CERCARBONO
Certified Carbon Standard

Methodology CM-LU-CW-001
Blue Carbon Methodology for Mitigation of Climate Change in Coastal Wetlands

Version 1.0

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Abbreviations and Acronyms

CCMP	Climate Change Mitigation Programme or Project
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon dioxide
DOC	Dissolved Organic Carbon
GHG	Greenhouse Gas
ha	Hectare
ICVCM	Integrity Council for the Voluntary Carbon Market
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LiDAR	Light Detection and Ranging
LUC	Land Use Change
MRV	Measurement/Monitoring, Reporting, and Verification System
N_2O	Nitrous oxide
NDC	Nationally Determined Contributions
PDD	Project Description Document
REDD+	Reduction of Emissions from Deforestation and Forest Degradation and other actions in this sector
RFCW	Restoration of Forest Coastal Wetlands
RFCW-M	Mangrove restoration
RFCW-S	Seagrass meadows restoration
RFCW-T	Tidal marsh restoration
RVCW	Revegetation of Coastal Wetlands
RVCW-M	Mangrove revegetation
RVCW-S	Seagrass meadows revegetation
RVCW-T	Tidal marsh revegetation
SDG	Sustainable Development Goal
SedOC	Sediment organic carbon
SLR	Sea Level Rise
SOC	Soil organic carbon
TOC	Total organic carbon
UNFCCC	United Nations Framework Convention on Climate Change

Terms and definitions

The terms and definitions contained in the document ***Terms and Definitions of the Voluntary Certification Programme of Cercarbono***, available in www.cercarbono.com, section: Documentation, shall apply. For this methodology, the following terms[1] apply:

allometric equation: An equation that utilizes the genotypical relationship among tree components to estimate the characteristics of one tree component from another. Allometric equations estimate the below-ground root volume using the above-ground bole volume.

aquaculture: Organised production of aquatic animals and plants (e.g. fish, crustaceans, and seaweeds) in marine or freshwater environments. Fish farming and shrimp ponds are the most important aquacultural practices in coastal wetlands.

autochthonous/allochtonous soil carbon: Organic substrates for pelagic bacteria are derived from dissolved organic carbon (DOC) in the water column. DOC is a heterogeneous mixture of molecules; some imported from the watershed (allochthonous DOC) and others produced by autotrophs within the system (autochthonous DOC).

autochthonous carbon: Organic material generated in situ within the project ecosystem (e.g., root biomass, litterfall, microbial deposition). Always included in SOC estimation.

allochthonous carbon: Organic material transported from external sources such as rivers, estuaries, or adjacent ecosystems.

base year (or base period): A particular year or timeframe used as a reference point to measure changes in greenhouse gas emissions or forest carbon stocks.

blue carbon: A common term that refers to the carbon captured by the world's ocean and coastal ecosystems. The carbon is absorbed and deposited in biomass and sediments by living organisms in coastal (e.g., mangroves, tidal marshes, seagrass meadows) and marine environments.

brackish/saline water: Water that generally contains 0.5 or more parts per thousand (ppt) of dissolved salts.

brackish/saline wetland: A wetland inundated or saturated by brackish/saline water for all or part of the year.

carbon buffer: Percentage of GHG removals or GHG emission reductions (where applicable) from all climate change mitigation programmes and projects related to land use that are retired and left as a guarantee of long-term permanence of such removals or reductions, to cover the risk of reversals of the removals achieved.

coastal wetland: Wetland at or near the coast influenced by brackish/saline water and astronomical tides. It consists of organic and mineral soils that are covered or saturated for all or part of the year by tidal freshwater, brackish or saline water and are vegetated by vascular plants. Include mangrove forests, tidal marshes and seagrass meadows. The

[1] Some terms are adapted from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use, and 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.

boundary of coastal wetlands may extend to the landward extent of tidal inundation and may extend seaward to the maximum depth of vascular plant vegetation.

coastal wetland restoration: Set of actions that lead to re-establishthe ecological functions and vegetation cover of coastal wetlands, through the establishment of native tree, shrub and non-tree species (including herbaceous halophytes and seagrasses) in areas with a forest vocation The objective is to restore ecosystem services and carbon storage capacity that existed in a specific area before its degradation or destruction. In the case of drained former wetlands, restoration always must include hydrological recovery 'rewetting'as an essential condition for the re-establishment of wetland processes.

CCMP eligible area: The geographic extent to which the program or project activity (GHG removal and/or reduction of GHG emissions) is implemented, where the climate change mitigation project or programme directly intervenes in the land and its resources.

CCMP total area: A geographic area with legal ownership[2], encompassing both the eligible area (in which the program or project activity(ies) is/are implemented) and the non-eligible area.

Dissolved Organic Carbon (DOC): Fraction of organic carbon operationally defined as that which can pass through a filter with a pore size typically between 0.22 and 0.7 micrometres.

drainage/drained: Artificial lowering of the soil water table. In this document, 'drainage' describes changing wet soil into dry soil. Drained soil is soil that formerly was damp but, because of human intervention, tends to become dry soil.

emission: In the context of this methodology, it is the act or instance of emitting any greenhouse gas.

emission reduction: In the context of this methodology, it is the act or process of reducing the release of greenhouse gases into the atmosphere.

extraction in coastal wetlands: In the context of this methodology, the activity implies the removal of soil (and associated biomass, dead wood and litter).

forest: Land area normally permanently covered by trees, according to the parameters of area, tree cover and minimum height of trees at adult age reported by each country under the United Nations Framework Convention on Climate.

forest coastal wetland: Refers to forested ecosystems located within coastal watersheds, characterized by their hydrological setting geographic location, water conditions, and dominant vegetation of trees and woody plants adapted to wetland environments. Their characteristics may vary depending on water salinity and other environmental factors. For the purpose and scope of this methodology, only mangrove ecosystems that meet the official national definition of forest shall be classified as forest coastal wetlands.

freshwater: Water that contains < 0.5 parts per thousand (ppt) of various dissolved salts.

[2] CCMP holder must demonstrate that they have the right to use and own the area where the project and/or management of GHG emissions and removals is established.

halophilic Is the adjective applied to organisms that live in environments with large amounts of salts. Some halophilic microorganisms (primarily bacteria) are specifically called extremophiles since they live in substrates with very high concentrations of salts.

halophyte Is a salt-tolerant plant that grows in soil or waters of high salinity, encountering saline water through its roots or by salt spray, such as in saline semi-deserts, mangrove swamps, marshes and sloughs, and seashores.

hydroperiod: The period in which a soil area is waterlogged. It may be permanent or intermittent.

impounded water: A pool of water formed by a dam or pit.

inundation: The temporary or permanent submergence of land by water, which can occur in various wetland ecosystems and coastal areas. In the context of climate change mitigation in wetlands, inundation is a critical process that influences carbon sequestration, greenhouse gas emissions, and overall ecosystem dynamics.

Land Use Change (LUC): A process by which human activities transform the natural landscape, referring to how land has been used or managed.

mangrove: A subset of tidal wetlands in subtropical and tropical coastal ecosystems dominated by halophytic trees, shrubs, and other plants growing in brackish to saline tidal waters.

mangrove restoration: The process of restoring and replanting mangrove areas that have been depleted, usually through mangrove deforestation.

marsh: A subset of wetlands, typically treeless, characterized by emergent soft-stemmed vegetation adapted to saturated soil conditions (grasses, sedges, cattails, and rushes). There are many kinds of marshes, ranging from the prairie potholes to the Everglades, coastal to inland, freshwater to saltwater, but the scope of the tidal restoration methodology is limited to tidal marshes. Salt marshes consist of salt-tolerant and dwarf brushwood vegetation overlying mineral or organic soils.

mean sea level (MSL): An average level for the sea surface from which heights such as elevations may be measured.

micro-watershed: A small hydrological unit that typically covers an area ranging from 100 to 1000 hectares and is defined by natural ridges that direct the runoff from rainfall into the same place, be it a wetland, river, lake, or ocean.

mineral soil: Non-organic soil (refer to the definition of 'organic soil'). It consists predominantly of and has properties predominantly determined by mineral matter. This Soil is formed initially by the weathering of parent rock, often accompanied by deposition of material by ice, water or wind. Wetland Mineral Soils are classified as Aquic soil (Unites States Department of Agriculture, USDA) or Gleysols (World Reference Base) and are described as having restricted drainage, leading to periodic flooding and anaerobic conditions.

mitigation potential: In the context of climate change mitigation, the amount of mitigation that could be realised over time. This potential is inherent to the activity and does not vary from one verification to another, except when methodological updates or project condition changes require recalculation.

mudflat: A subset of tidal wetlands consisting of soft substrate not supporting emergent vegetation.

non forest coastal wetlands: Non-forested coastal wetlands of continental or transitional character that are not classified as forests, typically dominated by herbaceous halophytic vegetation. Typical examples include tidal marshes and inland coastal marshes influenced by saline or brackish conditions. It must be demonstrated that such areas have remained non-forested coastal wetlands from the start (t_1) to the end (t_2) of the historical reference period, and that they have not qualified as stable forest coastal wetlands or non-stable forest coastal wetlands for at least ten (10) years prior to the CCMP start date. It must be established in accordance with the country's official land-use classification or territorial ordinance system. These areas are considered degraded non-forest coastal wetlands, where halophytic herbaceous vegetation is reduced, degraded, or absent, resulting in the loss of ecological cover or functionality. The ecological condition of these wetlands can be progressively improved, enhancing their capacity for carbon storage and the provision of ecosystem services through the implementation of tidal marsh restoration and/or revegetation activities.

non-forest coastal marine wetlands: Coastal wetland ecosystems that are not classified as forests, characterized by the dominance of submerged vegetation under direct marine influence rather than woody or emergent herbaceous species. A typical example is seagrass meadows, which provide significant carbon storage and ecosystem services despite not meeting the national definition of forest. It must be demonstrated that such areas have remained unvegetated, degraded, or lacking stable seagrass cover for at least ten (10) years prior to the CCMP start date. These areas are considered temporarily degraded but are expected to regain ecological functionality and carbon storage capacity through seagrass revegetation and/or restoration activities.

Non-stable forest coastal wetlands : Coastal wetland ecosystems classified as forests that have historically supported mangroves but currently lack sufficient or continuous woody vegetation cover due to anthropogenic or natural disturbances. They correspond to areas identified as forest in the national territorial ordinance system but that do not qualify as stable forest coastal wetlands from the start (t_1) to the end (t_2) of the historical reference period. It must be demonstrated that such areas have not maintained stable forest coastal wetland conditions for at least ten (10) years prior to the CCMP start date. These areas are considered temporarily degraded or deforested but are expected to regain forest characteristics through mangrove restoration or revegetation activities.

open water: An area in which water levels do not fall to an elevation that exposes the underlying substrate.

organic soil: The soil created by the decomposition of plant and animal materials to create a nutrient and mineral-rich mini-ecosystem with microorganisms that feed and breathe life back into the soil. Organic soils are found in wetlands or drained and converted to other land-use types (e.g., Forest Land, Cropland, Grassland, Settlements). Wetlands do not all have organic soils. Soil with a surface layer of material with a sufficient depth and percentage of organic carbon to meet thresholds set by the IPCC (Wetlands supplement) for organic soil. For example, *soils that are never saturated with water for more than a few days must contain* *more than 20 per cent organic carbon by weight, i.e., about 35 per cent organic matter* (IPCC 2014).

reforestation: direct human-induced conversion of non-forest land into land meeting the country's definition of forest, achieved through planting, seeding, and/or human-induced promotion of natural seed sources or tree species that are native and/or legally approved by the regulatory framework of the country where the CCMP is implemented. Don't cover in this methodology.

mangrove revegetation: Planned activity of planting or assisted natural regeneration of native mangrove species in historically mangrove areas lacking woody vegetation. As these areas do not meet the UNFCCC national definition of "forest".

mangrove restoration: Planned activity to restore the ecological integrity and functionality of mangrove ecosystems by recovering hydrological, soil, and connectivity conditions that support the natural regeneration and long-term persistence of native mangrove species. This activity does not necessarily involve planting and focuses on restoring ecological processes.

rehabilitation: The re-establishment, on formerly drained sites, of some but not necessarily all the hydrological, biogeochemical and ecological processes and functions that characterised pre-drainage conditions.

restoration of coastal wetlands: Corresponds to activities that enhance carbon sequestration and storage in eligible pools by re-establishing the ecological integrity and functionality of mangroves, tidal marshes, and seagrass meadows, relative to the baseline scenario. These practices may involve replanting, assisted natural regeneration, or targeted ecological interventions aimed at restoring hydrological, geomorphological, soil, and connectivity conditions (e.g., re-establishing tidal exchange, blocking drainage channels, restoring natural water circulation, or reducing nutrient and sediment loads).

Such actions enable the natural regeneration and long-term persistence of native species—including trees, shrubs, halophytic vegetation, or submerged seagrass species, depending on the ecosystem type. The primary mitigation outcome is the removal of CO_2 from the atmosphere and its long-term storage in biomass and soils. Additional reductions or avoidance in CH_4 or N_2O emissions may only be accounted for where scientifically demonstrated, typically under conditions where hydrological restoration reverses prior drainage, soil disturbance, or eutrophication processes**.**

revegetation of coastal wetlands: corresponds to activities that increase carbon stocks in eligible pools by actively re-establishing vegetation cover in degraded or non-vegetated coastal wetland areas, relative to the baseline scenario. These activities involve the planting, seeding, or transplantation of native species to accelerate recovery in sites where natural regeneration is unlikely or insufficient due to degradation severity, lack of propagule sources, or persistent disturbances.

The primary mitigation outcome of revegetation is the removal of CO_2 from the atmosphere and its long-term storage in biomass and soils. While co-benefits such as sediment stabilization, nutrient load reduction, or improved hydrological balance may occur, these are secondary outcomes. Reductions or avoidance of CH_4 or N_2O emissions shall only be accounted for when scientifically demonstrated, typically under conditions where revegetation measurably improves soil oxygenation, reduces erosion, or mitigates nutrient-driven eutrophication.

rewetted soil: A soil that had formerly been drained but has once more become wet soil because of human intervention.

rewetting: The deliberate action of changing drained soil into wet soil, e.g. by blocking drainage ditches, disabling pumping facilities or breaching obstructions. This term also describes the management activities designed to reestablish vegetation on undrained soils in seagrass meadows.

sediment: Deposit of inorganic or organic material carried and deposited by wind, water, or ice.

seagrass meadow: An accumulation of seagrass plants over a mappable area. This definition includes the biotic community and the geographic area where the biotic community occurs. Note that most seagrass meadows are sub-tidal, but a percentage are intertidal. Coastal wetland vegetated by seagrass species (rooted, flowering plants), permanently or tidally covered by brackish/saline water.

seagrass meadows revegetation: Planned activity of planting, seeding, or transplanting native seagrass in areas where natural cover has been lost, to accelerate recovery, enhance carbon sequestration, and restore ecosystem service.

seagrass meadows restoration: Planned activity to recover the ecological integrity of seagrass ecosystems by restoring environmental conditions that enable natural regeneration and long-term persistence, without necessarily involving planting.

sea level rise (SLR): The increase in the average level of the world's oceans. Sea levels can change, both globally and locally, due to (i) changes in the shape of the ocean basins, (ii) changes in the total mass of water and (iii) changes in water density. Factors leading to sea level rise under global warming include increases in the total mass of water from the melting of land-based snow and ice and changes in water density from increased ocean water temperatures and salinity changes. Relative sea-level rise occurs when there is a local increase in the ocean level relative to the land, possibly due to ocean rise or land level subsidence.

salt marsh habitat zone: The area within upper and lower elevation boundaries where salt marsh habitat can survive.

soil carbon: A carbon sink and the most significant carbon pool in the terrestrial ecosystem, it is present in two forms: organic and inorganic. Soil organic carbon is the carbon component of organic compounds. Soil inorganic carbon consists of mineral forms of carbon often found in arid areas.

stable forest coastal wetland: corresponds to the surface covered by natural forest coastal wetland that have remained intact and stable from the start (t1) to the end (t2) of the historical, projection and monitoring period. It shall be demonstrated that such areas have maintained continuous natural forest coastal wetland for at least ten years before the climate change mitigation project or programme start date. These areas are used to document historical deforestation activities and serve as a reference for baseline establishment. In this document, the term *stable forest coastal wetland* is used synonymously with *forest coastal* *wetland* when referring to areas that have remained stable over time. In these areas, REDD+ activities[3] addressing avoided deforestation or avoided degradation of mangroves that meet the national definition of forest may be established (See **Annex 1**).

Settlements: Urbanized areas, including transport infrastructure (among them fluvial and land access roads) and human settlements of any size, unless already included in other categories.

Segment: In the context of climate change mitigation programs or projects, a segment is an area or set of areas dedicated to the same type of mitigation activity.

Segment component: Areas or portions of areas (with the same activity) that form a segment (program or project activities) within categorized as eligible land strata (non-stable forest coastal wetlands, non-forest coastal wetlands, and non-forest coastal marine wetlands) present in the project or program. These allow them to be treated as a unit for analysis, calculations, inventories, monitoring, management, and other purposes.

stratum: In land use sector, climate change mitigation programs or projects, this refers to areas that share common characteristics, allowing for classification of eligible areas within the CCMP.

tidal marsh: A subset of marshes consisting of salt-tolerant and dwarf brushwood vegetation that overlies mineral or organic soils.

tidal wetland: A subset of wetlands under the influence of the wetting and drying cycles of the tides (e.g., marshes, seagrass meadows, tidal forested wetlands, and mangroves). Subtidal seagrass meadows are not subject to drying cycles but are still included in this definition.

tidal wetland restoration: Restoration of degraded tidal wetlands in which the establishment of prior ecological conditions is not expected to occur without project activity. For this methodology, this definition includes activities that create wetland ecological conditions on mudflats or within open or impounded water and re-establishing or improving the hydrology, salinity, water quality, sediment supply and vegetation in degraded or converted tidal wetlands. This definition also includes activities that create wetland ecological conditions on uplands under the influence of sea level rise, convert one wetland type to another, or convert open water to wetland.

Tidal Marsh Revegetation: Planting or seeding native tidal marsh vegetation to restore cover, enhance carbon sequestration, and recover ecosystem services.

Tidal Marsh Restoration: Restoring ecological integrity of tidal marshes by recovering hydrological, soil, and geomorphological conditions that enable natural regeneration.

total organic carbon: All the carbon present in the organic matter.

wetland: ecosystem characterised by either permanent or seasonal water that creates unique soil conditions and supports aquatic vegetation adapted to saturated conditions.

[3] These activities are not covered under this methodology; they may be implemented in these areas using Cercarbono's REDD+ methodology as a complementary framework.

Summary

This methodology provides technical guidance for designing and implementing Climate Change Mitigation Projects (CCMPs) in coastal wetlands, including mangroves, tidal marshes, and seagrass meadows. Eligible activities (restoration and revegetation across these ecosystems) generate GHG removals and reductions through ecological recovery, hydrological restoration, and soil rewetting.

The methodology defines procedures for establishing project boundaries, determining eligible areas, and developing baseline and project scenarios. It details the quantification of carbon stocks and GHG emissions and removals across key carbon pools, including biomass, dead wood, and soil organic carbon, consistent with the IPCC Wetlands Supplement[4].

It also outlines monitoring, reporting, and verification (MRV) requirements; addresses leakage, uncertainty, and non-permanence; and specifies buffer provisions.

1 Introduction

Wetlands are among the most effective carbon sink/storage on the planet. However, their capacity to sequester and store carbon has been significantly altered by human intervention, turning them into Greenhouse Gas (GHG) sources. Wetlands occur naturally on all continents (except Antarctica) in a wide variety of sizes, types, and hydrological conditions (freshwater, brackish, and saline). They range from herbaceous-dominated systems to shrub- and tree-dominated forests and provide critical ecosystem services such as biodiversity conservation, shoreline protection, flood regulation, and nutrient cycling.

Globally, different efforts have been implemented to halt the degradation and conversion of wetlands. In terrestrial ecosystems, this role has been largely framed under REDD+ (Reducing Emissions from Deforestation and Forest Degradation, and other actions in this sector). When rigorously quantified, verified, and aligned with national strategies, REDD+ projects have demonstrated the importance of site-specific initiatives led by communities, civil society, and the private sector in leveraging climate finance and supporting country-level commitments (See **Annex 1**).

In parallel, the concept of Coastal Blue Carbon has emerged to highlight the critical role of mangroves, tidal marshes, and seagrass meadows in the global carbon cycle. These ecosystems continuously sequester and store carbon in biomass and soils over millennia, making them disproportionately important for climate change mitigation. Despite covering only 2–6% of the area of tropical forests, their degradation contributes an estimated 3–19% of global carbon losses from deforestation. The soils of seagrass meadows, for example, contain more organic carbon than most terrestrial forests, while mangroves hold the highest blue carbon density among coastal wetlands. (Donato et al., 2011; Pendleton et al., 2012; Fourqurean et al., 2012).

Worldwide discussion of wetlands conservation importance led to the Ramsar Convention[5], one of the first international agreements designed to conserve and promote the sustainable

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[4] Available at: www.ipcc-nggip.iges.or.

[5] The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

use of wetlands, including mangrove forests (RAMSAR, 1971; Kingsford et al., 2021). Mangrove areas are currently represented at 305 Ramsar Sites throughout the world (RAMSAR, 2021). The Paris Agreement (2015) further reinforced the global mandate for the protection of these ecosystems.

Mangrove exists in the intertidal zone of tropical and subtropical shores with the highest blue carbon content of mangroves, such as in Malaysia, Indonesia, Philippines, India, Bangladesh, Australia, Papua New Guinea, Brazil and Mexico. Global Mangrove Watch, GMA's mapping initiative, reports that the planet's mangrove cover has decreased by 11,700 km^2 (4,517 mi^2) since 1996, but accounting for gains, it estimates the net loss as 5,245 km^2 (2,025 mi^2) or 3.4%. Seagrass meadows are among the most threatened ecosystems worldwide, with losses accelerating from 0.9% per year before 1940 to 7% per year since 1990, mainly due to water quality degradation, dredging, and land reclamation. Tidal marshes have been historically drained, diked, or converted into aquaculture and salt extraction ponds, leading to widespread degradation and loss of soil carbon stocks.

The rate of carbon lost from disturbed coastal wetlands is typically much greater than the rate at which it can be restored. Therefore, when planning to manage carbon stocks, it is more effective to prevent carbon-bearing soils from being disturbed than to begin a process of restoration. However, given the dramatic decline in coastal wetlands globally, restoration and rewetting of soil activities are critically needed to rebuild carbon sinks and restore coastal and near-shore marine ecosystem health.

For project-level contributions to be credible and effective, mitigation activities must be rigorously, transparently quantified, verified, and properly aligned with national wetland management frameworks. Site selection is particularly critical, as hydrology, sediment dynamics, propagule availability, and community engagement are key determinants of successful restoration. Livelihood diversification, including activities such as sustainable fisheries, beekeeping, and ecotourism, can serve as mechanisms to strengthen long-term conservation outcomes.

This methodology provides technical guidance for the design and implementation of Climate Change Mitigation Programmes or Projects (CCMPs) in coastal wetlands. Eligible activities under this methodology encompass mangrove revegetation, mangrove restoration, tidal marsh revegetation and restoration, and seagrass meadow revegetation and restoration. These interventions address both GHG removals and emission reductions, including soil rewetting activities, with an emphasis on restoring wetland hydrology and ecological functionality.

It enables the integration of multiple wetland activities under separate but consistent accounting segments, ensuring appropriate differentiation of calculation methods while allowing integrated landscape-level management. Where relevant, this methodology also allows the incorporation of REDD+ activities through the complementary use of ***Cercarbono's REDD+ methodology*** (See **Annex 1**), thereby promoting a more holistic approach to landscape management that integrates both forest and coastal wetland ecosystems.

2 Principles and Their Operability at the CCMP level

The principles set the basis for the generation of robust carbon credits from initiatives that meet the ultimate objective of climate change mitigation by CCMPs focused on GHG removals or GHG emission reductions for mitigation activities implemented in coastal wetlands, namely mangroves, tidal marsh and seagrass.

CCMPs applying this methodology shall comply with and refer to the relevant principles and how they have been used according to the current version of the ***Cercarbono's Protocol for Voluntary Carbon Certification*** (from now on ***Cercarbono's Protocol***, available at www.cercarbono.com, section: Documentation).

3 Objective and application field

This methodology is specific to the Cercarbono certification programme. Any natural or legal, public, or private person can use this methodology to establish projects to GHG removal or/and reduce GHG emissions based on their resulting activities (**Section 5.3**). It outlines principles and requirements, providing project-level guidance for CCMPs in coastal wetlands.

3.1 Scope

Program o project activities covered by this methodology are:

- **Restoration of Forest Coastal Wetlands (RFCW):** Planned activities aimed at re-establishing the ecological integrity and functionality of coastal wetland ecosystems —including mangroves, tidal marshes, and seagrass meadows— by restoring hydrological, geomorphological, soil, and connectivity conditions that enable the natural regeneration and long-term persistence of native species. These practices may include replanting, assisted natural regeneration, or ecological interventions such as re-establishing tidal exchange, blocking drainage channels, restoring natural water circulation, or reducing nutrient and sediment loads. Planting is not always required, as the focus is on restoring ecological processes that allow ecosystems to recover and thrive naturally. Depending on the ecosystem, this includes:

  - **Mangrove restoration (RFCW-M):** Planned activity aimed at re-establishing the ecological integrity and functionality of mangrove ecosystems by restoring hydrological, soil, and connectivity conditions —including rewetting interventions such as re-establishing tidal exchange or removing barriers— that support the natural regeneration and long-term persistence of native mangrove tree and shrub species. Planting is not always required, as the emphasis is on restoring ecological processes that allow mangroves to recover and thrive naturally. The primary mitigation outcome is the removal of CO_2 from the atmosphere and the long-term accumulation of carbon in biomass and soils. Reduction or avoidance of CH_4 and N_2O in this activity shall be addressed as bellow described. This activity may occur in areas classified as non-stable forest coastal wetland cover.

