Standard Indicator 1 - Mitigation

Estimating emission reductions from IKI project activites

Online Seminar 2 - AFOLU

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Virtual, 02.08.2023

Zukunft Umwelt Gesellschaft

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Agenda

1. Introduction
2. Common understanding of direct and indirect mitigation
3. Typical emission sources for emission reduction activities / measures in the AFOLU sector (incl. applicable methodologies)
4. Typical baseline and project scenario (incl. leakage)
5. Calculation of emission reductions (incl. example)
6. Relevant default values and reference source
7. Conclusion

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1 Introduction

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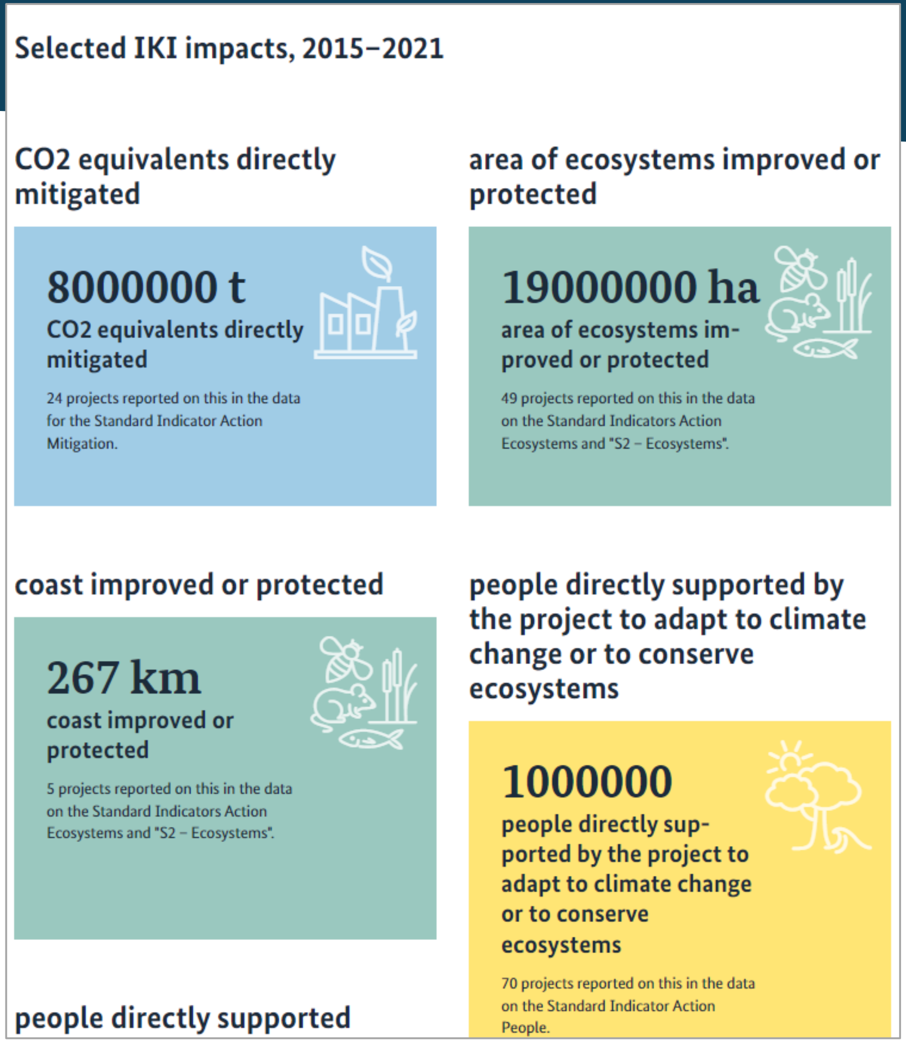
Introduction to the IKI Standard Indicators (SI)

- First introduced in 2015 and revised in 2022
- SI enable the IKI to aggregate headline results across individual projects
- Data is used to communicate IKI‘s achievements to the public, German parliament and other stakeholders and as part of national and international reporting



Source: https://www.international-climate-initiative.com/en/about-iki/impact-and-learning/ .

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Overview of IKI Standard Indicators

SET A - Old SI

- Action Mitigation
- Action Ecosystems
- Action People

SET B – SI as of 2022

SI 1 - Mitigation	**GHG emissions reduced or carbon stocks enhanced directly or indirectly by IKI project measures.**
SI 2 - Ecosystems	Area of ecosystems with improved conservation and sustainable use due to IKI project measures.
SI 3 - Adaptation	Number of people directly and indirectly supported by IKI projects to better adapt to climate change.
SI 4 - Capacity People	Number of people directly supported by IKI projects through networking and training to address climate change and/or to conserve biodiversity.
SI 5 – Leveraged Finance	Volume of private and/or public finance leveraged for climate change and biodiversity purposes in EUR.

Provisions for IKI projects in a nutshell

- Report **on new Standard Indicators (Set B),** if the project has submitted the first interim report in April 2022 or thereafter.
  - Older projects may be required to switch due to large amendment requests or can switch voluntarily
- Report **on all relevant Standard Indicators** (i.e. SI for which the project is producing results)
- Report in line with the respective Indicator Guidance Sheets in the **IKI Project Planning and Monitoring Guidelines**
- Report on new Standard Indicators (SET B) through the **IKI Standard Indicator Report** (Annex 7, Excel Tool)

Key guidance documents (click here)

- IKI Standard Indicator Report (Excel Tool)
- IKI Project Planning and Monitoring Guidelines (incl. Standard Indicator Guidance Sheets

Please note that slight updates where made to both documents in July 2023 to improve clarity and useability.

2 Common understanding of direct and indirect mitigation

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IKI differentiates between direct and indirect GHG mitigation

Estimating mitigation required for reporting of direct financed and technical support leading to immediate mitigation

Direct GHG emission reduction / carbon stock enhancement (in tCO_2e)	reduced or avoided immediately through mitigation measures (partly) ***financed by the IKI project or measures***	Estimating mitigation required for reporting
Indirect GHG emission reduction / carbon stock enhancement (in tCO_2e)	reduced or avoided by means of ***IKI-funded technical support*** for mitigation measures financed by a party other than the IKI, but the IKI plays a critical role in providing essential technical implementation support	
Long-term mitigation impact through enhanced policy frameworks	potential future / long-term emission reductions through ***enhanced policy frameworks***	Reference to existing target only

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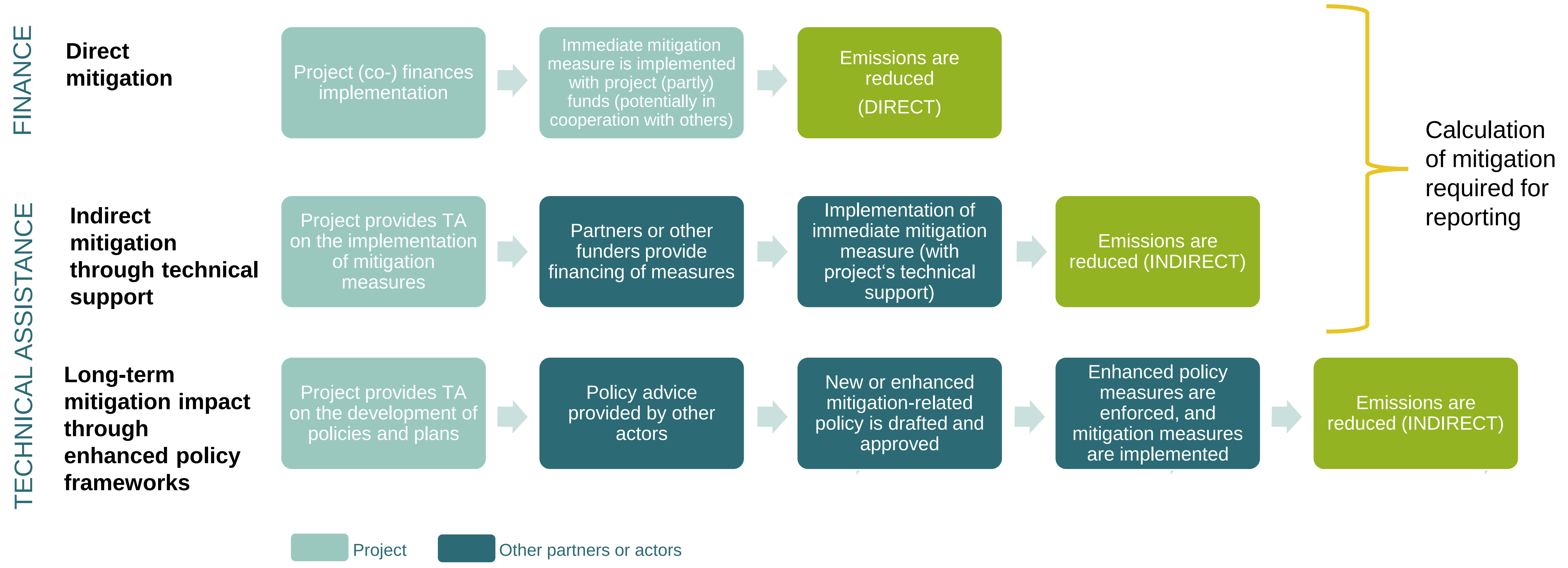
Different pathways and causal chains of IKI projects

