I. INTRODUCTION AND HOW TO USE THIS METHODOLOGY

1.1 Purpose

This document serves as a technical guide for project proponents participating in the Malaysia Forest Carbon Offset (FCO) program. It provides a structured framework for quantifying and implementing projects that aim to remove, reduce or avoid Greenhouse Gas (GHG) emissions.

This FCO methodology supports a range of project types. It enables project proponents to:

a. Assess project eligibility
b. Define project boundary
c. Establish baseline scenarios
d. Quantify GHG reductions, and
e. Monitor project performances.

This FCO methodology is designed to be adaptable and can be used in conjunction with other FCO methodologies depending on project-specific needs.

Project proponents may reference the Theory of Change framework, which maps how interventions are expected to deliver emission reductions and co-benefits by identifying causal pathways, assumptions, and risks[1] to inform project design. Proponents may refer to *Theory of Change UNDAF Companion Guidance* by United Nations Development Group or other relevant frameworks developed by intergovernmental organisations, NGOs and NPOs, or jurisdictional authorities to guide the development of a project-specific Theory of Change.

1.2 Core FCO Methodologies

The FCO program currently supports four key FCO methodologies which is as illustrated in Annex 1:

a. **Afforestation, Reforestation, and Restoration (ARR):** Focuses on foreWe'll include Theory of Change references in other relevant methodologies as applicable.
b. st establishment or restoration on degraded lands to boost carbon sequestration.
c. **Improved Forest Management (IFM):** Enhances carbon stocks in production forests through sustainable practices like reduced impact logging and longer rotation cycles.
d. **Reducing Emissions from Deforestation and Degradation (REDD):** Aims to prevent deforestation and degradation in all forest types.
e. **Wetland Ecosystems (WE):** Activities on wetland ecosystems including restoration, vegetation establishment, deforestation and degradation prevention as well as rewetting.

Additional methodologies may be incorporated in the future.

1.3 How to Use this Methodology

This FCO Methodology guides project proponents to assess and implement activities under the FCO framework. The process begins with a spatial and historical assessment of the land:

[1] Theory of Change UNDAF Companion Guidance, United Nations Development Group, 2017

a. **Current Land Assessment:** Evaluate the present condition of the land using maps and satellite imagery.
b. **Historical Land Use:** Determine the land's previous state to establish a baseline.
c. **Condition Classification:** Compare current and historical states to classify the land as either intact or disturbed.

Based on this classification, project proponents can identify suitable intervention types:

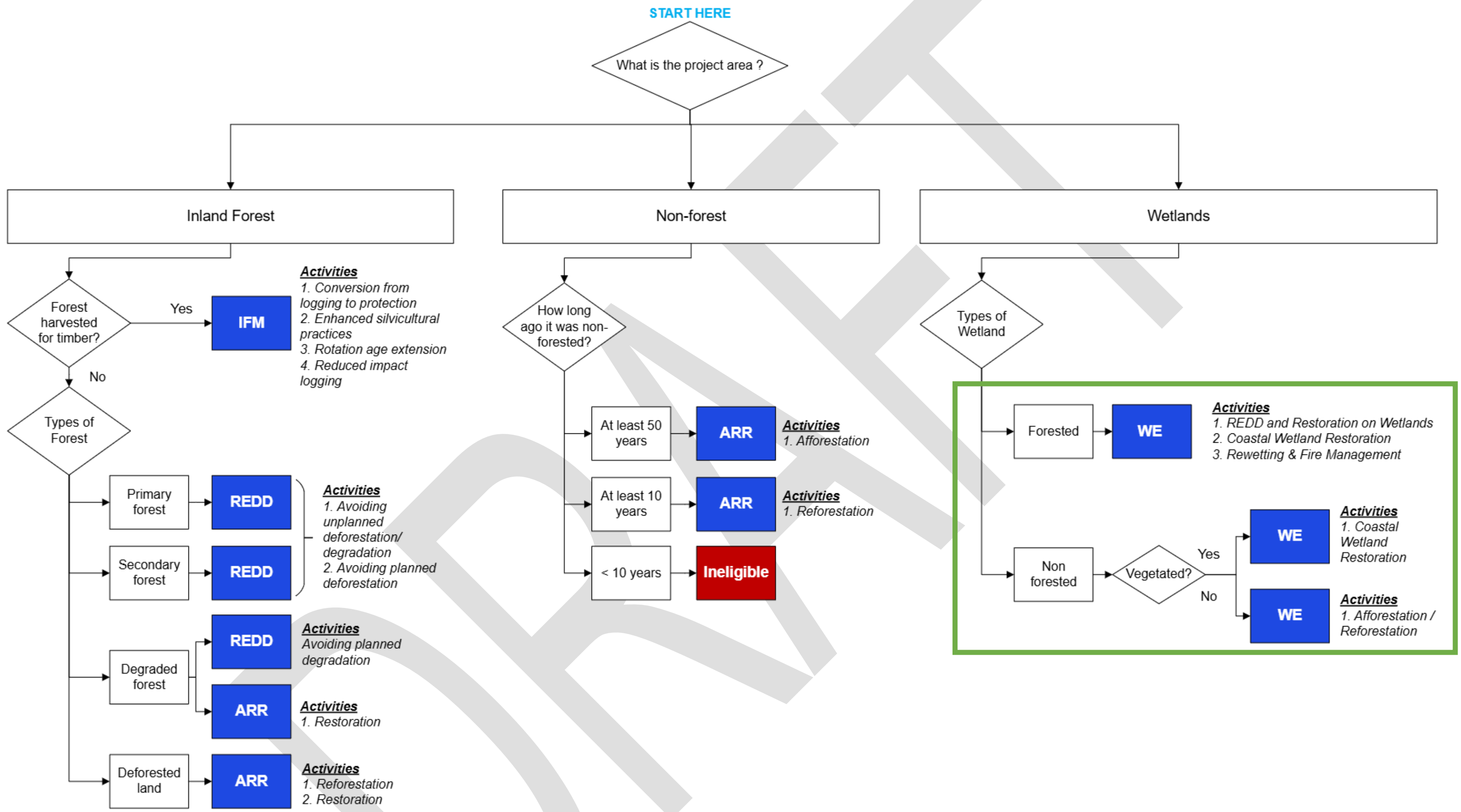
a. **GHG Avoidance Activities:** Actions the prevent emissions from occurring, such as avoiding planned or unplanned deforestation.
b. **GHG Reduction or Removal Activities:** Interventions that actively reduce or sequester emissions, tailored to forest lands, wetlands, or production forests.

1.4 Focus of this FCO Methodology Document

This document specifically focuses on the **Wetland Ecosystems: REDD & Restoration Methodology**. It should be used in conjunction with the overarching FCO Main Guidelines, Subsidiary Guidelines, and standardised FCO Tools. These resources collectively ensure that project design, monitoring, and reporting are accurate, consistent, and aligned with program requirements.

Project proponents may reference relevant sources such as national strategies, sectoral reports, or frameworks developed by international organisations, NGOs and NPOs, or jurisdictional authorities, such as *Wetland Restoration: Contemporary Issues & Lessons Learned* by the National Association of Wetland Managers, when identifying anticipated implementation challenges, including data limitations, technical constraints, and other contextual factors.

Figure 1: Overall Flowchart for Methodologies under FCO



The eligibility flowchart for WE activities is detailed in the following section.

II. ELIGIBILITY FLOWCHART

This flowchart guides project proponents in determining whether a proposed project area qualifies for WE activities under the FCO program. It outlines the step-by-step decision process based on land type, forest condition, and ecosystem classification.

The Wetland Ecosystems methodology comprise four (“4”) modules – Afforestation/Reforestation, REDD & Restoration on Wetlands, Coastal Wetland Restoration, as well as Rewetting and Fire Management. Figure 2 in the following page summarises the ecosystems applicable to each module.

Module 2: REDD & Restoration on Wetlands may be used independently for intact forested wetlands that is facing risk of canopy loss. Further, this methodology is intended to be used alongside Module 3: Coastal Wetland Restoration and Module 4: Rewetting & Fire Management when degraded mangrove or nipa areas as well as degraded peat swamp forests, respectively facing risk of canopy loss. Table 1 below provides a summary of applicable ecosystems, conditions, and activities under each module and their combined application.

Table 1: Overview of Eligible Ecosystems, Conditions, and Activities Across Modules

	Single Modules			**Combined Application**	
	REDD & Restoration on Wetlands (REDD-W)	**Coastal Wetland Restoration (CWR)**	**Rewetting & Fire Management (R&FM)**	**REDD-W + CWR**	**REDD-W + R&FM**
Wetland Ecosystems	• Mangrove Forests • Nipa Swamps • Peat Swamp Forests • Freshwater Swamps	• Mangrove Forests • Nipa Swamps • Salt Marsh • Seagrass Meadows	Peat Swamp Forests	• Mangrove Forests • Nipa Swamps	Peat Swamp Forests
Condition	Land must have been a **forest** for at least 10 years prior that **faces the risk of canopy loss**	**Degraded**: Area experiencing direct human-induced declining forest values	**Drained:** Area with lowered water tables, drier vegetation, and aerobic peat decomposition, increasing fire risk and CO_2 emissions.	Land must have been a **forest** for at least 10 years prior, that faces the **risk of canopy loss** and is **currently degraded**	Land must have been a **forest** for at least 10 years prior, that faces the **risk of canopy loss** and is **currently drained**

	Single Modules			Combined Application	
	REDD & Restoration on Wetlands (REDD-W)	**Coastal Wetland Restoration (CWR)**	**Rewetting & Fire Management (R&FM)**	**REDD-W + CWR**	**REDD-W + R&FM**
Activity	1. Avoiding Planned Deforestation; **or** 2. Avoiding Unplanned Deforestation/ Degradation	Restoration activities, that re-establishes or improves: • Hydrological conditions • Sediment supply • Salinity • Water quality • Vegetation	Rewetting activities	1. Avoiding Planned Deforestation; **or** 2. Avoiding Unplanned Deforestation/ Degradation **and** 3. Restoration activities	1. Avoiding Planned Deforestation; **or** 2. Avoiding Unplanned Deforestation/ Degradation **and** 3. Rewetting activities

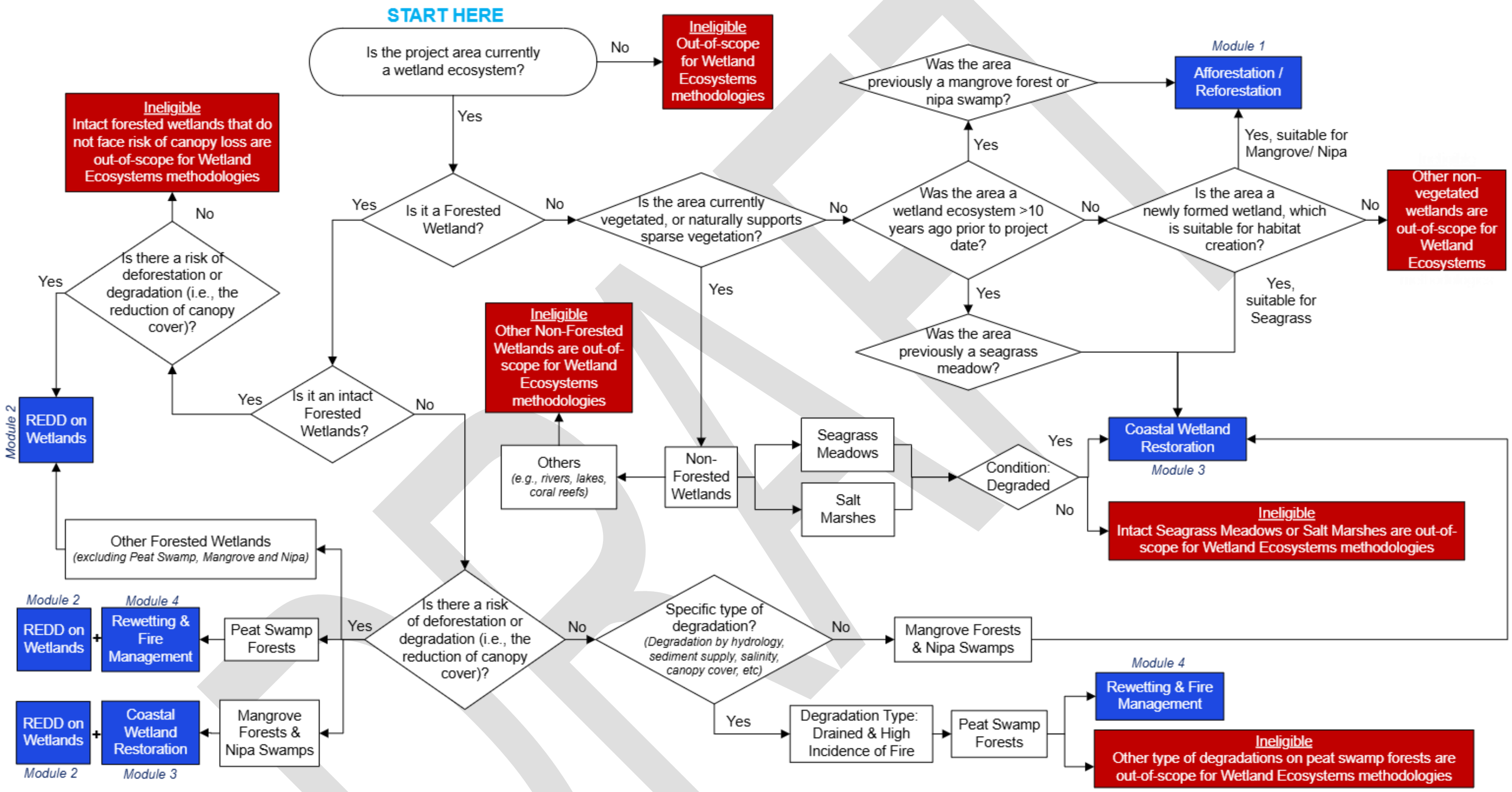
Refer to

Annex 2 and

Annex 3 for further guidance on how to use this module in combination with other modules.

Figure 2: Eligibility Flowchart for Wetland Ecosystems modules

Note: For project areas that are part of a larger forest or wetland complex, only clearly delineated sub-areas that meet eligibility conditions (e.g., degraded, non-vegetated, or at risk of deforestation) may be included. These must be supported with spatial evidence and should be implemented under an appropriate project modality (e.g. JPoA or GP).



III. SUMMARY DESCRIPTION

This methodology establishes a framework for quantifying carbon sequestrated, or GHG emission reductions and removals, from wetlands ecosystem that are applicable for WE project activities in Malaysia. It encompasses an overview of the types of GHG emissions mitigation actions, guidance on when to apply the methodology, the applicable ecosystem, and an outline of the pre-project, baseline scenario, and project scenario considerations, as detailed below.