    Where mangroves meet the nationally adopted definition of "forest" under the UNFCCC, activities related to avoided deforestation or avoided degradation must be accounted for under ***Cercarbono's REDD+ methodology*** (See **Annex 1**), ensuring alignment with national frameworks.

  - **Tidal marsh restoration (RFCW-T):** Planned activity aimed at re-establishing the ecological integrity and functionality of tidal marsh ecosystems by restoring hydrological, geomorphological, and soil conditions —such as blocking drainage channels, removing levees, or re-establishing tidal flooding regimes— that support the natural regeneration and long-term persistence of native halophytic vegetation. Planting is not always required, as the focus is on restoring ecological processes that allow tidal marsh vegetation to recover and thrive naturally. The primary mitigation outcome is the removal of CO_2 from the atmosphere and the long-term accumulation of soil organic carbon. Reduction or avoidance of CH_4 and N_2O in this activity shall be addressed as bellow described. This activity may occur in areas classified as non-forest coastal wetlands.

- **Seagrass meadows restoration (RFCW-S):** Planned activity aimed at re-establishing the ecological integrity and functionality of seagrass ecosystems within coastal wetlands by restoring environmental conditions —such as improving hydrological connectivity, restoring natural water circulation, or reducing nutrient and sediment loads— that enable the natural regeneration and long-term persistence of native seagrass species. Planting or transplantation is not always required, as the focus is on restoring ecological processes that allow seagrass meadows to recover and thrive naturally. The primary mitigation outcome is the removal of CO_2 from the atmosphere and the accumulation of carbon in biomass and sediments. Reduction or avoidance of CH_4 and N_2O in this activity shall be addressed as bellow described. This activity may occur in areas classified as non-forest coastal marine wetlands.

➢ **Revegetation of Coastal Wetlands (RVCW):** Planned activities aimed at establishing or re-establishing vegetation cover in degraded or unvegetated coastal wetland ecosystems (including mangroves, tidal marshes, and seagrass meadows) in cases where natural regeneration is unlikely to occur within a reasonable timeframe. Revegetation involves direct planting, transplantation, or seeding of appropriate native species, combined with management interventions that ensure their establishment and long-term persistence. Depending on the ecosystem, this includes:

- **Mangrove revegetation** (**RVCW-M):** Planned activity involving the planting, seeding, or transplantation of native mangrove species (including trees and shrubs) in areas where natural regeneration has not occurred or is unlikely to occur. This may include propagule planting, nursery-raised seedlings, or ecological engineering approaches to facilitate establishment. The primary mitigation outcome is the removal of CO_2 and the accumulation of carbon in above- and below-ground biomass and soils. Reduction or avoidance of CH_4 and N_2O in this activity shall be addressed as bellow described. This activity may occur in areas classified as non-stable forest coastal wetlands.

  Where mangroves meet the nationally adopted definition of "forest" under the UNFCCC, activities related to avoided deforestation or avoided degradation must be accounted for under ***Cercarbono's REDD+ methodology*** (See **Annex 1**), ensuring alignment with national frameworks.

- **Tidal marsh revegetation (RVCW-T):** Planned activity involving the planting or seeding of native halophytic herbaceous species (e.g., grasses, sedges, rushes) in degraded or unvegetated marsh areas where natural regeneration has not occurred for at least ten (10) years. This may include nursery-raised seedlings, direct seeding, or transplantation of sods or plugs. The objective is to accelerate the recovery of marsh vegetation cover, enhance carbon sequestration in soils, and restore ecosystem services. Reduction or avoidance of CH_4 and N_2O in this activity shall be addressed as bellow described. This activity may occur in areas classified as non-forest coastal wetlands.

- **Seagrass meadows revegetation (RVCW-S):** Planned activity involving the transplantation or seeding of native seagrass species (e.g., shoots, plugs, or seeds) in unvegetated or degraded seagrass beds where natural recolonization has not taken place for at least ten (10) years. The objective is to accelerate the recovery of seagrass cover, enhance carbon sequestration in biomass and marine sediments, and restore key ecosystem services such as habitat provision, sediment stabilization, and water quality improvement. Reduction or avoidance of CH_4 and N_2O in this activity shall be addressed as bellow described. This activity may occur in areas classified as non-forest coastal marine wetlands.

Reduction or avoidance of CH_4 and N_2O emissions:

Reductions or avoidance of CH_4 and N_2O emissions shall only be accounted for where technical, scientific, and methodological viability is demonstrated, in accordance with the following provisions:

- Any reduction or avoidance of CH_4 and N_2O emissions shall be credited only when supported by robust scientific evidence, derived from:
  - Direct field measurements;
  - Peer-reviewed literature applicable to the project context; or
  - IPCC Wetlands Supplement (2013) guidance.
  - In the absence of sufficient evidence or in cases of high uncertainty, a conservative approach shall be applied, and no credits shall be issued for CH_4 or N_2O.
- Accounting for CH_4 and N_2O must follow the same monitoring and verification cycles established for CO_2, ensuring traceability, transparency, and consistency across project reporting.

Ecosystem-specific characteristics:

- **Mangroves (restoration or revegetation):** CH_4 and N_2O reductions may be credited when hydrological restoration or revegetation demonstrably reverses prior conditions that favored emissions, such as artificial drainage of mangrove soils, prolonged soil disturbance, or degradation of water quality affecting soil redox dynamics.
- **Tidal marshes (restoration or revegetation):** CH_4 and N_2O reductions may be credited only where project activities demonstrably reverse prior land-use changes or soil degradation processes, such as drainage or conversion of tidal marsh soils, oxidation of organic soils due to lowered water tables, or loss of natural tidal flooding regimes.
- **Seagrass meadows (restoration or revegetation):** CH_4 and N_2O reductions may be credited only where project activities demonstrably improve water quality and sediment conditions, such as reduction of nutrient inputs that drive eutrophication, decreased turbidity or sediment resuspension, or reversal of conditions favoring anaerobic processes linked to CH_4 and N_2O production.

RFCW-M, RFCW-T or RFCW-S [6]activities for restoration and RVCW-M, RVCW-T or RVCW-S [7] for revegetation activities can be carried out (all or some of them) in coastal wetlands and may require rewetting[8] of previously drained wetlands. Each previous activities must be implemented in a separate area of the project (continuous or discrete), with no overlap. The region corresponding to a specific action is called a ***segment***, as explained in **Section 5.2**.

REDD+ activities as reduction of GHG emissions from avoided coastal wetland deforestation and reduction of GHG emissions from avoided forest degradation of coastal wetland are not covered by this methodology. REDD+ activities must be developed within the framework of ***Cercarbono's REDD+ methodology*** (See **Annex 1**). Although the present methodology does not integrate such a mechanism, it provides provisions in the eligibility section to ensure that the results of areas designated for REDD+ activities are identified and extracted from the CCMP area.

The methodology also presents the essential elements that holders and developers must cover in the formulation and development of these initiatives, such as the requirements for inclusion and effective participation, the criteria for additionality and eligibility as well as the bases that support the delimitation of the CCMP, the identification and selection of baseline and project scenarios (including emission sources and carbon pools), the monitoring periodically and quantification of results in blue carbon stored in the vegetative biomass and soils of mangrove, tidal marshes, and seagrasses, uncertainty, risks and non-permanence.

In this context and to make it easier for communities, companies, and individuals to contribute to GHG removals and GHG emission reductions through coastal wetland restoration and revegetation actions, this methodology considers the following characteristics:

- **Consistency with national and international MRV systems:** Project-level results must be consistent with official Measurement/Monitoring, Reporting and Verification (MRV) systems with national reporting to the UNFCCC through Biennial Transparency Report.
- **Robust technical foundation:** The methodology draws on academic and regulatory sources (State and voluntary), expert knowledge, scholarly literature, UNFCCC decisions, IPCC guidelines for national greenhouse gas inventories, recommendations, methods of voluntary certification programmes, and methods supporting country agreements and country-level frameworks. These references are integrated into three pillars:

  (i) the ISO 14064 family Standards,
  (ii) the technical references in the regulated and voluntary standards, and
  (iii) the regulatory framework of the country where the project is implemented.

[6] These activities: Revegetation of Coastal Wetlands in mangroves (RVCW-M), tidal marshes (RVCW-T), and seagrass meadows (RVCW-S); may be collectively referred to as RVCW/M-T-S.
[7] These activities: Restoration of Forest Coastal Wetlands in mangroves (RFCW-M), tidal marshes (RFCW-T), and seagrass meadows (RFCW-S); may be collectively referred to as RFCW/M-T-S.
[8] In this methodology, rewetting (e.g., blocking drainage channels, re-establishing tidal exchange, restoring natural flooding regimes) is considered a technique that may be applied under both restoration (RFCW/M-T-S) and revegetation (RVCW/M-T-S) activities. Rewetting interventions may contribute to reductions in CH_4 and N_2O emissions when they demonstrably reverse prior conditions that favored such emissions, including soil drainage, land conversion, oxidation of organic soils, or degradation of water quality. However, these reductions shall only be accounted for when supported by evidence above mentioned.

Together, these ensure alignment with national national MRV systems (if applicable), environmental integrity and additionality, while promoting direct benefits for local implementers.

- **Risk and uncertainty management:** The methodology incorporates mechanisms to address leakage and non-permanence, as well procedures for managing uncertainty in the quantification of baseline and project scenarios and mitigation outcomes.
- **Alignment with IPCC categories and REDD+:** The methodology is consistent with the wetland categories defined in the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. It incorporates the relevant activities and considerations for calculating GHG emissions and removals in coastal wetland ecosystems. It is also aligned with REDD+ actions through the integrated application of Cercarbono's REDD+ methodology (see **Annex 1**).
- **Verification and certification:** The methodology is designed in accordance with ISO 14064-2:2019, is articulated with Cercarbono's Protocol. It specifies technical requirements for defining baseline and project scenarios, quantifying results, and ensuring rigorous reporting and monitoring of GHG removals and emission reductions. Independent validation and verification of projects shall be carried out by accredited bodies in line with ISO 14065:2020.

3.2 Specific consideration on Overlapping of Wetlands Forest and REDD+

Mitigation outcomes achieved by program or project activities in coastal wetlands can be supported by using the ***Cercarbono's REDD+ methodology***, independently, complementary and under the same or different[9] period, thus avoiding double counting (See **Annex 1**).

3.3 Technical and program compliance

The following Cercarbono regulatory and technical framework documents[10], in their current versions, are complementary and essential for the application of this methodology:

- Cercarbono's Protocol for Voluntary Carbon Certification.
- Procedures of Cercarbono's Certification Programme.
- Terms and Definitions of the Voluntary Certification Programme of Cercarbono.
- Cercarbono´s tool to demonstrate the additionality of climate change mitigation initiatives.
- Tool to estimate carbon buffer in initiatives to mitigate climate change in the land use sector Cercarbono.
- Cercarbono's Tool to Report Contributions from Climate Change Mitigation Initiatives to the Sustainable Development Goals.
- Guidelines for mapping presentation and analysis.
- Safeguarding Principles and Procedures of Cercarbono's Certification Programme.
- Guidelines for using Models in Baseline Carbon Quantification in the Land Use Sector.

[9] As long as it is ensured that the areas only focus on a single program or project activity.

[10] Available at www.cercarbono.com, section : Documentation. In addition, CCMP must incorporate applicable technical tools developed by Cercarbono in the land use sector. not listed previously, available for new CCMP verification events.

As well as the following Clean Development Mechanism (CDM)[11] methodological Tools:

- AR-Tool 08 - Methodological tool: Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity.
- AR-Tool 14 - Methodological tool: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.
- AR-Tool 17 - Methodological tool: Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities.
- AR-Tool 18 - Methodological tool: Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities.

This methodology considers the provisions of the:

- 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.

It is complementary to the Cercarbono methodology:

- Methodology M/UT-REDD+ integral consistent with the international agreements established by the UNFCCC.

3.4 Compliance with applicable legal provisions

Within the framework of this methodology, the CCMP must fully consider and comply with the applicable regulations, measures, and circumstances (national, regional or jurisdictional, local, social, environmental, technological, among others) for the implementation of its activities, ensuring robust and verifiable supporting documentation.

The CCMP holder must demonstrate that the areas where the CCMP is implemented comply with licenses, permits or environmental management plans, as well as with all applicable regulations in accordance with the technology used in the competent jurisdiction, prior to the start of validation and verification activities.

GHG removals obtained by the CCMP, as applicable, must be registered in the national registry of the country they are implemented in (if they correspond to the GHG removal commitments assumed by said country), aligned with international efforts of Measurement/Monitoring, Reporting, and Verification of climate change mitigation initiatives.

4 Eligibility and Inclusion Requirements

4.1 Preliminary Analysis

The preliminary analysis of the CCMP aims to provide a guiding framework for the initial characterization of the territorial, socioeconomic, ecological, and hydrological context, to support the feasibility of the intervention and to guide the selection of eligible activities (RFCW and RVCW). This analysis must include an initial review of activity data relevant to the baseline, particularly those associated with historical loss or degradation of coastal wetland ecosystems. The CCMP holder shall:

[11] Or those substituting them under Article 6.4 mechanism or complementing them under Cercarbono's regulatory framework. This comment applies to any mention related to any CDM methodological documents referred throughout this document.

- Align, where applicable, with national or jurisdictional strategies or action plans for coastal wetlands, climate change, or blue carbon, in the country where the CCMP is implemented.
- Compile relevant secondary information on historical dynamics of wetland degradation, conversion, or loss, as well as socioeconomic variables related to direct drivers and underlying causes of ecosystem pressure.
- Analyse available activity data at the local, subnational, or national level to establish historical trends of carbon loss or gain in coastal wetland carbon pools (biomass, soils, sediments).
- Identify eligible strata with potential for restoration (RFCW/M-T-S) or revegetation (RVCW/M-T-S), supported by secondary information, field assessments, and participatory processes (e.g., interviews, community mapping, stakeholder workshops).
- Assess the technical, institutional, and economic feasibility of the CCMP, considering the potential to reverse historical degradation or conversion trends, the level of support from local actors and governance structures, and the balance of expected carbon revenues relative to implementation costs.
- Determine land tenure and resource-use rights in coastal and marine areas and outline a preliminary framework for stakeholder engagement and benefit-sharing mechanisms, where applicable (e.g., with indigenous peoples, Afro-descendant communities, artisanal fishers).

The preliminary analysis should conclude with the identification of the eligible Blue Carbon activities to be implemented (RFCW-M, RFCW-T, RFCW-S, RVCW-M, RVCW-T or RVCW-S), as well as an initial proposal for the geospatial delimitation of the areas involved (CCMP total area, reference region, and potential leakage areas).

4.1.1 Analysis of Agents and Causes of Coastal Wetland Loss and Degradation

The analysis of agents and causes of coastal wetland loss and degradation is required to describe the socio-environmental context and the pressures affecting the project area.

Unlike terrestrial deforestation methodologies, this analysis is not used to derive baseline rates of change, but to identify and document the main processes leading to wetland degradation or conversion, the agents involved, and the underlying factors that the project seeks to address.

This qualitative and spatial analysis shall include:

- Direct drivers, such as aquaculture expansion, drainage, overharvesting, tourism and port infrastructure, or eutrophication.
- Underlying causes, such as weak governance, unclear tenure, lack of coastal zoning, or climate-induced pressures.

The analysis supports the justification of project activities (RFCW or RVCW), the definition of intervention priorities, and the demonstration of additionality and long-term permanence.

It may be updated periodically as new socio-economic or biophysical data become available, using information from national agencies, remote sensing, literature, and local stakeholders.

4.1.2 Classification of factors contributing to coastal wetland degradation and loss

The analysis of factors contributing to coastal wetland degradation and loss shall be qualitative and contextual, aimed at identifying the main pressures that explain the current condition of the project area and inform the selection and prioritization of restoration or revegetation activities.

Unlike terrestrial deforestation methodologies, this analysis is not used to estimate baseline rates of change, but rather to understand the interactions among biophysical, socio-economic, and institutional factors that have influenced wetland degradation or conversion.

The following categories of contributing factors should be examined, as applicable to the project context:

Biophysical factors: climate variability, soils/sediments, bathymetry, hydrology, tidal regime, shoreline erosion, vegetation composition.

- Biophysical factors: hydrology and tidal regime, sedimentation and erosion processes, salinity gradients, vegetation structure, and the impacts of climate variability or extreme events.
- Economic and technological factors: expansion of aquaculture and coastal agriculture, infrastructure development, and technological changes affecting coastal dynamics.
- Production factors: extractive or unsustainable practices degrading wetlands (e.g., shrimp ponds, dredging, drainage, destructive fishing).
- Demographic factors: population density, livelihood dependence on wetland resources, and migration trends.
- Institutional factors: governance systems, tenure arrangements, policy and regulatory frameworks, and incentives influencing wetland management.
- Territorial factors: spatial distribution of pressures, proximity to intact reference ecosystems, and exposure to sea-level rise or subsidence.

This classification provides a consistent framework for diagnosing the direct and underlying causes of degradation and supports the design of targeted mitigation actions.

The identified factors will later be used in **Section 6.1.1** to inform the quantification and spatial definition of the baseline scenario.

4.2 Area eligibility

The eligibility of areas under this methodology is determined through the initial classification analysis, complemented by the analysis of agents and causes of coastal wetland loss or degradation (**Section 3.1**), and by the assessment of the feasibility of modifying the trajectories associated with their direct or underlying causes. The classification distinguishes the following strata:

- Stable forest coastal wetlands,
- Non-stable forest coastal wetlands,
- Non-forest coastal wetlands,

- Non-forest coastal marine wetlands, and
- Settlements.

Based on this classification:

The eligible areas correspond to non-stable forest coastal wetlands, non-forest coastal wetlands and non-forest coastal marine wetlands, must meet the following conditions:

- **RFCW (Restoration of Forest Coastal Wetlands):** Restoration activities are implemented through interventions aimed at re-establishing ecological integrity and functionality according to the ecosystem type:
  - **Mangroves Restoration (RFCW-M):**
  - Areas classified as non-stable forest coastal wetlands.
  - Areas historically classified as forest coastal wetlands with mangroves (e.g., Ramsar-designated).
  - Must not have been classified as stable forest coastal wetlands for at least ten (10) years prior to the CCMP start date.
  - Currently lack continuous woody cover due to degradation/deforestation.
  - Restoration must not alter natural tidal hydrology.
  - **Tidal marshes Restoration (RFCW-T)**
  - Areas classified as non-forest coastal wetlands.
  - Historically dominated by halophytic herbaceous vegetation.
  - Degraded or vegetation lost, but with intact hydrological conditions to support recovery.
  - Must not have been classified as forested for at least ten (10) years prior to the CCMP start date.
  - **Seagrass meadows Restoration (RFCW-S)**
  - Areas classified as non-forest coastal marine wetlands.
  - Areas historically supporting seagrass meadows.
  - Degraded due to turbidity, eutrophication, or disturbance.
  - Must not have been classified as forested for at least ten (10) years prior to the CCMP start date.
  - Hydrodynamic and light conditions must remain suitable (no dredging or artificial blockage).
- **RVCW (Revegetation of Coastal Wetlands):** Revegetation activities are implemented through interventions aimed at re-establishing vegetation cover and ecological functionality according to the ecosystem type:
  - **Mangroves Revegetation (RVCW-M)**
  - Areas classified as non-stable forest coastal wetlands
  - Deforested or degraded areas lacking natural regeneration for at least ten (10) years prior to the CCMP start date.
  - Demonstrated suitability for mangrove establishment.
    Hydrology must remain intact (no artificial drainage).
  - **Tidal marshes Revegetation (RVCW-T)**
  - Areas classified as non-forest coastal wetlands.
  - Unvegetated or degraded marshes with no natural recovery for ≥10 years.

- Naturally suitable hydrology intact.
- Must not have been classified as forested for at least ten (10) years prior to the CCMP start date.

- **Seagrass meadows Revegetation (RVCW-S)**

- Areas classified as non-forest coastal marine wetlands.
- Unvegetated or degraded seabeds suitable for seagrass establishment.
- No seagrass covers for at least ten (10) years prior to the CCMP start date.
- Hydrodynamic/light conditions must support re-establishment.

In addition, the following conditions shall apply to the blue carbon mitigation Project or program (CCMP):

1. Project activities shall not lower the water table, except in cases where open water is converted to tidal wetlands. Rewetting techniques are permitted; however, drainage or flood irrigation of wet areas is strictly prohibited.
2. Project activities shall not lead to the disturbance of intact natural ecosystems.
3. Land tenure rights must be demonstrated, and all necessary permits for CCMP implementation must be obtained.
4. Projects that alter the hydrological connectivity of the project area with adjacent areas shall not result in a significant increase (greater than 5%) in greenhouse gas emissions outside the project area.
5. CCMP holder or developer must ensure that the areas allocated to this activity are not considered as results in the REDD+ mechanism (before mentioned), thus avoiding double counting.
6. Project activities shall not lead to the disturbance of intact natural ecosystems.

The following coastal wetland areas are not eligible:

- Environmental protection areas[12].
- Areas with non-compatible overlaps (temporary or geographical) with another land use climate change mitigation project or programme.
- Wetlands used for agriculture e.g rice paddies.

Eligible areas (non-stable forest coastal wetlands, non-forest coastal wetlands, and non-forest coastal marine wetlands) must be determined based on the cross-referencing of information presented in a traceable manner.

Non-eligible areas correspond to stable forest coastal wetland areas and settlements, (not considered), which must be extracted from the eligible area. **Table 1** presents the structure of how the CCMP can present information for eligible and non-eligible areas.

[12] Geographically defined areas that have been designated, regulated and managed by public entities to achieve specific conservation objectives. CCMPs may only be implemented when the competent authority determines that there is compatibility with this and authorizes such implementation, such as project proponent can demonstrate that the CCMP meets additionality criteria and that the regulatory protection has not been effectively implemented or enforced due to exceptional circumstances.

Table 1. Presentation of CCMP total area.

Item	Baseline (ha)	Project (ha)
Eligible area ($A_{Eligible:}$)		
Non-stable forest coastal wetland	Non-stable forest coastal wetland hectares	- Mangrove restoration segment - Mangrove revegetation segment
Non forest coastal wetland	Non forest coastal wetland hectares	- Tidal marsh restoration segment - Tidal marsh restoration segment
Non-forest coastal marine wetland	Non-forest coastal marine wetland hectares	- Seagrass meadows restoration segment - Seagrass meadows restoration segment
Non- eligible area ($A_{Non\text{-}eligible}$)		
Stable forest coastal wetland	Total stable forest coastal wetland areas	
Settlements	Total settlement areas	
Total CCMP area	Total of eligible area + non-eligible area	

4.3 Ownership

CCMP must demonstrate the capacity to act on the CCMP areas or obtain express authorization from the current holder or legal representative (both in the preparation of the PDD and during the monitoring periods that generate mitigation results), individually, publicly, or collectively, of the property or boundary(ies)[13].

For privately owned properties, explicit authorization from the holder, possessor, or holder of the property(ies) must be provided, authorizing the implementation of the CCMP. The delimitation of the possession area corresponds to a declaration of ownership or administration.

Ownership of GHG removals and GHG emissions reductions between interested parties must be evidenced; that is, participation, claim, or transfer of rights over GHG removals or GHG emissions reductions must be supported by a signed document between the parties.

CCMPs that directly involve/integrate local or ethnic communities must carry out a ***Governance Analysis*** through an additional document. The guidelines for the components of this document are in the ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme***, available in www.cercarbono.com, section documentation.

CCMP must identify the local or ethnic communities in the reference region and ensure their full and effective participation per the ***Safeguarding principles and procedures of Cercarbono's Certification Programme*.**

In areas where farmers, indigenous people or other groups are established, the property must comply with the current regulatory legal framework or the one that this or Cercarbono incorporates in the future.

[13] Including cases of areas where farmers populations, indigenous communities or other groups are established, in which in addition to the ownership demonstrated as established here, the validity and legality of the representation held by the signatories of the respective contracts or agreements must be demonstrated, of such populations, communities or groups, including full verification and legal identity documents of such representatives, as well as the certifications or endorsements of the government authorities involved and their representatives, in accordance with the legal framework applicable in the jurisdiction where CCMP is implemented.

The CCMP must support all the documentation listed above, including the validity of the legal representation of the person signing the powers of attorney.

The governance analysis document is a Cercarbono requirement for approval of CCMP registry.

If the CCMP is developed in private areas (i.e., land not owned by the community but by a natural or legal person(s)), this analysis is not required. In the case of natural persons, a copy of the legal title deed must be sufficient. Legal entity holders are required to prove the validity of the legal representation.

4.4 Compatibility with land use categories, land-use planning, and applicable environmental legislation

The CCMP shall demonstrate the compatibility of its actions with the land use categories established at the subnational or national level, if any, in the country where it is implemented, for which it has two options:

a) Certificate of land-use compatibility: Request the certificate from the competent public authority responsible for land-use planning in the CCMP area., which must issue an administrative act indicating whether the initiative to be carried out as per land use planning, according to the land use or territorial planning instrument. If the initiative is to be carried out in areas under special ecological protection (e.g., mangrove reserves, Ramsar sites, marine protected areas), a permit or authorisation, as appropriate, must also be obtained from the administrative environmental authority with jurisdiction in the intervention area, which will verify the harmony of the CCMP with the management instrument and the zoning established therein.
b) Comparative cross-check with planning instruments: Alternatively, the proponent may perform a comparative analysis of the land-use categories and guidelines derived from territorial or coastal-marine planning instruments, relevant government programmes, and the activities proposed under the CCMP.

This comparison shall clearly demonstrate the geographical and functional compatibility of the proposed actions, explicitly indicating how each activity contributes to, or complements, official institutional efforts for the sustainable management of coastal wetlands.

In both cases, the proponent must:

- Identify, describe, and ensure compliance with all applicable local, regional, and national legal and regulatory frameworks, including environmental laws, statutes, decrees, and technical guidelines relevant to wetland conservation, coastal zone management, and marine biodiversity protection.
- Establish mechanisms to periodically assess and demonstrate compliance with such legal requirements.

Finally, eligible mitigation results shall be considered valid only if they comply with applicable regulations and in accordance with the timing of the verification process, as established in Cercarbono's Protocol.

