but also beyond, the use of data and information should be consistent among different measures, especially in the context of NDC-related reporting.
Comparability	Similar to the consistency principle, the information and data used should allow comparison across different measures and across different periods of time, especially in the context of NDC-related reporting.
Transparency	Transparency of the data and methodologies used for the calculations of GHG emission reductions should not only allow the NAMA Facility to understand the approach applied, but also the public.

Source: authors

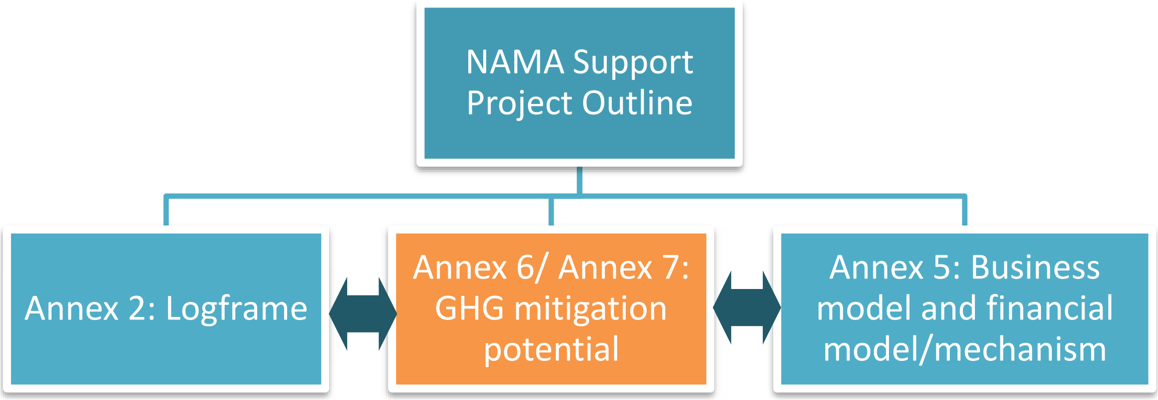
5 Relation to other documents

5.1 Alignment with NAMA Support Project Outline or Proposal, Annexes 2 and 5

Together with the NSP Outline, users need to provide additional Annexes besides the Mitigation Annex. The Outline or Proposal and the Annexes should be aligned and consistent with regards to the intended scope, results and assumption/parameters of the NSP. In particular, the Annex on the NSP's logframe (Annex 2) and the underlying Annexes on the business case/model and financial mechanism need to be aligned with the Mitigation Annex. For instance, the same assumptions, e.g., on implementation schedule and units should be featured across all documents. This in particular applies for the following elements, among others:

- *Technical features (e.g., capacities, size) incl. referring to availability of the technology/practice on the national market*
- *BAU technology / practice description*
- *Mitigation technology / practice description*
    - *The lifetime of a technology / practice can be prolonged (e.g., through a replacement of specific parts)*
    - *Key technical features per unit of a technology / practice*
- *The number of investment projects that are expected to be installed directly under the NSP financial support mechanism(s)*
    - *Investment projects within the NSP lifetime*
    - *Investment projects beyond the NSP lifetime*

Figure 7: Relation of the Mitigation Annex, the NSP Outline and other Annexes



Source: authors

In the NSP Outline or Proposal, the results from the Mitigation Annex should be presented in a summary table (copy the completed table in *Sheet 1: Results* to the Outline).

Potential pitfall: Assumptions, units and parameters should be constantly used across all application documents, in particular Annex 5a, Annex 5b and the Mitigation Annex. Ensure cross referencing between the annexes is accurate and traceable. Typical inconsistencies may happen easily, e.g., the Outline speaks about a lifetime of solar PV plants of 25 years, but the emission reductions are calculated for 20 years without further explanation. At the same time, equipment (units, appliances, etc.) cannot be considered to generate emission reductions after the end of its lifetime and would therefore need be removed from the calculation after the end of its lifetime or replaced by new equipment. Hence, double check that key parameters are applied in a consistent manner, such as the technology lifetime across all Annexes and the main Outline or Proposal document.