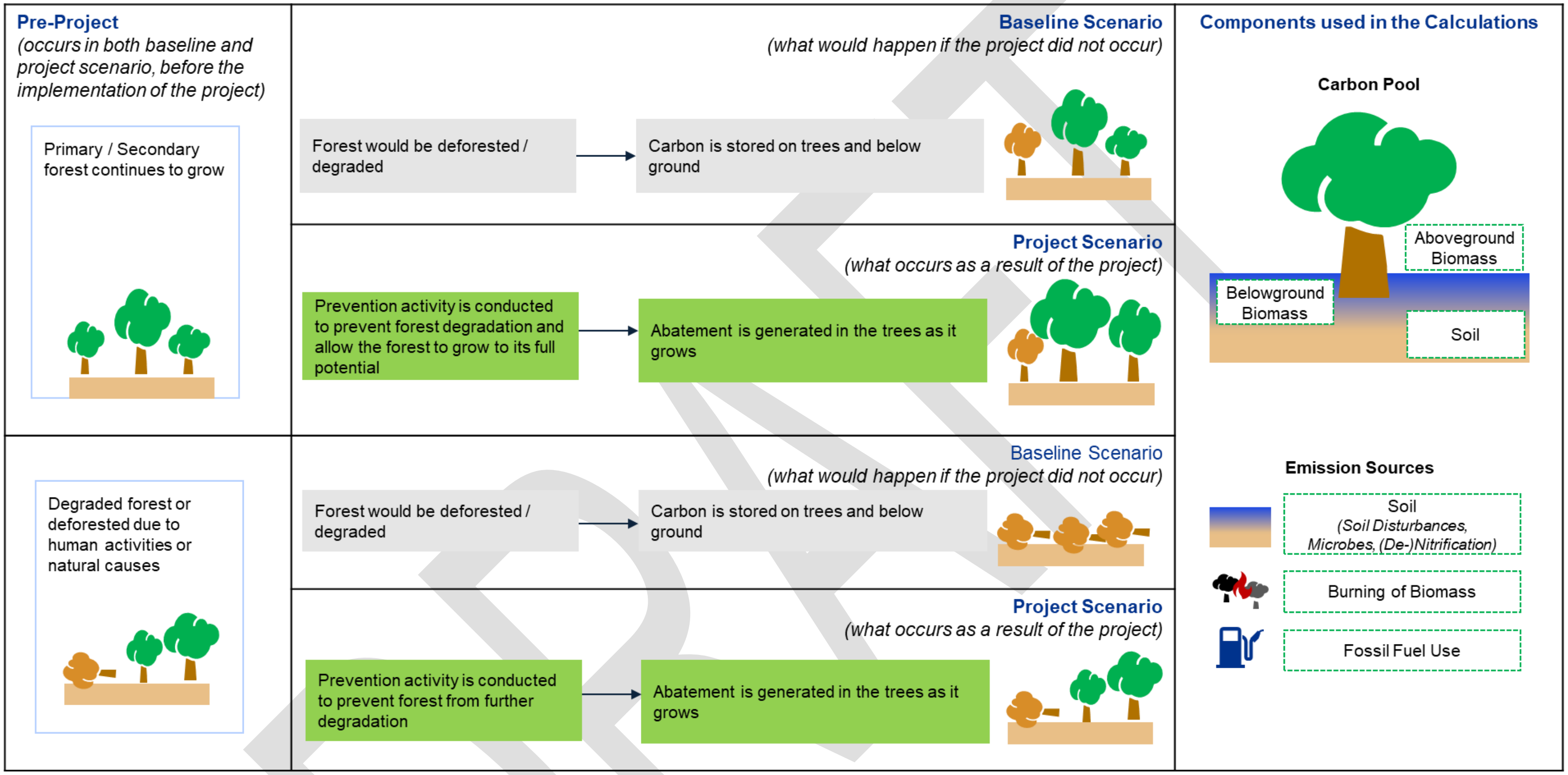
Type of GHG Emissions Mitigation Action *Refers to how the project reduces GHG emissions*	Project activities that prevent/reduces GHG emissions through: 1. **Avoiding Planned Deforestation:** Preventing deforestation on lands authorised for conversion from forest land to alternate uses. 2. **Avoiding Unplanned Deforestation/Degradation:** Preventing deforestation/degradation from activities like shifting agriculture, fuelwood collection, illegal logging, and unauthorised infrastructure developments Note: Avoiding planned degradation refers to activities that stops or reduces timber harvest in areas where harvesting is permitted – the IFM Methodology is referred for details.
Applicable Ecosystem *Identifies the type of environment where the project can be implemented*	The applicable wetlands in this methodology are **mangrove forests, nipa swamps, peat swamp forests and freshwater forested wetlands.** These forested wetlands may be classified as primary, secondary or degraded with the respect to its canopy cover. 1. **Primary Forest:** Intact forests that have been undisturbed[2] 2. **Secondary Forest:** Forests that regenerated after human-induced or natural disturbances[3] 3. **Degraded Forest:** Forest that show signs of disturbance, such as reduced canopy cover or carbon stock.
Pre-Project *Refers to the state of the land and forest prior to the start of the FCO project*	• The forested wetlands may be classified as primary, secondary or degraded. • Land must have been a forest for at least 10 years prior to the project start date.
Baseline Scenario *Represents the "business-as-usual" projection on what would happen to the forest and its carbon stocks in the absence of the project*	1. Forest clearing for other land uses. 2. Forest land clearing by local communities (fuelwood collection, shifting agriculture) or illegal logging.

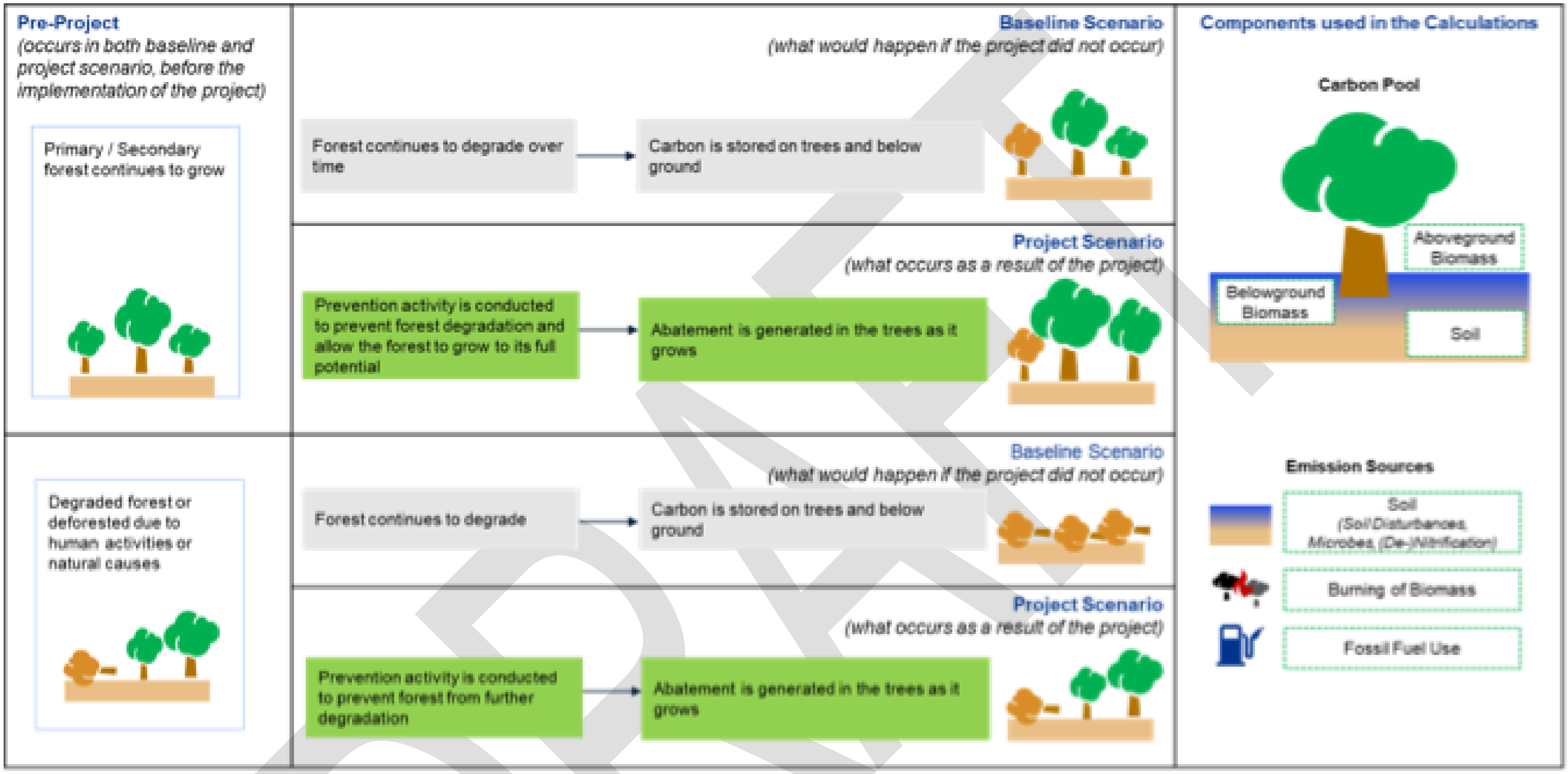
[2] *"Second Expert Meeting on Harmonizing Forest-Related Definitions for Use by Various Stakeholders", FAO, 2024. https://www.fao.org/4/y4171e/y4171e36.htm*
[3] *"Workshop on Tropical Secondary Forest Management in Africa: Reality and Perspectives", FAO, 2003. https://www.fao.org/4/j0628e/J0628E16.htm*

Project Scenario *Describes the proposed interventions to-be implemented under the FCO project to prevent or reduce GHG emissions.*	1. **Avoiding Planned Deforestation:** Implements protection measures to prevent forest conversion. 2. **Avoiding Unplanned Deforestation/Degradation:** Implements interventions to reduce or stop deforestation/degradation

Figure 3 in the following page illustrates the pre-project, baseline and project scenario as well as the relevant carbon pools and GHG emission sources for this methodology.

Figure 3: Framework: Activity Conditions, Scenarios, and Carbon Accounting Components




Pre-Project
(occurs in both baseline and project scenario, before the implementation of the project)
Primary / Secondary forest continues to grow
Degraded forest or deforested due to human activities or natural causes
Baseline Scenario
(what would happen if the project did not occur)
Forest continues to degrade over time
Carbon is stored on trees and below ground
Project Scenario
(what occurs as a result of the project)
Prevention activity is conducted to prevent forest degradation and allow the forest to grow to its full potential
Abatement is generated in the trees as it grows
Baseline Scenario
(what would happen if the project did not occur)
Forest continues to degrade
Carbon is stored on trees and below ground
Project Scenario
(what occurs as a result of the project)
Prevention activity is conducted to prevent forest from further degradation
Abatement is generated in the trees as it grows
Components used in the Calculations
Carbon Pool
Aboveground Biomass
Belowground Biomass
Soil
Emission Sources
Soil
(Soil Disturbances, Microbes, (De-)Nitrification)
Burning of Biomass
Fossil Fuel Use

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V. LIST OF FIGURES

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VII. MODULES & TOOLS

This methodology uses the following modules and tools:

- FCO Tool: Baseline Determination and Additionality Assessment
- FCO Tool: GHG Quantification Equations
- FCO Tool: Buffer Risk Assessment
- FCO Tool: Allometric Equations Guidance

VIII. LIST OF ABBREVIATIONS

Abbreviations	Definition
ARR	Afforestation, Reforestation and Restoration
FCO	Forest Carbon Offset
FCU	Forest Carbon Units
GHG	Greenhouse gas emissions
GIS	Geographic Information System
IFM	Improved Forest Management
IPCC	Intergovernmental Panel on Climate Change
PRF	Permanent Reserve Forest
REDD	Reducing Emissions from Deforestation and Degradation
SOC	Soil organic carbon
TPA	Totally Protected Area
WE	Wetland Ecosystems

1 Definitions

Terms	Definition
Avoiding Planned Deforestation	Activities that reduce GHG emissions by preventing or minimising deforestation on forest lands that are legally authorised by the relevant authorities for conversion to non-forest uses
Avoiding Planned Degradation	Activities that reduce GHG emissions by stopping or reducing timber harvests in areas where harvesting is legally permitted under a Forest Management Plan.
Avoiding Unplanned Deforestation/ Degradation	Activities that reduce GHG emissions by stopping deforestation and/or degradation of degraded to mature forests that would have occurred in any forest configuration. Activities that address subsistence farming or illegal logging.
Degraded Coastal Wetland	**Degraded coastal wetlands**: Coastal wetlands experiencing direct human-induced declining forest values – reductions in canopy cover[4], altered hydrological conditions, disrupted sediment supply, changes in salinity characteristics, degraded water quality and/or loss of native plant communities
Forested Wetland	Wetlands dominated by woody vegetation, such as trees, that grow on land saturated or flooded with water either permanently or seasonally[5,6] and meet the forest definition. *The applicable forested wetlands in this methodology are mangroves, nipa swamps, peat swamp forests and freshwater forested wetlands.*
Freshwater Swamp	Freshwater swamp occurs on permanently or seasonally flooded soil with over 35% mineral content, normally in a zone along the lower reaches of rivers or around freshwater lake systems[7].
Leakage Belt	Land surrounding or adjacent to the project area in which baseline activities could be displaced due to the project activities implemented in the project area[8].
Leakage Management Zone	Areas outside the project boundary and outside the leakage belt area in which the project proponent intends to implement activities that will reduce the risk of activity displacement leakage[9].
Mangroves	An association of halophytic trees, shrubs, and other plants growing in brackish to saline tidal waters of tropical and sub-tropical coastlines.[10]

[4] *Data Hutan Malaysia: Definisi / Terminologi Utama Sektor Perhutanan Malaysia, NRES*
[5] *"Forested wetlands", Wisconsin Wetlands Association. https://www.wisconsinwetlands.org/learn/about-wetlands/wetland-types/forested-wetlands/*
[6] *"Forested wetlands", NSW Environment, Energy and Science, 2017. https://threatenedspecies.bionet.nsw.gov.au/*
[7] *I. Parlan, H. I. Mohd Husin, and T. Husin, 2021. "An Overview of Wetlands in Malaysia." Forest Research Institute Malaysia.*
[8] *Fundação Amazônia Sustentável (FAS), 2010, Methodology for Estimating Reductions of Greenhouse Gases Emissions from Frontier Deforestation REDD-NM-002*
[9] *Ibid*
[10] *J. B. Kauffman and D. C. Donato, 2012. "Protocols for the measurement, monitoring, and reporting of structure, biomass, and carbon stocks in mangrove forests." Center for International Forestry Research. doi: 10.17528/cifor/003749.*

Terms	Definition
Mineral Soil	Soils that do not fall within the definition of organic soil[11].
Nipa Swamps	Tidal, monospecific stands of the Nipa Palm (*Nypa fruticans*). Nipa occurs in association with mangroves and extent further into brackish water, often lining the tidal reaches of rivers and forming huge swamp in delta areas[12].
Organic Soil	Soils are identified based on criteria 1 and 2, or 1 and 3[13]: 1) Thickness of organic horizon greater than or equal to 10 cm. A horizon of less than 20 cm must have 12% or more organic carbon when mixed to a depth of 20 cm. 2) Soils that are never saturated with water for more than a few days must contain more than 20% organic carbon by weight (i.e., about 35% organic matter). 3) Soils are subject to water saturation episodes and has either: a. At least 12% organic carbon by weight (i.e., about 20% organic matter) if the soil has no clay; or b. At least 18% organic carbon by weight (i.e., about 30% organic matter) if the soil has 60% or more clay; or An intermediate, proportional amount of organic carbon for intermediate amounts of clay.
Peat Swamp Forests	Peat swamp forests are waterlogged forests growing on a layer of dead leaves and plant material up to 20 metres thick. They comprise an ancient and unique ecosystem characterized by waterlogging, with low nutrients and dissolved oxygen levels in acidic water regimes. Their continued survival depends on a naturally high-water level that prevents the soil from drying out to expose combustible peat matter[14].
Permanent Reserve Forest	A collective term encompassing Protection Forests, Amenity Forests, and Research & Education Forests, as defined under the National Forestry Act. Specific references to PRF types will be indicated where relevant.
Permanent Reserved Forest (PRF) Protection Forest	Permanent Reserved Forest (PRF) Protection Forest serves to maintain climate and environmental stability, regulate water resources, conserve soil and biodiversity, and reduce flood and erosion impacts on rivers and agricultural land.
Permanent Reserved Forest (PRF) Amenity Forest	Permanent Reserved Forest (PRF) Amenity Forest functions to maintain a sufficient area for recreational and eco-tourism activities and to increase public awareness on forests.