Direct financing, technical support and enhanced policy framework



Project activities lead to different impact and potential mitigation

Examples for the three categories of impact

Direct mitigation	Indirect mitigation through technical support	Enhanced policy frameworks
• On-the-ground piloting or demonstration components of IKI projects • Use of financial mechanisms • Development and financing of an app • Project activities resulting in lower-carbon intensity of services or products	• Technical capacity development for the scaling of pilots • Implementation of community forest management plans that translate into protected forest areas • Improved land or marine management status • Short-term removal of regulatory barriers	• Technical support on the development/ revision of NDCs or LT-LEDS • Development of sectoral policies / strategies • Development of subnational net-zero emissions action plans • Roadmaps for policies
Immediate GHG emission reductions	**Short-term / upscale GHG emission reductions**	**Long-term mitigation impact / potential for future GHG emission reductions**

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3 Typical emission sources and emission reduction activities

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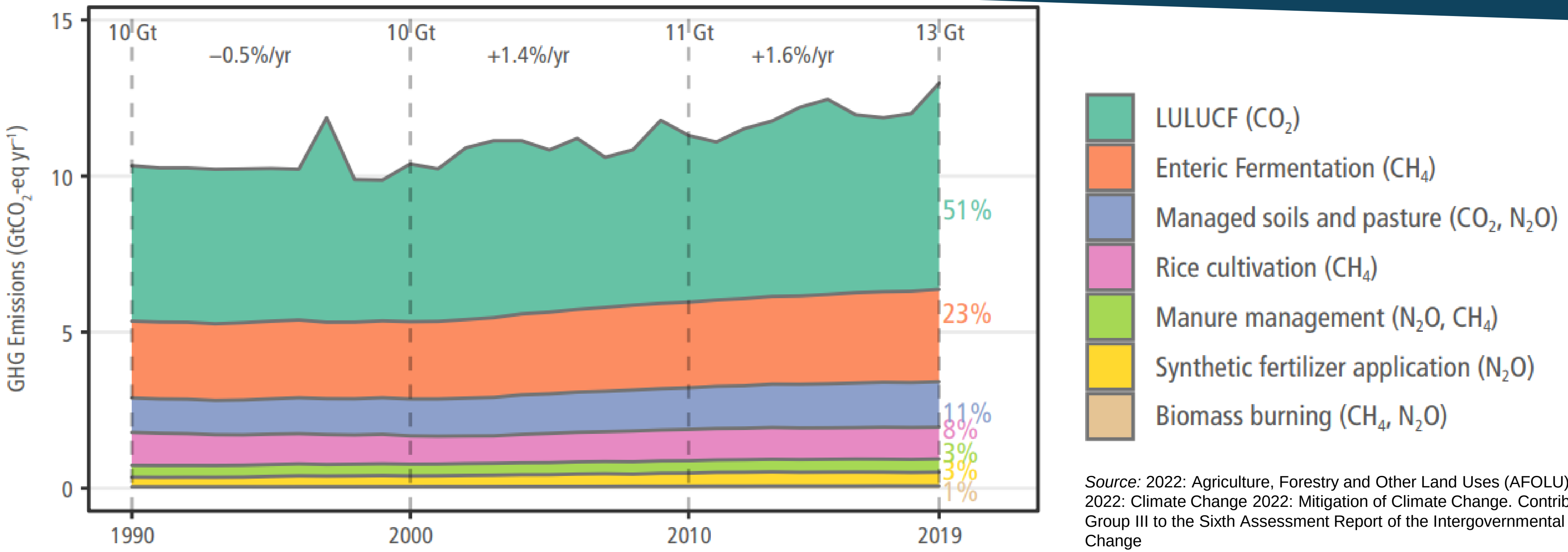
Global AFOLU-related CO_2 emissions trends since 1990

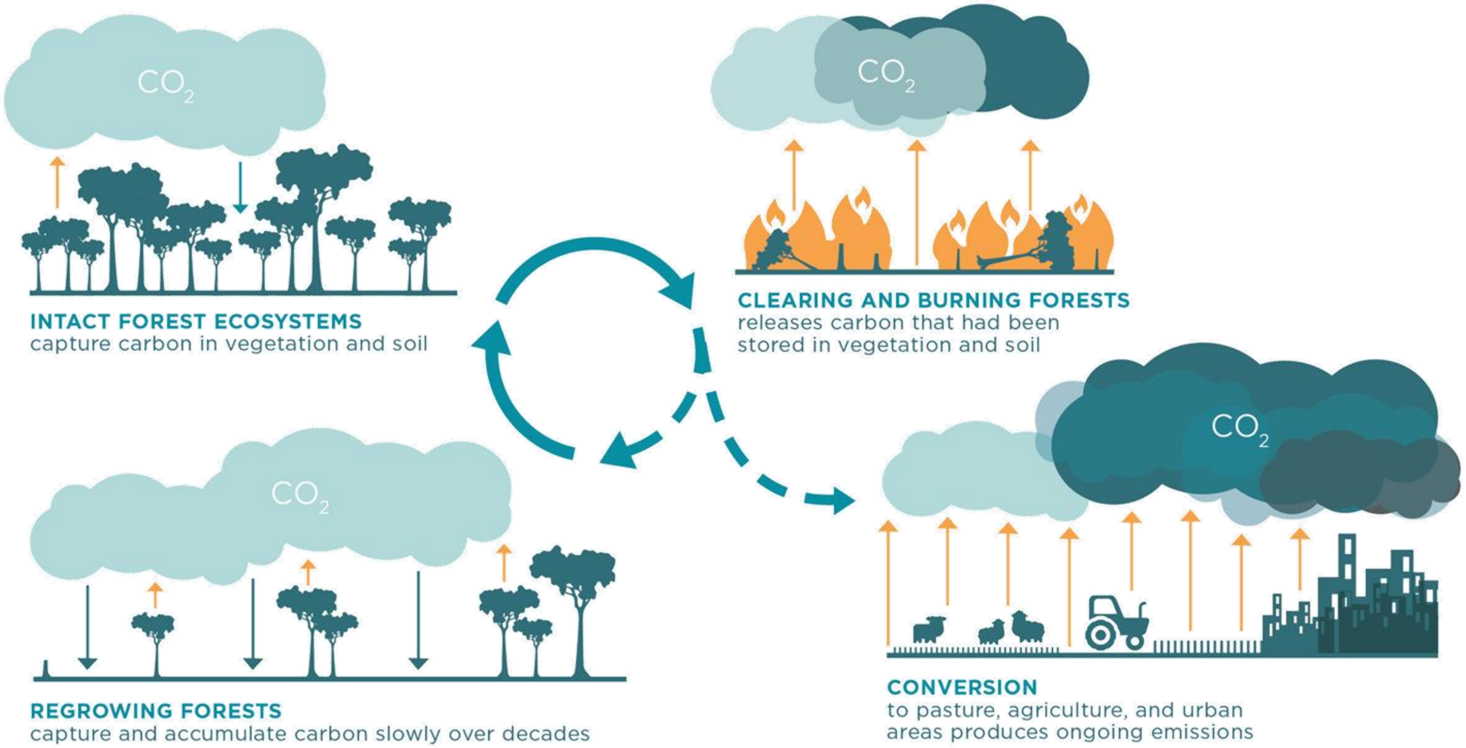
Key messages from IPCC-Report: ~21% of global total anthropogenic GHG emissions



Source: 2022: Agriculture, Forestry and Other Land Uses (AFOLU). In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

- Mainly driven by land use change which accounts for about half of total net AFOLU emissions.
- GHG emissions from the AFOLU sector are rising due to growing demands, but there are large mitigation potentials
- Despite the challenges, the AFOLU sector offers unique opportunities for climate change mitigation.