4.5 CCMP general objective

The CCMP objective must be described in the PDD, presenting the main positive impact expected from the implementation of its activities and the expected mitigation potential.

It must also include, as a minimum, the main activity, the geographical location of the implementation of the program or project activities, the actors involved and the period of execution of the project activities.

5 Additionality

Additionality in the framework of this methodology follows the criteria set out in ***Cercarbono's Tool to Demonstrate Additionality of Climate Change Mitigation Initiatives***, available at www.cercarbono.com, section: Documentation.

6 CCMP delimitation

6.1 CCMP temporal boundaries

The CCMP must define the temporal boundaries of the activities to be implemented in the PDD. Credits may only be earned for GHG removals or GHG emission reductions during the period determined within these boundaries.

The temporal boundaries determined based on the diagnosis of agents and causes of coastal wetland forest degradation or loss; and the monitoring of historical and projected activity data. They must be defined in terms of:

- **CCMP start date**: Date on which the first direct action is implemented in the programme or project that generates measurable climate change mitigation outcomes. This corresponds to the initiation of GHG removals or reductions resulting from on-the-ground project interventions.
- **Historical period (of historical emissions analysis)**: A continuous period of years used to analyse historical trends in drivers and agents of coastal wetland degradation or loss. This period supports the estimation of the expected rate of ecosystem degradation, destruction, or conversion during the projection period.
    - For mangrove ecosystems that qualify as forests, in stable forest coastal wetlands (and where avoided deforestation or degradation activities are addressed under the REDD+ methodology), the historical period shall not be less than ten (10) years, in alignment with national or subnational frameworks.
    - For mangroves, tidal marshes, seagrass meadows in non-stable forest coastal wetlands, non-forest coastal wetlands, and non-forest coastal marine wetlands, the default shall also be ten (10) years, unless a shorter or longer period is technically justified by data availability or ecosystem dynamics.
- **Projection period**: The time range (in years) over which the baseline scenario is projected, based on historical data. Emissions from deforestation, ecosystem degradation, or conversion are modelled for this period. The starting year of this period should coincide with the project start date where the first CCMP interventions are carried out in the territory, covering the entire project duration or beyond. The baseline shall be evaluated by the holder of the CCMP every 5 years, verifying its initial consistency. If significant changes have been made in it, the holder must validate the CCMP again.
- **Results period**: The period (in years) during which CCMP activities and their results are monitored and reported for their climate change mitigation outcomes (GHG emission reductions and removals). The duration of this period is equal to the CCMP crediting period.

- **Duration of the CCMP** (day.month.year to day.month.year): The period (in years) between the start of project actions and their conclusion in a given territory. The duration of the CCMP must be equal to or greater than 40 years (day.month.year to day.month.year).
- **Verification times:** Are the periods within the results period in which the GHG removal or GHG emission reduction results are verified by an independent third party. A CCMP shall have a maximum interval of three years between successive verifications.
- **Crediting period:** This period is defined in accordance with the provisions of the current version of the ***Cercarbono's Protocol***.

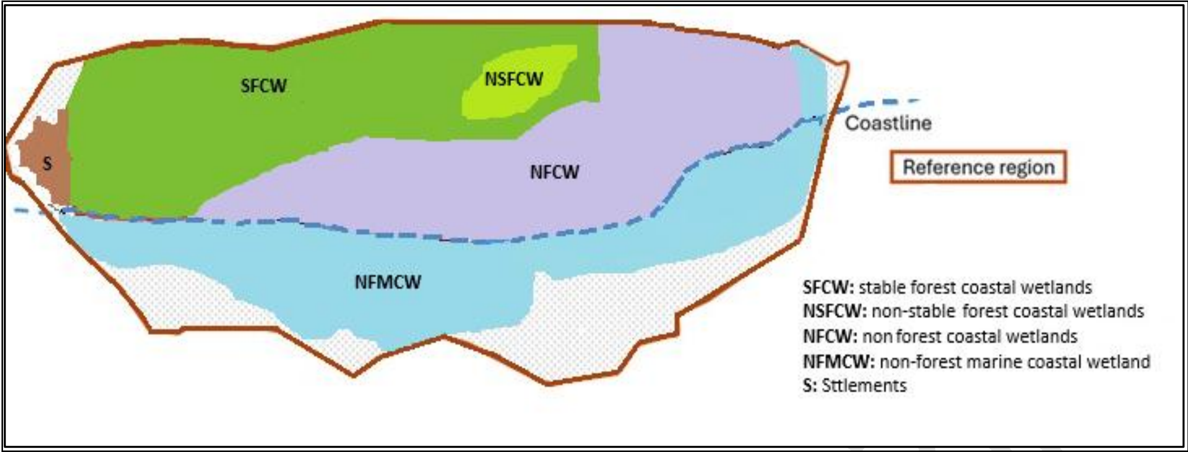
In defining these limits, the CCMP shall comply with the relevant provisions of the ***Cercarbono's Protocol for Voluntary Carbon Certification*** and the ***Procedures of Cercarbono's Certification Programme*** including any applicable memoranda or official statements in force at the time of project registration.

Once validated, these temporal limits may not be modified. They shall apply uniformly across all segments, baseline and project scenarios, and any reassessment of these scenarios if required.

6.2 CCMP Spatial boundaries

The CCMP must identify and delimit the following areas in the context in which it is implemented, as exemplified in **Figure 1**.

Figure 1. Example spatial delimitation which integrates the strata of the initial classification.



The spatial boundaries of the CCMP must be explicitly defined in the PDD. The CCMP area must be composed of:

- **Reference Region:** In coastal wetlands, carbon dynamics are determined by hydrological, sedimentary, and edaphic processes, rather than by historical rates of deforestation or degradation.

  Therefore, this methodology does not require the definition of a reference region to establish the baseline scenario, which is instead determined based on the biophysical conditions of the project area and the applicable emission or removal factors, in accordance with the IPCC 2013 Wetlands Supplement.

  Optionally, an ecological or hydromorphological reference region may be delineated for contextual or calibration purposes (e.g., to derive local Tier 2 factors), without replacing the direct characterization of the project area.

- **CCMP total area:** area within which the blue carbon CCMP is implemented. Within this boundary, an initial land-cover classification is carried out to determine:

  - Eligible strata
  - Non-stable forest coastal wetlands
  - Non-forest coastal wetlands
  - Non-forest coastal marine wetlands

  - **Non-eligible areas**
  - Stable forest coastal wetlands
  - Settlements or non-wetland land uses

    The non-eligible areas are excluded from baseline and project quantification, are not part of carbon accounting, and may only be analyzed in leakage assessments when relevant.

- **CCMP eligible areas:** Eligible areas constitute the portion of the total CCMP area where the baseline GHG emissions or removals are quantified, and project scenario removals and emission reductions occur.

  Eligible strata serve as the macro-level division, from which segments are defined.

The carbon pools, emission/removal factors, and activity data used in the baseline and project scenarios must be representative of each segment and consistent with their ecological attributes.

This classification ensures that only strata meeting the ecological and temporal requirements established in this methodology are included as eligible for CCMP activities, while all other areas are explicitly and transparently excluded from project accounting.

The spatial boundaries of the CCMP must be explicitly defined in the PDD. For both the baseline and project scenarios, the CCMP shall delineate three spatial typologies -strata, segment and segment components- all of which must be georeferenced and submitted in shapefile (.shp), to see more details you can check the guide l:

– **Strata** represent the eligible areas the blue carbon CCMP can be implemented at. They are derived from the initial land-cover classification and correspond to non-stable forest coastal wetlands, non-forest coastal wetlands, and non-forest coastal marine wetlands. Strata define the **macro-level spatial** structure of the CCMP and provide the basis for identifying the areas subject to monitoring through the establishment of *segments*. All strata must be explicitly mapped and documented in both the baseline and project scenarios.

$$A_{stratum,k} = \sum_{i=1}^{n_k} A_{k,i}$$

Equation 1

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$A_{stratum,k}$	Total area of stratum *k*, obtained as the sum of all polygons belonging to the stratum in the baseline and project scenarios.	ha	X	X	X	X	X	X
$A_{k,i}$	Area of polygon *i* within stratum *k*. Each polygon represents an indivisible spatial unit derived from the land-cover classification.	ha	X	X	X	X	X	X
n_k	Number of polygons assigned to stratum *k*.	NA	X	X	X	X	X	X
k	Index of eligible wetland strata used for CCMP stratification (non-stable forest coastal wetlands, non-forest coastal wetlands, non-forest coastal marine wetlands).	NA	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S and/or RVCW-S: Seagrass meadows revegetation, implemented in each segment.
X: Applicable
NA: Not applicable.

When segments may cover part or all of an eligible stratum:

$$\sum_{s \in Sk} \boldsymbol{TSA_{s,k}} \leq \boldsymbol{A_{stratum,k}}$$

Let S_k be the set of all segments assigned to stratum k.

Equation 2

If the CCMP design assigns all eligible area in a stratum to segments (this equation should be treated as a special case, not replacing **Equation 2.** This situation applies only when the total eligible area of stratum *k* is fully allocated across all segments in S_k.):

$$\boldsymbol{A_{stratum,k}} = \sum_{s \in Sk} \boldsymbol{TSA_{s,k}}$$

Equation 3

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$\boldsymbol{TSA_{s,k}}$	Area of segment *s* located within stratum *k*. Used for consistency checks between stratum and segment areas.	ha	X	X	X	X	X	X
$\boldsymbol{A_{stratum,k}}$	Total area of stratum *k*, obtained as the sum of all mapped polygons belonging to the stratum in the baseline and project scenarios (Eq. 1).	ha	X	X	X	X	X	X
$\boldsymbol{Sk}$	Index of eligible wetland strata defined for CCMP spatial stratification.	NA	X	X	X	X	X	X
$\boldsymbol{s}$	Index of segments included in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	NA	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation and/or RVCW-S: Seagrass meadows revegetation, implemented in each segment.

- **Segments:** Are the spatial operational units within strata where carbon accounting occurs. Each segment[14] corresponds to one of the six coastal wetland categories: RFCW-M, RFCW-T, RVCW-M, RVCW-T and/or RVCW-S. Each segment must be located entirely within an eligible stratum of the CCMP. A segment may encompass part or all of the area of an eligible stratum. This structure is the basis for area aggregation equations such as ***Equations 4*** and ***5***.

[14] In all equations Segment *s* corresponds to one of the blue carbon activities (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).

$$TSA_s = \sum_{i=1}^{N_S} A_{s,i}$$

Equation 4

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
TSA_s	Total area of segment *s*, calculated as the sum of all polygons or segment components that belong to segment *s*. Each segment corresponds to one Blue Carbon activity.	ha	X	X	X	X	X	X
$A_{s,i}$	Area of polygon or segment component *i* within segment *s*. Each $A_{s,i}$ represents an individual spatial unit contributing to TSA_s	ha	X	X	X	X	X	X
N_S	Total number of polygons associated with segment *s*.	NA	X	X	X	X	X	X
s	Index of the blue carbon segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	NA	X	X	X	X	X	X
i	Index of polygons or segment components that constitute segment *s*.	NA	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation and/or RVCW-S: Seagrass meadows revegetation, implemented in each segment.
X: Applicable
NA: Not applicable.

- **Segment components:** Are **optional sub-units** of segments used when a segment contains several disconnected polygons, or different activities need to be assigned within the same segment. They group together areas with similar ecological or management characteristics and facilitate calculations during quantification and monitoring.

$$TSA_s = \sum_{f=1}^{Ncp_S} A_{s,f}$$

Equation 5

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
TSA_s	Total area of segment s, calculated as the sum of all segment components.	ha	X	X	X	X	X	X
$A_{s,f}$	Area of segment component *f* within segment *s*. Each component represents a spatially distinct unit that contributes to TSA_s.	ha	X	X	X	X	X	X
Ncp_S	Number of segment components associated with segment *s*.	NA	X	X	X	X	X	X

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
s	Index of the segments to be implemented by CCMP (maximum 6: RFCW-M; RVCW-M; RFCW-T; RVCW-T; RFCW-S; and/or RVCW-S).	NA	X	X	X	X	X	X
f	Index of segment components associated with segment *s*.	NA	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation and/or RVCW-S: Seagrass meadows revegetation, implemented in each segment.
X: Applicable
NA: Not applicable.

- **Blue carbon Program or Project Activities**: Once the eligible strata have been identified through the initial classification and eligibility analysis (see **Section 3.1**), the CCMP must select the corresponding segments for the Blue Carbon activities to be implemented. These activities fall into two categories: Restoration (RFCW) and Revegetation (RVCW), depending on the ecosystem type (mangroves, tidal marshes, seagrass meadows).

  Activity data must be compiled annually for the historical, projection, and results periods. Data must capture relevant land-use and ecological transitions, such as:
  - Non-stable forest coastal wetlands transitioning to stable forest coastal wetlands (through restoration or revegetation of mangroves).
  - Non-forest coastal wetlands transitioning to vegetated tidal marshes.
  - Non-forest coastal marine wetlands transitioning to vegetated seagrass meadows.

  These data enable:
  - Identifying and classifying areas according to baseline and project scenarios.
  - Determining the segments where GHG removals or emission reductions will occur.
  - Monitoring annual changes in coverage and ecological condition according to the criteria established for each Blue Carbon activity.

6.3 Confirmation of Activities

The final selection of activities must:

- Be based on the preliminary classification of eligible areas, refined by the analysis of agents and drivers of degradation or loss (**Section 3.1.1**).
- Ensure precise delimitation of non-overlapping segments, according to historical coverage and eligibility conditions.

This methodology allows for the implementation of two main categories of climate change mitigation activities in coastal wetlands: Restoration (RFCW) and Revegetation (RVCW). Each category is applied to specific ecosystem types as described as:

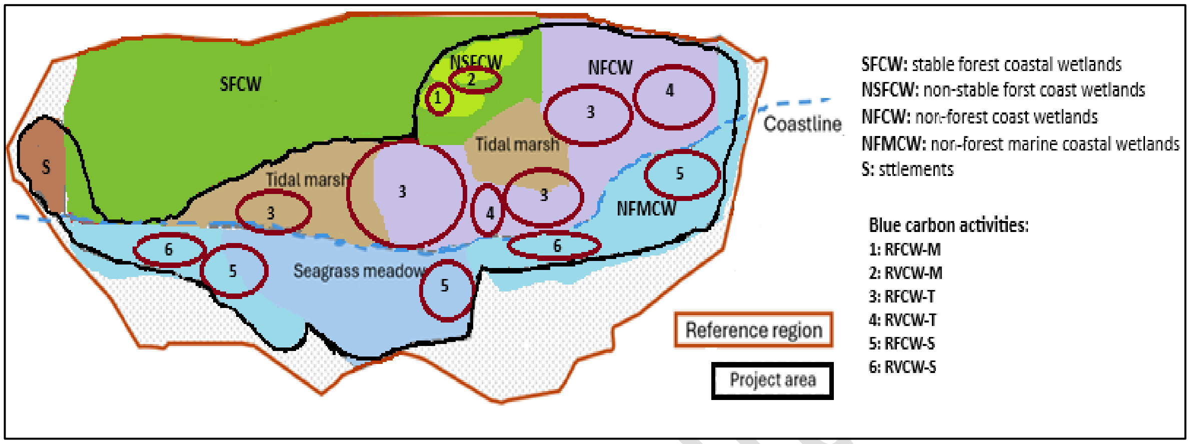
- **Restoration of forest coastal wetland (RFCW):** Restoration activities aim to re-establish the ecological integrity and functionality of forested coastal wetlands (mangroves) through interventions that enable natural regeneration and long-term persistence of native species. These may include:
  - **Mangrove Restoration (RFCW-M):** Planned interventions in non-stable forest coastal wetlands historically supporting mangroves. ***Main mitigation pathway:*** Mixed: Emission reductions and/or Removals. Techniques may include:

    - Assisted natural regeneration or planting of native mangrove species.
    - Hydrological restoration (e.g., rewetting drained sites, re-establishing tidal flushing).
    - Restoration of sedimentation dynamics and salinity balance.
    - Removal of barriers affecting tidal exchange or connectivity.
  - **Tidal Marsh Restoration (RFCW-T):** Planned interventions in degraded tidal marshes within non-forest coastal wetlands. ***Main mitigation pathway:*** Removals (primary). Techniques may include:
    - Hydrological restoration (e.g., blocking drainage channels, removing levees).
    - Re-establishing tidal flooding regimes and natural inundation frequencies.
    - Reducing nutrient inputs or sediment imbalances that prevent recovery.
    - Allowing natural regeneration of halophytic herbaceous vegetation.
  - **Seagrass Meadows Restoration (RFCW-S)** Planned interventions in degraded seagrass ecosystems within non-forest coastal marine wetlands. ***Main mitigation pathway:*** Removals (primary). Emission reductions and/or Removals, but removal is dominant. Techniques may include:
    - Improving water quality (reducing turbidity, nutrient inputs, or pollutants).
    - Restoring hydrodynamic conditions (e.g., removing dredging impacts, enhancing circulation).
    - Facilitating natural recolonisation where viable seed banks remain.
- **Revegetation in coastal wetland (RVCW):** Revegetation activities aim to re-establish vegetation cover and restore ecological functions in non-forested coastal wetlands where natural regeneration has not occurred for a prolonged period (≥10 years). These activities involve deliberate planting, seeding, or transplantation of native species to accelerate ecosystem recovery.
  - **Mangrove Revegetation (RVCW-M):** Planned establishment of mangrove vegetation in non-stable forest coastal wetlands lacking natural regeneration. ***Main mitigation pathway:*** Removals (primary). Techniques may include:
    - Propagule planting, nursery-raised seedlings, or ecological engineering approaches.
    - Establishment of pioneer species to facilitate mangrove community recovery.
    - Site preparation to ensure hydrological and soil suitability.
  - **Tidal Marsh Revegetation (RVCW-T):** Planned establishment of mangrove vegetation in non-stable forest coastal wetlands lacking natural regeneration. ***Main mitigation pathway:*** Removals (primary). Techniques may include:
    - Propagule planting, nursery-raised seedlings, or ecological engineering approaches.
    - Establishment of pioneer species to facilitate mangrove community recovery.
    - Site preparation to ensure hydrological and soil suitability.
  - **Seagrass Meadows Revegetation (RVCW-S)** Planned establishment of mangrove vegetation in non-stable forest coastal wetlands lacking natural regeneration. ***Main mitigation pathway:*** Removals (primary). Techniques may include:
    - Propagule planting, nursery-raised seedlings, or ecological engineering approaches.
    - Establishment of pioneer species to facilitate mangrove community recovery.
    - Site preparation to ensure hydrological and soil suitability.

The spatial boundaries of the segments considered in the CCMP may only change during its implementation, when areas are added or removed, in which case, the CCMP must be re-validated.

Once the strata (eligible areas) that will be part of the CCMP have been identified, the different segments that will be considered by the CCMP must be selected.

Figure 2. Example spatial delimitation of the CCMP.



Note: Total area (black line), reference region (orange line), Red circles represent activity-specific segments, which may consist of one or more spatially separate segment components within the same stratum.

Segment Delineation and Identification by Activity Data

The delineation of segments for mangroves, tidal marshes, and seagrass meadows shall combine ecological and hydrological characteristics with historical activity data to ensure accuracy and comparability across baseline and project scenarios. Each ecosystem type distinguishes between restoration (RFCW/M-T-S) and revegetation (RVCW/M-T-S) activities.

- Mangroves (Non-stable Forest Coastal Wetlands)
  - Ecological criteria
    - Delineated within non-stable forest coastal wetlands.
    - Boundaries are defined by hydrological connectivity (tidal channels, intertidal flats) and species zonation along salinity/soil gradients.
    - Biomass relatively stable year-round, though soil carbon dynamics are strongly influenced by tidal flushing.
  - Activity data criteria
    - RFCW-M (Restoration): Identified through historical records of mangrove degradation, deforestation, or hydrological alteration where natural regeneration is still possible.
    - RVCW-M (Revegetation): Identified through activity data confirming loss of mangroves for at least ten (10) years with no evidence of natural regeneration, often linked to aquaculture conversion, prolonged drainage, or persistent land use.
- Tidal Marshes (Non-forest Coastal Wetlands)
  - Ecological criteria
    - Delineated within non-forest coastal wetlands dominated by halophytic herbaceous vegetation.

        - Boundaries defined by inundation frequency, vegetation type, and elevation gradients within coastal sub-watersheds or estuaries.
        - Strong seasonal variability requires monitoring at peak standing stock, repeated in the same season each year for comparability.
    - Activity data criteria
        - RFCW-T (Restoration): Identified through historical data showing degradation from drainage, levee construction, nutrient loading, or conversion to pasture/cropland, but where hydrological conditions remain suitable for natural recovery.
        - RVCW-T (Revegetation): Identified where marshes remain unvegetated or highly degraded for at least ten (10) years, with historical activity data confirming absence of natural recolonisation and suitability for planting or seeding.
- Seagrass Meadows (Non-forest Coastal Marine Wetlands)
    - Ecological criteria
        - Delineated within non-forest coastal marine wetlands, stratified by depth intervals (bathymetry), and distinguishing intertidal from subtidal zones.
        - Biomass varies seasonally, particularly in temperate and boreal regions. Monitoring shall coincide with maximum standing stock each year.
        - Segment boundaries must consider risks of submergence, erosion, or sediment loading relative to sea-level rise and hydrodynamic processes.
    - Activity data criteria
        - RFCW-S (Restoration): Identified through activity data showing degraded seagrass beds due to turbidity, eutrophication, or dredging, where natural seed banks or rhizomes allow for natural recolonisation once stressors are removed.
        - RVCW-S (Revegetation): Identified in unvegetated or degraded seafloor areas lacking natural recovery for ≥10 years. Expansion from revegetation must be distinguished from natural expansion; where restored and natural meadows converge, both must be delineated separately until merger is detectable (typically after year 5).

6.3.1 Collection and Presentation of Mapping information

The mapping presentation of the CCMP shall comply with the ***Guidelines for Mapping Presentation and Analysis*** issued by Cercarbono, serving as the primary reference for data quality and consistency. Complementarily, CCMPs shall adopt quality standards from ISO 19157:2013 and national official cartography frameworks.

At a minimum, the CCMP must:

- Delineate the total area of the CCMP, corresponding to the full geographic extent where the program or project is implemented.
- Delineate the eligible area of the CCMP, corresponding to the strata that meet the eligibility requirements of this methodology (i.e., non-stable forest coastal wetlands, non-forest coastal wetlands, and non-forest coastal marine wetlands).

These two spatial boundaries (total and eligible area) shall be explicitly georeferenced and submitted in official format shapefile at an appropriate resolution and scale relative to the project size.

For Blue Carbon programs or projects, additional cartographic layers are recommended to strengthen technical traceability and support the location of eligible areas, including areas situated in water surfaces:

- Coastline boundaries, updated to the most recent available data, to ensure the correct positioning of intertidal and subtidal strata.
- Hydrological and geomorphological features, such as tidal channels, estuarine systems, sediment plumes, and drainage or levee structures, which define ecological connectivity and project feasibility.
- Historical degradation drivers, such as aquaculture ponds, drainage channels, dredging scars, coastal infrastructure, and shoreline erosion.
- Reference ecosystems (intact or relatively undisturbed wetlands) used as ecological benchmarks for restoration or revegetation, comply with the ***Guidelines for using Models in Baseline Carbon Quantification in the Land Use Sector***.
- Areas at risk of submergence or erosion under projected scenarios of sea-level rise and sediment dynamics.

The inclusion of these layers facilitates the validation of baseline conditions, the demonstration of eligibility in aquatic or intertidal environments (e.g., unvegetated seagrass beds, tidal flats), and the transparent tracking of spatial changes during monitoring cycles.

All strata, segments, and segment components must be georeferenced and submitted in standard format shapefile, consistent with both baseline and project scenarios. The mapping scale must ensure sufficient precision to monitor restoration/revegetation progress and detect changes in carbon pools and ecosystem condition.

6.4 Carbon pools

The carbon pools included in eligible segments are those that are affected by the implementation of project activities and that can be measured during the monitoring periods. The potential carbon pools included in this methodology are presented in ¡Error! No se encuentra el origen de la referencia.**2** and their description.

Table 2. Potential carbon pools to be considered in CCMPs.

Mangroves (non-stable forest coastal wetland)			
Carbon pool	**RFCW-M**	**RVCW-M**	**Explanation**
Above-ground biomass (AGB)	Yes	Yes	Major pool. Trees and shrubs (stems, branches, bark, foliage, seeds, pneumatophores). **In baseline scenario:** Severely reduced or absent due to deforestation, degradation, or conversion; decomposition of residual biomass contributes to CO_2 emissions. **In project scenario:** Increases through natural regeneration or planting, resulting in removals of atmospheric CO_2. Reductions (avoided emissions from biomass loss) and Removals (biomass regrowth). Anti-double counting rule: Transfers of AGB carbon to litter or soil are excluded until stabilized in SOC.
Below-ground biomass (roots)	Yes	Yes	Significant carbon pool. Root (40–60% of total biomass). **In baseline scenario:** Severely diminished in degraded/cleared areas; roots decay contributes to CO_2 emissions.