[11] *2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4: Chapter 3), IPCC, 2006*
[12] *I. Parlan, H. I. Mohd Husin, and T. Husin, 2021. "An Overview of Wetlands in Malaysia." Forest Research Institute Malaysia.*
[13] *2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4: Chapter 3), IPCC, 2006*
[14] *"Malaysia's Peat Swamp Forests - Conservation and Sustainable Use", Ministry of Natural Resources and Environment Malaysia (NRES) and United Nations Development Programme (UNDP), April 2006.*

Terms	Definition
Permanent Reserved Forest (PRF) - Research and Education Forest	Permanent Reserved Forest (PRF) Research and Education Forest Functions to reserve some forests for the purpose of research, education and the preservation of biological diversity.
Non-Permanent Reserved Forest (Non-PRF)	Non-Permanent Reserved Forest (PRF) are forested areas that have not been gazetted and are termed state land forests.
Totally Protected Area (TPA)	Totally Protected Area (TPA) is a legally designated land or marine zone protected under national and state laws to conserve biodiversity and ecosystems under the National Parks Act 1980, Wildlife Conservation Act 2010, where activities like logging, hunting, or resource extraction are prohibited or highly restricted.

2 Applicability Conditions

While the Eligibility Flowchart (Section II) provides a high-level visual guide to help project proponents quickly assess whether a proposed area may qualify for REDD on WE activities under the FCO Program, this chapter on Applicability Conditions offers a more detailed technical criteria that must be met for a project to be formally considered eligible.

The Applicability Conditions outlined here ensures that only those initiatives which align with the program's requirements proceed to quantification and crediting.

2.1 General Eligibility

To ensure consistency and integrity of REDD & Restoration on Wetlands activities implementation under the FCO Program, all proposed projects must first satisfy a set of overarching criteria. These general serve as the foundational screen before the detailed project-specific eligibility assessment are applied.

1. **Forest Classification**:
    - The project area must meet the definition of a forest, as recognised under national definition and/or FCO program.
    - Areas that lack vegetation, and hence do not qualify as forests, shall use the other WE Modules:
        - **FCO Methodology: Wetland Ecosystems – Rewetting & Fire Management** for Peat Swamp Forests
        - **FCO Methodology: Wetland Ecosystems – Afforestation / Reforestation** for Mangrove Forests and Nipa Swamps.

2. **Forest Condition**: The land must have maintained forest canopy cover for at least 10 consecutive years prior to the project start date. Eligible forest types include:
    - The project area in the baseline scenario may be a Primary Forest: Largely undisturbed by any activities
    - Secondary Forest: Forest that have been cleared and have recovered naturally
    - Degraded Forest: Forest that shows signs of disturbances, such as reduced canopy cover or carbon stock.

3. **Baseline Alignment**: The proposed project activity must correspond to a baseline scenario involving either deforestation or forest degradation, whereby:
    - **Avoiding Planned Deforestation**: Legally permitted forest clearing for other land uses.
    - **Avoiding Unplanned Deforestation/Degradation**: Informal clearing of forest land by local communities (fuelwood collection, shifting agriculture) or illegal logging.

4. **Legal and Customary Land Tenure**:
    - The project must be grounded in clear legal frameworks or policies that recognises both statutory (legal) land tenure and indigenous customary rights.
    - The project must also comply with all applicable national and international laws.

2.2 Project-Level Eligibility

While the general eligibility conditions ensure that a project aligns with the overarching goals of the FCO REDD & Restoration on Wetlands methodology, project-level applicability conditions provide a more detailed and activity-specific framework. These conditions help determine whether the proposed REDD & Restoration on Wetlands activity is technically feasible within the context of the project area. Project-level eligibility conditions are essential for:

- Ensuring that REDD & Restoration on Wetlands activities are grounded in credible baseline scenarios
- Aligning project activities (interventions) with drivers of deforestation or degradation
- Validating that the project can deliver measurable GHG emissions.

Table 2 below outlines the eligibility conditions for REDD on WE activities by aligning the specific disturbances or key drivers of deforestation/degradation, to designated forest types in baseline scenario. It illustrates the conditions and the required evidence necessary to implement REDD & Restoration on Wetlands activities in project scenarios involving both Planned and Unplanned Deforestation/Degradation scenarios.

Table 2: Eligibility Scenarios for REDD Based on Forest Class, Condition, and Key Drivers

Forest Class	Forest Condition	Examples	Baseline: Key Drivers	Project: Potential REDD Activity
PRF Protection	• Primary • Secondary • Degraded	Water catchment forest, soil protection forest, virgin jungle forest	• Evidence of unauthorized logging or disturbance threats • Documentation of fire events from adjacent land	Avoiding Unplanned Deforestation/ Degradation
			Official documentation of planned conversion applications (e.g. applications submitted to the relevant authority for conversion of forest land to other land uses)	Avoiding Planned Deforestation
PRF Amenity Forest	• Secondary • Degraded	Forests designated for recreation, tourism and community engagement	Official documentation of planned conversion (e.g., applications submitted to the relevant authority for conversion of forest land to other land uses)	Avoiding Planned Deforestation
			Evidence of unauthorized logging or disturbance threats like encroachment or shifting agriculture	Avoiding Unplanned Deforestation/ Degradation

Forest Class	Forest Condition	Examples	Baseline: Key Drivers	Project: Potential REDD Activity
PRF Research and Education Forest	• Primary • Secondary • Degraded	Forests for research, education and biodiversity conservation	Evidence of illegal occupation or unauthorised deforestation[15]	Avoiding Unplanned Deforestation/ Degradation
Non-PRF: State Land/ Private Forests	• Primary • Secondary • Degraded	• State land forests • Private forests	Official documentation of planned conversions (e.g. evidence of legal ownership or rights to the land and valid permits or licenses to deforest)	Avoiding Planned Deforestation
			Evidence of unauthorized logging or disturbance threats like encroachment or shifting agriculture	Avoiding Unplanned Deforestation/ Degradation
TPA	• Primary	Legally protected forests where no extractive activities are permitted, primarily for conservation	Evidence of unauthorized logging or disturbance threats like encroachment or shifting agriculture	Avoiding Unplanned Deforestation/ Degradation

2.2.1 Avoiding Unplanned Deforestation/Degradation

This condition applies to forest areas experiencing deforestation or degradation occurring without formal authorisation, typically driven by subsistence activities or informal land use.

Baseline agents must meet all of the following criteria:

- Activities include clearing land for purposes such as tree harvesting, settlements expansion, road constructions, crop production, or ranching, where these activities are not part of large-scale industrial operations.
- Agents lack the legal rights to deforest or degrade the land for these purposes.
- Agents are either local residents or immigrants within the reference region for deforestation.

In this context, a 'baseline agent' refers to the individual, group, or entity responsible for activities that could lead to deforestation or forest degradation without the intervention of the FCO project.

2.2.2 Avoiding Planned Deforestation

[15] *Agricultural Research Council, "Illegal Occupation of Agricultural Research Land and Illegal Deforestation of Natural Forests," June 2024.*

This condition applies to forest areas where the conversion of forest land to a non-forest condition is legally permitted.

Key conditions include:

1 The forest land must be under legal threat of conversion (e.g., for agriculture, infrastructure, or development).
2 There must be documented evidence of intent to deforest, such as government approvals, land use plans, or applications for conversion.
3 The project must demonstrate that its intervention will prevent this legally sanctioned deforestation.

This ensures that REDD on WE activities are not only additional but also prevent emissions that would otherwise occur under lawful development.

2.3 Ineligibility

While the above lists down the eligible project activities, certain scenarios are explicitly excluded to maintain the integrity, additionality and permanence of emission reductions. Projects are considered ineligible if they meet any of the following conditions:

1 Baseline reforestation assumption

- Projects are ineligible if the baseline scenario assumes that the land will be reforested, afforested, or converted to agroforestry immediately following deforestation. Such assumptions undermine the permanence of emission reductions, as they imply that carbon stocks would naturally recover without project intervention.
- For example, this includes clearing forests in areas legally designated for future reforestation or under existing land use plans (e.g., forest plantations or reforestation zones).
- Exception: Projects may still be eligible only if they can clearly demonstrate that such clearing would result in net emissions and that REDD+ interventions would deliver additional and permanent climate mitigation benefits beyond what is legally or customarily expected

2 Commercial harvesting of trees

- Projects located in the PRF Production Forest classes are not eligible.
- Projects involving the harvest of trees for commercial wood products (e.g., timber, fuelwood, charcoal, fiber) are not eligible under the REDD activities. However, exceptions are if the trees were planted as part of the REDD project, specifically for the purpose of leakage mitigation or supporting community development. In such cases, the harvest is permitted only if it aligns with the project's approved objectives and does not compromise the integrity of emission reductions.

3 Non-forest efficiency measures

- Projects that reduce emissions solely through efficiency improvements in non-forest activities (e.g., industrial upgrades etc.) are not eligible under this methodology.

4 Restrictions in TPA

- Projects located in TPA (e.g., National Parks, Wildlife Sanctuaries, Wildlife Reserves) are not eligible if state policies prohibit the monetisation of carbon credits.

3 Project Boundary

This section defines the spatial boundaries within which the project activities are implemented and monitored. Establishing a clear project boundary is essential for ensuring transparency, consistency and credibility in the quantification of GHG emission reductions. The project boundary encompasses three key dimensions.

1. **Geographical Boundaries**
   These define the physical extent of the project area using spatial data such as satellite imagery, maps, and georeferenced coordinates. It includes delineation of project area, reference area, proxy areas and leakage belts depending on the REDD on WE activity type (e.g., planned vs. unplanned deforestation).

2. **Carbon Pools**
   The project proponents must identify which carbon pools are included or excluded in the accounting process. These typically include aboveground and belowground biomass, soil organic carbon, litter, deadwood, and harvested wood products.

3. **GHG Emission Sources**
   All relevant sources of GHG emissions within the project boundary must be identified and assessed. These may include emissions from biomass burning, fossil fuel combustion, and other project-related activities.

3.1 Geographical Boundaries

In the implementation of REDD on WE project activities, it is essential to clearly define and differentiate the spatial boundaries based on the specific REDD category such as, avoiding planned deforestation or avoiding, unplanned deforestation/degradation. Accurate delineation of these boundaries is critical for establishing credible baselines, monitoring emissions reductions, and managing leakage risks.

1. **Avoiding Planned Deforestation**

   Planned deforestation refers to forest loss that is legally sanctioned or permitted, typically for land-use conversion such as agriculture, infrastructure development, or logging concessions. In REDD projects aimed at avoiding planned deforestation, the following spatial features must be delineated:
   - **Project Area** (*Section 3.1.1*): The area under the control of the Project Proponent in which the REDD project activity will be implemented and GHG emission reductions accounted.
   - **Proxy Area** (*Section 3.1.3*): If a verifiable deforestation plan is unavailable, a proxy area must be identified. This area is used to estimate the average annual rate of land clearing and serves as the basis for establishing baseline deforestation rates

2. **Avoiding Unplanned Deforestation/Degradation**

   Unplanned deforestation and degradation refer to unauthorised or illegal forest loss, often driven by small-scale agriculture, encroachment, or unsustainable logging practices. For REDD projects addressing unplanned deforestation or degradation, the following spatial features must be delineated:
   - **Project Area** *(Section 3.1.1)*: The area under the control of the Project Proponent in which the REDD project activity will be implemented and GHG emission reductions will be accounted for.

- **Reference Region/Area** *(Section 3.1.2):* The region from which historical deforestation data is extracted and projected forward to identify areas likely to be deforested in the absence of the project.
- **Leakage Belt** *(Section 3.1.4):* The area surrounding or adjacent to the project site where baseline deforestation activities could be displaced due to the project implementation.
- **Leakage Management Zone**: A designated area outside the project and leakage belt boundaries where interventions (e.g., improved land management, agroforestry, reforestation) are implemented to reduce the risk of activity displacement.

3.1.1 Project Area

The project area refers to the specific land parcel(s) under the control of the Project Proponent where REDD on WE activities will be implemented and GHG emissions reductions will be accounted for. The area must consist exclusively of forested wetland as defined by national or FCO standards at the project start date.

To ensure transparency and verifiability, the project area must be clearly delineated and supported by appropriate documentation. This includes:

1. **Legal Proof Control**
   - Land titles issued by the public registry, or
   - Other legally recognised documents confirming ownership or management rights, or
   - Written consent from landowners authorising the implementation of REDD activities

2. **Spatial Definition**
   - The physical boundaries of the project must be precisely mapped to enable accurate measurement, monitoring, and verification of emissions reductions. If the project comprises multiple discrete land parcels, each must be individually identified and documented.
   - For each discrete parcel, the following information must be provided:
     i. Name of the project area (e.g., compartment number, allotment number, local name), giving a unique ID for each discrete parcel of land
     ii. Digital map(s) of the area
     iii. Geographic coordinates of each polygon vertex along with documentation of their accuracy (from a geo-referenced digital map)
     iv. Total land area
     v. Details of current land-tenure and ownership, including any legal arrangement related to land ownership

3.1.2 Reference Area/Region

The reference area (also referred to as reference region) is used to analyse historical land use and land cover changes; such as deforestation rates and spatial patterns, that inform the baseline scenario for REDD projects. It serves as the foundation for projecting future deforestation or degradation in the absence of project intervention.

To ensure the reference area is representative, it must meet the following conditions:

Spatial Requirements	The reference area must be larger than the project area and must include either the project area or the leakage belt[16]. If direction inclusion is not feasible, the reference area must be located in a geographically similar conditions that reflects comparable deforestation pressures[17].
Similarity Criteria	The reference area must closely resemble the project area in the following dimensions[18]: • Wetland class and ecological function • Soil type, slope, and elevation (±20%) • Agents and drivers of deforestation • Socioeconomic and policy context (e.g., land tenure, enforcement)

3.1.3 Proxy Areas

In the absence of a verifiable general harvesting or tree planting plan that includes a projected deforestation rate, REDD projects must use proxy areas to estimate baseline deforestation rates. Proxy areas serve as representative analogs to the project area and provide empirical data on historical land clearing patterns under similar conditions.

To ensure the validity of proxy-based estimates, the selected proxy areas must meet the following criteria:

Land Conversion Practices	The methods and scale of land clearing must match those used by the baseline agent or class of agents in the project area.
Post-Deforestation Land Use	The land use following deforestation must be the same as what is expected in the project area under a business-as-usual scenario (e.g., conversion to agriculture, aquaculture, or infrastructure).
Land Rights and Management	Proxy areas must have the same type of land tenure (e.g. private, state, concession) and management arrangements as the project area.
Geographic Location	Proxy areas should be selected in the following order of preference: (a) near the project site, (b) elsewhere within the same country, (c) in neighbouring countries (only if no suitable domestic proxies exist)
Legal and Suitability Status	The proxy area must meet the same legal and land suitability conditions as the project area, including zoning, land use permissions and development potentials
Timing of Deforestation	Deforestation in the proxy area must have occurred within the 10 years prior to the baseline period to ensure relevance and recency

[16] *FAS - Fundação Amazônia Sustentável, 2010, Methodology for Estimating Reductions of Greenhouse Gases Emissions from Frontier Deforestation REDD-NM-002*
[17] *Ibid*
[18] *Ibid*

Biophysical Conditions	The proxy area must fall within ±20% similarity of the project area in terms of forest type or vegetation class, soil types, slope, and elevation class

3.1.4 Leakage Belt

Leakage belt refers to the area surrounding or adjacent the project area where deforestation or degradation activities may be displaced as a result of REDD project implementation[19]. This is critical for assessing and managing activity-shifting leakages, which occurs when baseline agents relocate their activities outside the project area due to restrictions imposed by the project.