AFOLU sector accounts for GHG sources, as well as sinks



Source: CGDEV.org

Center for Global Development

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GHG emission mitigation activities in the AFOLU sector

Examples of Emission Reduction

- **Reduce emissions from Agriculture**
  - Cropland nutrient management N_2O
  - Reduced N_2O from manure on pasture
  - Manure management N_2O and CH_4
  - Improved rice cultivation CH_4
  - Reduced enteric fermentation CH_4
  - Reduced synthetic fertilizer production
- **Reduce emissions from Forests and other Ecosystems**
  - Reduce deforestation
  - Reduce forest degradation
  - Reduce conversion, draining, burning of peatlands
  - Reduce conversion of coastal wetlands (mangroves, seagrass and marshes)
  - Reduce conversion of savannas and natural grasslands

Examples of Carbon Stock Enhancement

- **Creation or improvement of carbon pools & reservoirs and their ability & capacity to sequester & store carbon**
  - Afforestation/Reforestation (AR)
  - Forest management
  - Agroforestry
  - Peatland restoration
  - Coastal wetland restoration
  - Soil carbon sequestration in croplands
  - Soil carbon sequestration in grazing lands
  - Biochar application

Emission target of the project activity serves as orientation for categorization

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4 Typical baseline and project scenario (incl. leakage)

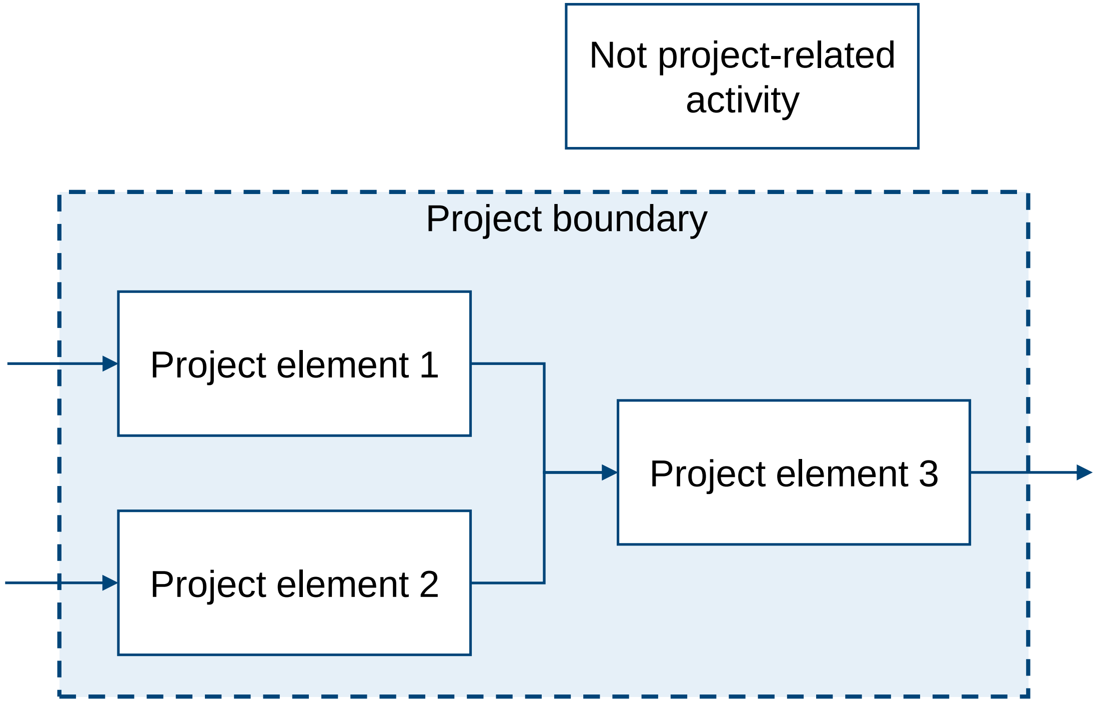
Project boundary

The project boundary

- Refers to the ***defined scope*** or geographical area within which emissions and emission reductions are accounted for
- Sets the limits for the emissions included in the assessment

For typical AFOLU-related projects

- The project boundary refers to the ***limits or borders of the designated project area***. This area could encompass various types of land, such as a farm, a protected site, or a specific region within a larger area, such as a municipality or a park



Source: own illustration

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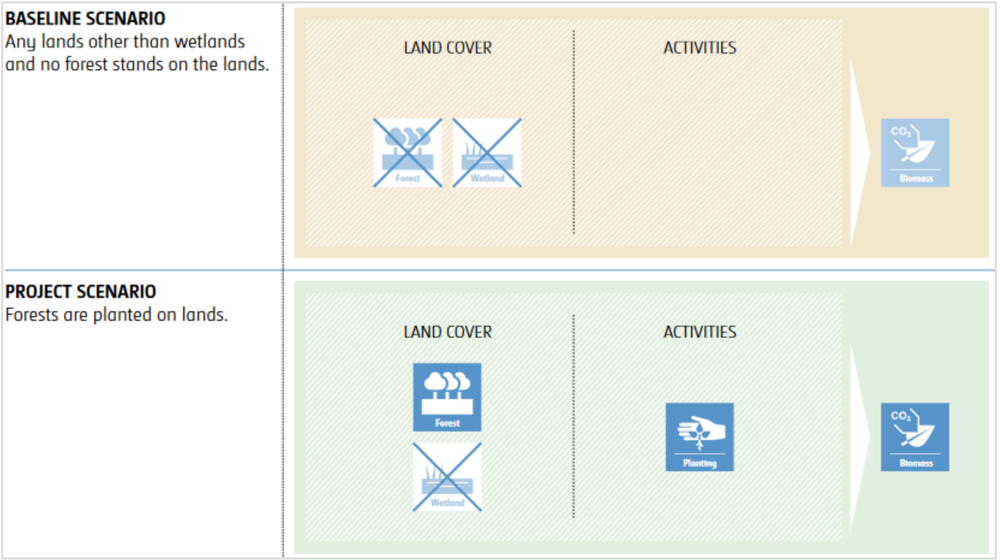
Typical baseline and project scenario

Baseline scenario

- reflects the emissions that would occur ***without the project***
- represents the reference situation, e.g.,
  - the continuation of current activities (e.g. Business-as-Usual)
  - emissions from an activity that represents an economically attractive course of action
  - a benchmark approach (considering emissions from similar project activities undertaken in the previous five years in similar circumstances)

Project scenario

- represents the emissions associated ***with the (proposed) project's implementation***
- reflects the expected outcomes of the project



Source: UNFCCC (2022): CDM Methodology Booklet, p. 280.

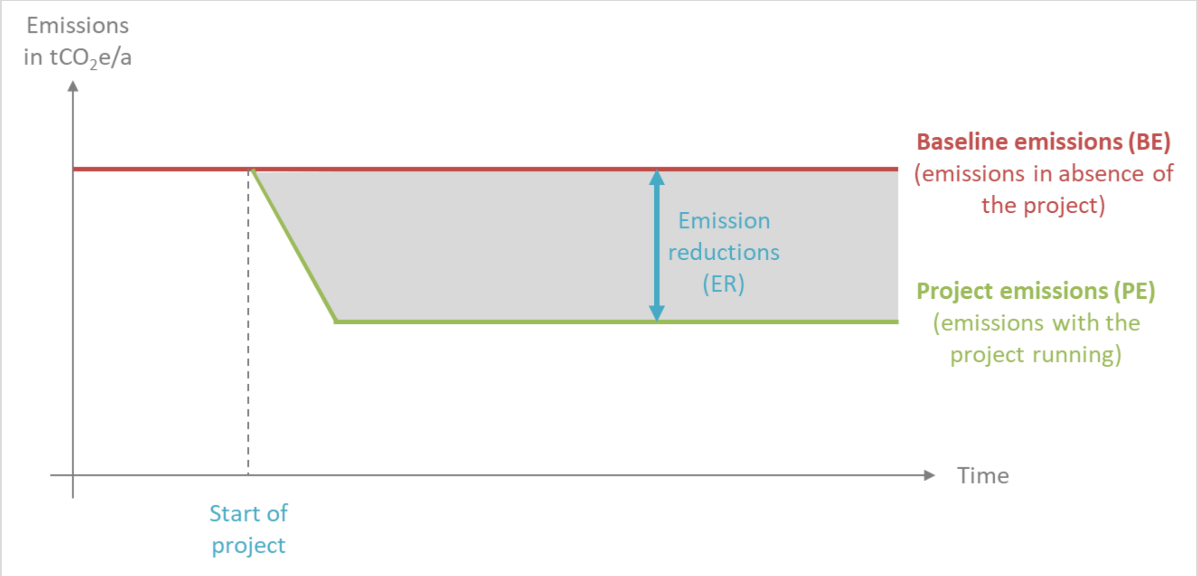
Calculation of emission reductions

General approach for mitigation activites considering baseline and project emissions

The achieved emissions reductions are typically calculated as the ***difference between baseline emissions and emissions after project implementation***, considering any potential leakage.

$$ER_y = BE_y - PE_y - LE_y$$

Where:
ER_y = Emissions 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)



Source: Mitigation Action Facility (2023): Mitigation Action Facility – Mitigation Guideline for the Project Concept Phase, p. 10