Mangroves (non-stable forest coastal wetland)			
			In project scenario: Root regrowth stabilizes soils, promotes SOC accumulation. Removals via root carbon buildup and Reductions via avoided root oxidation. Anti-double counting rule: Root-derived SOC inputs are excluded from BGB pool once transferred.
Dead wood (standing/downed)	Optional	Optional	Included only if ≥5–10% of total C or disturbance legacy is present. **In baseline scenario:** May persist in degraded areas as legacy material. **In project scenario:** Gradual accumulation with canopy recovery; included if measurable and persistent. Reductions from avoided oxidation and minor Removals from re-accumulation. Accounting rule: Excluded if already counted in SOC or litter pool.
Litter (leaf/woody detritus)	Optional	Optional	Pool generally small and dynamic. **In baseline scenario:** Minimal and unstable due to canopy loss. **In project scenario:** Recovered with vegetation cover; dynamic but relatively small pool. Removals of (carbon input to soil) and partial Reductions (stabilization of litter under anoxic conditions). Rule: Only credited once carbon is stabilized in SOC.
Soil organic carbon (SOC)	Yes	Yes	Principal long-term carbon pool in mangrove soils (measured to 1 m depth or to refusal). **In baseline scenario:** Often depleted due to drainage, disturbance, or erosion. **In project scenario:** Restored by hydrological rewetting and litter/root inputs, leading to long-term SOC accumulation. Reductions from avoided oxidation and Removals from accretion. Rule: Reductions (avoided oxidation) and removals (accretion) are temporally exclusive for the same soil mass.
Tidal marshes (non-forest coastal wetlands)			
Carbon pool	**RFCW-M**	**RVCW-M**	**Explanation**
Above-ground biomass (AGB)	Yes	Yes	Herbaceous vegetation (halophytic grasses, sedges, rushes). **In baseline scenario:** Reduced due to degradation, drainage, grazing, or conversion to cropland/pasture. **In project scenario:** Rapid recovery of halophytic grasses, sedges, rushes via rewetting or planting; immediate CO_2 uptake. Removals (dominant) — photosynthetic CO_2 sequestration. Rule: No double counting as ER for the same biomass accumulation.
Below-ground biomass (roots/rhizomes)	Yes	Yes	Critical pool in marshes; roots/rhizomes provide major SOC inputs. **In baseline scenario:** Severely reduced in degraded marshes. **In project scenario:** Root recovery enhances sediment stabilization and SOC accumulation. Removals (dominant) — sustained carbon input to soils. Rule: Inputs to SOC excluded from BGB pool upon transfer.

Mangroves (non-stable forest coastal wetland)			
Dead wood (standing/downed	Optional	Optional	Generally, absent in herbaceous systems. **In baseline scenario:** Typically absent. **In project scenario:** Rare; included only if significant and measurable. Removals (transitional pool). Rule: Include only if persistent and ≥5% of total carbon.
Litter (herbaceous detritus)	Optional	Optional	Pool generally small but may contribute to SOC. **Baseline:** Minimal in degraded systems. **Project scenario:** Increases as vegetation recovers. Removals (organic inputs to soil carbon pool). Rule: Counted once stabilized in SOC.
Soil organic carbon (SOC/peat)	Yes	Yes	Largest long-term sink; includes organic soils/peat accretion. Required to 1 m depth (or refusal). **In baseline scenario:** Depleted by drainage, oxidation, or land-use change. **In project scenario:** Restored tidal flooding and vegetation inputs promote peat/SOC accretion. Removals (carbon burial); Reductions avoided oxidation. Rule: reductions and removals cannot be claimed simultaneously for the same soil mass.
Seagrass meadows (non-forest coastal marine wetlands)			
Carbon pool	**RFCW-M**	**RVCW-M**	**Explanation**
Above-ground biomass (AGB)	Yes	Yes	Shoots and leaves. It is significant but seasonal. **In baseline scenario:** Reduced or absent due to dredging, eutrophication, or physical disturbance. **In project scenario:** Restored via natural regeneration (RFCW) or planting/seeding (RVCW); monitored at peak biomass. Removals (photosynthetic CO_2 uptake) and Reductions avoided loss through stabilization. Rule: No double counting between seasonal AGB and detritus.
Below-ground biomass (roots/rhizomes)	Yes	Yes	Major long-term contributor to sediment C. **In baseline scenario:** Severely degraded in unvegetated seabeds. **In project scenario:** Root and rhizome establishment stabilizes sediments and promotes SOC accumulation. Removals (carbon input and sediment stabilization). Rule: When transferred to SOC, excluded from BGB stock.
Dead biomass (detritus)	Optional	Optional	May contribute significantly to sedimentary carbon if retained. **In baseline scenario:** Often lost due to degradation or decomposition. **In project scenario:** Increases as meadows recover, enhancing sedimentary carbon. Removals of organic matter deposition and burial in sediments. Removals (deposition and burial). Rule: Counted once incorporated into SOC.
Sediment organic carbon (SOC)	Yes	Yes	Principal long-term pool; measured to 1 m depth (or refusal). **In baseline scenario:** Often depleted in disturbed or eroded sediments.

Mangroves (non-stable forest coastal wetland)			
			In project scenario: Progressive accumulation through litter and root inputs; main carbon sink in seagrass ecosystems. Removals (sedimentary carbon burial) and Reductions avoided oxidation of stored C. Rule: reductions and removal are temporally and spatially exclusive for the same sediment mass.

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation and/or RVCW-S: Seagrass meadows revegetation, implemented in each segment.

All carbon pools included in the baseline scenario of the segment must be considered in the project scenario. After CCMP validation, no carbon pools can be added or removed during the duration of the CCMP.

All the carbon pools in the baseline and project scenarios are considered dynamic during the CCMP lifespan, as these carbon pools have not reached a dynamic equilibrium and therefore need to be measured in the field and calculated for both scenarios.

Soil organic carbon is typically the largest carbon pool in wetlands, and it should be account for; however, it can be omitted when there is limited technical capacity to assess carbon stocks.

6.4.1 Removal Factors

Removal factors are coefficients used to estimate the rate of carbon sequestration (removals of GHGs from the atmosphere) resulting from restoration (RFCW) or revegetation (RVCW) activities in coastal wetlands. They complement emission factors by quantifying net carbon accumulation in biomass, soils, and sediments.

Table 3. Removal Factors by Ecosystem Type.

Ecosystem	Removal Factors (RF)
Mangroves (RFCW-M / RVCW-M)	- Tree and shrub biomass accumulation (AGB/BGB). - Soil organic carbon sequestration via rewetting and root inputs. - Sediment accretion validated by ^{210}Pb and ^{137}Cs profiles[15].
Tidal Marshes (RFCW-T / RVCW-T)	- Herbaceus biomass accumulation (AGB/BGB). - Soil organic carbon sequestration via rewetting and root inputs. - Sediment accretion validated by ^{210}Pb and ^{137}Cs profiles.
Seagrass Meadows (RFCW-S / RVCW-S)	- Shoot and rhizome regrowth. - Sediment carbon burial and stabilization. - Sediment accretion rates confirmed with $^{210}Pb/^{137}Cs$ profiles.

Data Sources

- Direct field measurements (permanent plots, sediment cores, biomass increment surveys).
- Peer-reviewed scientific literature reporting sequestration rates in comparable ecological contexts.
- Calibrated and validated models (growth, sediment accretion, or carbon burial models).

[15] Radionuclides used in sedimentation and carbon accumulation studies in coastal wetlands: ^{210}Pb (Lead-210) and ^{137}Cs (Cesium-137).

- Official national/subnational data from inventories or blue carbon initiatives.
- IPCC 2013 Wetlands Supplement Tier 1 defaults, only for secondary pools or where higher-tier data are unavailable.

Removal factors shall include, where relevant:

- Aboveground biomass increment (trees, shrubs, herbaceous cover, seagrass shoots).
- Belowground biomass accumulation (roots, rhizomes) contributing to soil/sediment stabilization and carbon input.
- Soil organic carbon (SOC) / Sediment organic carbon (SedOC) accrual through accretion, reduced oxidation, and organic matter inputs.
- Dead organic matter pools (detritus, litter, coarse woody debris) when measurable and persistent.

Methodological Requirements

- Ecosystem-specific factors must distinguish between mangrove, tidal marsh, and seagrass dynamics.
- Monitoring must reflect seasonal variation in marshes and seagrass meadows, and relatively stable accumulation in mangroves.
- Sediment accretion should be quantified with radiometric dating (e.g., ^{210}Pb, ^{137}Cs) or validated sedimentation models.
- Factors must be updated at least every 10 years to incorporate new scientific evidence and harmonize with national MRV frameworks.

QA/QC Requirements

- All datasets used for removal factors must be traceable, with clear documentation of protocols, calibration, and uncertainty.
- Where literature values are applied, ecological comparability with the project site must be demonstrated.
- Conservative assumptions shall be used where uncertainty remains high.

6.4.2 Specific considerations for the Soil Organic Carbon (SOC) pool

SOC is included in the carbon pools considered in the segment, hence the CCMP will need to estimate the impacts of soil activities and land use change from coastal wetlands on CO_2 emissions and removals. Carbon Stock in the SOC carbon pool must deduct the percentage of sequestration resulting from allochthonous soil organic carbon accumulation at baseline scenario and project scenario. The deduction for allochthonous carbon must only be applied to soil layers deposited or accumulated after the project start date (such as materials formed above a feldspar marker horizon).

A deduction must not be used if:

- The approach used above to estimate CO2 emissions directly estimates autochthonous CO2, excluding the emissions that accounts for allochthonous carbon (demonstrating that allochthonous carbon have been released to atmosphere as CO2 in the absence of the project).
- The organic surface layer exceeds 10 cm whereby the soil is deemed organic.

If the organic surface layer is 10 cm or less, deduction of allochthonous carbon is applicable where mineral sediment on soil layer happens, unless proven otherwise.

This methodology does not consider the loss of dissolved organic carbon (DOC) in drainage waters that would occur in the baseline scenario, as the available science and data are insufficient to provide guidance on CO_2 emissions or removals associated with these carbon fluxes.

The most important factors considered for estimating in situ CO_2 emissions from drained organic soils are land use and climate. Other factors, such as soil fertility and drainage level, affect emissions and can be considered where appropriate and with suitable methods. It is recommended to stratify the use categories generated by land use change according to climate classification, fertility, and drainage.

For the estimation of changes in SOC, the CCMP should use annual emission factors that estimate carbon losses that would happen in the degradation and loss baseline scenario. The area of the segment is multiplied by the associated emission factor to obtain an estimate of annual CO_2 emissions in that baseline stratum. The emission factor used should be at the local level, developed based on direct measurements or supported by official publications or studies published in peer-reviewed articles.

To accurately quantify the soil carbon pool, soil must be collected, subsampled and analysed for specific depth. Three parameters must be quantified for each segment, strata, and/or coring site to estimate the soil carbon pool, namely Soil Depth, Dry Bulk Density and Soil organic carbon content.

6.5 GHG Emission Sources

The potential GHG emission sources included in the baseline and project scenarios are presented in **Table 4**. See **Section 8.5** for GHG emission sources due to leakage.

Table 4. Summary of GHG emission sources that can be included in segments and baseline and project scenarios (see symbology below).

Mangroves Restoration or Revegetation (non-stable forest coastal wetland– RFCW-M or RVCW-M)			
Process-source	**GHG**	**Inclusion**	**Explanation**
Burning of biomass	CO_2	Yes (mandatory)	Accounted as biomass stock change. **In Baseline:** Fires may occur in degraded mangroves due to land clearing, fuelwood extraction, or accidental fire. **In Project scenario:** Burning is prohibited; only included if unexpected fires occur. Rule: Counted once under AGB stock change. No double counting with deadwood or litter
	CH_4	Optional (if significant)	Generally negligible; include if significant. **In Baseline:** Emitted during biomass burning if recurrent in baseline. **In Project scenario:** Only included if fire occurs despite prohibition. Rule: Include only if recurrent burning documented. Exclude from oxidation fluxes to avoid overlap.
	N_2O	Optional (if significant)	Generally negligible; include if significant. **In Baseline:** Same conditions as CH_4. **In Project scenario:** Only included if fire occurs despite prohibition.

Mangroves Restoration or Revegetation (non-stable forest coastal wetland– RFCW-M or RVCW-M)			
			Rule: Include only if recurrent burning documented. Exclude from oxidation fluxes to avoid overlap.
Hydrological alteration (drainage removal, levees breaching, tidal reconnection)	CO_2	Optional (if significant)	Only if project activities significantly modify water regime (Net positive effect long-term). **In Baseline:** Drainage promotes SOC oxidation and sustained CO_2 emissions. **In Project scenario:** Rewetting causes short-term flux, then avoided oxidation + SOC accretion. Rule: Reductions and Removals credited sequentially, not simultaneously. SOC gains credited only once stabilized. When ΔSOC is applied, CO_2 emissions from hydrological alteration ($E\_HydroAl,CO_2$) must be set to zero. Conversely, when using process-based emission factors, ΔSOC must be set to zero.
	CH_4	Optional (if significant)	Long-term stabilization. **In Baseline:** CH_4 fluxes suppressed in drained baseline soils. **In Project scenario:** Short-term CH_4 increase after rewetting; stabilizes within 1–3 yrs. Rule: Temporary CH_4 flux deducted from Removal.
Nitrification/denitrification	N_2O	Optional (if significant)	Include if site-specific data show relevance. **In Baseline:** Higher fluxes may occur in drained soils with altered redox. **In Project scenario:** Generally negligible after restoration; include only if site-specific data confirm significance. Rule: Counted separately from soil respiration; no overlap with SOC fluxes.
Tidal Marsh Restoration or Revegetation (non-forest coastal wetlands– RFCW-T or RVCW-T)			
Burning of vegetation	CO_2	Yes (mandatory)	Accounted as biomass stock change. **In Baseline:** Fires may occur in drained/degraded marshes converted to pasture or cropland. **In Project scenario:** Controlled burning prohibited; only included if accidental fires occur. Rule: Accounted once as AGB stock loss.
	N_2O CH_4	Optional (if significant)	**In Baseline:** Include only if baseline fire regime documented. **In Project scenario:** Burning prohibited;
Hydrological restoration (levee removal, tidal flooding)	CO_2	Yes(mandatory)	Must be considered if project alters tidal flooding. Main avoided emission. **In Baseline:** Drained peat oxidizes releasing CO_2. **In Project scenario:** Restoration halts oxidation (Reductions) and enhances SOC accretion (Removals). Rule: SOC reductions and Removals temporally exclusive. SOC stock monitored to 1 m depth to avoid overlap
	CH_4	Optional (if significant)	**In Baseline:** Suppressed in drained soils. **In Project:** Short-term CH_4 increase deduct from removals.
SOC disturbance (excavation/soil works)	CO_2	Optional	**In Baseline:** Baseline soils may be exposed in degraded sites **In Project scenario:** Planting/earthworks may release CO_2; minimized by best practices. Rule: Counted as project emission if > 5 % of site area disturbed.

Mangroves Restoration or Revegetation (non-stable forest coastal wetland– RFCW-M or RVCW-M)			
Nitrification/denitrification	N_2O	Optional (if significant)	Include if site data indicate relevance; separated from SOC fluxes.
Seagrass Meadows Restoration or Revegetation (non-forest coastal marine wetlands– RFCW-S or RVCW-S)			
Sediment disturbance (planting, anchoring modules, dredging prep)	CO_2	Optional	If significant sediment resuspension occurs. **In Baseline:** Degraded seabeds release CO_2. **In Project scenario:** Planting modules/seeds may disturb sediments temporarily; offset by long-term carbon gains from revegetation. Rule: Only counted if measurable (> 5 % SOC loss).
Nutrient-driven processes (eutrophication)	N_2O	Optional	If sediments are exposed. **In Baseline:** Eutrophic conditions in baseline may release N_2O. **In Project scenario:** Revegetation improves water clarity and nutrient cycling, reducing N_2O; only accounted if significant. Rule: Reductions credited only once per site.

Treatment and Significance of GHG Emission Sources

- CO_2 emissions from coastal wetlands can be significant, primarily associated with:
  - Drainage, excavation, or disturbance of organic and mineral soils, particularly for aquaculture, salt extraction, or infrastructure construction.
  - Oxidation of exposed mangrove or tidal-marsh soils following hydrological alteration or drainage.

During restoration or revegetation, temporary CO_2 fluxes may occur from soil rewetting or minor earthworks. However, these short-term emissions are generally offset by long-term soil organic carbon (SOC) accumulation once hydrological balance and vegetation recovery are restored. All CO_2 fluxes associated with soil disturbance or stabilization must be reported as soil carbon stock changes in accordance with the IPCC 2013 Wetlands Supplement.

- CH_4 emissions are generally negligible in saline coastal wetlands (mangroves, tidal marshes, and seagrass meadows) due to the dominance of sulfate-reducing conditions that suppress methanogenesis. They become potentially significant only under the following conditions:
  - Nutrient enrichment caused by agricultural runoff or wastewater inputs.
  - Rewetting of previously drained freshwater or brackish soils during restoration activities.

CH_4 emissions are therefore treated as optional and included only when site-specific data or literature demonstrate a material contribution (>5 % of the project's net GHG balance).

N_2O emissions are typically minor in undisturbed saline wetlands but may arise from:

- Aquaculture discharges or nutrient loading.
- Fertilization or soil amendments used during revegetation establishment.

N_2O is included only when management practices or monitoring evidence confirm relevance. When required, default emission factors from IPCC (Wetlands Supplement) may be applied.

- Emissions from Biomass Burning: The IPCC 2013 Wetlands Supplement covers CO_2, CH_4, and CO emissions from the burning of biomass or organic soils, particularly in degraded mangroves and drained tidal marshes converted to agriculture or pasture. To ensure methodological consistency, the estimation must include:
  a) Determination of the burned area (ha);
  b) Estimation of the fuel load available for combustion, including live biomass, litter, and dead wood;
  c) Application of combustion factors suitable for each vegetation type;
  d) Use of GHG-specific emission factors (CO_2, CH_4, N_2O) following IPCC 2006.

CO_2 emissions from biomass burning are already reflected in biomass stock-change calculations; therefore, they must not be counted separately as process-based emissions.

6.5.1 Emission Factors

GHG emission factors are coefficients that quantify the amount of greenhouse gases (GHGs) released per unit of activity or land-use change in coastal wetland ecosystems. Within CCMPs, they are essential for estimating emissions in both the baseline and project scenarios.

Table 5. Emission Factors by Ecosystem Type.

Ecosystem	Relevant Emission Factors (EF)
Mangroves (RFCW-M / RVCW-M)	- Biomass combustion (CO_2, CH_4, N_2O). - Soil oxidation from drainage (CO_2). - Disturbance of SOC during land conversion (CO_2, N_2O).
Tidal Marshes (RFCW-T / RVCW-T)	- Vegetation burning (CO_2, CH_4, N_2O). - Soil oxidation under drainage (CO_2). - Hydrological modification (CO_2, CH_4).
Seagrass Meadows (RFCW-S / RVCW-S)	- Sediment disturbance from dredging or anchoring (CO_2). - Eutrophication-driven emissions (N_2O, CH_4).

Data Sources:

Emission factors must be derived from one or more of the following sources, ensuring representativeness and traceability:

- Direct field measurements (e.g., flux chambers for CH_4 and N_2O, soil carbon loss measurements).
- Peer-reviewed literature reporting site-relevant emission rates.
- Validated biogeochemical or hydrological models adjusted to local conditions.
- Official national/subnational datasets, including national GHG inventories or blue carbon programs.
- IPCC 2013 Wetlands Supplement Tier 1 defaults, only when site-specific or higher Tier data are not available and provided conservativeness is demonstrated.

Emission factors shall include, where significant:

- Biomass burning emissions (CO_2, CH_4, N_2O).

- Soil carbon oxidation/combustion due to drainage, disturbance, or excavation.
- Hydrological alterations affecting CO_2 and CH_4 fluxes.
- Nitrification/denitrification leading to N_2O emissions in rewetted soils.

Methodological Requirements

- Factors must be ecosystem-specific (mangroves, tidal marshes, seagrass meadows) and, when applicable, stratified by segment (RFCW or RVCW).
- Where possible, emissions must be estimated using Tier 2 or Tier 3 approaches (measured or modeled), default Tier 1 values only as last resort.
- QA/QC protocols must validate the accuracy, traceability, and representativeness of all data used.

GHG emission factors must be representative of the coastal wetland strata within each segment and demonstrate internal consistency with the area where activity data are monitored and where project activities occur.

For significant carbon pools, emission factors shall be derived from field-based inventories of mangroves, tidal marshes, and seagrass meadows. These inventories and other GHG source assessments must include a statistically representative number of samples to determine (for each segment, and stratum) the variables required for estimating carbon content in all affected carbon pools and for all selected emission sources.

Emission factors are applied to all carbon pools potentially affected by activity-induced changes, as indicated in **Table 4**, and are used to estimate net emissions from these processes.

For methodological consistency, the same emission factors are applied to both the baseline and project scenarios, unless justified adjustments are made due to Tier level changes, data source updates, or environmental condition differences.

Field sampling provides data on the structure and composition of coastal wetland ecosystems, which are used to parameterize allometric equations and biogeochemical models for estimating carbon stocks within the selected carbon pools.

All emission factors must be supported by QA/QC procedures and demonstrate conservativeness, ensuring that uncertainties remain within acceptable bounds and that no overestimation of emission reductions.

6.6 Long-term Average GHG Mitigation Potential

The long-term average GHG mitigation potential is defined as the annual means of net emission reductions and/or net carbon removals achieved by the CCMP across all its segments (RFCW-M/T/S and RVCW-M/T/S) over its total crediting duration. It is expressed in tons of CO_2 equivalent per year (t CO_2e / year) and is calculated as the difference between the net emissions and removals projected in the project scenario and those estimated in the baseline scenario, including significant emission sources and attributable leakage.

The long-term average GHG mitigation potential represents the mean annual net GHG mitigation achieved by the CCMP across its entire crediting period. It integrates both net GHG removals and net GHG emissions avoided, and deducts project emissions and attributable leakage. Is calculated as:

$$R_{LA} = \frac{1}{T}\sum_{t=1}^{T}(GHG_{BL,t} - GHG_{P,t})$$

Equation 6

Variable	Description	Units	Blue carbon activities*	
			RFCW/M-T-S	RFCW/M-T-S
R_{LA}	Long-term average GHG mitigation potential.	t CO_2e / year	X	X
$GHG_{BL,t}$	Annual net GHG balance of the baseline scenario in year *t*.	t CO_2e	X	X
$GHG_{P,t}$	Annual net GHG balance of the project scenario in year *t*, according to the applicable equation.	t CO_2e	X	X
T	Total duration of the CCMP crediting period over which the long-term average is calculated.	years	NA	NA
t	CCMP year index used to compute annual values within the crediting period.	NA	NA	NA

* Blue carbon activities simplified: RFCW/M-T-S: Mangrove, Tidal marsh, or Seagrass meadows restoration. RVCW/M-T-S: Mangrove, Tidal marsh, or Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

This long-term average value defines the upper conservative limit of carbon credits that a Blue Carbon CCMP may issue over its implementation period.

Considerations by activity type:

- When the CCMP implements exclusively restoration or revegetation activities in eligible non-forest coastal wetland strata (such as non-stable forest mangroves, tidal marshes, or seagrass meadows), baseline emissions may be low and therefore emission reductions may be minimal. In such cases, the long-term average mitigation potential will be driven primarily by net GHG removals, derived from increases in biomass and soil/sediment carbon stocks under the project scenario.
- Conversely, when the CCMP implements activities in mangrove ecosystems where avoided degradation or avoided conversion applies, the long-term average must integrate both emissions avoided (e.g., avoided soil oxidation, avoided biomass loss) and net GHG removals (e.g., forest regrowth, sediment SOC accumulation), consistent with the project and baseline GHG balance equations.
- For CCMPs that combine multiple activity types across mangroves, tidal marshes, and seagrass meadows, both avoided emissions and net removals shall be included in the long-term average mitigation estimate, ensuring methodological consistency, no double counting, and clear traceability of segment-level mitigation contributions.

The long-term average GHG mitigation potential shall be established in coherence with:

- The eligibility of strata, carbon pools, and emission/removal sources included in the CCMP;

- National or jurisdictional reference frameworks for wetlands or Blue Carbon (if available);
- The host country's regulatory and technical frameworks, including NDC commitments, coastal management plans, and applicable social and environmental safeguards.

The estimation must:

- Be grounded in empirical or scientifically validated historical rates of carbon change in each wetland type (mangroves, tidal marshes, seagrass meadows), based on permanent plots, sediment cores, isotopic dating (e.g., ^{210}Pb, ^{137}Cs), remote sensing, or other verifiable sources.
- Reflect the specific carbon dynamics of each ecosystem and activity type (e.g., above- and below-ground biomass accumulation in mangroves, rhizome production in seagrasses, peat and SOC accretion in tidal marshes).
- incorporate both avoided emissions (e.g., prevented degradation, conversion, drainage, sediment disturbance) and net GHG removals, feeding the variables $GHG_{BL,t}$ and $GHG_{P,t}$ used in the long-term average equation.
- Be periodically reassessed (at least every five years) to reflect new national data, updated scientific evidence, or changes in hydrological, geomorphological, or climatic conditions (e.g., sea-level rise, sediment supply).
- Ensure internal consistency between baseline and project scenarios, following a conservative approach that avoids overestimation and safeguards environmental integrity.

7 Baseline Scenario

The baseline scenario represents the most plausible trajectory of carbon stocks and GHG fluxes within the CCMP area in the absence of project activities. It must be identified in a conservative manner, supported by empirical evidence, and include a clear assessment of uncertainty.

A CCMP holder or developer shall select the baseline scenario from one of the following approaches, depending on the ecological, socio-economic, and institutional context of the project area:

a) Existing or historical baseline: documented changes in carbon pools minimum 10 years. This approach may also incorporate applicable including legal or regulatory requirements, as applicable, changes in carbon stocks in the carbon pools within the project boundary.
b) Baseline based on economically attractive land use: projected changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, considering barriers to investment, and stakeholders' opinions on their plans for development/management project area before its start.
c) Baseline based on the most likely land use trajectory: carbon stock changes expected under prevailing trends, including potential management practices, coastal development, or natural expansion of vegetation.

- **Additional Factors for baseline Determination in Coastal Wetlands**

The factors identified in **Section 4.1** shall be applied to determine the baseline scenario of the CCMP, providing a technical basis for modeling carbon dynamics and estimating GHG emissions and removals in the absence of project intervention.

The analysis should consider biophysical, socioeconomic, and management conditions that influence carbon storage and GHG fluxes in coastal wetlands, including:

- Hydrological and geomorphological conditions: tidal regime, water depth, sedimentation rates, and connectivity.
- Soil and substrate characteristics: organic carbon content, salinity, nutrient availability, and drainage status.
- Vegetation cover and productivity: species composition, canopy density, and biomass turnover rates.
- Land and resource use: intensity and type of human activities (e.g., aquaculture, dredging, infrastructure) that modify wetland structure and function.
- Climatic and oceanographic influences: precipitation, temperature trends, sea-level rise, and extreme events affecting wetland stability.
- Institutional and management context: effectiveness of local governance, land tenure security, and conservation enforcement influencing land-use trajectories.