To ensure the leakage belt is appropriately defined, following conditions must be met:

- The area remains forested under the baseline scenario[20]
- There must be a credible risk that drivers of deforestation or degradation may be displaced from the project area into this area[21].

The boundary of the leakage belt must be defined based on the following dimensions:

Mobility Constrains for the Agents	Use historical data, expert judgment, participatory rural appraisal (PRA), and/or other verifiable sources to assess how agents may shift their activities[22]. Consider[23]: • Availability and pricing of inputs and outputs tied related to land-use activities. • Proximity to roads, rivers, or other access routes • Distance to markets or trading hubs where products are sold or traded. • Location of existing or planned settlements and infrastructure.
Regulation & Social Condition	The leakage belt must be situated in areas with similar: • Land-use policies and enforcement mechanisms • Social and institutional conditions (e.g., community governance, customary rights) The leakage belt must not extend across state or jurisdictional boundaries unless: • There is explicit legal permission to include cross-boundary areas, or • The adjacent jurisdiction enforces comparable forest and land-use regulations.

[19] *Ibid*
[20] *Ibid*
[21] *Forest Carbon Partnership, FCPF Carbon Fund Methodological Framework Discussion Paper #5: Displacement (Leakage), October 2013*
[22] FAS - Fundação Amazônia Sustentável, 2010, Methodology for Estimating Reductions of Greenhouse Gases Emissions from Frontier Deforestation REDD-NM-002
[23] Ibid

Landscape & Ecological Condition	The leakage belt must have similar ecological characteristics to the project area[24]. This includes[25]: • **Forest or Vegetation Classes**: The composition of forest or vegetation types in the leakage belt must be within ±20% similarity in composition. • **Elevation range**: The elevation range in the leakage belt must fall within ±20% of that in the project area. These parameters should be validated using GIS-based spatial analysis and remote sensing tools[26].

3.1.5 Drivers of Forest Change

To establish a credible and defensible baseline, the project must identify the key drivers of deforestation and forest degradation that are relevant to the project area. These drivers must be consistent with those observed in the reference area or proxy areas. Any discrepancies must be clearly explained and justified with supporting evidence.

Drivers of Forest Change refer to the underlying activities or pressures that lead to forest loss. These can be categorised based on whether the deforestation is planned (legally sanctioned) or unplanned (unauthorised or informal). Examples are listed in Table 2 and Table 3 below:

Table 3: Examples of Drivers of Forest Change

Forest Change	Drivers of Forest Change
Unplanned Deforestation/ Degradation	• Clearing land for settlements, crop production, ranching where such clearing for crop production does not amount to large scale industrial agricultural activities • Anthropogenic interventions without legal rights to deforest
Planned Deforestation	• Large scale agricultural or aquaculture operations • Land clearing on parcels larger than 500 ha • Activities conducted under formal land-use permits or legal frameworks

Understanding and documenting these drivers is essential for:

- Aligning the baseline scenario with actual land-use pressures.
- Designing targeted interventions that address the root causes of forest loss.
- Ensuring consistency across the project, reference, and proxy areas.

3.1.6 Stratification

Stratification is the process of dividing areas into relatively homogenous units, or strata, to improve the accuracy and precision of carbon stock estimations and land-use change assessments. This is particularly important in Malaysia's ecologically diverse landscapes.

[24] Ibid
[25] Ibid
[26] Ibid

Given the diversity of wetland ecosystems and the variability in carbon dynamics, stratification shall align with the primary wetland type present within the project area. The following activity modules provide the detailed stratification based on the respective wetland class:

Table 4: Stratification Approach Based on Wetland Area

Wetland Type	Module
Peat Swamp Forest	FCO Methodology: Wetland Ecosystems – Rewetting & Fire Management.
Mangrove Forests & Nipa Swamps	• FCO Methodology: Wetland Ecosystems – Afforestation / Reforestation • FCO Methodology: Wetland Ecosystems – Coastal Wetlands Restoration
Freshwater Swamps	Due to the absence of a reference module, the following stratification criteria may be considered: • Vegetation cover • SOC stock and depletion rate • Hydrology and land management

Each stratum should be internally consistent in terms of these characteristics and distinct from other strata. This allows for more accurate sampling, monitoring, and reporting of carbon stock changes and GHG emissions.

3.2 Carbon Pools

Table 5 below describes the relevant carbon pools essential for this methodology. The significance of the carbon pools is determined by a threshold >5% of total decreases in carbon pools or net emission reductions, whichever is lower.

Table 5: Carbon Pools Covered in the Methodology

	Carbon Pool	Description
Included	Aboveground tree biomass	May increase or decrease in project scenario, in the case of establishment or presence of tree vegetation.
	Aboveground non-tree biomass	May increase or decrease in project scenario, in the case of establishment or presence of herbaceous vegetation.
	Belowground tree biomass	May increase or decrease in project scenario, in the presence of tree vegetation.
	Soil Organic Carbon	A key carbon pool in wetland ecosystems, major source of emissions if disturbed through deforestation and/or degradation. This carbon pool is accounted in carbon stock for freshwater swamps, and through GHG emissions or mangrove forests, nipa swamps and peat swamp forests.

	Carbon Pool	Description
Excluded	Deadwood	Excluded – because decomposition of wood in wetlands is slow[27], and changes over the project duration are expected to be minimal, maintaining a conservative approach.
	Harvested wood products	Harvested wood products may be excluded from REDD initiatives, particularly in cases where timber harvest activities have a negligible impact on carbon stocks in the baseline scenario.
	Litter	Comprises decomposing leaves and organic material with a fast turnover rate, contributing minimally to long-term carbon storage.

3.3 GHG Emission Sources

This subsection outlines the relevant GHG emission sources that must be considered within the defined project boundaries.

To determine if an emission source is significant and whether it can be omitted within the project boundaries, a stepwise procedure must be carried out. Some emissions are conservative to exclude or are considered negligible if their relative contribution is less than 5% of the net GHG emissions.

Table 6: GHG Emission Sources Considered Under the Methodology (All Wetland Types)

	Sources	Gas	Included	Description
Baseline	Burning of woody biomass	CO_2	✓	CO_2 is addressed in carbon stock change quantification.
		CH_4	Optional	Conservative to exclude
		N_2O	Optional	Conservative to exclude
	Fossil fuel use	CO_2	✓	May be conservatively excluded.
		CH_4	✗	Conservatively excluded.
		N_2O	✗	Conservatively excluded.
Project	Burning of woody biomass	CO_2	✓	CO_2 is addressed in carbon stock change quantification.
		CH_4	✓	Major emission source
		N_2O	✓	Major emission source
	Fossil fuel use	CO_2	✓	Fossil fuel combustion is a major global source of CO_2 emissions[28], where project-related fuel use in vehicles and machines is included.

[27] *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, IPCC, 2013*
[28] *U.S. Environmental Protection Agency (EPA), "Global Greenhouse Gas Overview," www.epa.gov, April 2024. https://www.epa.gov/ghgemissions/global-greenhouse-gas-overview*

	Sources	Gas	Included	Description
		CH_4	✗	CH_4 emissions is not a significant source of emissions in project fuel use.
		N_2O	✗	N_2O emissions is not a significant source of emissions in project fuel use.

Additionally, for mangrove and nipa areas, supplementary emission sources must be accounted for, as outlined in Table 7.

Table 7: GHG Emission Sources Specific to Mangrove and Nipa Areas

	Sources	Gas	Included	Description
Baseline	Production of methane by microbes	CH_4	✓	May be conservatively excluded.
	Denitrification or nitrification process	N_2O	✓	May be conservatively excluded.
Project	Production of methane by microbes	CH_4	✓	Potential major source of emissions in the project in low salinity areas[29].
	Denitrification or nitrification process	N_2O	✓	May increase because of the project activity.

4 Baseline Scenario and Additionality

This section outlines the procedures for establishing and reassessing the baseline scenario and demonstrating additionality for REDD on WE projects under the FCO framework. A robust baseline scenario is essential to conservatively estimate GHG emissions or removals that would occur in the absence of project intervention. Additionality ensures that project activities result in real, measurable climate benefits beyond business-as-usual practices.

4.1 Baseline Determination and Additionality Assessment

The baseline scenario represents the most likely land use or management practices that would occur in the absence of the project. It serves as the reference point for estimating GHG emissions or removals.

To determine and justify this scenario, Project Proponents should refer to the **FCO Tool: Baseline Determination and Additionality Assessment.** This standardised tool guides project proponents

[29] *L. He, C. She, J. Huang, P. Yang, H. Yu, and C. Tong, "Effects of constant and fluctuating saltwater addition on CH4 fluxes and methanogens of a tidal freshwater wetland: A mesocosm study," Estuarine, Coastal and Shelf Science, vol. 277, p. 108076, Oct. 2022, doi: https://doi.org/10.1016/j.ecss.2022.108076.*

through a series of steps to ensure that the selected baseline is realistic, evidence based and conservative.

4.2 Reassessment of Baseline Scenario

To maintain alignment with evolving land-use trends and ensure continued credibility, the baseline scenario must be reassessed periodically throughout the crediting period. The frequency and method for reassessment depend on the type of REDD activity:

1. **Avoiding Planned Deforestation**
   The baseline must be reassessed every 10 years for the duration of the project.
2. **Avoiding Unplanned Deforestation and Degradation**
   The baseline must be reassessed every 6 years throughout the project duration.

5 Quantification of Estimated GHG Reductions and Removals

This section outlines the methodology for calculating the GHG emission reductions achieved through the project activities. It provides a structured approach to quantify the difference between baseline emissions (what would have occurred without the project) and actual project emissions (with FCO interventions in place).

5.1 Baseline Emissions

Baseline emissions are established to represent the expected level of emissions in the absence of the project. The baseline net GHG emissions for planned/unplanned deforestation will be determined as follows:

$$GHG_{BSL} = \sum_{t=1}^{t*}\sum_{i=1}^{M}(\Delta C_{BSL,Def/Deg,i,t} + GHG_{BSL-E,i,t}) \quad \textbf{(1)}$$

Where:

Variable	Description	Unit
GHG_{BSL}	Net greenhouse gas emissions in the baseline from planned/unplanned deforestation up to year *t**	tCO_2e
$\Delta C_{BSL,Def,i,t}$	Sum of the baseline carbon stock change under deforestation in stratum *i* in year *t* outlined in Equation 8 (Planned) or Equation 9 (Unplanned)	tCO_2e
$\Delta C_{BSL,Deg,i,t}$	Baseline carbon stock change from forest degradation in stratum i outlined in Equation 10	tCO_2e
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the baseline scenario in stratum *i* in year *t* as outlined in **FCO Tool: GHG Quantification Equations**	tCO_2e/yr
i	1, 2, 3, … M strata	-
t	1, 2, 3, … t* years elapsed since the projected start of the project activity	-

5.1.1 Avoiding Planned Deforestation

Below is a summary of the key steps to calculate baseline emissions for Avoiding Planned Deforestation projects:

Figure 4: Key Steps for Estimation of Baseline Emissions Calculation for Avoiding Planned Deforestation

Step 1: Identify the Agent of Planned Deforestation → **Step 2:** Define the Area of Deforestation → **Step 3:** Estimate the Rate of Planned Deforestation → **Step 4:** Calculate the Annual Area of Deforestation → **Step 5:** Calculate the Baseline Carbon Stock Change

5.1.1.1 Step 1: Identify the Agent of Planned Deforestation

Begin by determining the specific agent responsible for the planned deforestation within each baseline stratum. In straightforward cases, this agent may already be defined as an individual, organisation, or corporation.

If the agent is not yet clearly defined such as when the government or another authority currently manages the land and future deforestation agents are unknown but expected to be officially approved, then identify the most probable class of deforestation agents. Please refer to Section 3.1.5 for examples of deforestation agent and Section 3.1.6 for stratification process.

5.1.1.2 Step 2: Define the Area of Deforestation

All Avoiding Planned Deforestation projects must show a concrete, site-specific threat of deforestation that would occur within a defined timeframe. This threat must be supported by documentary evidence of the following:

Legal Permissibility	Proof that deforestation is legally allowed on the project site
Land Suitability	Evidence that the area is suitable for conversion to a non-forest land use considering factors like soils, topography, climate and market access
Ownership Transfer *(if applicable)*	If relevant, show likely transfer of land to the baseline agent or class of agent through one of the following, before REDD consideration: • Bidding process for the project area indicating intent to deforest • Purchase offer from a development-focused entity • Other documentation showing the area would have been transferred to the agent/class of agent without the project
Government approval (if required)	If deforestation needs official approval, the intention to deforest must be provided: • Recent approval from a relevant government authority for land conversion; or • A filed request for deforestation approval

Intent to Deforest	The intent to deforest must be shown through evidence dated prior to any REDD activity: • Deforestation identified by class of agent (i.e., generalised group of actors typically engage in deforestation activities) - A documented history (e.g., maps, government data) of similar planned deforestation within the past five years. • Deforestation identified by a specific baseline agent (i.e., a known entity like a particular company) - Either a verifiable land use plan for deforestation or a documented history of similar activities within the past five years.

5.1.1.3 Step 3: Estimate the Rate of Planned Deforestation

This methodology requires an estimate of the annual deforestation rate defined as the area expected to be cleared each year for each planned stratum over the duration of the project.

- If a valid and verifiable plan exists that outlines the projected rate of deforestation, that rate must be used.
- If no such plan is available, the rate must be estimated using proxy areas.

The applicability of proxy areas as detailed in Section 3.1.3 Proxy Areas must be considered for determination of deforestation rate. The proxy area is used to estimate the average annual proportion of land cleared, so it must include a sufficient number of land parcels to accurately reflect common deforestation practices both in the proxy area and the project area.
Assessment of proxy areas can be done through original data collection (such as field surveys or remote sensing) or, where appropriate, by using reliable existing data from credible sources.
This equation calculates the annual rate of planned deforestation for a particular forest type (stratum) using data from multiple proxy parcels (land parcels that were previously deforested under similar legal/land-use conditions):

$$D\%_{\text{planned,i,t}} = \left(\frac{\sum_{n=1}^{N}(D\%_n/Yrs_n)}{N}\right) \quad \textbf{(2)}$$

Where:

Variable	Description	Unit
$D\%_{\text{planned,i,t}}$	Projected annual deforestation rate in stratum i during year t	%
$D\%_n$	Percent of land deforested in land parcel *n* of a proxy area	%
Yrs_n	Number of years over which deforestation occurred in land parcel *n*	-
N	Total number of land parcels examined	-
n	1, 2, 3, …*N* land parcels examined in proxy area	-

Variable	Description	Unit
i	1, 2, 3, … *M* strata	-

Step-by-step explanation for the equation:

1. Define the stratum of a specific forest class
2. Select the number of land parcels that belong to the same stratum i with similar legal, ecological and land-use which have undergone planned deforestation.
3. For each land parcel (n):
   - Determine the total percent of the parcel area that was cleared ($D\%_n$).
   - Divide the total percentage of forest land deforested by the number of years it took to clear that land (Yrs_n).
4. Sum the annual deforestation rates for all land parcels calculated in Step 3, then divide the total by the number of proxy parcels (N) to get the average annual deforestation rate for that stratum and year.