5.2 NAMA Facility Monitoring and Evaluation Framework

The NSPs aim to contribute to the overall objectives of the NAMA Facility, hence, a harmonised monitoring and evaluation (M&E) system is desirable. An important aspect of NSP implementation is the need to demonstrate progress on the mandatory core indicators e.g., on GHG emission reductions - core indicator M1 - in a systematic and verifiable manner. To do this, NSPs' data collection and monitoring and reporting systems need to be harmonised with each other and must be sound and systematic. Hence, it is recommended that the NSP Outline and Proposal already take into account the requirements as defined in the NAMA Facility Monitoring and Evaluation Framework.

The users should already in the Outline Phase bear in mind that the measurability of the data will be important and essential during the NSP implementation. 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 NSP's M&E Plan. Please refer to the NAMA Facility Monitoring and Evaluation Framework for further information and requirements for reporting of GHG emission reductions under core indicator M1.

6 Sector specific considerations

The Mitigation Annex was developed to be used for various mitigation measures applied by NSPs. As mitigation measures can be very different, with different approaches and methodologies applied to determine the mitigation potential, the template may not satisfy all specific needs of an individual NSP. This may be also observed on a more generic level for some selected specific sectors. The NAMA Facility would therefore like to provide sector specific guidance on how the Mitigation Annex can be filled out taking sector specific circumstances into account. This sector specific guidance is presented as an Appendix to this Guideline. To date, the following sector specific guidance is available:

Appendix	Sector
Appendix A1	Agriculture, Forestry and Other Land Use (AFOLU)
Appendix A2	Municipal Solid Waste Management

In addition, the NAMA Facility is also offering examples for the Mitigation Annex. The following examples are currently available:

Example	Phase	Description
01	Outline (Annex 6)	Energy Efficiency (EE) in residential buildings, including renewable energy measures (RE). The example as well as a podcast can be found on the NAMA Facility website.

The NAMA Facility will continue to work on development of further sector specific guidance and Mitigation Annex examples. Please check the NAMA Facility website on a regular basis.

7 Checklist

Section	Completeness Check		
1. Results	Have you filled in the required **NSP information**?		
	Have you filled in the **NSP duration** (number of years and months) and the **requested NSP funding**?		
	Is the section on **NSP cost-efficiency** properly filled out? (see section performance indicators in Sheet 1 Results)		
2. Parameters and Assumptions	Is the list of **parameters and assumptions transparently filled** out with sufficient justification and references?		
3. Direct mitigation	Have you described the Business As Usual (**BAU) scenario**, the **baseline scenario** (if different to BAU) and the **NSP boundary** (incl. lifetime of the technology)?		
	Is the a**pproach/methodology followed for Emission Reduction (ER) calculation** (Baseline Emissions (BE) minus Project Emissions (PE) minus Leakage Emissions (LE) = ER) clearly described and justified?		
	Are **leakage emissions** through the project intervention / project scenario taken into account and identified? Have you provided a justification; in case the effects are deemed not applicable?		
	Are **potential rebound effects** through the project intervention / project scenario taken into account and identified? Have you provided a justification; in case the effects are not applicable?	Not required in Outline Phase	
	Are the **annual Emission Reductions** (ER) and **cumulative values** over NSP duration, for additional 10 years after project finalisation provided?		
	Is '**over the technology lifetime**' calculated?		
4. Indirect mitigation	Are the **specifications of indirect mitigation effects** that are triggered or influenced by the NSP described (quantify if possible)?		
	Is the **approach** for determining indirect emission reductions different from the methodology applied for direct emissions methodology?	No	
	Are **sources of indirect Emission Reductions (ER)** and **difference to the baseline** clearly described?		*If No is selected above, then this checklist item is not valid.*
	Have you determined the **baseline emissions** accordingly?		
	Have you determined the **project emissions** accordingly?		
	Have you determined the **leakage emissions** accordingly?		

8 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.

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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).

NAMA Facility (2020), Monitoring and Evaluation Framework.