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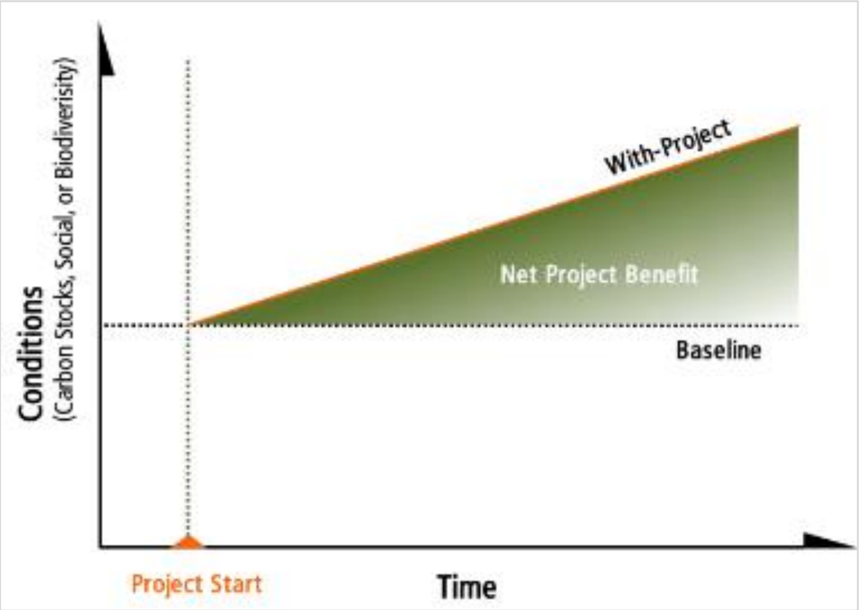
Calculation of carbon stock enhancement

General approach for mitigation activites considering baseline and project emissions

The carbon stock enhancements are typically calculated as the ***difference between carbon stock after project implementation and the carbon stock without intervention***, considering any potential leakage.

$$CSE_y = PCS_y - BCS_y - LE_y$$

Where:
CSE_y = Carbon stock enhancement in year y (tCO_2)
PCS_y = Project carbon stock in year y (tCO_2)
BCS_y = Baseline carbon stock in year y (tCO_2)
LE_y = Leakage emissions in year y (tCO_2)



Source: Johannes Ebeling, Jacob Olander - Forest Trends: Building Forest Carbon Projects Step-by-Step Overview and Guide p. 35

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Consideration of leakage emissions

GHG emissions which occurs outside the project boundary attributable to the project activity

Carbon leakage

- The increase of ***GHG emissions which occurs outside the project boundary*** which is attributable to the project activity (cf. Glossary: CDM terms)
- Under GHG Protocol, leakage emissions are also referred to as “secondary effects”
- Attention: leakage is used in different meanings: e.g., “physical leakage” from bio-digester (i.e., a project emission source)

Examples of carbon leakage

- Biomass projects
  - Shift of pre-project activities (e.g., deforestation outside the land area where the biomass is grown)
  - Emissions from biomass generation / cultivation and transportation (outside project boundary)
  - Competing uses for the biomass

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Accounting Principles

- Relevance
- Completeness
- Consistency
- Transparency
- Accuracy
- **Conservativeness**

Use conservative assumptions, values, and procedures when uncertainty is high. Conservative values and assumptions are those that are more likely to overestimate GHG emissions and underestimate removals, rather than underestimate emissions and overestimate removals.

- Permanence

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5 Calculation of emission reductions (incl. example)

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Example – Agriculture – Rice irrigation management

Project: Adjustment of water management practices in rice cultivation

- **Target group**: farmers cultivating rice in flooded conditions
- **Objective:** reduce methane emissions from anaerobic decomposition of organic materials in flooded rice fields
- **Project intervention**: Support farmers to switch from continuously to intermittent flooded conditions.

Gold Standard methodology:
[Methodology for methane emission reduction by adjusted water management practice in rice cultivation]

Source: [CCAFS]


Gold Standard
for the Global Goals

METHODOLOGY

METHODOLOGY FOR METHANE EMISSION REDUCTION BY ADJUSTED WATER MANAGEMENT PRACTICE IN RICE CULTIVATION

Publication Date: 06/07/2023
Version: 1.0
Next Planned Update: 05/07/2026

CONTACT DETAILS

SUMMARY

Example – Baseline and project scenario

Project boundaries:

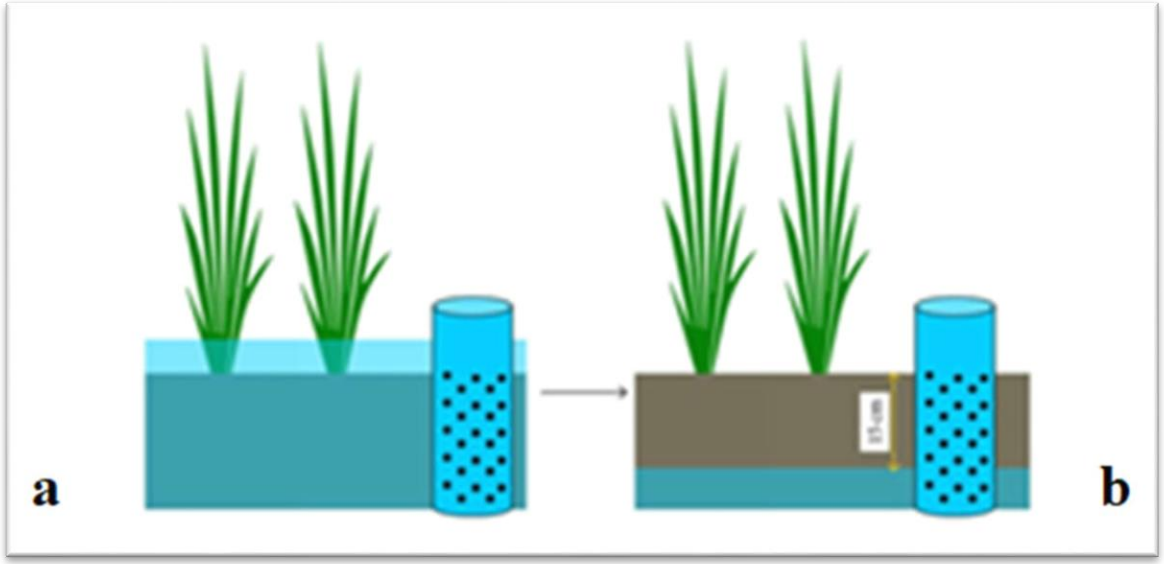
- Area: 100 ha.
- Single cropping period
- GHG emissions considered: CH_4, N_2O and CO_2

Baseline scenario

- 100 ha of fields flooded during the cultivation period (140 days / year).

Project scenario

- 100 ha are progressively shifting from continuously to intermittent flooded conditions (multiple drainage).



Source: Bwire 2022

Calculation of emission reductions

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The achieved emissions reductions are typically calculated as the ***difference between baseline emissions and emissions after project implementation***, considering any potential leakage.

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Where:
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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)

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Calculation of baseline emissions of rice irrigation management

Baseline emissions are calculated based on the area of project fields that would have been under continuously flooded rice cultivation

$$ER_y = BE_y - PE_y - LE_y$$

$$BE_y = \sum_{s}^{S} BE_s$$

Where:
BE_y = Baseline emissions in year y (tCO_2e)
BE_s = Baseline emissions from project fields in season s (tCO_2e)

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Baseline ***emissions*** are calculated based on the ***area*** of project fields that would have been under continuously flooded rice cultivation

$$ER_y = BE_y - PE_y - LE_y$$

$$BE_y = \sum_{s}^{S} BE_s$$

$$= Emission\ FactorBaseline * Area\ * GWP$$

Where:
BE_y = Baseline emissions in year y (tCO_2e)
BE_s = Baseline emissions from project fields in season s (tCO_2e)

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$$ER_y = BE_y - PE_y - LE_y$$

$$BE_y = \sum_{s}^{S} BE_s$$

$$BE_s = \sum_{g=1}^{G} EF_{BL,s,g} \times A_{s,g} \times 10^{-3} \times GWP_{CH4}$$

Where:

BE_y = Baseline emissions in year y (tCO_2e)

BE_s = Baseline emissions from project fields in season s (tCO_2e)

$EF_{BL,s,g}$ = Baseline emission factor of group g in season s ($kgCH_4$/ha per season)

$A_{s,g}$ = Area of project fields of group g in season s (ha)

GWP_{CH4} = Global warming potential of CH4 (tCO_2e/t CH4)

g = Group g, covers all project fields with the same cultivation pattern

s = Single season / S = Seasons in a year considered in the project activity

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Calculation of baseline emissions of rice irrigation management