5.1.1.4 Step 4: Calculate the Annual Area of Deforestation

The annual area of deforestation in the baseline can be determined using the following equation:

$$AA_{planned,i,t} = A_{planned,i} \times D\%_{planned,i,t} \quad (3)$$

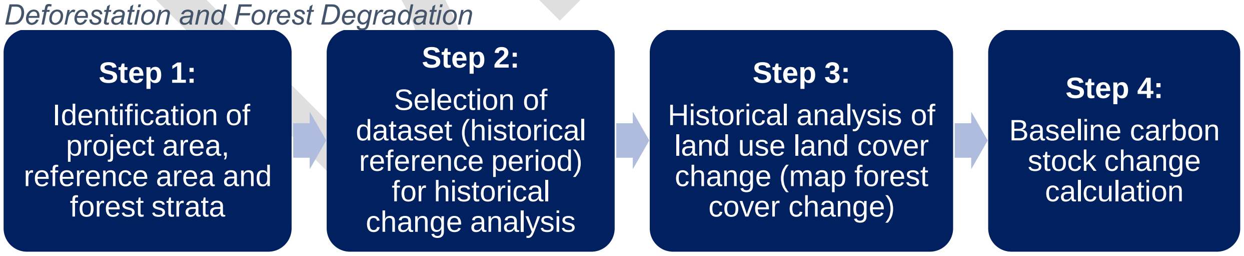
Where:

Variable	Description	Unit
$AA_{planned,i,t}$	Annual area of planned deforestation in stratum i during year t	ha
$D\%_{planned,i,t}$	Percent of land deforested in land parcel *n* of a proxy area or Projected rate of deforestation from verifiable plan	%
$A_{planned,i}$	Number of years over which deforestation occurred in land parcel *n*	-

5.1.2 Avoiding Unplanned Deforestation and Forest Degradation

Below is a summary of the key steps to calculate baseline emissions for Avoiding Unplanned Deforestation and Forest Degradation projects:

Figure 5: Key Steps for Estimation of Baseline Emissions Calculation for Avoiding Unplanned Deforestation and Forest Degradation



5.1.2.1 Step 1: Identification of Project Area and Reference Area

The identification of the project and reference area is as per below:

Project Area	• The project area must be clearly delineated by the project proponent.

	• The area matches with geographical, administrative or jurisdictional boundaries based on Section 3.1.1. This helps ensure operational clarity and minimises overlap with adjacent projects.
Reference Area	• The reference area must comply with the criteria set out in Section 3.1.23.1.2. It is used to assess land-use changes over time to inform the baseline scenario for the project. • The project must demonstrate that the drivers of forest cover change in the reference area are comparable to those in the project area. • The same reference boundaries must be applied consistently across REDD activity within a project to ensure baseline integrity.

5.1.2.2 Step 2: Dataset Selection for Historical Change Analysis

To assess historical land-use change in the reference area, the project proponent must choose a suitable and consistent data set where it covers the same season over different years. Ideally, the datasets must meet these requirements:

- The analysis must cover 10 to 30 years prior to the project start date, using data no earlier than the year 2000, consistent with updated remote sensing standards and land use classification practices used in Malaysia.
- The analysis must include at least three temporal data points (e.g., 2001, 2010, 2020) to capture meaningful forest cover trends.
- Time intervals between these points must be at least 3 years to ensure detectable changes.
- At least one satellite image or land-use dataset must be dated within 2 years before the project start date, ensuring current land dynamics are reflected.

5.1.2.3 Step 3: Historical Analysis of Land Use Land Cover Change

5.1.2.3.1 Land Use Classification

At the start of the project, the developer must identify and describe the existing land use within the reference area.

Classification Requirements	• **The classification and sampling methods used should follow national or regional procedures that align with Intergovernmental Panel on Climate Change (IPCC) guidelines and other international standards.** • **Land classification must be based on IPCC's six categories[30] – Forests, Farmland, Grasslands, Wetlands, Settlements and Other lands**

[30] *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry, IPCC, 2003*

Further Classification	• For forested areas, further classification is required by forest type and density. • These strata may be further divided using appropriate classification methods chosen by the project proponent. • Similarly, non-forest lands such as plantations can also be subdivided, especially when linked to cropland or arable land systems. • These sub-stratifications help identify land use types associated with potential deforestation and degradation drivers, which can result in forest carbon stock losses during land cover transitions. However, such detailed sub-classification is optional.
Supporting Criteria	Land use descriptions should be supported by clear criteria, which could include: • Elevation, slope • Soil type • Proximity to roads and villages • Forest classifications

5.1.2.3.2 Spatial Analysis and Techniques

1) Types of Remote Sensing (RS) Data

The final spatial classification map must include at least six IPCC-defined land-use categories to quantify deforestation. If the reference area contains varied forest types, the map should also depict the dominant forest types across the landscape. Project proponents may utilise existing forest/non-forest classifications from relevant administrative divisions or analyse land use dynamics within or around the landscape to enhance the accuracy of land-use classification. No additional classification by the project proponent is required in such cases.

Examples of such remote sensing instruments are:

- Aerial photographs (e.g., from drone surveys or national mapping agencies),
- Satellite imagery in the visible and near-infrared spectrum (such as Landsat, Sentinel-2, or SPOT), and
- Radar data from satellite or airborne platforms (e.g., ALOS PALSAR, Sentinel-1), which is especially useful in Malaysia's often cloud-covered tropical environment.

A combination of these data types at various spatial resolutions is often used to effectively assess land use, especially across forest types such as PRFs categories (Protection, Amenity, and Research & Education Forests), TPAs, and state lands. These combinations allow for detailed tracking of land cover change and forest disturbance patterns.

2) Land Use Change Analysis

Remote sensing is essential for assessing historical land-use changes in reference areas to determine baseline conditions and rates of deforestation and degradation. In Malaysia, this may involve analysing transitions from natural forest (primary forest) to secondary (disturbed) forest, degraded forest, plantations, agriculture, or infrastructure.

3) Accuracy Assessment of Land Use Change Maps

Ensuring map accuracy is critical for MRV (Measurement, Reporting, and Verification) systems used in Malaysia's REDD+ projects. Accuracy assessments should align with best practices outlined in:

- Section 5 of the IPCC Good Practice Guidance (2003)
- Chapter 3A.2.4 of the 2006 IPCC Guidelines for AFOLU

Field verification, high-resolution satellite imagery, and national forest inventory data (e.g., from the Forest Department Peninsular Malaysia or state forestry agencies) can enhance the credibility of accuracy assessments in the Malaysian forest context. While not a land-use dataset, NFI can serve as a benchmark to cross-check mapped forest characteristics.

5.1.2.3.3 Historical Analysis of Land Use Land Cover Change

Projects must estimate the average annual forest cover change between different strata over a defined historical reference period. This period can be split into multiple sub-periods if necessary. To determine the annual forest area change, refer to the datasets requirements as outline in Section 5.1.2.2.

The change of forest from one stratum to another is assessed by mapping both forested and non-forested areas within the project boundary. The annual rate of change is determined using the following equation:

$$AA_{unplanned,i,t} = \left(\frac{\mathrm{A}_{t2} - \mathrm{A}_{t1}}{t_2 - t_1}\right) \quad (4)$$

Where:

Variable	Description	Unit
$AA_{unplanned,i,t}$	Annual Area of Forest Change for stratum *i* at year *t*	ha
A_{t1}	Forest area in stratum *i* at reference time point t_1	ha
A_{t2}	Forest area in stratum *i* at reference time point t_2	ha
t_1	Start of reference period	-
t_2	End of reference period	-
i	1, 2, 3, … *M* strata	-

Further, for areas that face unplanned degradation, the mean annual change in forest area from stratum 1 to stratum 2 is used to calculate the annual rate of forest area change, based on the equation provided below.

$$ARC_{i,} = \left(\frac{AA_{unplanned,i,t}}{\mathrm{A}_{t1}}\right) \times 100 \quad (5)$$

Where:

Variable	Description	Unit
$ARC_{i,}$	Annual Rate of Change in Forest Area from stratum 1 to stratum 2 at interval t_1 to t_2	%
$AA_{unplanned,i,t}$	Annual Area of Forest Change for stratum *i* at year *t*	ha

Variable	Description	Unit
A_{t1}	Forest area in stratum *i* at reference time point t_1	ha
t_1	Start of reference period	-
t_2	End of reference period	-

Changes in carbon stocks from forest degradation are influenced by land use land cover change, which is assessed using remote sensing technologies such as Synthetic Aperture Radar (SAR) or Light Detection and Ranging (LiDAR). To quantify these changes, data on carbon stock change in forest areas due to forest degradation must be provided. Hence, a greenhouse gas (GHG) emissions factor matrix related to deforestation is used to model the transition from forest to non-forest areas as the equation below:

$$\Delta C_{(1\rightarrow 2)t2-t1} = C_{1,t1} - C_{2,t2} \quad \textbf{(6)}$$

Where:

Variable	Description	Unit
$\Delta C_{(1\rightarrow 2)t2-t1}$	Net carbon stock changes in all pools from stratum 1 to stratum 2 in the t_2-t_1 period, based on Equation 5	$tCO_2e\ ha^{-1}$
$C_{1,t1}$	Carbon stocks in stratum 1 at time t_1	$tCO_2e\ ha^{-1}$
$C_{2,t2}$	Carbon stocks in stratum 2 at time t_2	$tCO_2e\ ha^{-1}$

5.1.3 Baseline Carbon Stock Change

This section applies to both planned and unplanned deforestation activities

Deforestation refers to the conversion of forest land into other land uses. Carbon stock changes in forest areas are determined using geographic information systems (GIS). To evaluate the carbon stock across the entire area, field assessments are conducted by collecting data from sampling plots in each stratum. Please refer to **FCO Tool: GHG Quantification Equation** under Sample Sizes in Stratified Simple Random Sampling for guideline on sample size in each stratum.

The net carbon stock changes in the baseline is equal to the baseline pre-deforestation stock minus the long-term carbon stock after deforestation. Carbon pools excluded from the project can be accounted as zero.

The post-deforestation carbon stock must represent the long-term average carbon stock on the land after deforestation. These values may be determined from reference area or sourced from reliable literature, such as peer-reviewed studies, or reports from the IPCC or FAO.

Carbon stock changes in each pool are calculated by subtracting post-deforestation carbon stocks from forest carbon stocks as per **FCO Tool: GHG Quantification Equations.**

$$\Delta C_{BSL,i,t} = \Delta C_{AGB,i} + \Delta C_{BGB,i} + \Delta C_{SOC,i} \quad \textbf{(7)}$$

Where:

Variable	Description	Unit
$\Delta C_{BSL,i,t}$	Net carbon stock changes in all pools in the baseline stratum *i* in year *t*	tCO_2e
$\Delta C_{AGB,i}$	Baseline carbon stock change in aboveground biomass in stratum *i*	$tCO_2e\ ha^{-1}$
$\Delta C_{BGB,i}$	Baseline carbon stock change in belowground biomass in stratum *i*	$tCO_2e\ ha^{-1}$
$\Delta C_{SOC,i}$	Baseline carbon stock change in soil organic carbon in stratum *i*	$tCO_2e\ ha^{-1}$

For mangrove forests, nipa swamps, and peat swamp forests, changes in soil organic carbon should be excluded from the carbon stock change calculation, as these are instead accounted for through GHG emissions as outlined in Section 5.1.4. The full formula including aboveground and belowground biomass as well as soil organic carbon is only applied to freshwater swamp forests, where changes in SOC are not separately captured as emissions.

Table 8 provides the default reference soil organic carbon stocks for wetland mineral soils. In Malaysia, freshwater swamps are typically found on permanently or seasonally flooded soils containing more than 35% mineral content[31].

Table 8: Default Reference Soil Organic Stocks for Wetland Mineral Soils

Climate region	Default SOC_{REF} ($t\ C\ ha^{-1}$)[32]
Tropical, dry	22
Tropical, moist	68
Tropical, wet	49
Tropical, montane	82

Table 9 shows the relative stock change factors for different management activities on cropland. Similarly, the relative stock change factors for grassland management are tabulated in Table 10. For cropland where natural hydrology has been restored, and where crop production may or may not continue, values are provided in Table 11.

Table 9: Default stock change factors for land-use, input and management on cropland

Factor Value Type	Level	Climate Regime	Moisture Regime	IPCC Defaults[33]
Land use (f_{LU})	Long-term cultivated	Tropical	Dry	0.58
			Moist/Wet	0.48
		Tropical montane	n/a	0.64
	Paddy rice	All	Dry and Moist/Wet	1.10
	Perennial/Tree crop	All	Dry and Moist/Wet	1.00
		Tropical	Dry	0.93

[31] I. Parlan, H. I. Mohd Husin, and T. Husin, 2021. “An Overview of Wetlands in Malaysia.” Forest Research Institute Malaysia.
[32] 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, IPCC, 2013
[33] 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Cropland, IPCC, 2006

Factor Value Type	Level	Climate Regime	Moisture Regime	IPCC Defaults[33]
	Set aside (<20 years)		Moist/Wet	0.82
		Tropical montane	n/a	0.88
Tillage (f_{MG})	Full	All	Dry and Moist/Wet	1.00
	Reduced	Tropical	Dry	1.09
			Moist/Wet	1.15
		Tropical montane	n/a	1.09
	No-till	Tropical	Dry	1.17
			Moist/Wet	1.22
		Tropical montane	n/a	1.16
Input (f_{IN})	Low	Tropical	Dry	0.95
			Moist/Wet	0.92
		Tropical montane	n/a	0.94
	Medium	All	Dry and Moist/Wet	1.00
	High without manure	Tropical	Dry	1.04
			Moist/Wet	1.11
		Tropical montane	n/a	1.08
	High with manure	Tropical	Dry	1.37
			Moist/Wet	1.44
		Tropical montane	n/a	1.41

Table 10: Default stock change factors for land-use, input and management on grassland

Factor Value Type	Level	Climate Regime	IPCC Defaults[34]
Land use (f_{LU})	All	All	1.0
Management (f_{MG})	Nominally managed (non-degraded)	All	1.0
	Moderately degraded grassland	Tropical	0.97
		Tropical Montane	0.96

[34] *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Grassland, IPCC, 2006*

Factor Value Type	Level	Climate Regime	IPCC Defaults[34]
	Severely degraded	All	0.7
	Improved grassland	Tropical	1.17
		Tropical Montane	1.16
Severely degraded	All	0.7	Severely degraded
Improved grassland	Tropical	1.17	Improved grassland

Table 11: Default stock change factors for land-use for long term cultivation on rewetting of cropland

Factor Value Type	Management	Climate Regime	Moisture Regime	IPCC Defaults[35]
Land use (f_{LU})	Rewetting (Years 1-20)	Tropical	Dry and moist	0.80
	Rewetting (Years 21-40)			1.0

5.1.3.1 Avoiding Planned Deforestation Project

$$\Delta C_{BSL,Def,i,t} = AA_{planned,i,t} \times \Delta C_{BSL,i,t} \quad \textbf{(8)}$$

Where:

Variable	Description	Unit
$\Delta C_{BSL,Def,i,t}$	Sum of the baseline carbon stock change under deforestation in stratum *i* in year *t*	tCO_2e
$AA_{planned,i,t}$	Annual Area of Forest Change (deforestation) for stratum *i* at year *t*	ha
$\Delta C_{BSL,i,t}$	Net carbon stock changes in all pools in the baseline stratum *i* in year *t*	tCO_2e

5.1.3.2 Avoiding Unplanned Deforestation Project

$$\Delta C_{BSL,Def,i,t} = AA_{unplanned,i,t} \times \Delta C_{BSL,i,t} \quad \textbf{(9)}$$

Where:

Variable	Description	Unit
$\Delta C_{BSL,Def,i,t}$	Sum of the baseline carbon stock change under deforestation in stratum *i* in year *t* *(Determined independently for project area and leakage belt)*	tCO_2e