These factors should be mapped, quantified when possible, and integrated into the baseline modeling through empirical data, remote sensing, or scientifically validated literature.

The integration ensures that baseline emissions and removals reflect realistic trajectories of degradation or recovery under a "without project" scenario.

- **Integration into Baseline Scenario Construction**

The baseline scenario must combine ecological evidence (e.g., hydrological regime, sedimentation rates, propagule sources) with socio-economic drivers (e.g., market demand, infrastructure expansion, tenure context) to establish a conservative representation of expected carbon dynamics. The baseline shall:

- Quantify carbon stock changes in relevant pools (aboveground biomass, belowground biomass, soils, or sediments).
- Identify expected emissions from degradation, conversion, or erosion processes.
- Account for natural regeneration potential and distinguish it from project-driven outcomes.
- Explicitly justify exclusions of any pools, sources, or drivers under the principle of conservativeness.

This integrated approach ensures that baseline scenarios in coastal wetlands reflect both ecological processes and human pressures, thereby supporting transparent and verifiable comparisons with project scenarios.

- **System and projection period**

The selection of the projection system in a Blue Carbon CCMP, whether for degradation, conversion, or land-use change in mangroves, tidal marshes, or seagrass meadows, shall be guided by two criteria: accuracy and relevance.

- Accuracy: The system must demonstrate the lowest error when comparing projected results against observed historical data. Projection systems may be:
  - Linear: trends or constant-rate extrapolations of degradation or loss.
  - Non-linear: e.g., logistic models that capture saturation effects in land-use change.
  - Probability-based: models estimating the likelihood of wetland degradation or conversion as a function of socio-economic and biophysical variables (e.g., aquaculture expansion, drainage infrastructure, erosion or salinity intrusion).
- Relevance: The projection method must be supported by scientific literature, empirical data, or technical guidance adapted to coastal wetlands, demonstrating its ecological and hydrological adequacy.

The projection shall integrate at least 10 years of historical data, expressed in annual carbon stock changes or GHG emissions, to estimate the most realistic trajectory:

- In linear approaches, the complete historical time series must be used.
- In non-linear or probabilistic models, when only a subset of historical years is needed (e.g., to calculate a rate), conservative assumptions shall be applied in both year selection and methodological approach.

The selected projection represents a static baseline reference, not a monitoring requirement, and shall remain fixed for the duration of the crediting period unless the methodology specifies conditions for its update.

7.1 Baseline Scenario Identification

The CCMP shall identify realistic and credible land-use and ecosystem condition scenarios that would occur within the implementation areas in the absence of the project activity, within the eligibility boundaries. This assessment must consider national and subnational policies, regulations, spatial planning instruments, and sectoral circumstances affecting coastal wetlands (e.g., mangrove zoning, conservation frameworks, aquaculture regulations), as well as relevant socioeconomic trends affecting coastal land use.

Based on this assessment, the proponent must select the most realistic baseline scenario and quantify its characteristics, ensuring that the scenario:

a. Reflects the best available, environmentally sound and economically viable practices, where applicable. This includes practices associated with the management, conversion, degradation or natural dynamics of mangroves, tidal marshes and seagrass meadows.

b. Applies an approach based on average emissions or removals derived from comparable activities of best performance. Under similar social, economic, environmental and technological circumstances. This may include hydrological alteration patterns, historical rates of deforestation, degradation, conversion to aquaculture or agriculture, erosion processes, or natural recovery dynamics.

c. Is conservatively set below the business-as-usual (BAU) scenario. To ensure environmental integrity:

- Extreme or artificially elevated assumptions about degradation or conversion rates are not acceptable and must be excluded.
- The baseline must be technically justified, verifiable, and situated below a reasonable upper limit of BAU conditions.

- Assumptions must reflect prudent, evidence-based expectations of land-use pressure, hydrological disturbance, ecosystem degradation trajectories, biomass decline, soil carbon loss, and other drivers affecting coastal wetland carbon stocks.

Cercarbono has developed ***Guidelines for the Use of Models in Baseline Carbon Quantification in the Land Use Sector*** to ensure environmental integrity, credit credibility, and the additionality of program or project activities. These guidelines apply equally to coastal wetland modeling, including hydrodynamic, geomorphological, biomass and soil carbon models relevant to blue carbon ecosystems.

To select the baseline scenario, the CCMP must comply with all requirements established in **Sections 3** and **4** of this methodology.

The baseline must be reassessed by the CCMP proponent every five (5) years to verify the continued validity of initial assumptions. If significant changes are identified (e.g., due to shifts in hydrological management, coastal development patterns, regulatory changes, or methodological updates), the CCMP may require revalidation.

7.1.1 Stratification criteria for the baseline scenario

Stratification for the baseline scenario shall be based primarily on the initial land cover classification, as defined during project eligibility and area delineation. This classification reflects the condition and extent of coastal wetland strata (such as degraded mangroves, non-forest areas suitable for revegetation, currently forested mangroves, tidal marshes, or seagrass meadows) and constitutes the mandatory basis for baseline stratification.

Where appropriate and justified, additional stratification criteria may be incorporated, such as region, biogeographic zone, salinity regime, hydrological or tidal classification, geomorphological setting, or levels of anthropogenic pressure. Any additional or higher-level stratification must be transparently documented and justified.

If the stratification approach changes after CCMP implementation, the project must undergo revalidation.

7.2 Quantification of the Baseline Scenario

The baseline scenario under this methodology is defined as the estimation of carbon stocks in the relevant carbon pools, together with significant GHG emission sources (as applicable to the eligible strata identified), that would have occurred within the CCMP eligible boundaries in the absence of the planned activities. The GHG emission sources and carbon pools to be included are specified in **Tables 2** and **4**.

The ***Guidelines for Using Models in Baseline Carbon Quantification in the Land Use Sector*** provide the framework for estimating baseline carbon stocks and emissions. These guidelines ensure a conservative approach that safeguards the environmental integrity of the CCMP, by requiring the use of validated methodologies, transparent procedures, and measurable or estimable data. They also allow the application of internationally recognized default factors, such as those provided by the IPCC, whenever site-specific data are not available.

The eligible land cover categories for the baseline scenario—comprising non-stable forest areas and non-forest areas (non-forest coastal wetlands and non-forest coastal marine wetlands) subject to CCMP activities—are presented in **Table 6**. In addition, land cover categories officially recognized and defined by the host country shall also be incorporated to ensure alignment with national systems.

Table 6. Eligible and non-Eligible coverage in the Baseline Scenario, considering the activities to be Implemented in the Project Scenario.

Eligible coverages (for the baseline and project scenarios)	**Non-eligible coverages**
Mangrove Restoration	
- Degraded secondary mangroves.	- Primary mangroves. - Stable tall secondary mangroves. - Existing forest plantations. - Coastal peatlands and permanent swamps with active hydrological function
- Fragmented areas or incomplete regeneration.	
- Degraded pastures within the tidal range.	
- Bare or sparsely vegetated areas within mangrove ecosystems	
Mangrove Revegetation	
-Heterogeneous agricultural areas without woody crops, adjacent to or within tidal range.	
- Degraded low secondary vegetation used as a basis for enrichment.	
- Induced pastures with restoration potential.	
Tidal Restoration	- Intact and stable salt marshes. - Swampy areas with high ecological sensitivity and high risk of emissions if altered.
- Marsh areas with degraded herbaceous cover. - Altered saline areas with modified channels or hydrology	
Tidal Revegetation	
- Heterogeneous agricultural areas without woody crops that can be converted to halophytic vegetation. - Permanent non-woody crops (e.g., rice fields) that can be transformed into functional marsh.	
Seagrass Restoration	- Intact, functional seagrass meadows. - Deep or high-energy hydrodynamic zones without ecological suitability. - Permanent wetlands with high sensitivit
- Fragmented or degraded meadows (loss of coverage, altered channels).	
- Sandy bottoms previously colonized by seagrass.	
Seagrass Revegetation	
- Bare or sparsely vegetated sandy bottoms suitable for revegetation through seagrass transplantation.	

Within the context of Blue Carbon activities, areas currently under active agropastoral use —including silvopastoral, agrosilvopastoral systems, or lands with the presence of grazing— may only be considered eligible when included under Revegetation of Coastal Wetlands.

Eligibility is restricted to cases where the CCMP design ensures their integral and permanent transformation into woody covers, strictly excluding livestock practices throughout the implementation and crediting period.

This conversion shall be clearly justified and documented in the Project Design Document (PDD) and supported with verifiable evidence addressing the following:

- Definitive elimination of livestock practices
  - Evidence of removal of grazing or livestock components, including management practices and permanent control measures to prevent reintroduction.
- Compliance with Blue Carbon eligibility and ecosystem improvement criteria

- Demonstration that the intervention enhances ecosystem functionality and resilience in line with the methodology's requirements on eligibility, permanence, and ecological improvement.
- Application of the principle of conservatism in baseline accounting
  - No allocation of GHG emissions to the previous agropastoral use in the baseline scenario, to prevent overestimation of net removals.
- Leakage risk identification and mitigation
  - Comprehensive assessment of potential leakage risks derived from displacement of the excluded agropastoral activities, along with the definition of mitigation measures consistent with the methodology's provisions for activity-shifting leakage.
- Safeguards for sustainability
  - Confirmation that the land-use change does not undermine food security, local livelihoods, or tenure rights.
  - Evidence that the intervention contributes to biodiversity conservation, soil restoration, and hydrological stability of the coastal wetland.

7.2.1 Carbon stock estimation

Changes in carbon stock in the relevant carbon pools shall be estimated separately for each eligible stratum of coastal wetlands (non-stable forest coastal wetlands, non-forest coastal wetlands and non-forest coastal marine wetlands) where the CCMP activities (Restoration or Revegetation) are to be implemented. It is necessary to calculate the baseline scenario carbon stocks in all applicable strata

It is necessary to calculate the baseline scenario carbon stocks in all applicable strata.

Sources of data, factors, and parameters

Data and parameters for estimating carbon stocks (or changes in stocks) across the relevant Blue Carbon vegetation types (mangroves, tidal marshes, seagrass meadows, coastal shrubs, etc.) shall be obtained, in order of preference, from:

- National or subnational inventories (forest or coastal wetland inventories, soil inventories, seagrass monitoring programs) applicable to the host country.
- Ramsar Site Information Service (RSIS), national Ramsar inventories, and Ramsar National Reports, when available, as complementary sources to characterize the ecological condition, extent, and typology of wetlands within the project boundary.
- IPCC Good Practice Guidance (GPG) and IPCC Guidelines (2006, 2013 Wetlands Supplement, 2019 Refinement) when country-specific data are not available.
- In all cases, the values shall be selected based on conservativeness and lowest uncertainty.

In all cases, parameters shall be selected based on conservativeness and lowest uncertainty. Where no adequate data exist, the CCMP may establish parameters using empirical field inventories, remote sensing, or validated models, consistent with the ***Guidelines for using Models in Baseline Carbon Quantification in the Land Use Sector***.

In the baseline scenario, the objective is to quantify the changes in carbon stocks (ΔC) in the relevant pools for each eligible segment (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S and/or RVCW-S).

The baseline does not assume any additional accumulation of carbon stocks, except where there is evidence of ongoing degradation or loss processes (e.g., mangrove deforestation, marsh drainage, seagrass erosion).

Inorganic carbon (e.g., carbonates) is normally not included. If considered, its inclusion must be justified and supported with appropriate evidence.

A given carbon pool shall only be included if its contribution is material and measurable with acceptable uncertainty; otherwise, its exclusion shall be conservatively documented.

The total carbon stock in the baseline scenario shall be calculated as the sum of all applicable project segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S and/or RVCW-S) recorded in the PDD and validated using the following equation:

$$\boldsymbol{Rcp_{BL,t} = \sum_{s=1}^{Ns} Rcp_{BL,s,t} * TSA_s}$$

Equation 7

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$Rcp_{BL,t}$	Total removals from all carbon pools across all applicable segments in year *t* under the baseline scenario	t CO_2e / year	X	X	X	X	X	X
$Rcp_{BL,s,t}$	Total removal by selected carbon pools in segment *s* (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) in year *t*, in the baseline scenario.	t CO_2e / ha / year	X	X	X	X	X	X
TSA_s	Total area of segment *s*, calculated as the sum of all polygons or segment components that belong to segment *s* as defined in the baseline scenario.	ha	X	X	X	X	X	X
N_S	Total number of polygons associated with segment *s*, in baseline scenario.	Number of segments	NA	NA	NA	NA	NA	NA
s	Index of the blue carbon segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	NA	NA	NA	NA	NA	NA	NA
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

For a ***s*** segment and given ***t*** year, the change in carbon stocks in the carbon pools of a segment component (where applicable, as the CCMP can only integrate segments) is calculated following:

For Mangrove (RFCW-M / RVCW-M):

$$Rcp_{BL,s,t} = [\sum_{f=1}^{NCps}(\Delta CAtree_{BL,f,s,t} + \Delta CBtree_{BL,f,s,t} + \Delta CAshrub_{BL,f,s,t} + \Delta CBshrub_{BL,f,s,t} + \Delta CDw_{BL,f,s,t} + \Delta CL_{BL,f,s,t} + \Delta CSoc_{BL,f,s,t}) * 44/12] \quad \text{Equation 8}$$

For Tidal Marshes (RFCW-T / RVCW-T):

$$Rcp_{BL,s,t} = [\sum_{f=1}^{NCps}(\Delta CAherb_{BL,f,s,t} + \Delta CBherb_{BL,f,s,t} + \Delta CDw_{BL,f,s,t} + \Delta CL_{BL,f,s,t} + \Delta CSoc_{BL,f,s,t}) * 44/12] \quad \text{Equation 9}$$

For Seagrass (RFCW-S / RVCW-S):

$$Rcp_{BL,s,t} = [\sum_{f=1}^{NCps}(\Delta CASeagrass_{BL,f,s,t} + \Delta CBSeagrass_{BL,f,s,t} + \Delta CDetritus_{BL,f,s,t} + \Delta CSedOC_{BL,f,s,t}) * 44/12] \quad \text{Equation 10}$$

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$Rcp_{BL,s,t}$	Total annual carbon removals from all selected carbon pools in segment *s* in year *t*, in the baseline scenario.	t CO_2e / ha / year	X	X	X	X	X	X
$\Delta CAtree_{BL,f,s,t}$	Change in aboveground tree carbon in component *f* of segment *s* (RFCW-M or RVCW-M) in year *t*, baseline scenario	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CBtree_{BL,f,s,t}$	Change in belowground tree carbon in component *f* of segment *s* (RFCW-M or RVCW-M) in year *t*, baseline scenario.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CAshrub_{BL,f,s,t}$	Change in aboveground shrub carbon in component *f* of segment *s* (RFCW-M or RVCW-M in year *t*, baseline scenario.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CBshrub_{BL,f,s,t}$	Change in belowground shrub carbon in component *f* of segment *s* (RFCW-M or RVCW-M) in year *t*, baseline scenario.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CAherb_{BL,f,s,t}$	Change in aboveground herbaceous biomass carbon in component *f* of segment *s* (RFCW-T or RVCW-T in year *t*, baseline scenario.	t C / ha year	NA	NA	X	X	NA	NA
$\Delta CBherb_{BL,f,s,t}$	Change in belowground herbaceous biomass carbon in component *f* of segment *s* (RFCW-T or RVCW-T) in year *t*, baseline scenario.	t C / ha year	NA	NA	X	X	NA	NA
$\Delta CASeagrass_{BL,f,s,t}$	Change in aboveground seagrass biomass carbon in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, baseline scenario.	t C / ha year	NA	NA	NA	NA	X	X

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$\Delta CBSeagrass_{BL,f,s,t}$	Change in belowground seagrass biomass carbon in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, baseline scenario.	t C / ha year	NA	NA	NA	NA	X	X
$\Delta CDw_{BL,f,s,t}$	Change in deadwood carbon in component *f* of segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T) in year *t*, baseline scenario.	t C / ha year	X	X	X	X	NA	NA
$\Delta CDetritus_{BL,f,s,t}$	Change in detritus carbon in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, baseline scenario.	t C / ha year	NA	NA	NA	NA	X	X
$\Delta CL_{BL,f,s,t}$	Change in litter carbon in component *f* of segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T) in year *t*, baseline scenario.	t C /ha year	X	X	X	X	NA	NA
$\Delta CSoc_{BL,f,s,t}$	Change in soil organic carbon (SOC) in component *f* of segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T) in year *t*, baseline scenario.	t C /ha year	X	X	X	X	NA	NA
$\Delta CSedOC_{BL,f,s,t}$	Change in sediment organic carbon (SedOC) in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, baseline scenario.	t C /ha year	NA	NA	NA	NA	X	X
Ncp_S	Number of segment components associated with segment *s*.	NA	X	X	X	X	X	X
f	Index of segment component within segment *s*.	NA	NA	NA	NA	NA	NA	NA
s	Index of segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	NA	NA	NA	NA	NA	NA	NA
t	Index of the CCMP year.	NA	NA	NA	NA	NA	NA	NA
$44/12$	Carbon (C) to carbon dioxide (CO_2) molecular weight ratio.	NA	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

Changes in carbon stocks in tree and shrub biomass within mangrove segments (RFCW-M or RVCW-M) may be estimated in accordance with the current version of CDM methodological Tool AR-Tool 14, applying species-appropriate allometric equations and considering as relevant the complementary guidance of AR-Tool 17 (root-to-shoot ratios) and AR-Tool 18 (wood density). For the baseline, data sources may include historical forest inventories, national mangrove monitoring programs, and peer-reviewed studies representative of pre-project conditions. Biomass changes shall be converted to carbon using the IPCC default carbon fraction (0.47), unless conservative site- or country-specific data are available.

Changes in carbon stocks in aboveground herbaceous biomass within tidal marsh (RFCW-T or RVCW-T) and seagrass meadow (RFCW-S or RVCW-S) segments shall be estimated using the guidance provided in the 2013 IPCC Wetlands Supplement and the 2019 Refinement, or peer-reviewed scientific literature demonstrating applicability to the project context. Baseline values shall be derived from national wetland inventories, seagrass monitoring programs, or published studies representative of conditions prior to project activities. In all cases, a conservative carbon fraction (default 0.37) shall be applied unless site-specific data exist.

Changes in carbon stocks in litter (leaves, twigs <2 cm, fine roots recently shed) within mangrove (RFCW-M or RVCW-M) or tidal marsh (RFCW-T or RVCW-T) segments shall be estimated using the 2013 IPCC Wetlands Supplement and peer-reviewed literature specific to the wetland type -within mangrove (RFCW-M and RVCW-M) or tidal marsh (RFCW-T, RVCW-T) segments-. Historical or regional data shall be preferred. Field measurements, where applicable, shall be representative of pre-project conditions. The IPCC default carbon fraction (0.37) shall be applied unless conservative site-specific values are available.

Changes in carbon stocks in detritus (non-living organic material >2 cm, coarse roots, and downed woody fragments) within seagrass segments (RFCW-S or RVCW-S) in the baseline scenario shall be quantified in accordance with the IPCC Good Practice Guidance and the 2013 Wetlands Supplement. Data shall be derived from national inventories, peer-reviewed literature, or field surveys characterising pre-project conditions. Carbon content shall be estimated using wood density factors and a carbon fraction of 0.47. In the absence of site-specific data, conservative literature-based values shall be applied.

Changes in carbon stocks in standing or lying deadwood within mangrove (RFCW-M or RVCW-M) or tidal marsh (RFCW-T or RVCW-T) segments in the baseline scenario shall be estimated following the 2006 IPCC Guidelines (Vol. 4, Ch. 4 & 12) and the 2013 Wetlands Supplement, using data from national inventories, historical forest monitoring, or peer-reviewed literature. Parameters shall include diameter, height/length, and decay class. Wood density and carbon fraction values shall follow AR-Tool 18 and IPCC defaults. Conservative assumptions shall be applied where species- or site-specific information is not available.

Changes in soil organic carbon within mangrove (RFCW-M or RVCW-M) or tidal marsh (RFCW-T or RVCW-T) segments shall be estimated using historical or existing soil core data, national or subnational soil inventories, Ramsar reports, or peer-reviewed literature representative of pre-project conditions. Where national or site-specific data are lacking, the 2013 IPCC Wetlands Supplement and the 2019 Refinement shall be applied. Soil cores shall be stratified into depth intervals and analysed for bulk density (BD) and organic carbon content (C%), with a minimum depth of 1 m (or to bedrock if shallower).

The quantitative procedures for estimating changes in all relevant carbon pools—including vegetation, detrital, sediment, and soil organic carbon (SOC)—with their corresponding equations, variables, parameters, and units, are presented in **Annex 1** – Guidelines for Quantifying Carbon Pools (in Baseline and Project Scenarios). This annex serves as a reference and example for the quantification of carbon stocks and annual changes (ΔC) under both the baseline and project scenarios**.**

7.2.1.1 Specific considerations for the soil organic carbon (SOC)

Soil Organic Carbon (SOC) is one of the principal carbon pools considered in coastal wetland segments. The CCMP shall estimate CO_2 emissions and removals associated with changes in SOC due to land use and management practices in the baseline scenario, representing conditions without project implementation.

Allochthonous Carbon Adjustment

The estimation of CO_2 emissions and removals from Soil Organic Carbon (SOC) shall account for the proportion of sequestration attributable to allochthonous organic matter—that is, organic carbon imported from external sources—across both the baseline (BL) and project (P) scenarios.

Deductions for allochthonous carbon apply only to soil or sediment layers deposited or accumulated prior to project start, as identified by stratigraphic or geochemical markers (e.g., feldspar horizons, radiometric dating).

If the organic surface layer exceeds 10 cm, the soil shall be considered organically formed, and no deduction is required.

If the organic surface layer is ≤10 cm, a deduction shall be applied where mineral sediment deposition occurs, unless evidence indicates that the material is predominantly autochthonous.

No deduction is required when the applied measurement method directly quantifies autochthonous CO_2 fluxes, thereby excluding external sources.

Special Considerations

- Loss of Dissolved Organic Carbon (DOC): Not included in SOC accounting, as current data are insufficient to reliably estimate CO_2 fluxes through dissolved pathways.
- Sediment Organic Carbon (SOC) in Seagrass and Tidal Marshes: Estimations shall rely on historical sediment core analyses, seagrass monitoring programs, Ramsar inventories, or peer-reviewed literature representative of pre-project conditions. Sediment cores must be stratified by depth and analyzed for bulk density (BD) and organic carbon content (C%) to a minimum depth of 1 meter (or to bedrock if shallower).

Drivers and Stratification

The primary drivers of CO_2 emissions and removals from organic soils include:

- Land-use and management practices,
- Climate regime,
- Soil fertility, and
- Drainage depth and condition.

Stratification of land-use categories by climate zone, soil fertility, and drainage regime is recommended whenever data allow.

Where local data are unavailable, conservative default factors from the IPCC 2013 Wetlands Supplement or the 2019 Refinement shall be applied.

7.2.1.2 Reference Site and Sea Level Rise Considerations

A comparative assessment between the project area and a nearby healthy reference site shall be conducted to establish realistic baseline conditions for coastal wetland ecosystems.

This comparison helps identify differences in biophysical parameters and ecosystem functioning that need to be addressed when defining baseline carbon stocks and degradation trajectories.

Baseline assessments should consider:

- Species ecology, including reproduction, dispersal, seedling establishment, and growth patterns;
- Hydrological and geomorphological processes influencing tidal regimes, sediment transport, and salinity gradients;
- Human-induced alterations such as barriers, drainage, or land conversion that prevent natural regeneration.

The reference site serves as a benchmark for pre-disturbance conditions, allowing estimation of the carbon potential that would exist under intact ecological processes.

Special consideration – Sea Level Rise (SLR):

Baseline projections must account for the potential effects of relative sea level rise on wetland migration, inundation, and erosion.

These factors influence SOC stability and the extent of wetland habitat under the "without project" scenario.

The CCMP proponent shall provide robust references and scientific justification for the SLR assumptions used, considering changes in topography, sedimentation, and hydrodynamics that may affect baseline carbon stocks.

7.2.2 GHG emissions sources estimation

The estimation of GHG emissions in the baseline scenario shall follow the sources and carbon pools defined in **Table 4** (**Section 6.5**), for each coastal wetland ecosystem. No additional processes shall be introduced to ensure alignment with the defined accounting boundary.

CO_2 emissions and removals accounted through carbon-stock changes (ΔC, ΔSOC, or ΔSedOC) shall not be duplicated.

When stock-change methods are used, all process-based CO_2 fluxes for the corresponding stratum shall be set to zero.