Table 7: Specific emission factors for baseline, project and emission reductions

	$EF_{BL,c}$	Baseline				Project scenarios	Project				Emission reduction factor (EF_{ER}) (kgCH4/ha/day) or (kgCH4/ha/season)
		$SF_{BL,w}$	$SF_{BL,p}$	$SF_{BL,o}$	Emission factor (EF_{BL})		$SF_{P,w}$	$SF_{P,p}$	$SF_{P,o}$	Emission factor (EF_P)	
For regions/ countries where double cropping is practiced	$EF_{BL,c}$	1.00	1.00	2.88	$EF_{BL,c}$ x 2.88	**Scenario 1:** change the water regime from continuously to intermittent flooded conditions (single drainage)	0.71	1.00	2.88	$EF_{BL,c}$ x 2.04	$EF_{BL,c}$ x 0.84
						Scenario 2: change the water regime from continuously to intermittent flooded conditions (multiple drainage)	0.55	1.00	2.88	$EF_{BL,c}$ x 1.58	$EF_{BL,c}$ x 1.30
For regions/ countries where single cropping is practiced	$EF_{BL,c}$	1.00	0.89	1.48	$EF_{BL,c}$ x 1.32	**Scenario 1:** change the water regime from continuously to intermittent flooded conditions (single drainage)	0.71	0.89	1.48	$EF_{BL,c}$ x 0.94	$EF_{BL,c}$ x 0.38
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Table 9: Global, regional and country specific default emission factors

Region	Emission factor ($EF_{BL,c}$) (kg CH4/ha/d)
Global	**1.19**
Regional values	
Africa	1.19
East Asia	1.32
Southeast Asia	1.22
South Asia	0.85
Europe	1.56
North America	0.65
South America	1.27
Country specific	
Bangladesh	0.97
Brazil	1.62
China	1.3
India	0.85
Indonesia	1.18
Italy	1.66
Japan	1.06
Philippines	0.6
South Korea	1.83
Spain	1.13
Uruguay	0.8
USA	0.65
Vietnam	1.13

Source: GoldStandard Methodology

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Key parameters required to estimate emission reductions of example

Parameter	Unit	Value	Source
Cultivation period of rice	days/year	140	Project documentation
Baseline scaling factor for water regime during cultivation period (continuously flooded) $SF_{BL,w}$	-	1.00	IPCC 2019, Volume 4, chapter 5.5, Table 5.12
Baseline scaling factor for water regime prior to rice cultivation (single cropping / Non flooded pre-season > 180 days) $SF_{BL,P}$	-	0.89	IPCC 2019, Volume 4, chapter 5.5, Table 5.13
Baseline scaling factor related to organic amendment $SF_{BL,o}$	-	1.48	IPCC 2019, Volume 4, chapter 5.5, Table 5.14
Default Emission factor - Global $EF_{,BL,C}$	$kgCH_4$/ha/day	1.19	Gold Standard Methodology

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Calculation of baseline emissions of rice irrigation management

Baseline emissions are calculated based on the area of project fields that would have been under continuously flooded rice cultivation

$$ER_y = BE_y - PE_y - LE_y$$

$$BE_y = \sum_{s}^{S} BE_s$$

$$BE_s = \sum_{g=1}^{G} EF_{BL,s,g} \times A_{s,g} \times 10^{-3} \times GWP_{CH4}$$

$$EF_{BL} = EF_{BL,c} \times SF_{BL,w} \times SF_{BL,p} \times SF_{BL,o} \quad = 1,57 \frac{kg_{CH4}}{ha * d}$$

Where:

BE_y = Baseline emissions in year y (tCO_2e)
BE_s = Baseline emissions from project fields in season s (tCO_2e)
$EF_{BL,s,g}$ = Baseline emission factor of group g in season s ($kgCH_4$/ha per season)
$A_{s,g}$ = Area of project fields of group g in season s (ha)

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$$= 1{,}57 \frac{kg_{CH4}}{ha * d} * 140d * 0{,}01ha * 28\, GWPCH_4 = \mathbf{614tCO_{2e}}$$

Where:

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General approach for mitigation activites considering baseline and project emissions

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Calculation of project emissions of rice irrigation management

In the case of rice irrigation management, there are three types of project emission (CH_4, CO_2 and N_2O).

$$ER_y = BE_y - PE_y - LE_y$$

$$PE_y = \sum_{s}^{n} PE_s +$$

$$= Emission\ FactorProject * Area * GWP$$

Where:
PE_y = Project emissions (CH4) in year y (tCO2e)
PE_s = Project emissions (CH4) from project fields in season s (tCO2e)

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Example: Calculation of baseline/project CH_4 emissions

Table 7: Specific emission factors for baseline, project and emission reductions

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Source: GoldStandard Methodology

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Calculation of project emissions of rice irrigation management

In the case of rice irrigation management, there are three types of project emission (CH_4, CO_2 and N_2O).

$$ER_y = BE_y - PE_y - LE_y$$

$$PE_y = \sum_{s}^{n} PE_s + PE_N + PE_p$$

Emissions resulting from project implementation

Where:
PE_y = Project emissions (CH4) in year y (tCO2e)
PE_s = Project emissions (CH4) from project fields in season s (tCO2e)
PE_N = Project emissions (N2O) from N-inputs in the project fields (tCO2e)
PE_p = Project emissions (CO2) from fields preparations (tCO2e)

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$$ER_y = BE_y - PE_y - LE_y$$

$$PE_y = \sum_{s}^{n} PE_s + PE_N + PE_p$$

In our example, although there is no increase of nitrogen (N)-inputs between baseline and project scenario, the fact of shifting from continuously flooded conditions to intermittent flooding could result in higher N2O emissions

Emissions from land preparation should also be considered, if significant. In our example, there is no land preparation work, therefore there are no CO_2 project emissions.

Where:

PE_y = Project emissions (CH4) in year y (tCO2e)

PE_s = Project emissions (CH4) from project fields in season s (tCO2e)

PE_N = Project emissions (N2O) from N-inputs in the project fields (tCO2e)

PE_p = Project emissions (CO2) from fields preparations (tCO2e)

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$$ER_y = BE_y - PE_y - LE_y$$

$$PE_y = \sum_{s}^{n} PE_s + PE_N + PE_p$$

$$= 531 tCO_{2e} + 1 tCO_{2e} + 0\ tCO_{2e} = \mathbf{532 tCO_{2e}}$$

Where:

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PE_y = Project emissions in year y (tCO_2)
LE_y = Leakage emissions in year y (tCO_2)

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Leakage emissions of rice irrigation management

In the case of rice irrigation management, leakage emissions are deemed to be negligible.

However, the ***methodology also recommends to apply an uncertainty deduction factor*** of 15% on emission reductions when default values are used for calculation (which is the case here). Thus, here we calculate and reflect the uncertainty-related ***decrease of emission reductions*** in the leakage section (based on baseline and project emissions).

$$ER_y = BE_y - PE_y - LE_y$$

$$LE_y = (BE_y - PE_y) * 15\%$$

Where:
ER_y = Emissions 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)