[35] *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, IPCC, 2013*

Variable	Description	Unit
$AA_{unplanned,i,t}$	Annual Area of unplanned deforestation for stratum *i* at year *t*	ha
$\Delta C_{BSL,i,t}$	Net carbon stock changes in all pools in the baseline stratum *i* in year *t*	tCO_2e

5.1.3.3 Avoiding Unplanned Degradation Project

$$\Delta C_{BSL,Deg,i,t} = \Delta C_{(1\rightarrow 2)t2-t1} \times ARC_{i,} \times A_i \quad \textbf{(10)}$$

Where:

Variable	Description	Unit
$\Delta C_{BSL,Deg,i,t}$	Baseline carbon stock change from forest degradation in stratum i	tCO_2e
$\Delta C_{(1\rightarrow 2)t2-t1}$	Net carbon stock changes in all pools from stratum 1 to stratum 2 in the t_2-t_1 *period*	$tCO_2e\ ha^{-1}$
$ARC_{i,}$	Annual Rate of Change in Forest Area from stratum 1 to stratum 2 at interval t_1 *to* t_2	%
A_i	Area of stratum in i	ha

5.1.4 Greenhouse Gas Emissions

This section applies to both planned and unplanned deforestation activities

The detailed calculation methods for GHG emission source can be found in **FCO Tool: GHG Quantification Equations**. The GHG emissions in the baseline is estimated as:

$$GHG_{BSL-E,i,t} = GHG_{FC,i,t} + GHG_{BURN,i,t} + GHG_{SOC,i,t} \quad \textbf{(11)}$$

Where:

Variable	Description	Unit
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions as a result deforestation and degradation activities within the project area in the stratum *i* in year *t*	tCO_2e
$GHG_{FC,i,t}$	Net CO_2e emission from fossil fuel combustion in stratum *i* in year *t*	tCO_2e
$GHG_{BURN,i,t,}$	Non-CO_2 emissions due to biomass burning in stratum *i* in year *t*	tCO_2e
$GHG_{SOC,i,t}$	Net CO_2e emission from soil in stratum *i* in year *t*	tCO_2e
i	1, 2, 3, …*M* strata	
t	1, 2, 3, …*t** years elapsed since the start of the project activity	

For freshwater swamp forests, changes in SOC are included as part of the carbon stock change calculation and are therefore should exclude the GHG emissions component $GHG_{SOC,i,t}$. In contrast, for mangrove forests, nipa swamps, and peat swamp forests, SOC changes are represented as emissions and included under rather than within carbon stock changes, as detailed below.

5.1.4.1 SOC Emissions for Mangroves Forests and Nipa Swamps

The detailed calculation method for the SOC emissions can be found in the **FCO Tool: GHG Quantification Equations**.

5.1.4.2 SOC Emissions for Peat Swamp Forests

For peat swamp forests in the baseline scenario, use the equation as follows:

$$GHG_{SOC-PEAT} = \sum_{t=1}^{t*}\sum_{i=1}^{M}(A_{peatsoil-BSL,i,t} \times GHG_{peatsoil-BSL,i,t} + A_{ditch-BSL,i,t} \times GHG_{peatditch-BSL,i,t} + A_{peatburn-BSL,i,t} \times GHG_{peatburn-BSL,i,t}) \quad \textbf{(12)}$$

Where:

Variable	Description	Unit
$GHG_{SOC-PEAT}$	Total net greenhouse gas (GHG) emissions from the peatland baseline scenario accumulated from year 1 up to year t*	tCO_2e
$A_{peatsoil-BSL,i,t}$	Area of peatland (excluding burnt areas and open water) in stratum *i* during year *t* in the baseline scenario	ha
$A_{ditch-BSL,i,t}$	Area of ditches or other open water bodies in stratum *i* during year *t* in the baseline scenario	ha
$A_{peatburn-BSL,i,t}$	Area of peat that has been burned in stratum *i* during year *t* in the baseline scenario	ha
$GHG_{peatsoil-BSL,i,t}$	GHG emissions from peat soil within the project boundary under the baseline scenario, for stratum *i* in year *t*	$t\ CO_2e\ ha^{-1}\ yr^{-1}$
$GHG_{peatditch-BSL,i,t}$	GHG emissions from ditches and water bodies under the baseline scenario, in stratum *i* during year *t*	$t\ CO_2e\ ha^{-1}\ yr^{-1}$
$GHG_{peatburn-BSL,i,t}$	GHG emissions from peat burning in the baseline scenario, in stratum *i* and year *t*	$t\ CO_2e\ ha^{-1}\ yr^{-1}$
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

5.1.4.2.1 Baseline GHG Emissions from Peat Drainage

GHG emissions can be estimated using proxy indicators (e.g., land use, water table depth, subsidence, etc.)[36] or IPCC default values. GHG emissions from peat soil in each stratum under the baseline scenario, resulting from drainage, are estimated using the following approach:

$$GHG_{peatsoil-BSL,i,t} = GHG_{proxy-CO2,i,t} + GHG_{proxy-CH4,i,t} \quad \textbf{(13)}$$

Where:

Variable	Description	Unit
$GHG_{proxy-BSL,i,t}$	GHG emissions associated with the selected proxy for the baseline scenario in stratum *i* during year *t*	t CO_2e ha^{-1} yr^{-1}
$GHG_{proxy-CO2,i,t}$	CO_2 emissions of chosen proxy in stratum *i* at year *t* Default factor from IPCC Table 2.1[37]	ha
$GHG_{proxy-CH4,i,t}$	CH_4 emissions related to the chosen proxy in stratum *i* at year *t;* this component may be conservatively excluded from the baseline scenario Default factor from IPCC Table 2.3[38]	ha
i	1, 2, 3, … *M* strata	-
t	1, 2, 3, … t* years elapsed since the projected start of the project activity	-

Examples for proxies, which must be justified using literature, manuals, or local expert judgment, and maintain conservative assumptions:

Subsidence	Drainage of organic soil leads to subsidence; whereby the oxidation of carbon may be related to the volume loss of the soil measured through soil coring[39].
Water Table Depth	Drainage lowers the water table, causing the exposed soil layers to oxidise and hence increasing the CO2 emissions. Alternately, drainage causes the reduction of the natural production of CH4[40].

5.1.4.2.2 Baseline GHG Emissions from Ditches and Open Water

GHG emissions from ditches and open water bodies can be estimated using area of ditch and area of open water combined with emission factors.

$$GHG_{peatditch-BSL,i,t} = GHG_{peatditch-CO2,i,t} + GHG_{peatditch-CH4,i,t} \quad \textbf{(14)}$$

[36] 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, IPCC, 2013
[37] Ibid
[38] Ibid
[39] Ibid
[40] *Ibid*

Where:

Variable	Description	Unit
$GHG_{peatditch-BSL,i,t}$	GHG emissions from ditches and other open water areas in baseline stratum *i* during year *t* of the baseline scenario	t CO_2e ha^{-1} yr^{-1}
$GHG_{peatditch-CO2,i,t}$	CO_2 emissions from ditches and open water in baseline stratum *i* during year *t* Default factor from IPCC Table 2.2[41]	t CO_2e ha^{-1} yr^{-1}
$GHG_{peatditch-CH4,i,t}$	CH_4 emissions from ditches and open water in baseline stratum *i* during year *t* Default factor from IPCC Table 2.4[42]	t CO_2e ha^{-1} yr^{-1}
i	1, 2, 3, … *M* strata	-
t	1, 2, 3, … t* years elapsed since the projected start of the project activity	-

Projects may either determine project-specific values for $GHG_{peatditch-CO2,i,t}$ and $GHG_{peatditch-CH4,i,t}$, or use values from peer-reviewed literature or IPCC defaults. Emissions from ditches and channels that already exist at the project start date are assumed not to increase under the project scenario[43] and may thus be conservatively excluded from accounting. This same approach applies to other open water bodies, such as lakes and ponds.

5.1.4.2.3 Baseline GHG Emissions from Peat Fire

GHG emissions from fires in peat swamp forests can occur due to either controlled or uncontrolled burning[44]. The estimation of GHG emissions from peat burning is as below:

$$GHG_{peatburn,i,t} = \sum_{g=1}^{G} (P_{i,t} \times EF_{g,i} \times 10^{-3} \times GWP_g) \quad \textbf{(15)}$$

Where:

Variable	Description	Unit
$GHG_{peatburn,i,t}$	GHG emissions from peat burning in stratum *i*, year *t*	t CO_2e ha^{-1} yr^{-1}
$P_{i,t}$	Average mass of peat burnt in stratum *i*, year *t*	t d.m. ha^{-1}
$EF_{g,i}$	IPCC emission factor in stratum *i* for gas *g* per tonne of dry peat burnt	kg t^{-1} d.m.

[41] *Ibid*
[42] *Ibid*
[43] *J. Couwenberg et al., "Assessing greenhouse gas emissions from peatlands using vegetation as a proxy," Hydrobiologia, vol. 674, no. 1, May 2011, doi: https://doi.org/10.1007/s10750-011-0729-x.*
[44] *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, IPCC, 2013*

Variable	Description	Unit
GWP_g	Global warming potential for gas *g*	t CO_2/t g
g	Greenhouse gas (CO_2, CH_4, N_2O); usually *g* = 1 to 3	-
i	1, 2, 3, … *M* strata	-
t	1, 2, 3, … t* years elapsed since the projected start of the project activity	-

The average mass of peat burnt within a stratum is calculated as follows:

$$P_{i,t} = D_{peatburn,i,t} \times BD_{soil,i} \times 10^4 \quad \textbf{(16)}$$

Where:

Variable	Description	Unit
$P_{i,t}$	Average mass of peat burnt in stratum *i*, year *t*	t d.m. ha^{-1}
$D_{peatburn,i,t}$	Average fire scar depth in stratum *i* in year *t*	m
$BD_{soil,i}$	Soil bulk density in stratum *i*	g cm^{-3}
i	1, 2, 3, … *M* strata	-
t	1, 2, 3, … t* years elapsed since the projected start of the project activity	-

When using historical data to estimate baseline fire frequency and impact, proponents shall use supporting evidence from official reports, statistics, and/or remote sensing data. In all cases, the justification for the data's applicability and the conservative nature of the assumptions must be clearly demonstrated.

5.1.5 Leakage Emissions

For Avoiding Planned Deforestation, if the specific deforestation agent is known, leakage does not need to be accounted for, provided it can be clearly demonstrated that the agent's management plans or land-use designations on their other lands have not significantly changed as a result of the project. Refer to Section 5.3.2.1 for further details.
For Avoiding Unplanned Deforestation or Degradation, use Equation 1 to quantify baseline carbon stock changes and GHG emissions in the leakage belt ($GHG_{BSL:\,LB}$). Baseline carbon stock changes are calculated using Equation 8, while GHG emissions are quantified using Equation 11.

5.2 Project Emissions

Net GHG emissions in project case is equal to the sum of stock changes due to deforestation and forest degradation plus the total GHG emissions:

$$GHG_{FCO} = \sum_{t=1}^{t*}\sum_{i=1}^{M}(\Delta C_{FCO,Def,i,t} + \Delta C_{FCO,Deg,i,t} + \Delta C_{FCO,NatD,i,t} + GHG_{FCO-E,i,t}) \quad (17)$$

Where:

Variable	Description	Unit
GHG_{FCO}	Net GHG emissions in the REDD project scenario up to year t*	tCO_2e
$\Delta C_{FCO,Def,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i in year t	tCO_2e
$\Delta C_{FCO,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i in year t	tCO_2e
$\Delta C_{FCO,NatD,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* in year *t*	tCO_2e
$GHG_{FCO-E,i,t}$	GHG emissions as a result of REDD activities within the project boundary in the baseline stratum i in year t as outlined in **FCO Tool: GHG Quantification Equations**	tCO_2e
i	1, 2, 3,…*M* strata	-
t	1, 2, 3,…*t** years elapsed since the start of the project activity	-

Leakage Belt:

Leakage belt is an area where leakage occurs around an individual project area parcel. Adjacent project parcels will share a leakage belt which when summed up will become the leakage area.

$$GHG_{FCO:\,LB} = \sum_{t=1}^{t*}\sum_{i=1}^{M}\Delta C_{FCO:\,LB,Def,i,t} \quad (18)$$

Where:

Variable	Description	Unit
$GHG_{FCO:\,LB}$	Net GHG emissions in the leakage belt in the REDD project scenario up to year t*	tCO2e
$\Delta C_{FCO:\,LB,Def,i,t}$	Net carbon stock change as a result of deforestation in the leakage belt in the project case in stratum i in year t	tCO2e
i	1, 2, 3,…*M* strata	
t	1, 2, 3,…*t** years elapsed since the start of the project activity	

5.2.1 Carbon Stock Change

5.2.1.1 Carbon Stock Change for Deforestation

To detect and map deforestation, various remote sensing methods can be used. The chosen method must follow established best practices, depend on available resources and image processing software, and be applied consistently throughout the baseline period. The method must reliably estimate deforestation in both the project and leakage areas. For further guidance, refer to IPCC 2006 GL AFOLU, Chapter 3A.2.4.

The variable that accounts for the net carbon stock change as a result of deforestation in the project area and leakage belt is equal to the area deforested multiplied by the emission per unit area is shown below:

$$\Delta C_{FCO,Def,i,t} = \sum_{u=1}^{U} (A_{FCO,u,i,t} * \Delta C_{FCO,Def,u,i,t}) \quad \textbf{(19)}$$

$$\Delta C_{FCO:LB,Def,i,t} = \sum_{u=1}^{U} (A_{FCO:LB,u,i,t} * \Delta C_{FCO,Def,u,i,t}) \quad \textbf{(20)}$$

Where:

Variable	Description	Unit
$\Delta C_{FCO,Def,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum *i* in year *t*	tCO_2e
$A_{FCO,u,i,t}$	Area of recorded deforestation in the project area stratum *i* converted to land use *u* in year *t*	ha
$\Delta C_{FCO,Def,u,i,t}$	Net carbon stock changes in all pools in the project scenario in land use *u* in stratum *i* in year *t*	$tCO_2e\ ha^{-1}$
u	1, 2, 3, …*U* post-deforestation land uses	-
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

The emission per unit area is equal to the difference between the stocks before and after deforestation minus any wood products created from timber extraction in the process of deforestation:

$$\Delta C_{FCO,Def,u,i,t} = C_{BSL,i} - C_{FCO,Post,i} - C_{WP} \quad \textbf{(21)}$$

Where:

Variable	Description	Unit
$\Delta C_{FCO,Def,u,i,t}$	Net carbon stock changes in all pools in the project case in land use *u* in stratum *i* in year *t*	tCO_2e
$C_{BSL,i}$	Carbon stock in all pools in the baseline scenario in stratum *i*	$tCO_2e\ ha^{-1}$
$C_{FCO,Post,i}$	Carbon stock in all pools in the project scenario in land use *u* in stratum *i* in year *t*	$tCO_2e\ ha^{-1}$
C_{WP}	Carbon stock sequestered in wood products from harvests in stratum *i*	$tCO_2e\ ha^{-1}$
u	1, 2, 3, …*U* post-deforestation land uses	-

Variable	Description	Unit
i	1, 2, 3,…*M* strata	-
t	1, 2, 3,…*t** years elapsed since the start of the project activity	-

All carbon stocks are assumed to be emitted in the year deforestation occurs, with no carbon considered permanently sequestered, regardless of whether burning is involved in the conversion process. In addition, it is considered conservative to assume that no wood products are produced.