Total GHG emissions by sources in the baseline scenario are calculated according to the following equation:

$$E_{BL,t} = \sum_{s=1}^{Ns} E_{BL,s,t}$$

Equation 11

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$E_{BL,t}$	Total baseline GHG emissions in year *t*, aggregated across all blue carbon activities- segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) and emission sources.	t CO_2e / year	X	X	X	X	X	X
$E_{BL,s,t}$	Baseline GHG emissions in segment *s* in year *t*. Each segment *s* corresponds to one of the following types: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S.	t CO_2e / year	X	X	X	X	X	X
Ns	Total number of polygons associated with segment *s*, in the baseline scenario.	Segments count	NA	NA	NA	NA	NA	NA
s	Index of the segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).) in the baseline scenario.	NA	NA	NA	NA	NA	NA	NA
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

For Mangrove (RFCW-M / RVCW-M):

$$E_{BL,s(RFCW/RVCW-M),t} = \sum_{s=1}^{Ns}(EB_{CH4+N2O,s,t} + EHydroAl_{CH4,s,t} + ESoilNDN_{N2O,s,t}) * GWP_g$$

Equation 12

For Tidal Marsh (RFCW-T / RVCW-T):

$$E_{BL,s(RFCW/RVCW-T),t} = \sum_{s=1}^{Ns}(EB_{CH4+N2O,s,t} + EHydroAl_{CH4,s,t} + E\ SoilNDN_{N2O,s,t}) * GWP_g$$

Equation 13

For Seagrass (RFCW-S / RFCW-S):

$$E_{BL,s(RFCW/RVCW-S),t} = \sum_{s=1}^{Ns}(ESediDis_{CO2+CH4,s,t} + EEutrop_{CH4+N2O,s,t}) * GWP_g$$

Equation 14

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$E_{BL,s(RFCW/RVCW-M),t}$	Baseline GHG emissions from the segment *s* (RFCW-M or RVCW-M) in year *t*, in the baseline scenario.	t CO_2e / year	X	X	NA	NA	NA	NA
$E_{BL,s(RFCW/RVCW-T),t}$	Baseline GHG emissions from the segment *s* (RFCW-T or RVCW-T) in year *t*, in the baseline scenario.	t CO_2e / year	NA	NA	X	X	NA	NA
$E_{BL,s(RFCW/RVCW-S),t}$	Baseline GHG emissions from the segment *s* (RFCW-S or RVCW-S) in year *t*, in the baseline scenario.	t CO_2e / year	NA	NA	NA	NA	X	X
$EB_{CH4\text{-}N2O,s,t}$	CH_4 + N_2O emissions from biomass burning in segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T), in year t, in the baseline scenario	t CO_2e	X	X	X	X	NA	NA
$EHydroAl_{CH4,s,t}$	CH_4 emissions from Hydro-logical alteration (from drainage/barriers -CO_2 by ΔSOC) in segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T), in year t, in the baseline scenario	t CO_2e	X	X	X	X	NA	NA
$ESoilNDN_{N2O,s,t}$	N_2O emissions from Nitrifi-cation/denitrification in *s* segment (RFCW-M, RVCW-M or RFCW-T), in year t, in the baseline scenario	t CO_2e	X	X	X	X	NA	NA
$ESediDis_{CO2+CH4L,s,t}$	CO_2 +CH_4 emissions from Sediment disturbance (CO_2 Only if there is no ΔSOC) in *s* segment (RFCW-S or RVCW-S), in year t, in the baseline scenario.	t CO_2e	NA	NA	NA	NA	X	X
$EEUtro_{CH4+N2O,s,t}$	CH_4+N_2O GHG emissions from eutrophication in seg-ment *s* (RFCW-S or RVCW-S), in year t, in the baseline scenario.	t CO_2e	NA	NA	NA	NA	X	X
Ns	Total number of polygons associated with segment *s*, in the baseline scenario.	Seg-ments count	NA	NA	NA	NA	NA	NA
s	Index of the segments, each representing one blue car-bon activity (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S or RVCW-S) in the baseline scenario.	NA	NA	NA	NA	NA	NA	NA

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA
GWP_g	Global Warming Potential for gas *g* (CO_2, CH_4 or N_2O).	Dimensionless	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

7.2.2.1 Treatment of GHG Emission Sources

Emissions in the baseline scenario shall be estimated only for the sources and gases defined in **Table 4** (**Section 5.6**), following IPCC methodological guidance. Each source shall be treated as described below to ensure consistency and prevent double counting with carbon-stock accounting.

Burning of biomass (RFCW-M, RVCW-M, RFCW-T, RVCW-T). Emissions from biomass burning shall be estimated in accordance with the 2006 IPCC Guidelines (Vol. 4, Ch. 2 & 3) and the 2013 IPCC Wetlands Supplement, distinguishing between CO_2, CH_4, and N_2O. In the baseline scenario, emissions shall be estimated using national fire monitoring programs, historical records of land clearing or accidental fires, or peer-reviewed literature representative of pre-project conditions. For consistency, CO_2 emissions shall be reflected through stock changes in biomass pools, while CH_4 and N_2O are quantified using emission factors. Rule:

- CO_2 from combustion is reflected in biomass ΔC (not as process emissions).
- Only CH_4 and N_2O are explicitly estimated using emission factors (EFs).
- No double counting between biomass, litter, and deadwood pools.

Hydrological alteration (RFCW-M, RVCW-M, RFCW-T, RVCW-T).

Emissions from drainage, levees, or restricted tidal exchange shall be estimated using the 2013 IPCC Wetlands Supplement and the 2019 Refinement, based on drained area (activity data) and emission factors stratified by climate, soil type, and hydrological regime. In Baseline scenario: Drainage promotes aeration and SOC oxidation, producing sustained CO_2 emissions and potential N_2O fluxes. Project scenario: Rewetting or tidal reconnection reduces oxidation and may cause short-term CH_4 increases (1–3 years). Accounting rule:

- When ΔSOC is applied, all process-based CO_2 fluxes ($E\_HydroAl,CO_2$) must be set to zero.
- When process EFs are used instead of ΔSOC, ΔSOC = 0 for that stratum and period.

Nitrification and denitrification (RFCW-M, RVCW-M, RFCW-T, RVCW-T)

N_2O emissions from microbial nitrification/denitrification processes shall be estimated following the 2013 IPCC Wetlands Supplement, using emission factors stratified by climate, fertility, and drainage conditions. In Baseline scenario: Higher N_2O fluxes may occur in drained or oxidized soils. In Project scenario: Fluxes typically decline after restoration of hydrology. Inclusion rule: Mandatory only if field data or literature indicate significant flu

Sediment disturbance (RFCW-S, RVCW-S)

Emissions from sediment disturbance (e.g., dredging, anchoring, bottom trawling, planting modules) shall be estimated according to the 2013 IPCC Wetlands Supplement using activity data and emission factors for CO_2 and CH_4. In Baseline scenario: Unmanaged or degraded seabeds may emit CO_2 and CH_4 through sediment resuspension. In Project scenario: Temporary emissions may occur during restoration but decline once sediment stabilizes. Accounting rule: When ΔSedOC is applied, CO_2 from sediment disturbance (E_SediDis,CO_2) = 0. Reductions credited only after post-restoration stabilization is demonstrated.

Eutrophication / nutrient-driven processes (RFCW-S, RVCW-S)

Emissions from nutrient enrichment shall be estimated using peer-reviewed literature or national water-quality data when available. In Baseline scenario: Nutrient loading may enhance CH_4 or N_2O fluxes under anoxic conditions. In Project scenario: Restoration and revegetation reduce nutrient input and associated GHG emissions. Accounting rule: Include only if significant; avoid overlap with co-benefit reporting (e.g., water-quality improvements).

7.2.2.2 Treatment of CO_2, CH_4, and N_2O in Coastal Wetland Accounting

In this methodology, CO_2 emissions and removals from biomass, litter, deadwood, and soil or sediment carbon pools are primarily accounted through stock-change approaches (ΔC, ΔSOC, ΔSedOC).

Therefore, in the section on baseline emission sources, only non-CO_2 gases (CH_4 and N_2O) are normally included, as their dynamics are not captured within ΔC pools.

For CO_2 fluxes associated with soils or sediments, if direct measurement of stock changes (ΔSOC or ΔSedOC) is not feasible, CO_2 emissions may alternatively be estimated using process-based emission factors (EFs) from the IPCC Wetlands Supplement or the 2019 Refinement.

Rule for avoiding double counting

1. When ΔSOC or ΔSedOC is applied: All CO_2 emission sources related to soils or sediments (E_HydroAl,CO_2, E_SoilSOC, E_SediDis,CO_2) must be set to zero for that stratum and period.
2. When process-based emission factors are applied: CO_2 from these processes may be estimated via *activity data × EF*, but ΔSOC or ΔSedOC must be set to zero for that same stratum and period. The methodological choice shall be transparently documented and justified in the Project Design Document (PDD).

This approach ensures that CO_2 is counted once and only once (either through direct stock-change measurement or through emission-factor estimation) while CH_4 and N_2O remain consistently treated as complementary GHG sources.

7.3 Baseline GHG balance

The baseline GHG balance represents the net greenhouse gas flux that would occur in the absence of the CCMP. It is calculated annually by combining baseline emissions and baseline removals from all relevant carbon pools across eligible coastal wetland segments. The resulting balance forms the reference against which project mitigation outcomes are quantified.

$$GHG_{BL,t} = E_{BL,t} - Rcp_{BL,t}$$

Equation 15

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$GHG_{BL,t}$	Annual net GHG balance of the baseline scenario in year *t.*	t CO_2e	X	X	X	X	X	C
$E_{BL,t}$	Total GHG emissions from all relevant baseline sources in year *t.*	t CO_2e / year	X	X	X	X	X	C
$Rcp_{BL,t}$	Total baseline removals from all carbon pools in year *t,*	t CO_2e /year	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
C = Conditional.

8 Project Scenario

The project scenario in this methodology consists of estimating the amount of carbon in the carbon pools and the emissions by sources within each segment limits because of the activities to be performed. These estimations are presented for each segment in the following sections. The CCMP project scenario GHG emissions and removals correspond to the sum of the segments considered.

In addition, leakage and compliance with safeguards, risks and non-permanence, uncertainty, and Sustainable Development Goals (SDGs) should be analysed and described jointly for all segments considered in the CCMP.

8.1 Carbon stock estimation

Changes in carbon stock in the relevant carbon pools shall be estimated separately for each eligible stratum of coastal wetlands (non-stable forest coastal wetlands, non-forest coastal wetlands and non-forest coastal marine wetlands) are to be implemented.

It is necessary to calculate the project scenario carbon stocks and their changes in all applicable strata, ensuring consistency with the methods, parameters, and depth definitions applied in the baseline scenario.

Existing carbon stocks at project start shall be estimated consistently with the baseline, and subsequent monitoring shall quantify the annual or periodic changes (ΔC) in each pool.

Only measurable and material pools shall be included; exclusions must be conservatively documented.

Inorganic carbon (e.g., carbonates) is normally excluded unless justified and supported with robust scientific evidence.

Project estimations shall reflect real, measurable, and verifiable changes attributable to project activities, distinct from the baseline trajectory.

The total carbon stock in the project scenario shall be calculated as the sum of all applicable project segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) recorded in the PDD and validated using the following equation:

$$Rcp_{P,t} = \sum_{s=1}^{Ns} Rcp_{P,s,t} * TSA_s$$

Equation 16

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$Rcp_{BP,t}$	Total removals from all carbon pools across all applicable segments in year *t* under project scenario or corresponding monitoring.	t CO_2e / year	X	X	X	X	X	X
$Rcp_{P,s,t}$	Total removal by selected carbon pools in segment ***s*** (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) in year *t*, in the project scenario or corresponding monitoring.	t CO_2e / ha year	X	X	X	X	X	X
TSA_s	Total area of segment *s*, calculated as the sum of all polygons or segment components that belong to segment *s* as defined in the project scenario, or monitoring stage.	ha	X	X	X	X	X	X
s	Index of the segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	NA	NA	NA	NA	NA	NA	NA
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA
N_S	Total number of polygons associated with segment *s*, in the project scenario or corresponding monitoring.	Number of segments	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

For a ***s*** segment and given ***t*** year, the change in carbon stocks in the carbon pools of a segment component (where applicable, as the CCMP can only integrate segments) is calculated following:

For Mangrove (RFCW-M / RVCW-M):

$$Rcp_{P,s,t} = [\sum_{f=1}^{NCps} (\Delta CAtree_{P,f,s,t} + \Delta CBtree_{P,f,s,t} + \Delta CAshrub_{P,f,s,t} + \Delta CBshrub_{P,f,s,t} + \Delta CDw_{P,f,s,t} + \Delta CL_{P,f,s,t} + \Delta CSoc_{P,f,s,t})] * 44/12$$

Equation 17

For Tidal Marshes (RFCW-T / RVCW-T):

$$Rcp_{P,s,t} = [\sum_{f=1}^{NCps} (\Delta CAherb_{P,f,s,t} + \Delta CBherb_{P,f,s,t} + \Delta CDw_{P,f,s,t} + \Delta CL_{P,f,s,t} + \Delta CSoc_{P,f,s,t}) * 44/12]$$

Equation 18

For Seagrass (RFCW-S / RVCW-S):

$$Rcp_{P,s,t} = [\sum_{f=1}^{NCps} (\Delta CASeagrass_{P,f,s,t} + \Delta CBSeagrass_{P,f,s,t} + \Delta CDetritus_{P,f,s,t} + \Delta CSedOC_{P,f,s,t})] * 44/12$$

Equation 19

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$Rcp_{P,s,t}$	Total annual carbon removals from all selected carbon pools in segment *s* in year *t*, in the project scenario or corresponding monitoring.	t CO_2e / ha / year	X	X	X	X	X	X
$\Delta CAtree_{P,f,s,t}$	Change in aboveground tree carbon in component *f* of segment *s* (RFCW-M or RVCW-M) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CBtree_{P,f,s,t}$	Change in belowground tree carbon in component *f* of segment *s* (RFCW-M or RVCW-M) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CAshrub_{P,f,s,t}$	Change in aboveground shrub carbon in component *f* of segment *s* (RFCW-M or RVCW-M in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CBshrub_{P,f,s,t}$	Change in belowground shrub carbon in component *f* of segment *s* (RFCW-M or RVCW-M) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	NA	NA	NA	NA
$\Delta CAherb_{BL,f,s,t}$	Change in aboveground herbaceous biomass carbon in component *f* of segment *s* (RFCW-T or RVCW-T in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	NA	NA	X	X	NA	NA
$\Delta CBherb_{P,f,s,t}$	Change in belowground herbaceous biomass carbon in component *f* of segment *s* (RFCW-T or RVCW-T) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	NA	NA	X	X	NA	NA
$\Delta CASeagrass_{P,f,s,t}$	Change in aboveground seagrass biomass carbon in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	NA	NA	NA	NA	X	X

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$\Delta CBSeagrass_{P,f,s,t}$	Change in belowground seagrass biomass carbon in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	NA	NA	NA	NA	X	X
$\Delta CDw_{P,f,s,t}$	Change in carbon content of deadwood in segment component ***f*** of segment ***s*** (RFCW-M, RVCW-M, RFCW-T or RVCW-T) in year ***t***, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	X	X	NA	NA
$\Delta CDetritus_{P,f,s,t}$	Change in detritus carbon in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	NA	NA	NA	NA	X	X
$\Delta CL_{P,f,s,t}$	Change in litter carbon in component *f* of segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	X	X	NA	NA
$\Delta CSoc_{P,f,s,t}$	Change in soil organic carbon (SOC) in component *f* of segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	X	X	X	X	NA	NA
$\Delta CSedOC_{BL,f,s,t}$	Change in sediment organic carbon (SedOC) in component *f* of segment *s* (RFCW-S or RVCW-S) in year *t*, in the project scenario or corresponding monitoring.	t C / ha / year	NA	NA	NA	NA	X	X
Ncp_S	Number of segment components associated with segment s.	NA	X	X	X	X	X	X
f	Index of the segment component of segment ***s*** in the project scenario or corresponding monitoring.	NA	NA	NA	NA	NA	NA	NA
s	Index of segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	NA	NA	NA	NA	NA	NA	NA
T	Index of the CCMP year.	NA	X	X	X	X	X	X
44/12	Carbon (C) to carbon dioxide (CO_2) molecular weight ratio.	NA	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

Changes in carbon stocks across all relevant pools under the project scenario shall be estimated in accordance with the methodological considerations, data sources, and parameters established for the baseline scenario (**Section 7.2.1**), ensuring full consistency in methods, depth definitions, and carbon fractions.

For the project scenario, changes in carbon stocks in tree and shrub within mangrove segments (RFCW-M and RVCW-M), shall be derived from field inventories and permanent monitoring plots established within project boundaries. Where available, project-specific allometric equations and wood density data shall be applied.

Estimation of changes in aboveground herbaceous biomass within tidal marsh (RFCW-T, RVCW-T) and seagrass meadow (RFCW-S, RVCW-S), shall rely on destructive sampling within quadrats, non-destructive harvest proxies, or other accepted field methods, applied consistently across monitoring periods.

Changes in carbon stocks in litter within mangrove (RFCW-M and RVCW-M) and tidal marsh (RFCW-T, RVCW-T) segments shall be estimated through field sampling campaigns conducted at permanent monitoring plots, ensuring representativeness of restoration or revegetation areas.

Changes in carbon stocks in detritus within seagrass segments (RFCW-T, RVCW-T) shall be derived from volume and mass surveys of coarse debris within project monitoring plots. Where direct measurement is not feasible, conservative estimates from peer-reviewed scientific literature may be applied, provided they are consistent with project conditions.

Changes in deadwood carbon stocks (standing or lying) within mangrove (RFCW-M and RVCW-M) or tidal marsh (RFCW-T, RVCW-T) segments shall be estimated in accordance with the 2006 IPCC Guidelines (Vol. 4, Ch. 4 & 12) and the 2013 Wetlands Supplement, through direct field measurements in permanent project plots, including diameter, height/length, and decay class. Wood density and carbon fraction values shall follow AR-Tool 18 and IPCC defaults, unless project-specific measurements are available. Where species- or site-specific information is lacking, conservative assumptions shall be applied to avoid overestimation.

Changes in soil organic carbon within mangrove (RFCW-M and RVCW-M) or tidal marsh (RFCW-T, RVCW-T) segments shall be measured through periodic soil core sampling within permanent monitoring plots located inside project boundaries, using the same depth definitions and analytical protocols as in the baseline. Repeated sampling shall detect accumulation or conservation of SOC attributable to project activities.

Changes in carbon stocks in Sediment organic carbon (SOC) within seagrass segments (RFCW-T, RVCW-T), shall be measured through periodic sediment core sampling conducted within project boundaries. Cores shall be collected and analysed in accordance with the same depth definitions as the baseline scenario to ensure methodological consistency.

8.1.1 Specific considerations for the soil organic carbon (SOC)

The estimation of Soil Organic Carbon (SOC) in the project scenario shall quantify CO_2 removals and reduced emissions resulting from implemented mitigation activities such as restoration, rewetting, and revegetation of coastal wetlands.

SOC gains or avoided losses shall be estimated in the same spatial strata defined for the baseline scenario. The project scenario must use identical parameters (sampling depth, bulk density, and carbon content) to ensure consistency and traceability between both scenarios.

Quantification Approach

c) SOC accumulation or conservation:

Project activities that restore hydrological conditions, re-establish vegetation, or prevent soil oxidation shall be credited for the additional SOC stored relative to the baseline.

d) Sampling and parameters:
  - Sampling design, depth, and parameters (BD, D, C%) shall follow the same procedures as the baseline scenario.
  - Monitoring intervals may be aligned with verification cycles (e.g., every 5–10 years).

e) Emission and removal factors:
  - Apply annual SOC accumulation factors or removal coefficients derived from field data, national references, or peer-reviewed studies.
  - When local data are unavailable, use conservative IPCC defaults, ensuring transparency of sources.

f) Hydrological and ecological influences:
  - Document changes in tidal regime, sedimentation, or rewetting that influence SOC recovery rates.
  - Where hydrological restoration reverses previous drainage, emission reductions from avoided SOC oxidation may be accounted for as removals.

SOC quantification under the project scenario must maintain methodological consistency with the baseline estimation.

Any differences in measurement frequency, sampling design, or analytical method must be justified and supported by scientific or technical evidence.

SOC removals under the project scenario shall be reported as additional carbon stocks or avoided emissions relative to the fixed baseline, following the same stratification and estimation framework established in **Section 7.2.1.1**.

8.1.2 Site Typologies and Restoration Strategies

Mangrove and coastal wetland sites within the CCMP area may fall into distinct typological categories, each requiring specific management or restoration approaches (adapted from Best Practice Guidelines for Mangrove Restoration, Blue Carbon Initiative & GMA):

- **Deforested sites:** Tree cover removed but underlying hydrological and soil conditions intact; potential for natural regeneration or assisted planting.
- **Drained sites:** Water flow blocked or diverted; soils exposed to oxidation and subsidence; restoration may require rewetting and elevation correction.
- **Eroded sites:** Exposed to wind or wave energy; may require physical structures to stabilize sediment and promote recolonization.
- **Organic soil sites:** High carbon content (up to 80%); restoration can yield substantial GHG mitigation benefits by preventing oxidation losses.
- **Mineral soil sites:** Often in deltaic or estuarine zones; suitable for rapid biomass recovery if hydrology is restored.
- **Landward edge sites:** Reduced hydrological connectivity and propagule availability; may need interventions to restore tidal exchange.
- **Seaward edge sites:** Subject to high energy and erosion; may require engineered solutions to re-establish stability and seed dispersal.

Each typology shall inform the SOC estimation, activity design, and expected carbon benefits under the project scenario.

8.2 GHG emissions sources estimation

For the determination of the project scenario, the values of the parameters used for GHG emission sources shall, in order of preference:

- **Project-specific monitoring data, derived from:**
  - Permanent sampling plots, field inventories, or flux measurements established within project boundaries;
  - Sediment and soil cores collected according to methodological requirements (e.g., ≥1 m depth or to refusal);
  - Direct monitoring campaigns for GHG fluxes (e.g., chamber methods, eddy covariance, or equivalent validated techniques).
- **National or subnational data sources,** applied only when project-specific measurements are not available or feasible, such as:
  - Coastal wetland or Blue Carbon inventories;
  - National GHG inventories;
  - Blue Carbon or wetland monitoring systems;
  - National Wetland Inventories, Ramsar site documentation, or other nationally recognized wetland monitoring systems.

When neither project-specific nor national data are available, adopt parameters from the most updated IPCC Guidelines (2006 Guidelines, 2013 Wetlands Supplement, 2019 Refinement). Use of older versions is acceptable if technically justified and shown to be conservative.

When none of the above are available, parameters may be sourced from peer-reviewed scientific literature, technical publications from accredited institutions, or validated field studies, provided their applicability to the project context is demonstrated and conservatively justified.

Total GHG emissions by sources in the project scenario are calculated according to the following equation:

$$E_{P,t} = \sum_{s=1}^{Ns} E_{P,s,t}$$ ***Equation 20***

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$E_{P,t}$	Total Project GHG emissions in year *t*, aggregated across all blue carbon segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) and all emission sources included in the project scenario or corresponding monitoring.	t CO_2e / year	X	X	X	X	X	X
$E_{P,s,t}$	Project GHG emissions in segment *s* in year *t*. Each segment corresponds to one of the following: RFCW-M,	t CO_2e / year	X	X	X	X	X	X

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
	RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S.							
s	Index of the blue carbon segments implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) in the project scenario or corresponding monitoring.	NA	NA	NA	NA	NA	NA	NA
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA
Ns	Total number of polygons associated with segment *s*, in the project scenario or corresponding monitoring.	Segments count	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

For Mangrove (RFCW-M / RVCW-M):

$$E_{P,s(RFCW/RVCW-M),t} = \sum_{s=1}^{Ns}(EB_{CH4+N2O,s,t} + EHydroAl_{CH4,s,t} + ESoilNDN_{N2O,s,t}) * GWP_g$$

Equation 21

For Tidal Marsh (RFCW-T / RVCW-T):

$$E_{P,s(RFCW/RVCW-T),t} = \sum_{s=1}^{Ns}(EB_{CH4+N2O,s,t} + EHydroAl_{CH4,s,t} + E\ SoilNDN_{N2O,s,t}) * GWP_g$$

Equation 22

For Seagrass (RFCW-S / RVCW-S):

$$E_{P,s(RFCW/RVCW-S),t} = \sum_{s=1}^{Ns}(ESediDis_{CO2+CH4,s,t} + EEutrop_{CH4+N2O,s,t}) * GWP_g$$

Equation 23

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$E_{P,s(RFCW/RVCW-M),t}$	Project GHG emissions from the segment *s* (*RVCW-M* or *RFCW-M*), in year *t*, in the	t CO_2e / year	X	X	NA	NA	NA	NA

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
	project scenario or corresponding monitoring.							
$E_{P,s(RFCW/RVCW-T),t}$	Project GHG emissions from the segment *s* (*RVCW-T* or *RFCW-T*), in year *t*, in the project scenario or corresponding monitoring.	t CO_2e / year	NA	NA	X	X	NA	NA
$E_{P,s(RFCW/RVCW-S),t}$	Project GHG emissions from the segment *s* (*RVCW-S* or *RFCW-S*), in year *t*, in the project scenario or corresponding monitoring.	t CO_2e / year	NA	NA	NA	NA	X	X
$EB_{CH4\text{-}N2O,s,t}$	CH_4+ N_2O emissions from biomass burning in segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T), in year t, in the project scenario or corresponding monitoring.	t CO_2e	X	X	X	X	NA	NA
$EHydroAl_{CH4,s,t}$	CH_4 emissions from Hydrological alteration (from drainage/barriers -CO_2 by ΔSOC) in segment *s* (RFCW-M, RVCW-M, RFCW-T or RVCW-T), in year t, in the project scenario or corresponding monitoring.	t CO_2e	X	X	X	X	NA	NA
$ESoilNDN_{N2O,s,t}$	N_2O emissions from Nitrification/denitrification in *s* segment (RFCW-M, RVCW-M or RFCW-T), in year t, in the project scenario or corresponding monitoring.	t CO_2e	X	X	X	X	NA	NA
$ESediDis_{CO2+CH4L,s,t}$	CO_2 +CH_4 emissions from Sediment disturbance (CO_2 Only if there is no ΔSOC) in *s* segment (RFCW-S or RVCW-S), in the project scenario or corresponding monitoring.	t CO_2e	NA	NA	NA	NA	X	X
$EEUtro_{CH4+N2O,s,t}$	CH_4+N_2O GHG emissions from eutrophication in segment *s* (RFCW-S or RVCW-S), in the project scenario or corresponding monitoring.	t CO_2e	NA	NA	NA	NA	X	X
Ns	Total number of polygons associated with segment *s*, in the project scenario or corresponding monitoring.	Segments count	NA	NA	NA	NA	NA	NA
s	Index of the segments to be implemented in the CCMP (maximum 6: RFCW-M, RVCW-M, RFCW-T, RVCW-T,	NA	NA	NA	NA	NA	NA	NA

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
	RFCW-S or RVCW-S) in the baseline scenario.							
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA
GWP_g	Global Warming Potential for gas *g* (CO_2, CH_4 or N_2O).	Dimensionless	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

8.2.1.1 Treatment of GHG Emission Sources

Burning of biomass (RFCW-M, RVCW-M, RFCW-T, RVCW-T). In the project scenario, burning of biomass is assumed to be prohibited. However, if unexpected fire events occur, emissions shall be quantified in accordance with the 2006 IPCC Guidelines (Vol. 4, Ch. 2 & 3) and the 2013 IPCC Wetlands Supplement, distinguishing between CO_2, CH_4, and N_2O. Monitoring shall include burned area, pre-fire fuel load, combustion efficiency, and emission factors. For consistency, CO_2 shall be accounted through biomass stock changes, while CH_4 and N_2O are estimated using emission factors.