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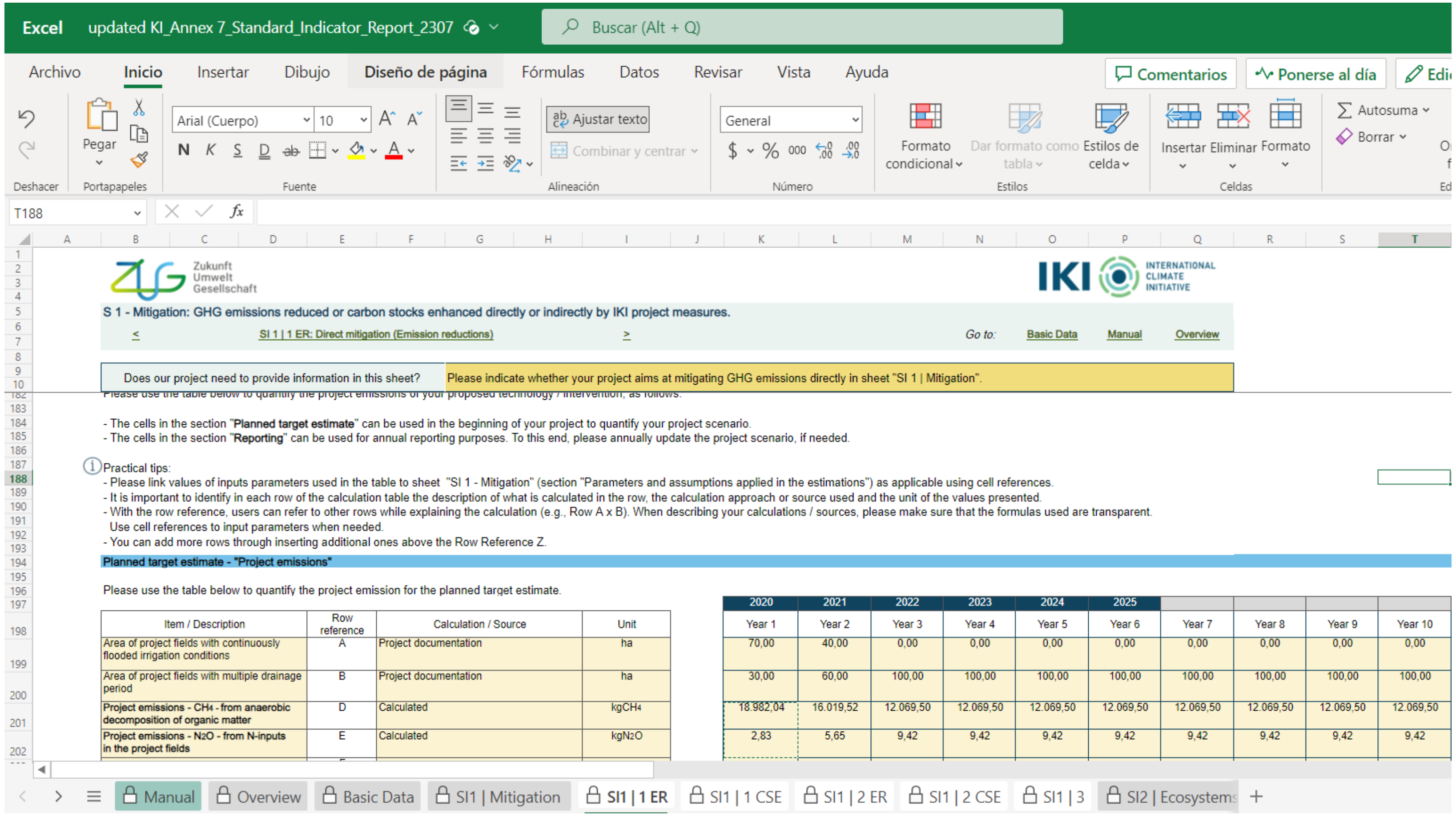
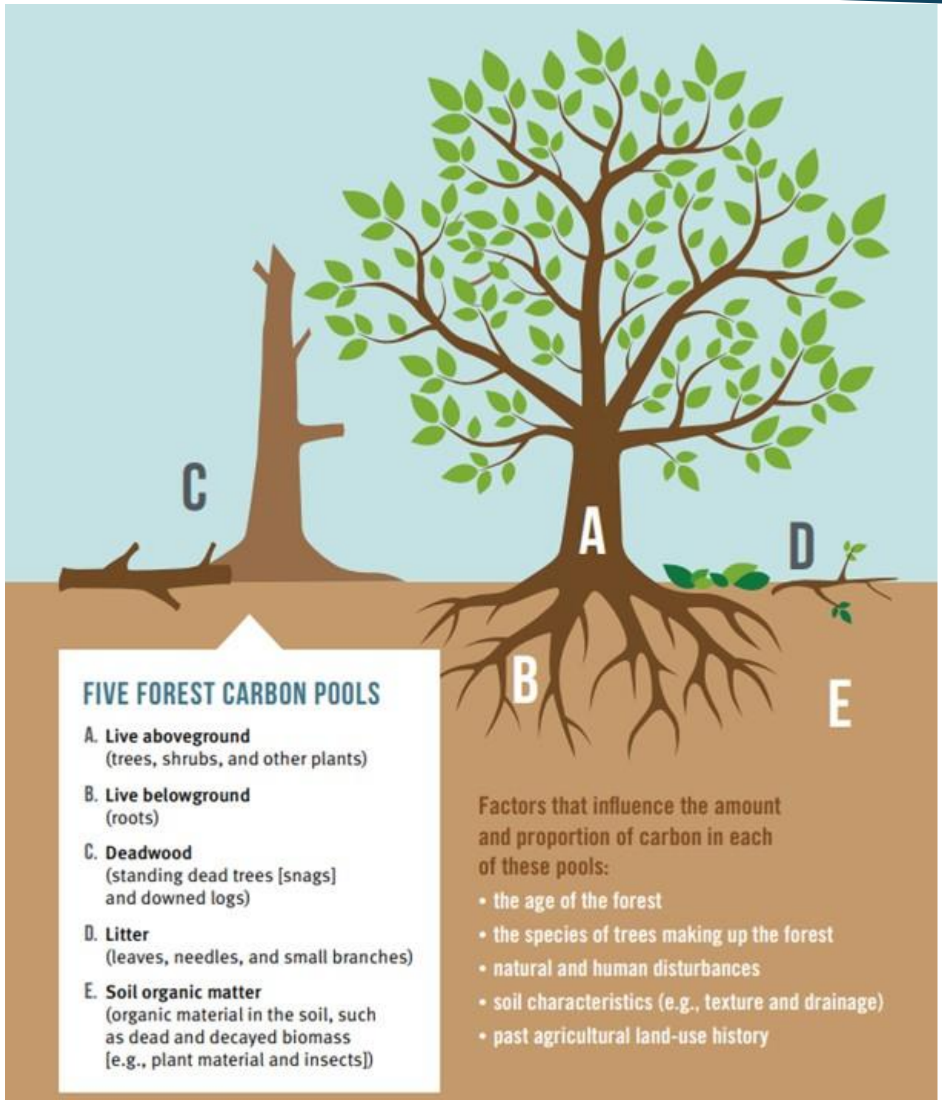
Example in the Excel Tool

View into the IKI Standard Indicator Report (Excel tool)



Forest carbon pools



Source: Connecticut - Department of Energy & Environmental Protection

More details about the definitions: IPCC Good Practice Guidance for LULUCF

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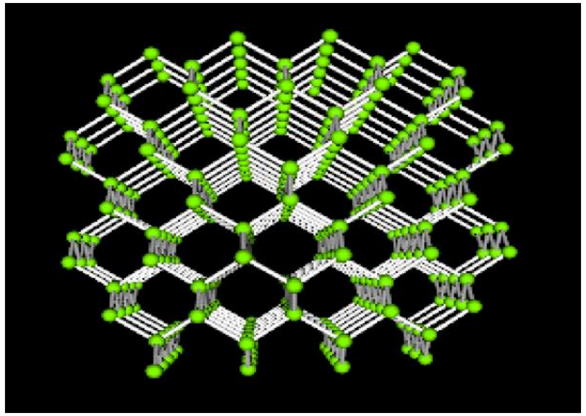
From wood to CO_2

Wood volume (m³/ha)

x specific density of wood

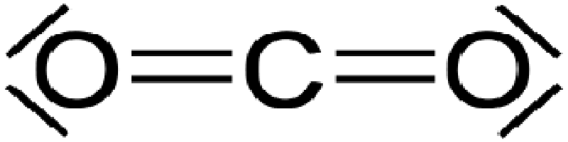
Biomass (t/ha)

x 0.47 (IPPC default)



C (t/ha)

x 3.6667 (44/12)



CO_2 (t/ha)

Source: Wikimedia
More details on the values used: IPCC Good Practice Guidance for LULUCF

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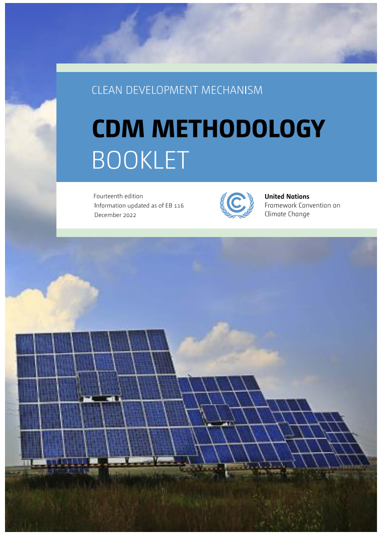
Example: Forestry

Project: Afforestation project

- **Target group:** Farmers and rural communities managing degraded land
- **Objective:** Improvement of carbon stock
- **Project intervention:** afforestation of 342 ha with fast growing trees

Methodology used:
[AR-ACM0003 - Afforestation and reforestation of lands except wetlands]

Source: [Project: Fazenda Nascente do Luar]



Source: [CDM Methodology Booklet]

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Example - Project boundary

The project boundary

- Refers to the defined scope or geographical area within which emissions and emission reductions are accounted for
- Sets the limits for what emissions/removals are included in the assessment

For typical AFOLU related projects

- The project boundary refers to the limits or borders of the designated project area. This area could encompass various types of land, such as a farm, or a specific region within a larger area, such as a municipality.

Source: Project: Fazenda Nascente do Luar

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Example – Baseline and project scenario

Baseline scenario

The land within the Project Area boundary before the start of the Project was degraded grassland, occupied by extensive cattle farming, as occurs in the same department and municipality. Such grasslands have historically been subject to burning activities that took place with the objective to reduce tree cover and expand grasslands in order to develop extensive cattle ranching activities.