For each post-deforestation land (u), estimation of long-term carbon stock is done using the following:

$$C_{FCO,Post,i} = C_{AGB,i} + C_{BGB,i} + C_{SOC,i} \quad \textbf{(22)}$$

Where:

Variable	Description	Unit
$C_{FCO,Post,i}$	Carbon stock in all pools in the project scenario in land use *u* in stratum *i* in year *t*	$tCO_2e\ ha^{-1}$
$C_{AGB,i}$	Carbon stock in aboveground biomass in stratum *i*	$tCO_2e\ ha^{-1}$
$C_{BGB,i}$	Carbon stock in belowground biomass in stratum *i*	$tCO_2e\ ha^{-1}$
$C_{SOC,i}$	Carbon stock in soil in stratum *i*	$tCO_2e\ ha^{-1}$
u	1, 2, 3, …*U* post-deforestation land uses	-
i	1, 2, 3,…*M* strata	-
t	1, 2, 3,…*t** years elapsed since the start of the project activity	-

For mangrove forests, nipa swamps, and peat swamp forests, changes in soil organic carbon should be excluded from the carbon stock change calculation, as these are instead accounted for through GHG emissions. The full formula including aboveground and belowground biomass as well as soil organic carbon is only applied to freshwater swamp forests, where changes in SOC are not separately captured as emissions, based on the default values in the

Table 8, Table 9, Table 10 and Table 11.

5.2.1.2 Carbon Stock Change for Degradation

Monitoring degradation is only necessary if logging (whether legal or illegal), fuelwood collection, or charcoal production is anticipated under the project scenario.

$$\Delta C_{FCO,Deg,i,t} = \Delta C_{FCO,Deg-W,i,t} + \Delta C_{FCO,Deg-SL,i,t} \quad \textbf{(23)}$$

Where:

Variable	Description	Unit
$\Delta C_{FCO,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i in year t	tCO_2e

Variable	Description	Unit
$\Delta C_{FCO,Deg-W,i,t}$	Net carbon stock change as a result of degradation through extraction of trees for illegal fuelwood and charcoal in the project area in the project case in stratum *i* in year *t*	tCO_2e
$\Delta C_{FCO,Deg-SL,i,t}$	Net carbon stock change as a result of degradation through selective logging of FSC certified forest management areas in the project area in the project case in stratum *i* in year *t*	$tCO_2e\ ha^{-1}$
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

$\Delta C_{FCO,Deg-SL,i,t}$ is considered to be zero in this case as this variable refers to selective logging which is not accounted for in this methodology.

Important to note that to address forest degradation, it is necessary to complete a participatory rural appraisal (PRA) of the communities within and surrounding the project area to determine if there is potential for illegal extraction of trees to occur.

If the PRA concludes that no illegal extraction of trees will occur, then $\Delta C_{FCO,Deg-W,i,t}$ can be assumed to be zero and no monitoring of this would be needed. However, the PRA process must be repeated every 2 years to ensure that the potential of illegal extraction of trees will not occur.

However, if the PRA assessment indicates the potential of degradation, limited field sampling must be done. Where the PRA and the limited sampling show that degradation is occurring:

$$\Delta C_{FCO,Deg-W,i,t} = A_{Deg-W,i} * \frac{C_{Deg-W,i,t}}{AP_i} \quad \textbf{(24)}$$

Where:

Variable	Description	Unit
$\Delta C_{FCO,Deg-W,i,t}$	Net carbon stock changes as a result of degradation in stratum *i* in the project area in year *t*;	tCO_2e
$A_{Deg-W,i}$	Area potentially impacted by degradation processes in stratum *i*	ha
$C_{Deg-W,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* in year t	tCO_2e
AP_i	Total area of degradation sample plots in stratum *i*	ha
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

5.2.1.3 Carbon Stock Change for Natural Disturbances

This sub section accounts for when natural disturbances occur ex-post within the project area such as natural disasters, pest, drought, or fire that caused degradation of forest carbon stocks. The areas affected by these disturbances shall be delineated, and the associated emissions shall be estimated. Emissions resulting from natural disasters may be omitted if the effects are deemed minimal.

The basis of net carbon stock change as a result of natural disturbance is equal to the area disturbed multiplied by the emission per unit area.

For planned deforestation the sum of $A_{FCO,NatD,q,i,t}$ shall be equal to the area of overlap between the delineated area of the disturbance and the summed area of planned deforestation in the project area $(A_{planned,i} \times D\%_{planned,i,t})$, summed to the year in which the disturbance occurred.

For unplanned deforestation the sum of $A_{FCO,NatD,q,i,t}$shall be equal to the area of overlap between the delineated area of the disturbance and the summed area of unplanned deforestation in the project area $(A_{BSL,unplanned,t})$ summed to the year in which the disturbance occurred.

$$\Delta C_{FCO,NatD,i,t} = \sum_{q=1}^{Q} A_{FCO,NatD,q,i,t} * \Delta C_{FCO,NatD,q,i,t} \quad \textbf{(24)}$$

Where:

Variable	Description	Unit
$\Delta C_{FCO,NatD,i,t}$	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum *i* in year *t*	tCO_2e
$A_{FCO,NatD,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum i, in year t	ha
$\Delta C_{FCO,NatD,q,i,t}$	Net carbon stock changes in pools as a result of natural disturbance in post-natural disturbance stratum q in stratum i in year t	$tCO_2e\ ha^{-1}$
q	1, 2, 3, …*Q* post-natural disturbance strata	-
i	1, 2, 3, …*M* strata	-
t	1, 2, 3,…*t** years elapsed since the start of the project activity	-

The area affected $(A_{FCO,NatD,q,i,t})$ must correspond to the portion of the delineated disturbance that overlaps with deforested or degraded areas in the project for the relevant year.
If the post-natural disturbance stratum q included fire, the area affected is assumed to be equal to the area impacted by natural disturbance in post natural disturbance stratum q.

$$A_{burn,i,t} = \sum_{q=1}^{Q} A_{burn,q,i,t} \quad \textbf{(25)}$$

$$A_{burn,q,i,t} = A_{FCO,NatD,q,i,t} \quad \textbf{(26)}$$

Where:

Variable	Description	Unit
$A_{burn,i,t}$	Area burned in stratum i in year t	ha
$A_{burn,q,i,t}$	Area burnt in post-natural disturbance stratum *q* in stratum *i,* in year *t*	ha

Variable	Description	Unit
$A_{FCO,NatD,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum *q* in stratum *i*, in year *t*	ha
q	1, 2, 3, …*Q* post-natural disturbance strata where natural disturbance included fire	-
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

Any emissions resulting from fire must be accounted for using Equation 23 below for GHG emissions under the project scenario.

The carbon stock change in stratum q is calculated as follows:

$$\Delta C_{FCO,NatD,q,i,t} = C_{BSL,i} - C_{FCO,NatD,q,i} - C_{WP,q,i} \quad \textbf{(27)}$$

Where:

Variable	Description	Unit
$\Delta C_{FCO,NatD,q,i,t}$	Net carbon stock changes in pools as a result of natural disturbance in post-natural disturbance stratum q in stratum i in year t	$tCO_2e\ ha^{-1}$
$C_{BSL,i}$	Carbon stock in all pools in the baseline scenario in stratum *i*	$tCO_2e\ ha^{-1}$
$C_{FCO,NatD,q,i}$	Carbon stock in pools in post-natural disturbance strata *q* in stratum *i*	$tCO_2e\ ha^{-1}$
$C_{WP,q,i}$	Carbon stock sequestered in wood products from harvests following natural disturbance in post-natural disturbance stratum *q*, in stratum *i*;	$tCO_2e\ ha^{-1}$
q	1, 2, 3, …*Q* post-natural disturbance strata	-
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

For each disturbance stratum (q), carbon stock must be estimated after the natural disturbance.

$$C_{FCO,NatD,q,i} = C_{AGB,i} + C_{BGB,i} + C_{SOC,i} \quad \textbf{(28)}$$

Where:

Variable	Description	Unit
$C_{FCO,NatD,q,i}$	Carbon stock in pools in post-natural disturbance strata *q* in stratum *i*	$tCO_2e\ ha^{-1}$
$C_{AGB,i}$	Carbon stock in aboveground biomass in stratum *i*;	$tCO_2e\ ha^{-1}$
$C_{BGB,i}$	Carbon stock in belowground biomass in stratum *i*;	$tCO_2e\ ha^{-1}$
$C_{SOC,i}$	Carbon stock in soil in stratum *i*	$tCO_2e\ ha^{-1}$

For mangrove forests, nipa swamps, and peat swamp forests, changes in soil organic carbon should be excluded from the carbon stock change calculation, as these are instead accounted for through GHG emissions. The full formula including aboveground and belowground biomass as well as soil organic carbon is only applied to freshwater swamp forests, where changes in SOC are not separately captured as emissions, based on the default values in Section 5.1.3;

Table 8, Table 9, Table 10 and Table 11.

5.2.2 Greenhouse Gas Emissions

The detailed calculation methods for GHG emission source can be found in **FCO Tool: GHG Quantification Equations**. The GHG emissions in the baseline is estimated as:

$$GHG_{FCO-E,i,t} = GHG_{FC,i,t} + GHG_{BURN,i,t} + GHG_{SOC,i,t} \quad \textbf{(29)}$$

$$GHG_{FCO:\,LB-E,i,t} = GHG_{BURN,i,t} + GHG_{SOC,i,t} \quad \textbf{(30)}$$

Where:

Variable	Description	Unit
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions as a result deforestation and degradation activities within the project area in the stratum *i* in year *t*	tCO_2e
$GHG_{FCO:\,LB-E,i,t}$	Greenhouse gas emissions as a result of leakage prevention activities up to year t*	tCO_2e
$GHG_{FC,i,t}$	Net CO_2e emission from fossil fuel combustion in stratum *i* in year *t*	tCO_2e
$GHG_{BURN,i,t,}$	Non-CO_2 emissions due to biomass burning in stratum *i* in year *t*	tCO_2e
$GHG_{SOC,i,t}$	Net CO_2e emission from soil in stratum *i* in year *t*	tCO_2e
i	1, 2, 3, …*M* strata	-
t	1, 2, 3, …*t** years elapsed since the start of the project activity	-

For freshwater swamp forests, changes in SOC are included as part of the carbon stock change calculation and are therefore should exclude the GHG emissions component $GHG_{SOC,i,t}$. In contrast, for mangrove forests, nipa swamps, and peat swamp forests, SOC changes are represented as emissions and included under rather than within carbon stock changes, as detailed below.

5.2.2.1 SOC Emissions for Mangroves Forests and Nipa Swamps

The detailed calculation method for the SOC emissions can be found in the **FCO Tool: GHG Quantification Equations**.

5.2.2.2 SOC Emissions for Peat Swamp Forests

Please refer to Section 5.1.4.2 for the detailed calculation for the SOC emissions.

5.2.3 Leakage Emissions

For quantification of carbon stock changes and GHG emissions in the leakage belt for project scenario $(GHG_{FCO:\,LB})$, apply Equation 18. Accordingly, carbon stock changes are calculated using Equation 20 in combination with GHG emissions calculated using Equation 30.

5.3 Leakage Emissions

The emission from leakage is calculated as follows:

$$GHG_{LK} = GHG_{LK-AS-LB} \quad \textbf{(31)}$$

Where:

Variable	Description	Unit
GHG_{LK}	Net CO_2 emissions due to leakage	tCO_2e
$GHG_{LK-AS-LB}$	Net CO_2 emissions from unplanned deforestation displaced from the project area into the leakage belt, accumulated up to year t*	tCO_2e

5.3.1 Activity Leakage

In REDD project implementation, deforestation that would have occurred within the project area may be displaced to areas outside its boundaries, resulting in leakage. If this displacement leads to increased deforestation, the associated carbon stock changes and GHG emissions must be accounted for as leakage.

5.3.1.1 Avoiding Planned Deforestation

If the specific deforestation agent is known, leakage does not need to be accounted for if it can be clearly shown that the agent's management plans or land-use designations on their other lands (which must be geographically identified) have not significantly changed due to the project.

Examples of such changes by the deforestation agent include:
- Assigning new areas as timber concessions
- Increasing timber harvest rates
- Clearing intact forests for agriculture
- Increasing use of fertilizer to enhance agricultural yield

In cases where the specific individual deforestation agent is not known, but the type or class of agent (e.g., smallholder farmers, logging companies) is identified, leakage does not need to be accounted for given if there is verifiable evidence showing that the management plans or land-use designations of all lands managed by that class of agents have not significantly changed as a result of the project. Additionally, leakage does not need to be considered if it can be shown that it is unrelated to the project and instead driven by external factors (e.g., market trends, policy changes). In such cases, project proponent must provide verifiable documentation, such as official records, market analyses, or peer-reviewed studies, along with an assessment explaining how these external factors influenced leakage accounting.

5.3.1.2 Avoiding Unplanned Deforestation

To quantify leakage from displaced unplanned deforestation, carbon stock changes and GHG emissions in the leakage belt must be estimated for both the baseline and the project implementation scenarios as per Sections 5.1.5 and 5.2.3.

$$GHG_{LK-AS} = GHG_{FCO,LB} - GHG_{BSL,LB} \quad \textbf{(32)}$$

Where:

Variable	Description	Unit
$GHG_{LK-AS-LB}$	Net CO_2 emissions from unplanned deforestation displaced from the project area into the leakage belt, accumulated up to year t*	tCO_2e
$GHG_{FCO,LB}$	Net GHG emissions in the leakage belt under the project scenario, up to year t*	tCO_2e
$GHG_{BSL,LB}$	Baseline net CO_2 emissions from unplanned deforestation occurring in the leakage belt, also measured cumulatively up to year t	tCO_2e

5.3.2 Ecological Leakage

In accordance with the applicability conditions, the project must be designed to avoid increases in GHG emissions in adjacent areas resulting from hydrological connectivity, specifically by preventing changes to mean annual water table levels and flooding frequency or duration. Compliance must be demonstrated through expert assessment, hydrologic modelling, or direct monitoring of water table fluctuations within the project area.

5.3.3 Market Leakage

Market leakage occurs when REDD activities causes an indirect increase of emissions elsewhere due to changes in supply of forest-related products, such as when reducing planned harvesting of timber, fuelwood, or charcoal in the project area causes increased harvesting in other areas[45].

To reduce the risk of market leakage, project proponents may set up leakage management zones – areas where sustainable activities (e.g., afforestation, reforestation, sustainable forest management) are promoted to reduce the pressure to shift deforestation.

5.4 Net GHG Emission Reductions and Removals

The total net GHG emission reductions or removals is calculated as follows:

$$NER = GHG_{BSL} - GHG_{FCO} - GHG_{LK} \quad \textbf{(33)}$$

Where:

[45] Forest Carbon Partnership, FCPF Carbon Fund Methodological Framework Discussion Paper #5: Displacement (Leakage), October 2013

Variable	Description	Unit
NER	Net CO_2 emissions reductions/removals from project activity	tCO_2e
GHG_{BSL}	Net CO_2 emissions in the baseline scenario	tCO_2e
GHG_{FCO}	Net CO_2 emissions in the project scenario	tCO_2e
GHG_{LK}	Net CO_2 emissions due to leakage	tCO_2e

5.5 Uncertainty

Uncertainty in emissions and carbon stock change estimates for both the baseline and project shall be determined following the procedures outlined in **FCO Tool: GHG Quantification Equations**.

5.6 Calculation of FCO Units

The calculation of FCO units issued must account for the buffer credits deposited in the FCO Buffer Account. The percentage of buffer credits to be contributed is determined using **FCO Tool: Buffer Risk Assessment**.