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 A1: Agriculture, Forestry and Other Land Use (AFOLU)

1. Introduction and objectives

This chapter outlines key aspects that must be considered when estimating and presenting the mitigation potential of NSPs in the Agriculture, Forestry and Other Land Use (AFOLU) sector. The main objective is to facilitate filling out the Mitigation Annex appropriately, taking into account sector specific issues (e.g., non-permanence and leakage) that need to be considered in addition to the aspects explained and provided before in the general Guideline. To this end, the chapter explains crucial elements in AFOLU mitigation calculations and provides guidance on how common pitfalls can be addressed.

AFOLU is an (economic) sector defined by the IPCC which includes activities related to Agriculture, Forestry, and Other Land Use. AFOLU can lead to both CO_2 emissions (e.g., from deforestation) and CO_2 sequestration (e.g., afforestation and soil carbon sequestration). Agriculture activities included in the AFOLU sector can also be a source of CH_4 and N_2O emissions; e.g., CH_4 from livestock enteric emissions and rice cultivation, N_2O from manure management, managed agricultural soils receiving N inputs as well as biomass burning (IPCC 2014).

2. Common pitfalls of AFOLU mitigation calculations

Leakage

To capture actual GHG emission reductions/removals, it is crucial to consider leakage (see section 3.1.4 of this Guideline for general explanation of leakage). Leakage occurs when GHG emission reductions within the boundaries of the project lead to higher GHG emissions elsewhere. This happens, for instance, if a shortfall in meat supply caused by the establishment of agroforestry systems and the cattle is compensated by additional cattle and/or conversion of forests in pastures in other locations. Managing leakage is complex as it requires knowledge about the (future) activities of (diverse) actors within and outside the project boundaries. Users should conduct a comprehensive leakage assessment as described in section 3.1.4 of this Guideline. If leakage is unlikely to happen, this should be justified.

Non-permanence

To achieve long-term – ideally everlasting – mitigation benefits, GHGs must be permanently kept out of or removed from the atmosphere. While some AFOLU activities (e.g., avoided N_2O from fertiliser or GHG emission reductions from changed diet patterns) are effectively permanent since avoided GHG emissions cannot be re-emitted, others (e.g., agricultural soil carbon sequestration, afforestation and reforestation) have an inherent risk of future reversals. Users should assess the risk of non-permanence of achieved GHG emission reductions/removals, i.e., the likelihood that sequestered GHGs are emitted back into the atmosphere, either due to natural events (e.g., wildfires, floods, diseases) or human interventions (e.g., forest mismanagement, farmer's decision to convert forests into other land use). Information should be provided on insurance mechanisms that are used to reduce this likelihood (e.g., risk buffer) and on how potential non-permanence would be accounted for and monitored.

Other rebound effects

If applicable, users should describe other potential rebound effects resulting from the NSP implementation (e.g., increased nitrous oxide (N_2O) emissions caused by measures to enhance soil carbon sequestration, or increased consumption caused by increases in yields). The users should also demonstrate how these effects are minimised.

3. How to address sector specific issues when filling the Mitigation Annex

Calculation

To ensure the transparency and traceability of calculations conducted for the (direct and indirect) mitigation potential estimate, the users should provide a detailed explanation of the following aspects:

- Overall calculation procedure and approach
- Formulae applied for calculating
- Assumptions, parameters, criteria, equations, and other justifications for estimating activity data, emissions factors and performance indicators
- (Raw) data and information used to construct the reference level, the project scenario, the geographical project boundary, and related estimations (including potential mitigation)
- Application of conservativeness principle (i.e., input values and assumptions being based on conservative estimations) to avoid overestimation

Generally, the users should provide as much detail as possible and describe all steps undertaken to estimate GHG reductions – that is, the decreases in GHG emissions or the increases in GHG removals – rather than just presenting summaries or totals. The origin of (raw) data should be clearly indicated to allow for cross checks and plausibility assessments of variables and values. Examples include both activity data and other parameters:

- Activity data: forest area, tree cover, deforestation rate, land area converted to other land use, managed land, etc.
  - → Potential data sources: ground surveys; local, regional, and national statistics; forest inventories; satellite data
- Carbon stock: quantity of carbon in a pool (e.g., aboveground biomass, below ground biomass, dead wood, litter, and soil organic matter); needed to estimate changes in carbon stock from carbon pools
  - → Potential data sources: default values provided by the IPCC
- Emissions factor(s): the GHG emissions rate(s) of a given source per unit of activity or input. For instance, the IPCC suggests the use of three emissions factors to estimate direct N_2O emissions from managed soils: one for the amount of N_2O emitted from synthetic and organic applications to soils, one for the amount of N_2O emitted from an area of drained/managed organic soils, and one for the amount of N_2O emitted from urine and dung. Emissions factors can differ between ecosystems, geographical and climatic zones, etc.
  - → Potential data sources: emissions factor used in national inventory or in other projects implemented in the country; default values provided by the IPCC

Data units (e.g., ha) should be provided for all numbers and used consistently. It should be clarified how certain key terms are understood and defined, especially those that lack a common definition, such as 'forest' and 'deforestation'.

A detailed explanation should be provided on whether and how the estimation approach takes into account risk discounts for uncertainties, leakage and non-permanence risks, as well as other rebound effects (see sections below). If a specific tool has been used to conduct calculations (e.g., a GHG Protocol for Agriculture tool, a GHG Protocol for Forestry tool), this tool should be made available. Additional calculation sheets should be presented as additional sheets within the Mitigation Annex rather than just providing a summary. Users should also give input on the various ecosystems and climatic zones the project would be addressing with differing calculations in case those are needed. Furthermore, users should calculate cost efficiency of the proposed investment in relation to direct GHG emission reductions/removals (tCO_2e / EUR of funding). The cost efficiency is unfavourable, for instance, if the conversion of degraded or deforested land into climate-smart agroforestry systems requires large investment volumes but is expected to generate a relatively limited amount of direct GHG emission reductions/removals.

Uncertainty analysis

An accurate measurement or estimation of the GHG mitigation potential of AFOLU activities is difficult compared to other sectors, with GHG fluxes from land use and land-use change activities varying significantly across spatial and temporal scales. First of all, it is not always possible to separate anthropogenic and natural GHG fluxes (e.g., in the case of deforestation caused by fire). Second, the data used to estimate GHG fluxes is often based on (country-level) statistics as well as information retrieved from remote sensing (e.g., satellite data to estimate GHG emissions from forest fires), rather than field measurements. Third, depending on the availability of consistent, precise and up-to-date data as well as stakeholder capacities, methods for quantifying actual GHG emissions/removals range from default methodologies (e.g., an IPCC default methodology to compute stock-difference) and the use of proxies (e.g., carbon loss associated with conversion of forest to other land use as a proxy for GHG emissions from deforestation) to complex estimates (e.g., model-based spatial analyses).

Evidence shows these complexities and challenges often lead to substantial measurement errors and/or uncertainties (usually as a combination of random errors, caused by a lack of precision, and systematic errors, caused by biased or incorrect assumptions, models and variables). Therefore, users should present and explain a detailed analysis that quantifies the uncertainty of baseline scenario estimates as well as expected performance (i.e., GHG emission reductions/removals), taking into account and explaining all relevant error sources. It should be clear what information forms the basis of uncertainty (e.g., quantification or expert judgement) and what factors are considered in the analysis (in particular confidence intervals and standard deviation). If conservativeness safeguards (e.g., uncertainty discounts) are applied, they should be explained in detail as well. Finally, a sensitivity analysis should be performed on the most critical and most uncertain assumptions in the calculations.

When filling out the Mitigation Annex, all relevant input parameters and assumptions should be listed in Sheet 2 (Parameters & Assumptions). To ensure transparency and traceability, users are asked to provide the source of each parameter and assumptions. In addition, they should estimate the accuracy of all values. Accuracy is evaluated as precision (relative error margin in %) based on a 90% confidence interval. The aim should be to rely on values of high accuracy (+/- 5%) whenever possible. Sheet 2 contains a separate column for a detailed description and additional comments. This should be used to explain the choice of parameters and assumptions, as well as relevant error sources (see also section 4.5 of this Guideline for further instructions).