Source: [Project: Fazenda Nascente do Luar]

Project scenario

Afforestation of 342 ha of degraded grassland with fast-growing tree species (Eucalyptus uro-grandis)

Source: [Project: Fazenda Nascente do Luar]

Project timeline: 30 years

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Calculation of Net GHG removals

According to the A/R Large-scale Consolidated Methodology, Afforestation and Reforestation of lands except wetlands **Net Anthropogenic GHG removals** by sinks is calculated as follows:

$$C_{AR-CDM} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK$$

Where:

$C_{AR\text{-}CDM}$ = Net Anthropogenic GHG removals by sinks, in year t, (tCO_2e)
ΔC_{ACTUAL} = Actual net GHG removals by sinks, in year t, (tCO_2e)
ΔC_{BSL} = Baseline net GHG removals by sinks, in year t, (tCO_2e)
LK = Leakage GHG emissions, in year t, (tCO_2e)

INTERNATIONAL CLIMATE INITIATIVE

Calculation of baseline emissions

According to the A/R Large-scale Consolidated Methodology, Afforestation and Reforestation of lands except wetlands the **baseline estimation** is given as follows

$$C_{AR-CDM} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK$$

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t}$$

Where:

ΔC_{BSL} = Baseline net GHG removals by sinks, in year t, (tCO_2e)
$\Delta C_{TREE\_BSL,t}$ = Change in carbon stock in baseline tree biomass within the project boundary in year t, (tCO_2e)
$\Delta C_{SHRUB\_BSL,t}$ = Change in carbon stock in baseline shrub biomass within the project boundary, in year t, (tCO_2e)
$\Delta C_{DW\_BSL,t}$ = Change in carbon stock in baseline dead wood biomass within the project boundary, in year t, (tCO_2e)
$\Delta C_{LI\_BSL,t}$ = Change in carbon stock in baseline litter biomass within the project boundary, in year t, (tCO_2e)

In this case, the baseline is assumed to be zero since the project starts from degraded land with no tree or shrub cover.
Leakage is also zero since there is no displacement of activities expected

Calculation of the actual project emissions or removals

According to the A/R Large-scale Consolidated Methodology, Afforestation and Reforestation of lands except wetlands the **net GHG removals** is defined as follows

$$C_{AR-CDM} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK$$

$$\Delta C_{ACTUAL} = \Delta C_{TREE\_Proj,t} + \Delta C_{SHRUB\_PRoj,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta C_{SOC\_PROJ,t}$$

Where:

ΔC_{ACTUAL} = Actual net GHG removals by sinks, in year t, (tCO_2e)

$\Delta C_{TREE\_PROJ,t}$ = Change in carbon stock in project tree biomass, in year t, (tCO_2e)

$\Delta C_{SHRUB\_PROJ,t}$ = Change in carbon stock in project shrub biomass, in year t, (tCO_2e)

$\Delta C_{DW\_PROJ,t}$ = Change in carbon stock in project dead wood biomass, in year t, (tCO_2e)

$\Delta C_{LI\_PROJ,t}$ = Change in carbon stock in project litter biomass, in year t, (tCO_2e)

$\Delta C_{SOC\_PROJ,t}$ = Change in carbon stock in soil organic carbon in project, in year t, (tCO_2e)

INTERNATIONAL CLIMATE INITIATIVE

Calculation of the C_{Tree} sub-element

Each sub-element in the equation mentioned in the slide before ($\Delta C_{TREE\_PROJ,t}$, $\Delta C_{SHRUB\_PROJ,t}$, $\Delta C_{DW\_PROJ,t}$, $\Delta C_{LI\_PROJ,t}$, $\Delta C_{SOC\_PROJ,t}$) in turn is calculated based on several equations.

$$C_{TREE} = \frac{44}{12} \times CF_{TREE} \times B_{TREE}$$

$$B_{TREE} = A \times b_{TREE}$$

Source: AR-TOOL14

Source	Annotations	Increment wood vol (m³/ha/year) I_v	Wood density D	Biomass Exp Fact BEF_1	Incr. biomass ABOVE (ton/ha/year) $G_w = I_v \bullet D \bullet BEF_1$	Root-shoot ratio R	Incr. Biomass ABOVE+BELOW (ton/ha/year) $G_{TOTAL} = G_w \bullet (1 + R)$
IPCC - TABLE 3A.7	*E. urophylla*	40.00	0.51	1.50	30.60	0.35	41.31
IPCC - TABLE 3A.7	*E. grandis*	32.50	0.51	1.50	24.86	0.35	33.56
PDD mean value between *E. urophylla* and *E. grandis*		**36.25**	**0.51**	**1.50**	27.73	**0.35**	**37.44**

Source: Project: Fazenda Nascente do Luar *Values source:* IPCC Good Practice Guidance for LULUCF

C_{TREE_PROJ} = *Biomass (b_{TREE}) * Carbon Factor (CF_{TREE}) * CO2 Factor * Area (A)*

C_{TREE_PROJ} = *37.44 (t/ha/year) * 0.47 * (44/12) * 342.7773 (ha)*

C_{TREE_PROJ}= *22,116 tCO2e/year*

INTERNATIONAL CLIMATE INITIATIVE

ΔC_{ACTUAL} Values for the project

Year	Estimated baseline emissions or removals (tCO_2e)	ΔCTREE,t	ΔCSOC,t	ΔCDW,t	ΔCLI,t	Net Anthropogenic GHG removals by sinks (tCO_2e)	Estimated leakage emissions (tCO_2e)	Net Anthropogenic GHG removals by sinks (tCO2e)
	$\Delta C_{BSL,t}$	tCO2e	tCO2e	tCO2e	tCO2e	$\Delta C_{ACTUAL,t}$ = ΔCTREE,t + ΔCSOC,t+ ΔCDW,t+ ΔCLI,t	LK_t	$\Delta C_{AR-CDM,t}$
1	0.00	22,114.88	735.26	221.15	221.15	23,292.43	0.00	23,292.43
2	0.00	22,114.88	735.26	221.15	221.15	23,292.43	0.00	23,292.43
3	0.00	22,114.88	735.26	221.15	221.15	23,292.43	0.00	23,292.43
4	0.00	22,114.88	735.26	221.15	221.15	23,292.43	0.00	23,292.43
5	0.00	22,114.88	735.26	221.15	221.15	23,292.43	0.00	23,292.43
6	0.00	22,114.88	735.26	221.15	221.15	23,292.43	0.00	23,292.43
...	...	...	...	...	...	...	...	...
							Total:	691,420.43

Example in the Excel Tool

View into the IKI Standard Indicator Report (Excel tool)

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INTERNATIONAL CLIMATE INITIATIVE

S 1 - Mitigation: GHG emissions reduced or carbon stocks enhanced directly or indirectly by IKI project measures.

< SI 1 | 1 ER: Direct mitigation (Emission reductions) > Go to: Basic Data Manual Overview

Does our project need to provide information in this sheet?	**Yes: Since the project aims at mitigating GHG directly through financial investments, please fill out this sheet.**

Please use the table below for the estimation as follows:

- The cells in the section **"Planned target estimate"** can be used in the beginning of your project to quantify your baseline scenario.
- The cells in the section **"Reporting"** can be used for annual reporting purposes. To this end, please annually update the baseline scenario, if needed. If no changes are necessary, you can simply enter the values from your planned target estimate for each year.

Practical tips:
- Please link values of inputs parameters used in the table to sheet "SI 1 - Mitigation" (section "Parameters and assumptions applied in the estimations") as applicable using cell references.
- 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). When describing your calculations / sources, please make sure that the formulas used are transparent. Use cell references to input parameters when needed.
- You can add more rows through inserting additional ones above the Row Reference Z.

Planned target estimate - "Baseline emissions"

Please use the table below to qutantify the baseline emission for the planned target estimate.

Item / Description	Row reference	Calculation / Source	Unit
Number of solar energy-based water treatment systems	A	Email correspondence with project team	Number
Average solar system size	B	Project documents	kWp
Total installed capacity - solar PV systems	C	Calculated	kWp
Capacity factor - solar PV	D	CDM-SSC WG Thirty-third meeting Report Ar	%
Total annual electricity generation from solar PV	E	Calculated	kWh/year
Share of water treatment systems connected to the electricity grid (import)	F	Assumed, based on expert judgement	%
Combined Margin Grid emission factor (GEF), intermittent energy generation	G	Harmonized IFI Default Grid Factors 2021 v3.:	tCO2e/MWh
Baseline emissions - electricity consumption from national power grids	H	Calculated	tCO_2e/year
Share of water treatment systems powered by diesel generators (captive generation)	I	Assumed, based on expert judgement	%
Emission factors for diesel generator systems (<15 kW) - productive applications/ water pumps	J	CDM TOOL33 Methodological tool: Default va	kgCO2e/kWh
Baseline emissions - diesel gensets	K	Calculated	tCO_2e/year
		Baseline emissions (BE) per annum	tCO_2e
		Baseline emissions cumulative (BE)	tCO_2e