Hydrological alteration (RFCW-M, RVCW-M, RFCW-T, RVCW-T). Project activities may temporarily alter hydrological regimes (e.g., breaching levees, filling ditches). In such cases, greenhouse gas fluxes (CO_2, CH_4, N_2O) shall be monitored directly in rewetting or restored sites, applying field-based measurements (e.g., chamber flux sampling) and ensuring methodological consistency with the baseline. Long-term effects are expected to be net negative emissions due to SOC accumulation.

Nitrification/denitrification (RFCW-M, RVCW-M, RFCW-T, RVCW-T). N_2O emissions in restored systems are generally negligible. However, if project interventions (e.g., soil amendments, fertilization) result in measurable fluxes, site-specific monitoring shall be conducted. If significant, emissions shall be included using emission factors stratified by soil and climate conditions.

Soil disturbance (RFCW-T, RVCW-T). Emissions from soil disturbance may occur during planting, excavation, or other site preparation activities. These shall be quantified using field surveys of disturbed area and depth, combined with emission factors or direct flux monitoring. Long-term avoided emissions shall be reflected in ΔSOC.

Sediment disturbance (RFCW-S, RVCW-S). Project revegetation or restoration works in seagrass meadows (e.g., transplanting, anchoring modules) may cause temporary sediment disturbance. Emissions (CO_2, CH_4) shall be quantified through direct field monitoring (e.g., sediment resuspension rates, chamber fluxes) or conservative emission factors. Over the long term, project activities are expected to stabilize sediments and enhance SOC accumulation.

Eutrophication (RFCW-S, RVCW-S). Project interventions that improve water quality (e.g., reducing nutrient inflows, restoring vegetation cover) are expected to lower eutrophication-driven CH_4 and N_2O emissions. If nutrient-driven fluxes are still significant, they shall be estimated using water quality monitoring data and peer-reviewed emission factors, ensuring consistency with baseline methods.

8.2.1.2 Treatment of CO_2, CH_4, and N_2O Emissions in Coastal Wetland Accounting

In this methodology, under the project scenario, CO_2 emissions and removals from biomass (trees, shrubs, herbaceous vegetation), litter, deadwood, and soil organic carbon (SOC) shall be accounted for through measured or estimated changes in carbon stocks (ΔC) in the relevant pools, using project-specific monitoring data.

Therefore, in the section on project emission sources, only non-CO_2 gases (CH_4 and N_2O) are included, since their dynamics are not captured in ΔC pools and may represent additional fluxes triggered during project implementation (e.g., soil rewetting, hydrological restoration, or nutrient cycling changes).

For CO_2 linked to SOC or sediment processes, the following applies:

- **Preferred approach**: Direct measurement of stock changes (ΔSOC), based on periodic sediment or soil cores sampled to ≥1 m depth (or refusal), stratified by depth intervals, and analysed for bulk density (BD) and organic carbon content (C%).
- **Alternative approach**: If ΔSOC cannot be measured, CO_2 emissions may instead be estimated using process-based emission factors (EFs), applied to project-specific activity data (e.g., rewetting a
- a, disturbed soil volume).

To avoid double counting, the following rule must be applied:

The treatment of CO_2 emissions and removals from soils and sediments in the project scenario follows the same principles established in the baseline scenario (**Section 7.2.2.1**). In particular, the rule to prevent double counting between ΔSOC and process-based emission factors (EFs) shall be strictly applied. This ensures that CO_2 is accounted for once and only once, while CH_4 and N_2O remain consistently quantified as additional emission sources under project conditions.

8.3 Implementation of Mitigation Actions

Once the activity data for each segment have been collected and the Analysis of Agents and Causes of Coastal Wetland Loss and Degradation required in **Section 4.1.1** has been completed, the mitigation actions to be implemented in each segment shall be defined, initiated, and documented. All actions shall directly respond to the specific drivers, pressures, and conditions identified for each segment, ensuring consistency with the diagnostic analysis.

The actions implemented shall not impair natural ecosystem functions, hydrological conditions, sedimentation processes, or native wetland vegetation. All actions must preserve ecological integrity in accordance with the requirements of this methodology.

Mitigation actions shall be territorial, corresponding to interventions carried out directly in the project area. Institutional or policy-related measures may be reported when relevant but shall not replace territorial actions. Territorial actions shall be supported by the explicit commitment of landowners and landholders to participate in and contribute to the implementation of the CCMP.

Actions may be designed and executed in coordination with local communities, governmental institutions, or private entities. In all cases, the start date of each mitigation action and the period during which it generates reductions in loss, degradation, or land-use change must be clearly specified.

Note 1: The longest time span during which any project activity generates measurable changes in any segment determines the duration of the CCMP.

Note 2: The moment at which project actions begin to generate measurable changes marks the end of the historical period and the beginning of the projection period for both the without-project and with-project scenarios.

Mitigation actions aimed at reducing degradation, loss, or land-use change shall be aligned with applicable national wetland, coastal, and forest policy frameworks.

Reductions in degradation or loss within the project scenario shall be quantified by comparing the expected degradation, loss, or land-use change for each segment with the annual observations recorded during the results period, following the procedures established in this methodology.

8.4 Stratification of the project scenario

The stratification of the project scenario shall remain consistent with the stratification principles applied in the baseline scenario. The level of stratification (e.g., climate zone, vegetation type, soil type, or other relevant criteria) shall be determined based on data availability, ecosystem characteristics, and the CCMP holder's technical capacity.

Where segments require stratification criteria or classes that differ from those used in the baseline scenario, distinct stratifications for the baseline and project scenarios may be applied, provided that such differentiation improves the accuracy and precision of net GHG removal or emission estimates.

As in the baseline scenario, stratification is mandatory whenever major vegetation types, land-cover categories, or land-use classes are present within the project area.

For the estimation of actual net GHG removals:

- Ex-ante stratification shall be based on the expected conditions of the project scenario.
- Ex-post stratification shall reflect the actual implementation and on-the-ground conditions observed during the verification period.

If natural or anthropogenic factors significantly modify biomass distribution, ecosystem structure, or land-cover patterns within the project area, the ex-post stratification shall be updated accordingly to ensure accurate representation of segment conditions and compliance with this methodology's monitoring requirements.

8.5 Project leakage

Leakage refers to an increase in greenhouse gas (GHG) emissions outside the CCMP boundary that occurs as a direct consequence of project implementation. In Blue Carbon ecosystems, leakage may arise when productive activities displaced by restoration or revegetation (e.g., aquaculture, agriculture, coastal infrastructure) are re-established in other areas, or when hydrological changes inadvertently affect adjacent ecosystems.

Although the risk of leakage in Blue Carbon projects is generally low, it must still be systematically assessed to ensure environmental integrity and avoid overestimation of mitigation outcomes.
To address this, the methodology distinguishes between:

– **Potential Leakage Area**: refers to the broader geographic zone outside the CCMP boundary that, based on the characterization of agents and drivers, may be subject to the relocation of displaced activities or indirect effects of project implementation. This area shall be identified during project design and explicitly included in the PDD as part of the socio-economic and land-use analysis, but it does not necessarily represent an area where leakage will occur.
– **Leakage Area:** is the specific portion of the potential leakage area where displaced activities or hydrological impacts are demonstrated, or are highly likely, to cause measurable increases in GHG emissions. Only this area shall be subject to leakage quantification and accounting under the CCMP.

Therefore it should be taken into account that:

a. No-activity displacement (normal case)

- If the baseline scenario represents degraded, abandoned, or unvegetated wetlands with no active productive use, no leakage area needs to be defined.
- Restoration or revegetation in such areas does not displace activities and therefore does not generate leakage.

b. Activity displacement (exception case)

- If project activities restore or revegetate wetlands previously occupied by active productive uses (e.g., shrimp farms in mangrove areas, drained marshes converted to pasture, dredged seagrass beds for navigation), baseline activities may be displaced.
- In these cases, the project proponent must:
  - Identify potential leakage pathways.
  - Delineate a potential leakage area where displaced activities are likely to relocate, using socio-economic and land-use evidence.
  - Quantify emissions only if displacement is material (likely to cause measurable GHG emissions)

Criteria for defining potential leakage areas

Based on the characterisation of agents and drivers associated with segment activities, the proponent shall define a potential leakage area outside the CCMP monitoring area, applying the following criteria:

- Presence of productive activities like those displaced by project activities (e.g., aquaculture, agriculture, fuelwood extraction).
- Ecological equivalence with the project area.

- Location within micro-watersheds adjacent to the CCMP monitoring area, or within the broader reference region.
- Where relevant, stable mangrove forests that could be subject to future displacement pressures.

Assessment requirements

- Leakage analysis must consider:
  - Local socio-economic drivers.
  - Historical trends of land/water use displacement.
  - Stakeholder consultations.

Only material leakage sources are quantified. Where risk is negligible, leakage may conservatively be set to zero.

$$LK_{P,t} = \sum_{j=1}^{N} LK_{j,t}$$

Equation 24

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$LK_{P,t}$	Total project leakage emissions in year *t*, aggregated across all material leakage sources.	t CO_2e / year	NA	NA	NA	NA	NA	NA
$LK_{j,t}$	Leakage emissions in year *t* from leakage source *j* (as defined in Table 7).	t CO_2e / year	NA	NA	NA	NA	NA	NA
N	Total number of leakage sources defined in the methodology (Table 7) and assessed for potential materiality in the CCMP.	Total leakages	NA	NA	NA	NA	NA	NA
j	Index of leakage sources considered (e.g., grazing/livestock displacement, agriculture/aquaculture, fertiliser use, timber extraction, non-forest degradation.	NA	NA	NA	NA	NA	NA	NA
t	CCMP year index.	NA	NA	NA	NA	NA	NA	NA

The possible sources of GHG emissions due to leakage are shown in **Table 7**.

Table 7. Leakage considered in a CCMP.

Source	GHG	Inclusion	Explanation
Displacement by grazing and livestock production	CO_2	Yes, if material	To be considered if significant in the potential leakage area.
	CH_4	Optional	To be considered if significant in the potential leakage area.

Source	GHG	Inclusion	Explanation
	N_2O	No	Excluded (manure management is not included in the scope of this methodology).
Displacement by agricultural or aquaculture activities	CO_2	Yes, if material	To be considered if significant in the potential leakage area.
	CH_4	Yes, if material	To be considered if significant in the potential leakage area.
	N_2O	No	Excluded.
Increased fertiliser use	Yes, if significant	No	To be considered if significant in the potential leakage area.
	CH_4	No	Excluded.
	N_2O	Yes, if material	To be considered if significant in the potential leakage area.
Timber harvesting	CO_2	Yes, if material	To be considered if significant in the potential leakage area.
	CH_4	No	Excluded.
	N_2O	No	Excluded.
Non-forest degradation or change of land use	CO_2	Yes	To be considered if significant in the potential leakage area.
	CH_4	Yes	To be considered if significant in the potential leakage area.
	N_2O	No	Excluded.

Entering the monitoring area in the CCMP defines the relevance of including leakage. If the project overlaps with a reference level, leakage is not accounted for.

8.6 GHG emission factors of the project scenario

All GHG emission factors the CCMP includes in the baseline scenario must be considered in the project scenario.

8.7 Project scenario activity data

The selection of activities and the procedures for calculating activity data should be internally consistent with the baseline scenario. If new emission sources are identified, they should be included in the project scenario, and the baseline scenario should be reassessed.

The segment activity data must be monitored annually and over the years of the results period, both in the segment area, the monitoring area, and the leakage area.

8.8 Project scenario GHG Balance

The project scenario GHG balance represents the net greenhouse gas flux resulting from CCMP implementation. Depending on the type of coastal wetland activity implemented, mitigation may arise from: carbon removals, avoided emissions, or both. Therefore, three functionally equivalent formulations are provided, each applicable to a distinct project condition.

A. Projects with removals only

$$GHG_{P,t} = Rcp_{P,t} - E_{P,t} - LK_{P,t}$$

Equation 25

B. Projects with emission reductions only

$$GHG_{P,t} = EA_{P,t} - E_{P,t} - LK_{P,t}$$

Equation 26

C. Projects with removals and emission reductions

$$GHG_{P,t} = Rcp_{P,t} + EA_{P,t} - E_{P,t} - LK_{P,t}$$

Equation 27

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$GHG_{P,t}$	Annual net GHG balance of the project scenario in year *t*, according to the applicable equation.	t CO_2e	X	X	X	X	C	C
$Rcp_{P,t}$	Annual GHG removals under the project scenario in year *t*, aggregated across all applicable segments (RFCW-M/T/S and RVCW-M/T/S).	t CO_2e	X	X	X	X	C	C
$EA_{P,t}$	Total annual emissions avoided under the project scenario in year *t*.	t CO_2e	X	X	X	X	C	C
$E_{P,t}$	Annual project emissions in year *t*.	t CO_2e	X	X	X	X	X	X
$LK_{P,t}$	Annual leakage emissions attributable to project implementation in year *t*	t CO_2e	C	C	C	C	C	C

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.
C: Conditional, depends on if leakages are generated.

9 Net Removals and Net Emissions Avoided Over the Verification Period

This section describes the procedures for quantifying the Net GHG Removals and Net GHG Emissions Avoided generated by the CCMP during each verification period.

Blue carbon ecosystems (mangroves, tidal marshes, and seagrass meadows) generate mitigation outcomes through two distinct but complementary mechanisms:

- Net GHG Removals, representing the additional carbon sequestered in biomass, soils, and sediments as a direct result of project activities relative to the baseline; and
- Net GHG Emissions Avoided, representing the prevention of CO_2, CH_4, and N_2O emissions that would have occurred under the baseline scenario (e.g., avoided soil oxidation, avoided drainage-related emissions, avoided sediment disturbance, avoided ecosystem conversion).

Both components must be calculated independently and then aggregated to determine the total mitigation achieved by the CCMP.

9.1 Net Removals Over the Verification Period

Net GHG removals achieved by the CCMP during each verification period must be calculated based on the quantified annual removals obtained from all applicable coastal wetland segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S). These removals must be documented in the Monitoring Report and verified using the equations established in this methodology.

Annual net removals (Ran_{p}, t_{x}) used in this section are derived as the difference between project removals and baseline removals

Net removals during the verification period x are calculated as:

$$RE_{P,tx} = \sum_{t1}^{tn} Ran_{P,tx}$$

Equation 28

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$RE_{P,tx}$	Net removals during the verification period x.	t CO_2e	X	X	X	X	X	X
$Ran_{P,tx}$	Net GHG removals in year t of the verification period, obtained from the annual project scenario calculations	t CO_2e	X	X	X	X	X	X
tx	Verification year index, counted from the CCMP start date or from the end date of the previous verification event (the latter applying when verification events occur consecutively).	NA	X	X	X	X	X	X
t_1 *to* ***tn***	Start and end years, respectively, of the verification period.	Years	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

As required by Cercarbono, net removals must be discounted using the ***Cercarbono Tool for Estimating the Carbon Buffer Reserve for Mitigation Initiatives*** *in the Land Use Sector*. The resulting adjusted value shall be reported as:

$$RE_{P,x}^{adj} = RE_{P,x}(1 - B)$$

Equation 29

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$RE_{P,x}^{adj}$	Net GHG removals achieved during verification period *x*, after applying the buffer deduction.	t CO_2e	X	X	X	X	X	X

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$RE_{P,x}$	Net GHG removals achieved during verification period *x*. (Prior to buffer deduction).	t CO_2e	X	X	X	X	X	X
B	Applicable buffer percentage assigned according to the ***Cercarbono Tool to estimate carbon buffer***.	%	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

9.2 Derivation of Annual Net Removals

The derivation of annual net removals establishes the yearly contribution of the CCMP to carbon sequestration across all applicable blue carbon segments. Annual net removals serve as the foundational input for calculating net removals over each verification period and must rely on measured, modeled, or conservatively estimated carbon stock changes, following the monitoring plan and methodological requirements. Annual net removals are estimated as:

$$\boldsymbol{Ran_{P,t} = Rcp_{P,t} - Rcp_{BL,t}}$$

Equation 30

Annual net removals used in **Equation 30**[16] are derived from the difference between:

Baseline removals:

$$\boldsymbol{Rcp_{BL,t} = \sum_{S=1}^{Ns} Rcp_{BL,s,t}}$$

Equation 31

Project removals:

$$\boldsymbol{Rcp_{P,t} = \sum_{S=1}^{Ns} Rcp_{P,s,t}}$$

Equation 32

[16] Ran_p,t is the annual net removal value used in **Section 8.1** for aggregating net removals over a verification period.

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
$Ran_{P,t}$	Annual net GHG removals in year *t.*	t CO_2e	X	X	X	X	X	X
$Rcp_{P,t}$	Total annual GHG removals under the project scenario in year *t*, aggregated across blue carbon segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	t CO_2e	X	X	X	X	X	X
$Rcp_{BL,t}$	Total annual GHG removals under the baseline scenario in year *t*, aggregated across blue carbon segments (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S).	t CO_2e	X	X	X	X	X	X
$Rcp_{BL,s,t}$	Annual baseline removals in segment *s* (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) for year *t.*	t CO_2e	X	X	X	X	X	X
$Rcp_{P,s,t}$	Annual project removals in segment *s* (RFCW-M, RVCW-M, RFCW-T, RVCW-T, RFCW-S, RVCW-S) for year *t.*	t CO_2e	X	X	X	X	X	X

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.

9.3 Net Reductions Over the Verification Period

Net GHG reductions represent the emissions that are avoided as a direct result of the CCMP when compared to the baseline scenario. In coastal wetland ecosystems, avoided emissions arise from preventing processes that would otherwise release significant amounts of CO_2, CH_4, and N_2O—such as soil oxidation, hydrological deterioration, sediment disturbance, or ecosystem conversion.

This section establishes the procedures for quantifying annual emissions avoided ($EA_{p,t}$) and aggregating them to obtain the net reductions achieved during each verification period as:

$$EA_{P,X} = \sum_{t1}^{t2} EA_{P,tx}$$

Equation 33

$$EA_{P,t} = \sum_{S=1}^{Ns} EA_{s,t}$$

Equation 34

Variable	Description	Units	Blue carbon activities*					
			RFC W-M	RVC W-M	RFC W-T	RVC W-T	RFC W-S	RVC W-S
$EA_{P,X}$	Net GHG emissions avoided during verification period *x*, aggregated from annual avoided emissions.	t CO_2e	X	X	X	X	C	C
$EA_{P,tx}$	Annual GHG emissions avoided in year t_x of verification period *x*.	t CO_2e	X	X	X	X	C	C
$EA_{P,t}$	Total annual emissions avoided under the project scenario in year *t*.	t CO_2e	X	X	X	X	C	C
$EA_{s,t}$	Annual emissions avoided in segment *s* (if applicable).	t CO_2e	X	X	X	X	C	C

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation; RVCW-S: Seagrass meadows revegetation.
X: Applicable
NA: Not applicable.
C = Applies only if disturbance/pressure in baseline would generate emissions (conditional).

Annual emissions avoided (EA_p,t) are calculated as the difference between baseline emissions and project emissions for each applicable segment.

9.4 Total Mitigation of the CCMP During the Verification Period

The total mitigation achieved by the CCMP during each verification period results from the combined effect of net GHG removals and net GHG emissions avoided, after accounting for project emissions and leakage. This section establishes how these components are integrated to determine the net climate impact of the project relative to the baseline scenario.

This section provides the equations for determining annual total mitigation and for aggregating these results over the verification period x. The values obtained serve as the basis for carbon credit issuance and must be fully documented in the Monitoring Report corresponding to each verification event.

$$Mit_t = GHG_{BL,t} - GHG_{P,t}$$

Equation 35

Mitigation over verification period:

$$Mit_{P,x} = \sum_{t=t_1}^{t_n} Mit_t$$

Equation 36

Optional buffer-adjusted mitigation:

$$Mit_{P,x}^{adj} = Mit_{P,x} \times (1 - B)$$

Equation 37

Variable	Description	Units	Blue carbon activities*					
			RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S
Mit_t	Annual net mitigation achieved by the CCMP in year *t*.	t CO_2e	NA	NA	NA	NA	NA	NA
$GHG_{BL,t}$	Annual net GHG balance of the baseline scenario in year *t*.	t CO_2e	NA	NA	NA	NA	NA	NA
$GHG_{P,t}$	Annual net GHG balance of the project scenario in year *t*, including removals, emissions avoided, project emissions and leakage, aggregated across all relevant segments.	t CO_2e	NA	NA	NA	NA	NA	NA
$Mit_{P,x}$	Total mitigation of the CCMP over verification period *x*.	t CO_2e	NA	NA	NA	NA	NA	NA
$Mit_{P,x}^{adj}$	Total mitigation of the CCMP over verification period *x* after applying the buffer deduction	t CO_2e	NA	NA	NA	NA	NA	NA
B	Applicable buffer percentage assigned according to the ***Cercarbono Tool to estimate carbon buffer***.	%	NA	NA	NA	NA	NA	NA

* RFCW-M: Mangrove restoration; RFCW-T: Tidal marsh restoration; RFCW-S: Seagrass meadows restoration; RVCW-M: Mangrove revegetation; RVCW-T; Tidal marsh revegetation and/or RVCW-S: Seagrass meadows revegetation, implemented in each segment.
X: Applicable.
NA = Not Applicable.

The resulting $Mit_{p,x}$ value represents the total mitigation attributable to the CCMP for the verification period and forms the basis for carbon credit issuance.

10 Grouped CCMPs

Grouped CCMPs are those explicitly designed to allow the incorporation of new participants or operational units (instances) based on predefined eligibility and consistency criteria that must be demonstrated by each new instance in order to join the grouped project. These additional instances may not be known at the time of project design or at the beginning of implementation.

The addition of instances—whether new areas or new participants within any segment—may occur during verification periods. Each added instance shall include the same reservoirs applicable to the segment to which it belongs, and must demonstrate compliance with all eligibility requirements and with the conditions established in the Cercarbono Protocol for grouped CCMPs. The inclusion or withdrawal of areas during verification requires a reassessment of baseline and project scenarios, as described in the relevant sections.

In grouped CCMPs, the total project area corresponds to the sum of all areas of the instances included at any point in time.

The monitoring system may differ among segments when justified by differences in ecosystem type, management conditions, or data availability; however, it shall remain internally consistent across all instances belonging to the same segment.

Leakage monitoring shall follow the requirements of this methodology and must be conducted for each segment in which project activities are implemented. Leakage assessments do not need to be spatially explicit in every case, but they must identify potential displacement of activities or indirect impacts outside the project boundary, in accordance with the procedures defined in the methodology. Instance-level monitoring technologies (e.g., drones or remote sensing tools) may be used when appropriate.

Monitoring of activity data for each instance shall correspond to the minimum mapping units defined for the activity type. The minimum monitoring area must align with the forest definition adopted by the host country, noting that some countries do not accept units smaller than 1.0 ha.

10.1 Addition and Exclusion of Grouped CCMP Areas

The addition of new instances to a grouped CCMP may occur during verification periods, provided that all requirements established in the Cercarbono Protocol for grouped CCMPs are fully met. Any addition or removal of areas requires a reassessment of the baseline and project scenarios.

When new instances are incorporated into the CCMP, a new assessment of risks, non-permanence, and uncertainty shall be carried out following the procedures described in **Section 11**. All inputs, assumptions, and parameters must reflect the expanded scope of the CCMP.

If a participant withdraws from the CCMP during a reporting period, the PDD shall be updated to create a new version that explicitly identifies the withdrawn areas and participants. Credits previously issued for the withdrawn area must be submitted for revalidation. That area shall not be included in calculations for subsequent verifications, and an equivalent quantity of previously issued credits shall be deducted from the mitigation results to be reported in the next verification.

The withdrawal of areas by a participant must be total; partial withdrawal of areas is not permitted in grouped CCMPs. The PDD update shall document the extent of the withdrawn area, the verification periods in which it was previously included, and the number of credits issued to date.

An equivalent amount of these previously issued credits shall be deducted from the volume of credits eligible for certification in the next verification. Alternatively, if applicable and at the discretion of the programme administrator, an equivalent number of already issued and available credits may be cancelled to meet this requirement.

10.2 Updating spatial limits of grouped CCMPs

If the spatial limits of the segments included in the CCMP change during its implementation, either by including new instances or by withdrawing participants, the spatial limits of each modified segment and of the total CCMP will need to be updated, as indicated in the methodology. The total area of each segment should be the same for the baseline and project scenarios.

When the spatial boundaries of activities included in a grouped CCMP change due to the addition of new instances or the withdrawal of participants, the spatial boundaries of each affected activity and of the overall CCMP must be updated accordingly. All spatial updates shall comply with the requirements of the Guidelines for Mapping Presentation and Analysis.

For consistency and traceability, the total area of each activity must remain the same in both the baseline and project scenarios. Spatial boundary updates shall therefore reflect administrative or organizational changes in participation, without modifying the baseline or project area used for GHG quantification unless explicitly required by **Section 6.6**.

11 Risk Assessment and Non-Permanence Management

The requirements of this methodology are designed to ensure accurate, transparent, and conservative quantification of GHG removals and emission reductions achieved by a Coastal Climate Mitigation Project (CCMP). Blue Carbon ecosystems (mangroves, tidal marshes, and seagrass meadows) are dynamic systems whose carbon stocks may be subject to both natural and anthropogenic disturbances. For this reason, risk identification and non-permanence management are fundamental components of the CCMP design.