The number of FCU units is calculated as follows:

$$FCU_{t2} = (adj\_NER_{t2} - adj\_NER_{t1}) * (1 - Buffer\_Factor_{t2}) \quad \textbf{(34)}$$

Where:

Variable	Description	Unit
FCU_t	Number of Forest Carbon Offset Units in year t	-
adj_NER_{t2}	Net CO_2 emissions reductions/removals from project activity up to year t2 adjusted to account for uncertainty	tCO_2e
adj_NER_{t1}	Net CO_2 emissions reductions/removals from project activity up to year t1 adjusted to account for uncertainty	tCO_2e
$Buffer\_Factor_{t2}$	Percentage of buffer credits to be contributed to the FCO Buffer Account in year t2	%

6 Monitoring

This section outlines the monitoring framework required to ensure the integrity, transparency, and accuracy of the project implementation and its associated GHG emission reductions. It provides guidance on the data and parameters to be validated and tracked throughout the project lifecycle.

6.1 Monitoring Plan

A monitoring plan must be developed to ensure transparent and accurate stock changes are recorded and monitored. The monitoring plan must include the following:

1. Monitoring of project implementation
2. Monitoring of actual carbon stock changes and GHG emissions
3. Monitoring of leakage carbon stock changes and GHG emissions
4. Ex post estimation of net carbon stock changes and GHG emissions

For each of the items listed above, the following information must also be included:

1. Technical description of the monitoring task
2. Data to be collected
3. Summary of data collection procedures
4. Procedures for quality control and quality assurance
5. Data archives
6. Organizations and responsibilities of the parties involved in the above

Managing Uncertainty

Quality management procedures must be in place to ensure that data and information collected are managed accordingly. The procedures must include the assessment of uncertainty relevant to the project and baseline scenarios. Uncertainties related to quantification of GHG emissions reductions and removals by sinks should be reduced.

Project must identify key paraments that would influence the accuracy of estimates significantly. Local values that are specific to the project's circumstances must be obtained for these key parameters wherever possible. These values must be based on:

1. Data from well-referenced peer-reviewed literature
2. National inventory data or IPCC default factors
3. Expert opinion must be used in data selection in the absence of options 1) and 2). Rationale for selecting data value must be briefly noted.

If uncertainty is significant, project must select data that will indisputably lean towards underestimating rather than overestimating. Important to note that if opinions on best estimates and uncertainties were obtained from expert judgement, the project proponent must use guidance provided in IPCC (Approaches to Data Collection).

To ensure that fluctuations in GHG are estimated accurately and consistent across measurement periods, project must establish clear standard operating procedures to ensure data quality persists throughout the measuring periods. The procedures must at least include:

1. Documentation of field measurements carried out in project area. (Must be comprehensive enough that replication of sampling in the event of staff turnover between monitoring periods).

2. Training procedures, including the scope and date of training, for all persons involved in field measurement or data analysis must be present.
3. Protocol for assessing accuracy of plot measurements using quality control cruise and plan for correcting inventory if errors are found.
4. Protocols for assessing data for outliers, transcription errors, and consistency across measurement periods.
5. Data sheets must be safely archived for the life of the project. Data stored in electronic formats must be backed up.

6.2 Data and Parameters

6.2.1 Data and Parameters at Validation

Variables	Definition	Unit	Equation
$AA_{i,t}$	Annual Area of Forest Change for stratum i at year t	ha	8, 9
$ARC_{i,}$	Considered for deforestation and degradation Annual Rate of Change in Forest Area from stratum 1 to stratum 2 at interval t_1 to t_2	-	10
$GHG_{peatburn-BSL,i,t}$	GHG emissions from peat burning in the baseline scenario, in stratum *i* and year *t*	t CO_2e ha^{-1} yr^{-1}	12, 14
$GHG_{peatsoil-BSL,i,t}$	GHG emissions from peat soil within the project boundary under the baseline scenario, for stratum *i* in year *t*	t CO_2e ha^{-1} yr^{-1}	12, 14

6.2.2 Data and Parameters Monitored

Variables	Definition	Unit	Equation
Project Location	Coordinates of project boundary's location	-	-
Project Boundary	Total project area	-	-
$A_{peatburn-BSL,i,t}$	Area of peat that has been burned in stratum *i* during year *t* in the baseline scenario	ha	12
$GHG_{proxy-CO2,i,t}$	CO_2 emissions of chosen proxy in stratum *i* at year *t* Default factor from IPCC Table 2.1[46]	ha	13

[46] Ibid

Variables	Definition	Unit	Equation
$GHG_{proxy-CH4,i,t}$	CH_4 emissions related to the chosen proxy in stratum *i* at year *t;* this component may be conservatively excluded from the baseline scenario Default factor from IPCC Table 2.3[47]	ha	13
$GHG_{peatditch-CO2,i,t}$	CO_2 emissions from ditches and open water in baseline stratum *i* during year *t* Default factor from IPCC Table 2.2[48]	t CO_2e ha^{-1} yr^{-1}	14
$GHG_{peatditch-CH4,i,t}$	CH_4 emissions from ditches and open water in baseline stratum *i* during year *t* Default factor from IPCC Table 2.4[49]	t CO_2e ha^{-1} yr^{-1}	14
$EF_{g,i}$	IPCC emission factor in stratum *i* for gas *g* per tonne of dry peat burnt	kg t^{-1} d.m.	15
GWP_g	Global warming potential for gas *g*	t CO_2/t g	15
$D_{peatburn,i,t}$	Average fire scar depth in stratum *i* in year *t*	m	16
$BD_{soil,i}$	Soil bulk density in stratum *i*	g cm^{-3}	16
$A_{FCO,u,i,t}$	Area of recorded deforestation in the project area in stratum *i* converted to land use *u* in year *t*	ha	20
$A_{Deg-W,i}$	Area potentially impacted by degradation processes in stratum *i*	ha	24
AP_i	Total area of degradation sample plots in stratum *i*	ha	24
$C_{Deg-W,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* in year t	tCO_2e	24
$A_{FCO,NatD,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum *i*, in year t	ha	24, 26

[47] *Ibid*
[48] *Ibid*
[49] *Ibid*

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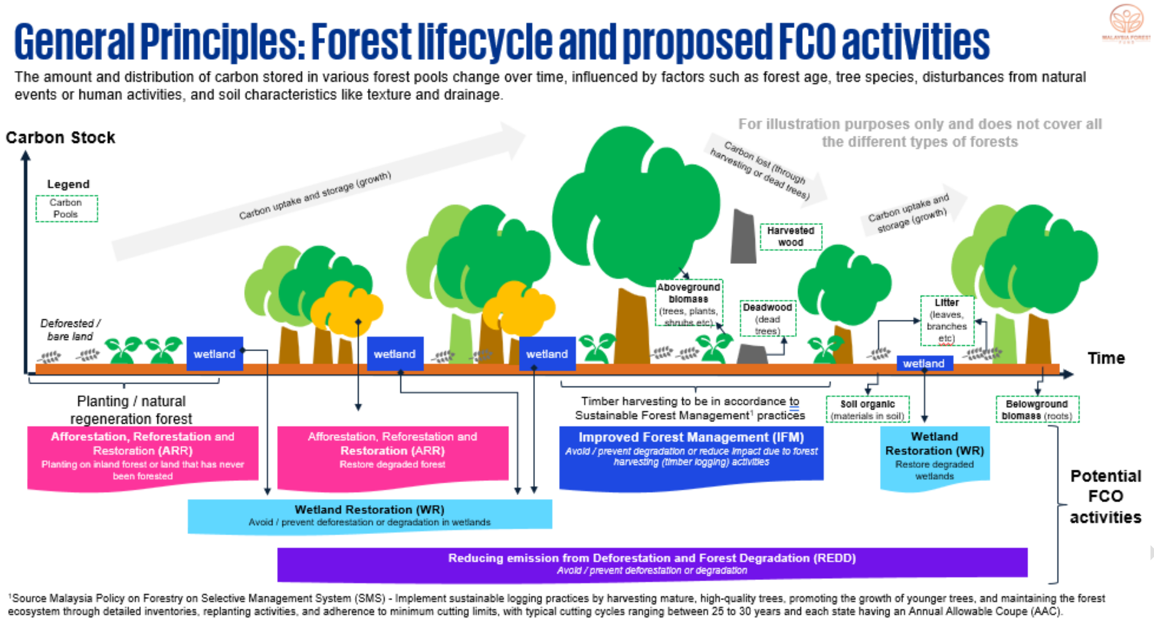
IX. ANNEXES

A1. Annex 1



A2. Annex 2

This table is intended to support project proponents in the combined application of the Module 2: REDD & Restoration on Wetlands (**REDD-W**) and Module 3: Coastal Wetland Restoration (**CWR**) methodologies under FCO, based on the following steps:

1. Determine the applicable project activity type using the Figure 2: Eligibility Flowchart for Wetland Ecosystems modules and Table 1: Overview of Eligible Ecosystems, Conditions, and Activities Across Modules. Where only one methodology is applicable, that methodology should be followed in full.
2. For projects where both methodologies apply, it is expected that the project includes both avoiding deforestation/degradation and restoration activities.
3. Refer to Table 12: Cross-Application Guidance for Combined REDD & Restoration on Wetlands and Coastal Wetland Restoration Projects
   - "Applicable Guidance" column for instructions on how to interpret or implement each sub-component; and
   - "Methodology and Relevant Section" column for the corresponding section references in the respective methodologies.

Where both methodologies apply, REDD-W should be treated as the primary reference unless specified otherwise.

Table 12: Cross-Application Guidance for Combined REDD & Restoration on Wetlands and Coastal Wetland Restoration Projects

Chapters			Applicable Guidance	Methodology and Relevant Section
Applicability Conditions	Eligibility		Excluded conditions are areas of non-forested wetlands (i.e., salt marsh and seagrass meadows), as well as where the baseline cannot reasonably involve land use conditions which would contradict the REDD-W eligibility criteria.	Combined: • **REDD-W** (Section 2.1 and 2.2) • **CWR** (Section 2.1): *except items 1 and 3*
	Ineligibility		No exclusions apply.	Combined: • **REDD-W** (Section 2.3) • **CWR** (Section 2.2)
Project Boundary	Geographical	Project Area	Refer to REDD-W requirements for providing project area details to support boundary mapping and documentation.	**REDD-W** (Section 3.1.1)
		REDD-Specific Boundaries	Apply the REDD-W requirements for delineating geographical boundaries in planned and unplanned deforestation/ degradation projects.	**REDD-W** (Section 3.1.1 to Section 3.1.5)
		Stratification	Refer to REDD-W guidance on stratifying areas.	**REDD-W** (Section 3.1.6)
		Sea Level Rise	Refer to CWR requirements for assessing sea level rise risks to restoration outcomes which should be considered of the project area and strata.	**CWR** (Section 3.1.3)
		Ineligible Areas	Refer to CWR guidance on identifying and excluding areas with minimal GHG mitigation potential.	**CWR** (Section 3.1.4)
		Buffer Zones	Refer to CWR requirements for including buffer zones, where applicable where hydrological connections may affect or be affected by project activities.	**CWR** (Section 3.1.5)
	Temporal		Refer to CWR criteria for applying SOC accounting temporal limits based on organic or mineral soil classification.	**CWR** (Section 3.2)
	SOC Carbon Accounting		Refer to CWR guidance for estimating emission reductions from the SOC pool.	**CWR** (Section 3.5)
	Carbon Pool		Refer to REDD-W requirements for identifying relevant carbon pools for accounting.	**REDD-W** (Section 00)
	GHG Emission Sources		Refer to REDD-W guidance for listing and including relevant GHG emission sources.	**REDD-W** (Section 3.3)
Baseline Scenario & Additionality			Refer to REDD-W procedures for establishing and reassessing the baseline scenario over time as well as demonstrating project additionality.	**REDD-W** (Section 40)

Chapters	Applicable Guidance	Methodology and Relevant Section
Quantification	Refer to REDD-W for all quantification requirements, including emissions accounting, net reductions, uncertainty, buffer deductions, and related procedures.	**REDD-W** (Section 50)
Monitoring	Refer to REDD-W for all monitoring requirements, including monitoring plans, procedures for handling uncertainty as well as data and parameters.	**REDD-W** (Section 63.3)

A3. Annex 3

This table is intended to support project proponents in the combined application of the Module 2: REDD & Restoration on Wetlands (**REDD-W**) and Module 4: Rewetting & Fire Management (**R&FM**) methodologies under FCO, based on the following steps:

1. Determine the applicable project activity type using the Figure 2: Eligibility Flowchart for Wetland Ecosystems modules and Table 1: Overview of Eligible Ecosystems, Conditions, and Activities Across Modules. Where only one methodology is applicable, that methodology should be followed in full.
2. For projects where both methodologies apply, it is expected that the project includes both avoiding deforestation/degradation and restoration activities.
3. Refer to Table 13: Cross-Application Guidance for Combined REDD & Restoration on Wetlands and Rewetting & Fire Management Projects
   - "Applicable Guidance" column for instructions on how to interpret or implement each sub-component; and
   - "Methodology and Relevant Section" column for the corresponding section references in the respective methodologies.

Where both methodologies apply, REDD-W should be treated as the primary reference unless specified otherwise.

Table 13: Cross-Application Guidance for Combined REDD & Restoration on Wetlands and Rewetting & Fire Management Projects

<table>
<tr><th colspan="2">Chapters</th><th>Applicable Guidance</th><th>Methodology and Relevant Section</th></tr>
<tr><td rowspan="2">Applicability Conditions</td><td>Eligibility</td><td>Excluded conditions on land use conditions which would contradict the REDD-W eligibility criteria.</td><td>Combined:
• REDD-W (Section 2.1 and 2.2)
• R&FM (Section 2.1): except items 11 and 13</td></tr>
<tr><td>Ineligibility</td><td>No exclusions apply.</td><td>Combined:
• REDD-W (Section 2.3)
• R&FM (Section 2.2)</td></tr>
</table>

<table>
<tr><th colspan="3">Chapters</th><th>Applicable Guidance</th><th>Methodology and Relevant Section</th></tr>
<tr><td rowspan="6">Project Boundary</td><td rowspan="3">Geographical</td><td>Project Area</td><td>Refer to the requirements for providing project area details to support boundary mapping and documentation, as well as excluded areas.</td><td>Combined:
• REDD-W (Section 3.1.1)
• R&FM (Section 3.1)</td></tr>
<tr><td>REDD-Specific Boundaries</td><td>Apply the REDD-W requirements for delineating geographical boundaries in planned and unplanned deforestation/ degradation projects.</td><td>REDD-W
(Section 3.1.1 to Section 3.1.5)</td></tr>
<tr><td>Stratification</td><td>Refer to R&FM guidance on stratifying areas.</td><td>R&FM
(Section 6.1)</td></tr>
<tr><td colspan="2">Temporal</td><td>Refer to R&FM criteria for temporal range of historical climate data, crediting period, monitoring and reassessment of baseline.</td><td>R&FM
(Section 3.2)</td></tr>
<tr><td colspan="2">Carbon Pool</td><td>Refer to REDD-W requirements for identifying relevant carbon pools for accounting.</td><td>REDD-W
(Section 00)</td></tr>
<tr><td colspan="2">GHG Emission Sources</td><td>Refer to REDD-W guidance for listing and including relevant GHG emission sources.</td><td>REDD-W
(Section 3.3)</td></tr>
<tr><td colspan="3">Baseline Scenario & Additionality</td><td>Refer to REDD-W procedures for establishing and reassessing the baseline scenario over time.</td><td>REDD-W
(Section 40)</td></tr>
<tr><td colspan="3">Quantification</td><td>Refer to REDD-W for all quantification requirements, including emissions accounting, net reductions, uncertainty, buffer deductions, and related procedures.</td><td>REDD-W
(Section 50)</td></tr>
<tr><td colspan="3">Monitoring</td><td>Refer to REDD-W for all monitoring requirements, including monitoring plans, procedures for handling uncertainty as well as data and parameters.</td><td>REDD-W
(Section 63.3)</td></tr>
</table>