Row reference	2020 Year 1	2021 Year 2	2022 Year 3	2023 Year 4	2024 Year 5	2025 Year 6
A	2	5	10	15	20	25
B	14	14	14	14	14	14
C	28	70	140	210	280	350
D	16	16	16	16	16	16
E	39.245	98.112	196.224	294.336	392.448	490.560
F	60	60	60	60	60	60
G	0,46	0,46	0,46	0,46	0,46	0,46
H	11	27	54	82	109	136
I	40	40	40	40	40	40
J	0,90	0,90	0,90	0,90	0,90	0,90
K	14	35	71	106	141	177
Baseline emissions (BE) per annum	25	63	125	188	250	313
Baseline emissions cumulative (BE)	25	88	213	400	651	963

Row reference	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
A	25	25	25	25	25	25
B	14	14	14	14	14	14
C	350	350	350	350	350	350
D	16	16	16	16	16	16
E	490.560	490.560	490.560	490.560	490.560	490.560
F	60	60	60	60	60	60
G	0,46	0,46	0,46	0,46	0,46	0,46
H	136	136	136	136	136	136
I	40	40	40	40	40	40
J	0,90	0,90	0,90	0,90	0,90	0,90
K	177	177	177	177	177	177
Baseline emissions (BE) per annum	313	313	313	313	313	313
Baseline emissions cumulative (BE)	1.276	1.589	1.902	2.215	2.528	2.840

Row reference	Values until** 2030	2040	2050
A	25	25	0,00
B	14	14	0,00
C	350	350	0,00
D	16	16	0,00
E	490.560	490.560	0,00
F	60	60	0,00
G	0,46	0,46	0,00
H	136	136	0,00
I	40	40	0,00
J	0,90	0,90	0,00
K	177	177	0,00
Baseline emissions cumulative (BE)	2.528	5.656	0

** until the end of the respectives year

INTERNATIONAL CLIMATE INITIATIVE

6 Relevant default values and reference sources

Default values for mitigation estimation of forestry projects

Parameter	Value and Unit	Source
Forestry		
Annual increment in volume of wood, I	36.25 (m^3/ha/year)	Source: IPCC – TABLE 3A.7 of ANNEX 3A.1 "Biomass Default Tables for Section 3.2 Forest Land" of IPCC Good Practice Guidance for LULUCF. Mean value between IV values of E. urophylla and E. grandis
Wood density, D	0.51 (tonnes dry matter m^3)	Source: IPCC – TABLE 3A.9-2 of ANNEX 3A.1 "Biomass Default Tables for Section 3.2 Forest Land" of IPCC Good Practice Guidance for LULUCF
Biomass Expansion Factor, BEF	1.50 (dimensionless)	Source: IPCC – TABLE 3A.1.10 of ANNEX 3A.1 "Biomass Default Tables for Section 3.2 Forest Land" of IPCC Good Practice Guidance for LULUCF
Root-shoot-ratio, R	0.35	Source: IPCC – TABLE 3A.8 of ANNEX 3A.1 "Biomass Default Tables for Section 3.2 Forest Land" of IPCC Good Practice Guidance for LULUCF
Default Values		
carbon fraction of dry matter for aboveground biomass in forests	0.47	IPCC Good Practice Guidance for LULUCF
carbon conversion rate from C to CO_2	3.6666 (44/12)	IPCC Good Practice Guidance for LULUCF
other important reference values		Biomass Default Tables and IPCC Good Practice Guidance for LULUCF
Tools		
EX-ACT		Carbon-balance Tool (EX-ACT)
Summary of CDM AR Methodological Tools		Building Forest Carbon Projects - Forest Trends p. 28 and 29

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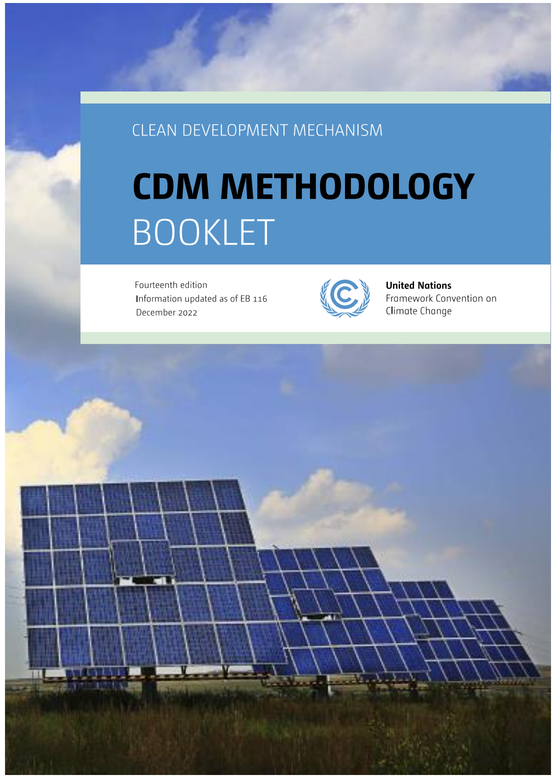
Right choice of an applicable methodological approach and use of default and reference values

General recommendations

To ***identify suitable methodological approaches and useful default / reference values***,

- check other projects that estimated emission reductions from same / similar activities, e.g.,
  - CDM Project Search, VERRA / VCS Project Registry, GoldStandard Registry, NAMA Support Projects *(NAMA is now rebranded as Mitigation Action Facility)*, etc.
  - consult existing methodologies, e.g.: CDM Methodologies in the CDM Methbook, VCS-Methodologies, GS-Methodologies etc.
- consult and use simplified tools for the estimation, if existing, e.g.,
  - Carbon-balance Tool (EX-ACT) is based on the IPCC methodology, covers the entire AFOLU sector and can be used ex-ante or ex-post
  - CBP Carbon Benefits Projects: Carbon-balance Tool (CBP)
- make use of default values and reasonable assumption source from references, e.g.,
  - Allometric equations, wood densities, raw biomass and volume data, biomass expansion factors: http://www.globallometree.org/
  - IPCC Good Practice Guidance for LULUCF Biomass Default Tables



INTERNATIONAL CLIMATE INITIATIVE

7 Conclusion

INTERNATIONAL CLIMATE INITIATIVE

Wrap-up

Identify relevant project/ activity types - Develop a clear understanding of the project type and mitigation action covered

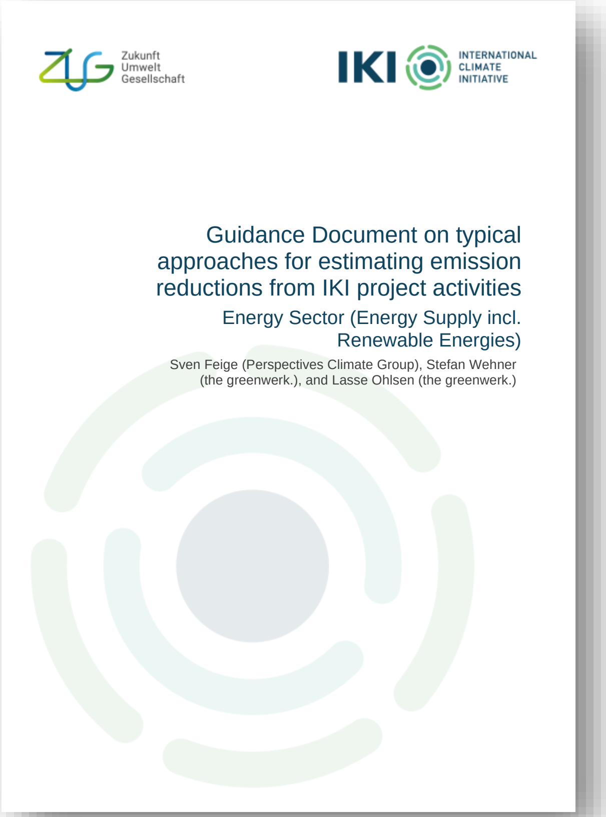
- Identify the ***key characteristics of the projects and the underlying technologies***
- Conduct an ***impact assessment***, e.g., using a causal chain analysis to identify the envisaged effects and possible co-benefits

Identification and quantification of emission reductions

- Identify the ***emission sources*** for emission reduction activities
- Select a ***suitable methodology*** or define an ***applicable estimation approach***
- Define ***clear baseline and project scenario***

Prepare a ***monitoring plan*** incl. monitoring and reporting processes

? Contact IKI Standard Indicator Helpdesk for questions: iki-si-helpdesk@z-u-g.org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Guidance Document on typical approaches for estimating emission reductions from IKI project activities

Energy Sector (Energy Supply incl. Renewable Energies)

Sven Feige (Perspectives Climate Group), Stefan Wehner (the greenwerk.), and Lasse Ohlsen (the greenwerk.)

Related Guidance Document will be published shortly

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THANK YOU FOR YOUR ATTENTION

Florian Schmitt & Pedro Passaro (Perspectives Climate Group)
& the IKI Standard Indicator Helpdesk

02.08.2023

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