Accounting approach

The Mitigation Annex should contain a detailed explanation of the accounting approach, which includes the measuring, reporting and verification of GHG emissions as well as defining the benchmark against which project performance is assessed. If the project follows an existing framework (e.g., the FCPF monitoring and accounting framework), potential deviations or amendments (e.g., a different reference period) should be transparently listed, discussed and justified.

Baseline setting

The baseline scenario is the reference case for the NSP as it describes what would have occurred in the absence of the proposed project (please refer to section 3.1.2 of this Guideline for general instructions regarding baselines). Users should provide full methodological detail on the calculation of baseline GHG emissions/removals, project GHG emissions/removals as well as (expected) GHG emission reductions. This includes the explanation of the selected reference period, if applicable. The users should list the sources of information and differentiate between expert knowledge, qualitative and quantitative analyses, modelling, etc.

Direct and indirect emission reductions

The users should differentiate between direct and indirect GHG mitigation potential, and make sure that direct and indirect GHG emissions/removals are indicated, substantiated, and correctly attributed (see section 3.2.2 of this Guideline). It must be noted though, that a reasonable direct mitigation potential is a pre-condition for the NAMA Facility to choose projects.

GHG removals

Users should describe and sufficiently explain how GHG removals were calculated. GHG removals are presented as negative (project) GHG emissions.

Example 1: Project plans to reforest 2,000 ha of barren land, creating a natural carbon sink capable of removing 20,000 tCO_2e/a during growth phase. The most likely baseline scenario for the land is continuation of the status quo (i.e., it will continue to lie barren; no GHG emissions/removals expected in the absence of the project). No existing vegetation (tree/non-tree biomass) is cleared. Leakage does not apply for the project activity.

- Baseline GHG emissions/removals (BE_y): 0 tCO_2e/a
- Project GHG emissions/removals (PE_y): -20,000 tCO_2e/a
- Leakage GHG emissions/removals (LE_y): 0 tCO_2e/a
- GHG emission reductions (ER_y) = 0 tCO_2e/a - (-20,000 tCO_2e/a) - 0 tCO_2e/a = **20,000 tCO_2e/a**

Example 2: Project plans to reforest 2,000 ha of barren land, creating a natural carbon sink capable of removing 20,000 tCO_2e/a during growth phase. The most likely baseline scenario for the land is continuation of the status quo (i.e., it will continue to lie barren; no GHG emissions/removals expected in the absence of the project). Existing vegetation (tree/non-tree biomass) is cleared[5], creating 5,000 tCO_2e in the first project year. Leakage does not apply for the project activity.

Year 1

- Baseline GHG emissions/removals (BE_y): 0 tCO2e/a
- Project GHG emissions/removals (PE_y): 5,000 tCO_2e/a -20,000 tCO_2e/a
- Leakage GHG emissions/removals (LE_y): 0 tCO_2e/a
- Emission reductions (ER_y) = 0 tCO_2e/a - (-20,000 tCO_2e/a + 5,000 tCO_2e/a) - 0,000 tCO_2e/a = **15,000 tCO_2e/a**

Year 2

- Baseline GHG emissions/removals (BE_y): 0 tCO_2e/a
- Project GHG emissions/removals (PE_y): -20,000 tCO_2e/a

[5] In this example, the existing vegetation has no removal capacity. If the existing vegetation would remove a certain amount of carbon from the atmosphere per year, it would be counted as baseline GHG removals.

- Leakage GHG emissions/removals (LE_y): 0 tCO_2e/a
- Emission reductions (ER_y) = 0 tCO_2e/a - (-20,000 tCO_2e/a) - 0 tCO_2e/a = **20,000 tCO_2e/a**

Example 3: Project plans to improve the level of fertilization over 1,000 ha of cropland, by shifting from low fertilization practice (removal of residues from the field) to high fertilization practice (use of green manure and cover crops), enabling an increase of C inputs. The baseline scenario for the fertilization practice is the continuation of the status quo (i.e., low fertilization practices are maintained) which will contribute to further reduce soil carbon stocks. The project will improve carbon sequestration compared to the baseline scenario by enabling reduced loss of carbon stocks by 300 tCO_2e/a during the time period for soil carbon stock change (20 years in this case). Leakage does not apply for the project activity.

- Baseline emissions from decrease in soil organic carbon (SOC), ($BE_{SOC,y}$): 1,223 tCO2e/a
- Project emissions from decrease in SOC ($PE_{SOC,y}$): 923 tCO_2e/a
- Leakage (LE_y): 0 tCO_2e/a
- Emission reductions (ER_y) = 1,223 tCO_2e/a - 923 tCO_2e/a - 0 tCO_2e/a = **300 tCO_2e/a**

Further information can be found at IPCC AFOLU Guideline (2014), GHG Protocol (2005) **and** GHG Protocol LULUCF Guidance (2006)

Appendix A2: Municipal Solid Waste Management

1. Introduction and objectives

This appendix outlines key aspects that must be considered when estimating and presenting the mitigation potential of NSPs in the municipal solid waste (MSW) sector. The guidance provided is partially also relevant for treatment of other waste types such as waste from agriculture, sewage sludge, industrial and construction and demolition waste. The main objective is to facilitate filling out the Mitigation Annex appropriately, taking into account sector specific issues (e.g. data availability, baseline definition, etc.) that need to be considered in addition to the aspects explained and provided before in the general Guideline. To this end, the appendix explains crucial elements in GHG mitigation calculations and provides guidance on how common pitfalls can be avoided and addressed.

According to IPCC the waste sector mainly covers emissions from solid waste disposal, biological treatment of solid waste, incineration, and open burning of waste, as well as wastewater treatment and discharge (IPCC 2006). In many countries, CH_4 emissions from solid waste disposal sites (SWDS), such as dump sites or landfills, are the major source of GHG emissions in the solid waste sub-sector. For activities such as incineration or recycling, CO_2 emissions play an important role and the emission reductions are partially or mostly occurring outside of the waste category as they will be achieved within the energy or industry sector. The IPCC waste category furthermore includes wastewater treatment which is however not subject of this specific guidance.

2. Common pitfalls of waste mitigation calculations

Data availability and baseline definition

The waste sector in many cases (and countries) faces important challenges related to data availability (e.g. waste collection rates, disposal practices, waste composition, waste generation rates per capita, etc.). However, the availability and quality of such data is important for determining baseline emissions and estimating potential emission reductions resulting from mitigation activities. In situations where the informal sector plays an important role and where the existence of other informal practices such as illegal waste disposal in uncontrolled dumpsites and uncontrolled open waste burning are still common practice, the baseline situation should be properly assessed and baseline emissions need to reflect the country's socio-political situation.

The user of the Mitigation Annex (in the following referred to as "user") should follow conservativeness principles where there is a risk of baseline overestimation and should document, reference and justify main assumptions. Factors that could lead to overestimation include but are not limited to:

- Waste composition: the use of surveys and local, regional, and national statistics and studies is encouraged. When national data is not available, benchmark data such as IPCC default values could be used. However, users are advised to take into consideration trends in the sector and adjust the waste composition accordingly given that waste composition and generation is subject to change due to development of demographic, macroeconomic and / or socio-political circumstances. Planned and recently introduced policies should be taken into consideration and where appropriate correction factors should be proposed and documented (e.g. policies restricting the use of single use plastics, policies promoting waste segregation, etc.).
- Waste generation rates: socio-economical tendencies could change the waste generation quantities over the implementation of the project. Some of these main factors include the level of urbanization, population increase, income trends and higher consumer demand. Similarly, planned and recently introduced policies should be taken into consideration when estimating and forecasting waste generation rates.
- Historic waste composition and generation and its development over time including forecasting during the envisaged NSP lifetime. Generally, with increased income more waste is generated and the composition changes from a high organic fraction to a high fraction of

packaging materials such as plastics and paper. In the absence of any reliable data or proxy (e.g. a neighbouring country with similar socio-economic circumstances), assumptions should be taken in a conservative manner, i.e. assuming values for the relevant parameters that would not overestimate the emission reduction potential.

- Solid waste disposal practices: Users should demonstrate the current practices in terms of different waste disposal options to determine the baseline. For example, in rural areas it could be more probable that certain practices such as open burning, organic waste use as animal feed or unmanaged disposal of solid waste are still applied. In contrasts, in higher income and high-density populated urban areas it could be expected that other practices such as landfilling or uncontrolled disposal prevail.
- Methane Correction Factor (MCF): the MCF serves to take into account the aerobic versus anaerobic decomposition of waste (IPCC 2019). The MCF indicates the extent to which the CH_4 producing capacity is realised in each type of treatment and discharge pathway and system. Thus, it is an indication of the degree to which the system is anaerobic (IPCC 2019). When the actual situation of the disposal sites is unknown, users are encouraged to follow a conservative approach applying a lower MCF within the possible range of appropriate MCF values. Nevertheless, following the concept of suppressed demand, a higher MCF representing a managed landfill might be applied if sufficiently justified (for further information on suppressed demand, refer to section 3.1.2 ‘Defining the Baseline scenario’ of the Mitigation Guideline).
- In the absence of a reliable data, NSPs are encouraged to collect country specific data applying for example sampling approaches as described by the CDM Guideline “Sampling and surveys for CDM project activities and programmes of activities“.

Appropriate consideration of the informal sector

In addition to the baseline definition, the consideration of the interactions between the project and the informal sector should be properly documented and reflected in the calculations. For example, if an informal sector in the waste sector of the host country exists, that already (at least partly) collects/segregates paper/plastics/metals from MSW (that is then sold for recycling purposes), users should take such aspects into consideration when projecting waste amounts and estimate emission reductions (e.g. that a proportion of certain materials from waste generated may not be available for the recovery and/or recycling within the project). Even if not directly related to mitigation, other impacts on the informal sector (e.g. on the workers), as well as potential actions to mitigate/minimize negative impacts on their livelihood should be described in the documentation submitted to the NAMA Facility.

Effective time of implementation - Waste segregation

To ensure that mitigation calculations reflect as much as possible the actual pace of implementation of the proposed GHG mitigation actions in the solid waste sector, users should ensure that most realistic assumptions are being considered, e.g. with regards to the time required for enabling change in people’s behaviour that may lead to achieving full or at least substantial level of segregation of waste at the source. Unfeasible assumptions such as considering that waste would be segregated perfectly according to the different waste stream already right from the start date of implementation of the project should be avoided, as this will likely result in an overestimation of the emission reduction potential of the entire NSP.

Applicants should assess the potential level of achieving the behavioural change over time, while the assumptions made should be consistent with mechanisms planned to be introduced by the NSP that support this change in behaviour. For example, NSPs with strong communication and capacity building campaigns targeting end users could expect a faster change in behaviour. However, examples from countries with long time experience in waste segregation at source show that still achieving a “perfect” segregation is not possible. Therefore, NSP should take conservative assumptions with regard to the achievable level of segregation at source.

3. How to address sector specific issues when filling out the Mitigation Annex

Calculations

To ensure the transparency and traceability of calculations conducted for the (direct and indirect) mitigation potential estimate of the NSP, the user should provide a detailed explanation of the following aspects:

- Overall calculation procedure and approach
- Formulae or model applied for the calculations
- Assumptions, parameters, criteria, equations, and other justifications for estimating activity data, emissions factors and performance indicators, and if applicable, default values used, including the source
- (Raw) data and information used to construct the reference level (baseline), the project scenario, the geographical project boundary, and related estimations (including potential mitigation)
- Application of conservativeness principle (i.e., input values and assumptions being based on conservative estimations) to avoid overestimation

The decomposition of organic waste in landfills occurs over several years. Accordingly, the waste landfilled in one year, will not release all potential methane emissions in the same year. To reflect this situation, first order decay models shall be applied in the calculations. The resulting emission profile shall be taken into consideration when presenting the mitigation potential of the NSP. In light of this fact, landfill gas capture projects should also apply conservative assumptions with regard to landfill gas generation and its potential capture and use, especially in the first years of implementation of landfill gas capture facilities.

Generally, the user should provide as much detail as possible and describe all steps undertaken to estimate GHG reductions rather than just presenting summaries or totals. The origin of (raw) data should be clearly indicated to allow for cross checks and plausibility assessments of variables and values. Examples include both activity data and other parameters:

- Activity data: Waste composition, waste generation rates, waste collection rates, disposal practices, population and population growth trends, etc.
- Emission factors:
  - Composting: default emission factor of methane and nitrous oxide per tonne of waste composted, etc.
  - Recycling: net recycling emission factor, specific electricity and/or fossil fuel consumption for the production of virgin materials, degradation correction factor (to account for the degradation of the material during production), adjustment factor based on the share of the production in non-Annex I countries etc. Default values from the CDM methodology AMS-III.AJ. could be used.
  - Landfill: Methane generation rate constant, oxidation factor, fraction of degradable organic carbon that can decompose, MCF, etc.

As mentioned before, mitigation activities in the waste sector are often resulting in emission reductions in other sectors such as energy, industry or agriculture. These effects should be carefully assessed whenever products produced from waste shall replace "conventional" products. For example, the use of compost to replace synthetic fertilizers could suffer from low quality and related low acceptance by potential users (i.e. farmers) so that expected replacement rates would not be achieved as planned.

Direct and indirect mitigation

The users should differentiate between direct and indirect GHG mitigation potential, and make sure that direct and indirect GHG emissions are indicated, substantiated, and correctly attributed. In general, the definitions of direct and indirect mitigation as provided by this Guideline and the GHG mitigation Annex shall be followed. However, in the MSW sector, especially in case of recycling activities, further considerations can become relevant. The mitigation potential of recycling activities depends on effects achieved within the whole value chains from raw material extraction towards the final products (mainly packaging materials). These value chains are often established cross-border.

In practice it is challenging to track the origin and destination of recovered and recycled materials, as well as ensuring that the recycled materials are afterwards fed back into the economic cycle. Furthermore, appropriate consideration of cross-border material flows can be problematic without the existing measures and monitoring requirements. Therefore, NSPs should transparently document the effects and disclose related uncertainties. The related mitigation potential achieved in cross-border value chains should be presented separately in the GHG mitigation Annex before being summed up with the mitigation potential of other activities. Mitigation clearly achieved outside of the NSP host country should be presented and included in the indirect mitigation calculations.

Uncertainty

An accurate measurement or estimation of the GHG mitigation potential of waste sector activities have some challenges. This is especially due to the general lack of data availability in the sector. Experience shows that these challenges often lead to substantial overestimation and/or uncertainties especially in the baseline calculations.

Therefore, user should present and explain a detailed analysis that quantifies the uncertainty of baseline scenario estimates taking into account and explaining all relevant error sources (e.g. waste generation and composition forecast, waste disposal practices, differentiation between direct and indirect results, etc.).

When filling out the Mitigation Annex, all relevant input parameters and assumptions should be listed in Sheet 2 (Parameters & Assumptions). To ensure transparency and traceability, users are asked to provide the source of each parameter and assumption. In addition, they should estimate the accuracy of all values. Accuracy is evaluated as precision (relative error margin in %) based on a 90% confidence interval. The aim should be to rely on values of high accuracy (+/- 5%) whenever possible. Sheet 2 contains a separate column for a detailed description and additional comments. This should be used to explain the choice of parameters and assumptions, as well as relevant error sources (see also section 4.5 of this Guideline for further instructions).

References

IPCC (2006): 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 – Waste

Appendix B: Glossary

Please consult also the general NAMA Facility Glossary available at the NAMA 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 NSP funding during the NSP period:

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

Indirect mitigation potential - Indirect GHG emission reductions achieved by the NSP capture emission reductions beyond those related to direct investments, e.g., resulting from technical assistance. Hence, potential emission reductions that fall in the following categories:

- Results of technical cooperation (TC) component during and after NSP period
- Results of financial cooperation (FC) component but only for units installed / measures implemented after NSP end, as result of the continuation of the financial mechanism
- Timing includes:
    - Technical cooperation: during NSP period and during period of 10 years after NSP end, (during lifetime: optional)
    - Financial cooperation: for units installed after NSP end for period 10 years after NSP end, (during lifetime: optional)

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 / NSP 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 NSP 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 NSP and the specification of GHGs and sources under the control of the project participants that are significant and reasonably attributable to the NSP, 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.