Cercarbono has established specific mechanisms for identifying and evaluating risks that may affect the permanence of carbon benefits, including environmental, social, and governance risks. These risks must be documented by the CCMP and, where relevant, assessed in consultation with local communities in a free, prior, and informed manner, in accordance with the ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme.***

Because GHG removals in Blue Carbon systems are inherently non-permanent, they may be reversed by internal or external events, such as:

- Cyclones, storm surges, erosion, and coastal flooding
- Large-scale hydrological alterations (e.g., drainage, barriers, dredging)
- Land-use change or conversion (agriculture, aquaculture, infrastructure)
- Wildfires, pollution events, eutrophication
- Biological pressures (pests, invasive species, disease)

This methodology manages non-permanence through the Buffer Reserve, whereby a percentage of verified net GHG benefits is withheld proportionally to the CCMP's assessed reversal risk. The buffer contribution is determined using the ***Tool to estimate carbon buffer in initiatives to mitigate climate change in the land use sector Cercarbono***. Rules for buffer allocation, update, and potential releases in case of verified reversals follow the requirements of the Tool.

The CCMP must also comply with the safeguard "Measures for Prevention and Management of Reversal Risks," including:

- Identification of potential causes of reversals
- Preventive and mitigation measures
- Monitoring of vulnerable conditions (e.g., erosion fronts, hydrological blockages)
- Contingency planning and adaptive management procedures

Any reversal event must be detected, documented, and delineated geographically and temporally. The impact of the reversal shall be deducted from the net removals or emission reductions reported for the monitoring period in which the event occurred. Reversal analysis must be updated every five (5) years, in alignment with the re-assessment of baseline and project scenarios.

To ensure permanence, a CCMP may complement buffer requirements with insurance mechanisms or comparable guarantee instruments, provided they reasonably cover the risk of reversals in the project area.

12 Uncertainty Assessment and Management

The CCMP must comprehensively document all data sources, parameters, emission factors, models, and measurement methods used to estimate carbon pools and GHG emission sources. Uncertainty[17] shall be evaluated systematically during project design and implementation.

The uncertainty analysis shall:

a) Identify key sources of uncertainty, including:
- Variability in biomass density, tree allometry, or marsh/seagrass productivity
- Soil and sediment carbon variability (SOC, SedOC)
- Hydrological and geomorphological fluctuations
- Emission factors for CH_4 and N_2O (often highly variable in wetlands)
- Remote sensing classification accuracy
- Sampling error and measurement error
- Model uncertainty (if Tier 2 or Tier 3 methods are used)

b) Quantify uncertainty wherever possible, using appropriate statistical methods such as:
- Variance and standard error estimation
- Confidence intervals
- Bootstrapping
- Monte Carlo simulations
- Error propagation methods when combining parameters

c) Reduce uncertainty through best-practice approaches, including:
- Selection of scientifically supported measurement techniques
- Use of country-specific or project-specific emission/removal factors when available
- Stratified sampling designs adapted to Blue Carbon heterogeneity
- Calibration of remote sensing classifications
- Periodic updates of parameters using improved data

d) Apply conservative adjustments when uncertainty remains significant, ensuring environmental integrity and avoiding over-estimation of mitigation benefits.

Uncertainty must be quantified for all parameters used in developing the baseline scenario. The quantified uncertainty value shall be applied, as specified in the corresponding baseline section of this methodology, to ensure that the resulting baseline remains conservatively below the business-as-usual (BAU) scenario. This adjustment aims solely to guarantee a conservative baseline and does not constitute a fixed discount factor.

[17] The uncertainty assessment approach described in this methodology is compatible with the principles and guidance provided in ISO 14064-2:2019 for project-level GHG quantification.

All results reported in the baseline and project scenario calculations must explicitly reflect the quantified uncertainty, ensuring transparent monitoring, reporting, and verification (MRV) and maintaining the credibility and environmental integrity of Blue Carbon carbon credits.

13 Contributions to the United Nations Sustainable Development Goals

Under the Cercarbono programme, CCMPs are required to report contributions to the SDGs using the ***Cercarbono's Cercarbono's Methodology of The Financial Transparency and Sustainable Development Reporting Framework for Environmental Projects***, which is available at www.cercarbono.com, section: Documentation. The review of the application of this tool shall be part of the verification process. The **SDG Tool rubric** must be duly signed by the Validation and Verification Body (VVB) in charge of the verification.

14 Safeguards

Under the Cercarbono Programme, all CCMPs must comply with ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme***, available at www.cercarbono.com (Documentation section). Safeguards apply to all CCMP segments and activities, without exception, and ensure continuous protection of human rights, local communities, and the environment throughout the full life cycle of the project.

Safeguards must be implemented following the "no-net-harm" principle, ensuring that project activities do not produce negative social, environmental, or institutional impacts. Safeguards must be assessed, documented, and monitored in all CCMPs regardless of land tenure or stakeholder type.

Compliance with safeguard requirements (including Free, Prior and Informed Consent – (FPIC) when applicable) forms part of the verification process. The Safeguards compliance rubric must be completed and signed by the Validation and Verification Body (VVB) responsible for the verification.

14.1 Effective Participation

CCMP shall identify local or ethnic communities present in the project area or those that may be directly affected by the implementation of the CCMP and guarantee full and effective participation with the legal mandates governing such procedures and in alignment with the rights of ethnic minorities.

CCMP shall comply with the provisions on effective participation outlined in the current ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document of the Cercarbono certification program.

14.2 Stakeholder Consultation

Stakeholder consultation in this methodology shall be carried out in accordance with the guidelines described in the section: ***Public consultation of CCMPs*** of the ***Cercarbono's Protocol*** and in the applicable reference documents.

All records and results of the public consultation process shall be uploaded to the EcoRegistry platform, where they will be duly stored.

Additionally, the requirements on this matter outlined in the current ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** document of the Cercarbono certification program shall be observed.

15 Monitoring procedure

The CCMP must be monitored throughout its full implementation period, both within its project area and for potential leakage, forming the basis for the quantification of results and issuance of verified credits.

All information and data associated with the CCMP must be fully traceable, transparent, and verifiable in accordance with Cercarbono's Protocol.

For each verification event, the CCMP proponent must prepare a Monitoring Report following the monitoring plan established in the PDD.

In the years between verification events, monitoring may rely on direct field measurements or on conservative projections derived from recent field data, supported by robust statistical models.

The Monitoring Report must include at minimum:

- A description of the monitored CCMP activities and methods used.
- Data supporting carbon stock calculations, changes in carbon pools, and net removals, based on field measurements, statistically representative sampling, reliable remote sensing tools, third-party sources, and published scientific literature, ensuring conservativeness and accounting for uncertainties.
- A summary of large datasets, indicating how full datasets may be accessed.
- Logs and records related to reversal events.
- Information on how reversal risks were assessed and mitigated, following the risk-management measures described in the PDD.
- Documentation of how environmental and social impacts were assessed, mitigated, and managed, consistent with the safeguards described in the PDD.

Although Cercarbono provides base templates (available online), CCMPs applying this methodology must comply with all requirements outlined herein.

15.1 Monitoring Plan Description

The CCMP must establish and maintain a Monitoring and Quality Management Plan that defines procedures for measuring, recording, collecting, analyzing, and reporting all data relevant for GHG emissions and removals, using conservative and appropriately justified values for the whole project life period.

The total monitoring period of CCMP activities shall not be less than 40 years, which is equivalent to the duration of the CCMP. All monitoring procedures, frequency, data management systems, and quality assurance and quality control (QA/QC) measures shall be designed to ensure continuous, consistent, and transparent monitoring over the entire project lifetime.

The plan must ensure that the quantified GHG removals and emissions are real, transparent, credible, and attributable to CCMP activities.

- Purpose.
- List of measured and monitored parameters (Including carbon pools, activity data, and emission sources.
- Data types and units (clearly specify units of measurement and data structures).
- Data origin (Explain whether derived from field measurements, remote sensing, laboratory analysis, literature, or third-party data sources).
- Monitoring methodologies (Include estimation, modeling, measurement, calculation approaches, and uncertainty treatment. When appropriate, include remote sensing and digital technologies enabling transparent, reliable, conservative estimation of GHG removals.
- Monitoring frequency (Defined based on CCMP needs, carbon pool dynamics, and methodological requirements).
- Calculation documentation (Provide step-by-step documentation of all equations, parameters, and results, ensuring that calculated removals are solely attributable to CCMP activities).
- Monitoring roles and responsibilities (Define who collects, verifies, approves, and manages data, and procedures for authorizing data changes).
- Internal controls (Define QA/QC procedures, cross-checks of inputs and outputs, and corrective action procedures).
- GHG information management systems (Including data storage, location, backups, traceability, and procedures for transferring between formats or systems).

15.2 Monitoring the implementation of the activities proposed for the segment

The CCMP activities implemented within the segment area must be consistent with the project area management plans and the PDD. The CCMP shall include, in the monitoring report, a summary of the activities carried out in the segment during each verification period and their effectiveness in climate change mitigation in the context of the activities proposed in the PDD, comparing what was planned with what was implemented.

If the data used for the emission factors applicable to the segment come from mangrove forest inventories and it is evident that there are no significant changes in emission factors in the monitored categories from the baseline scenario, the emission factors used in the project scenario should be the same and a repeat forest inventory is not necessary.

15.3 Boundaries Monitoring

Boundary monitoring involves the periodic verification that CCMP activities are being implemented strictly within the wetland areas initially validated in the PDD or, in the case of grouped projects, within any additional areas formally incorporated in accordance with the applicable protocol. This process includes:

- Use of remote sensing (satellite imagery, drone-based orthomosaics, LiDAR where available) and GPS-referenced field surveys to confirm the spatial extent and integrity of each wetland segment (mangroves, seagrasses, salt marshes).
- Verification of legal tenure, management rights, or formal agreements ensuring that all project areas remain under the authority or control of the participating entities.

– Annual review of mapping information, following the approved procedures for map submission, consistency checks, and spatial analysis.

Boundary monitoring must confirm that:

- All project areas remain under the control or authorized management of the participating entities, with no loss of access or shifts in land or resource tenure.
- Spatial boundaries, polygon geometries, and attribute data remain accurate and valid, reflecting any allowable updates or changes documented in accordance with the methodology.
- All mapping products comply with the requirements and technical specifications defined in the ***Guidelines for mapping presentation and analysis***, ensuring standardization, reproducibility, and traceability.

15.4 Monitoring of GHG emissions and Removals

Monitoring of greenhouse gas (GHG) emissions and removals must be carried out continuously throughout each reporting period to ensure transparent and accurate quantification of the CCMP's net climate benefits.

- GHG removals may be monitored annually, multi-annually, or at an appropriate frequency based on growth dynamics, carbon pool stability, and sampling design.
- GHG emissions, especially those originating from fuels, machinery, fertilization, fires (including unplanned events), or vegetation loss from extreme climate events (winds, frost, prolonged drought), must be recorded more frequently—typically annually or per event—due to their higher temporal variability and potential impact on the net GHG balance.

Monitoring must be ongoing and systematic during each reporting period to ensure completeness, consistency, and verifiability of all emissions and removals.

15.5 Carbon Pools Monitoring

Annual monitoring of carbon stocks shall be conducted for all relevant blue carbon pools, including aboveground biomass, belowground biomass, dead organic matter, sediment organic carbon, and, when applicable, dissolved organic carbon, following current IPCC Wetlands Supplement guidance.

- Measurements must rely on statistically representative sampling designs, robust and validated remote sensing tools, and/or scientifically supported literature values, applying conservative assumptions and rigorous uncertainty treatment, in alignment with Cercarbono methodological guidance and the Guidelines for Using of the ***Guidelines for using Models in Baseline Carbon Quantification in the Land Use Sector***.
- Average annual increments (AAI) may be used only when supported by robust empirical data, applied for periods not exceeding five years, and only when they do not lead to potential overestimation of removals. Direct field measurements must be conducted prior to verification events to validate estimates and maintain methodological integrity.

15.6 Revision of Removal and Emission Factors

Removal and emission factors are formally defined in the methodological section; however, their ongoing validity and applicability must be periodically evaluated as part of the monitoring process. This ensures consistency, scientific accuracy, and conservativeness throughout the crediting period.

- **Removal Factors**

The project proponent shall, during each verification cycle, assess whether the removal factors applied remain valid and scientifically justified. If new field measurements—such as updated sediment core analyses, biomass assessments, or ecosystem-specific monitoring data—demonstrate significant changes in carbon accumulation rates, removal factors must be revised using a conservative approach to prevent any potential overestimation of GHG removals. Updated national MRV information or advances in scientific literature may also warrant recalibration.

- **Emission Factors**

Similarly, the applicability of emission factors must be reviewed during verification events to ensure alignment with current scientific understanding and best available data. The project proponent shall confirm that emission factors remain consistent with updated IPCC guidance, national inventories, or project-specific evidence. If changes in fuel characteristics, fire dynamics, fertilization practices, or other emission-generating activities are observed, emission factors must be adjusted conservatively to avoid underestimation of GHG emissions.

15.7 Net Removal and Emission Reduction Calculations

Net GHG removals for each verification period must be quantified based on:

- Measured changes in carbon stocks across all relevant blue carbon pools, and
- Reductions in GHG emissions relative to the baseline scenario, consistent with the methodological framework.

All calculations must follow the equations and principles established in the IPCC Wetlands Supplement and applicable CDM tools, as complementary references to the equations described herein, ensuring transparency, accuracy, and conservative treatment of uncertainty.

The monitoring process must include comprehensive documentation of potential reversal risks, observed negative impacts, and all mitigation measures implemented during the monitoring period.

Applicable emission sources identified in **Section 6.5** must be monitored and included in the net removal and emission reduction balance. When these sources occur, the following rules apply:

- **Burning:**

If burning occurs—whether related to project activities, management actions, or natural events—each event shall be recorded and emissions calculated using IPCC/CDM guidance (e.g., A/R Tool 08). Burned area, affected biomass, combustion factors, and emission factors for CH_4 and N_2O must be documented.

- **Fertilizers and machinery:**

When applicable, record the quantities and types of fertilizers used, fuel consumption for machinery, and associated emission factors. Emissions shall be estimated using IPCC defaults, national factors, or scientifically supported project-specific data. Only emissions directly attributable to project implementation are included.

Net GHG removals shall integrate enhanced carbon sequestration and applicable emission reductions, subtracting any operational emissions, to produce a complete and conservative estimate of the project's climate benefits.

15.8 Monitoring of leakage

Leakage refers to increases in GHG emissions occurring outside the CCMP boundary as a direct consequence of project implementation. Although leakage risk in Blue Carbon projects is generally low (particularly in degraded or abandoned wetlands) it must be assessed and monitored to ensure that net climate benefits are not overstated.

For CCMPs without area expansion, leakage monitoring must occur during the first five years of implementation.

If project areas are added or modified, leakage monitoring must continue for three years following the change.

Area reductions do not require leakage monitoring.

Monitoring focuses on identifying whether project activities have displaced productive uses (e.g., aquaculture, agriculture, resource extraction) or altered hydrological conditions in ways that could generate emissions outside the project boundary. If the baseline contains no productive activities, no leakage is to be expected.

Only material leakage—i.e., that which results in measurable GHG emissions—must be quantified. If monitoring confirms that no displacement or indirect impacts have occurred, leakage may be conservatively set to zero. Any confirmed leakage must be quantified according to the methodology and deducted from the project's net climate benefits.

Monitoring reports must document:

- The delineation of potential and actual leakage areas;
- Evidence of displaced activities or hydrological impacts, if present; and,
- The results of leakage quantification.

15.9 Variables to be monitored

The table below summarizes the parameters to be monitored by the CCMP holder, including monitoring frequency and potential sources of the information.

Table 8. Variables to record and/or for monitoring.

Variable / Parameter	Unit	Blue carbon activities*						Data Origin & Measurement Procedure	Frequency	Equation Ref
		RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S			
$A_{stratum,k}$	ha	X	X	X	X	X	X	Remote sensing (satellite/drone), GPS field validation, national maps.	Validation, revalidation, verification cycle.	Eq. 1.
$TSA_{s,k}$	ha	X	X	X	X	X	X	GIS layers from field data or remote sensing	Validation/revalidation/ verification cycle.	Eqs. 2 and 3.
TSA_s	ha	X	X	X	X	X	X	GIS layers from field data or remote sensing	Validation/revalidation/ verification cycle.	Eqs. 4 and 5.
$A_{s,i}$	ha	X	X	X	X	X	X	Measurement in the field or using remote sensors.	Validation/revalidation/ verification cycle.	Eq. 4.
$A_{s,f}$	ha	X	X	X	X	X	X	Field mapping or remote sensing	Validation/revalidation/ verification cycle.	Eq. 5.
$CAtree$	t C / ha	X	X	NA	NA	NA	NA	Biomass plots, allometric equations, drone canopy models	Verification cycle.	Eqs. 8, 17 and 38.
$CBtree$	t C / ha	X	X	NA	NA	NA	NA	Root coring, root:shoot ratios (IPCC/peer-reviewed)	Verification cycle.	Eqs. 8, 17 and 39.
$CAShrub$	t C / ha	X	X	NA	NA	NA	NA	Biomass plots, allometric equations, drone canopy models	Verification cycle.	Eqs. 8, 17 and 40.
$CBShrub$	t C / ha	X	X	NA	NA	NA	NA	Root coring, root:shoot ratios	Verification cycle.	Eqs. 8, 17 and 41.

Variable / Parameter	Unit	Blue carbon activities*						Data Origin & Measurement Procedure	Frequency	Equation Ref
		RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S			
								(IPCC/peer-reviewed)		
$CAherb$	t C / ha	NA	NA	X	X	NA	NA	Field, IPCC/peer-reviewed,	Verification cycle	Eqs. 9, 18 and 44.
$CBherb$	t C / ha	NA	NA	X	X	NA	NA	Field, IPCC/peer-reviewed,	Verification cycle	Eqs. 9, 18 and 45.
CDw	t C / ha	X	X	X	X	NA	NA	Deadwood sampling using IPCC methods	Verification cycle	Eqs. 8. 9, 17, 18 and 42.
CL	t C / ha	X	X	X	X	NA	NA	Litter plots, dry mass, carbon fraction	Verification cycle	Eqs. 8. 9, 17, 18 and 43,
$CSoc$	t C / ha	X	X	X	X	NA	NA	Field, IPCC/peer-reviewed,	Verification cycle	Eqs. 8. 9, 17, 18 and 52.
$CASeagrass$	t C / ha	NA	NA	NA	NA	X	X	Field, IPCC/peer-reviewed,	Verification cycle	Eqs. 10, 19 and 46.
$CASeagrass$	t C / ha	NA	NA	NA	NA	X	X	Field, IPCC/peer-reviewed,	Verification cycle	Eqs. 10, 19 and 47.
$CDetritus$	t C / ha	NA	NA	NA	NA	X	X	Field, IPCC/peer-reviewed,	Verification cycle	Eqs. 10, 19 and 48.
$CSedOC$	t C / ha	NA	NA	NA	NA	X	X	Sediment cores (≥1 m), LOI/EA analysis, bulk density	Verification cycle	Eqs. 10, 19, 49, 50 and 51.
GWP_{CH4}	NA	NA	NA	NA	NA	NA	NA	Based on the MDL AR-Tool 08. Default value to be used in accordance with the latest IPCC report or Carbon	Verification cycle	Eqs. 12, 13, 14 and 21, 22 and 23

Variable / Parameter	Unit	Blue carbon activities*						Data Origin & Measurement Procedure	Frequency	Equation Ref
		RFCW-M	RVCW-M	RFCW-T	RVCW-T	RFCW-S	RVCW-S			
								Clearance guide-lines.		
GWP_{N2O}	NA	NA	NA	NA	NA	NA	NA	Based on the MDL AR-Tool 08. Default value to be used in accordance with the latest IPCC report or Carbon Clearance guidelines.	Verification cycle	Eqs. 12, 13, 14 and 21 ,22 and 23.

15.10 Roles, Responsibilities, and Controls

The monitoring plan must define the monitoring team roles, data approval, and change documentation procedures.

The CCMP must maintain logbooks for equipment calibration, measurement records, and project-related adverse events (such as disturbances, reversals, or any incidents that may affect carbon stocks) along with the corresponding corrective actions implemented.

15.11 Data Quality and Information Management

Appropriate QA/QC (quality assurance and quality control) measures must be conducted and described in the PDD. This may include cross-checking the monitoring results with other sources of data, identifying gaps and missing data, ensuring consistency between data sources, etc. Unexpected interruptions or errors in monitoring must be addressed by conservative treatment and deduction of climate change mitigation.

15.12 Monitoring and revalidation of the baseline scenario

Baseline scenarios, regardless of the approach chosen to establish them, need to be revised over time because the agents, drivers and underlying causes of degradation and loss change dynamically. They also need to be updated when new instances are added to grouping CCMPs.

Frequent and unplanned updating of the baseline scenario can create serious market uncertainties. Therefore, the baseline scenario should be reviewed every five years, choosing historical and projection periods that do not create inconsistencies with the periods already verified and thus with the results obtained and credited. Where an applicable jurisdictional, subnational, or national baseline scenario is available, baseline scenarios may be reassessed accordingly to the elements below. The tasks involved in revising the baseline scenario are:

1. Update information on agents, drivers, and underlying causes of degradation and loss.
2. Periodically collect information on the agents, drivers in the reference region as these are essential to improve future mitigation actions and project activity design.
3. Information should be collected that is relevant to understanding the agents and underlying causes. When a spatial model is used to locate future deforestation, degradation or change in land use, new data on the spatial driving variables used to model the risks should be collected as they become available. They should be used to create updated spatial datasets and new "Driver Maps" for the subsequent fixed reference period.
4. Adjust the land use and land cover change component of the baseline scenario.
5. Adjust the annual reference for CCMP areas.
6. Adjust the location of projected CCMP areas.
7. Adjust the carbon component of the baseline scenario.

15.13 Verifiable requirements in the implementation of the CCMP

The calculations of emission factors, activity data, historical period and projection method are performed by means of a verifiable methodological reconstruction, based on the execution of the baseline and project scenario building steps of the methodology in the segment, and consistent with the procedures reported. In case this reference is not available in the country or collectable, other academically based procedures can be followed.

In line with the principle of transparency, all information necessary for the reconstruction of the segment results should be documented.

15.14 Monitoring of contributions to Sustainable Development Goals

The monitoring of contributions to the UN Sustainable Development Goals is done according to the ***Cercarbono's Tool to Report Contributions from Climate Change Mitigation Initiatives to the Sustainable Development Goals***.

15.15 Safeguards monitoring

The monitoring of and compliance with focal areas of sustainable development and safeguards is carried out in accordance with the ***Safeguarding Principles and Procedures of Cercarbono's Certification Programme*** of the Cercarbono certification program.

16 Information Management

The CCMP shall establish and implement quality management procedures, in accordance with the principles of this methodology, for receiving, managing, and controlling data, databases, and information, including assessing uncertainty.

The CCMP shall, to the extent possible, reduce uncertainties related to the quantification of GHG removal and GHG emission reductions by identifying and addressing any errors or omissions detected.

The CCMP shall apply monitoring criteria and procedures, including consistent reviews or audits, to ensure the accuracy of the quantification of GHG removal and GHG emission reductions according to the monitoring plan.

Where measuring and monitoring equipment is used, the CCMP shall ensure that the monitoring and measuring equipment is used and maintained as appropriate.

All data and information related to CCMP monitoring should be recorded and documented.

17 CCMP validation and verification

The requirements for validation and verification processes, in addition to the technical guidelines of this methodology, are outlined in the current version of the ***Cercarbono's Protocol*** and in the ***Procedures*** document or other applicable supporting documents.

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19 Document History

Version	Date	Comments or changes
0.1	28.11.2025	Version available for public consultation

Annexes

Annex 1. General Guidelines for the Integration of Avoided Deforestation and Degradation Activities in Stable Forest Areas

The following general guidelines are established for CCMPs developed under this Blue Carbon Methodology to incorporate Avoided Deforestation and Avoided Forest Degradation activities in stable forest areas (non-eligible strata under blue carbon), in a manner consistent with the Cercarbono REDD+ Methodology.

These guidelines aim to ensure technical, accounting, and reporting consistency between the Blue Carbon and REDD+ approaches, upholding environmental integrity and avoiding any double counting of results.

Their purpose is to harmonize and guarantee technical and accounting compatibility with the Cercarbono REDD+ Methodology, considering all its methodological sections, including:

- Analysis of agents and causes of deforestation and degradation,
- Definition of the reference region,
- Establishment of the baseline and reference levels (FREL/FRL),
- Calculation of emission reductions,
- Monitoring, reporting, and verification (MRV),
- Other common sections (Safeguards, governance aspects, SDGs, among others).

These guidelines seek to facilitate ecological, institutional, and methodological integration between the REDD+ and Blue Carbon mechanisms, recognizing that many forest ecosystems —including stable forests associated with wetlands or coastal zones— can contribute simultaneously to terrestrial and coastal climate change mitigation strategies.

Principles of Articulation Between Methodologies

Every CCMP that integrates REDD+ activities in stable forest areas shall be governed by the following principles:

1. Comprehensive coherence: The principles, procedures, and requirements of the Cercarbono REDD+ Methodology must be applied across all relevant sections, ensuring methodological compatibility, temporal and accounting consistency, and traceability of information.
2. Consistency with national or subnational FREL/FRL: Reference levels, historical deforestation rates, and emission factors must correspond to or be aligned with those officially approved by the country under the UNFCCC.
3. Avoiding double counting: Emission reductions or removals accounted for under REDD+ or Blue Carbon projects must be exclusive, with no spatial or functional overlap.
4. Environmental integrity: Emission reductions or removals must not overlap with other REDD+ projects or national/subnational programs.

5. Temporal and spatial alignment: Stable forest areas must be clearly delineated within the CCMP and correspond to management units compatible with the segments defined as non-eligible by the Blue Carbon Methodology.

Mandatory Reference in the Project Description Document (PDD)

Every CCMP integrating activities derived from both the Cercarbono REDD+ Methodology and the Blue Carbon Methodology must explicitly reference both methodologies in its Project Design Document (PDD).

The PDD shall clearly and traceably indicate:

- Which program or project activities are governed under each methodology.
- How the methodological application is articulated, specifying the sections and procedures adopted from each (e.g., analysis of agents, reference region, baseline, MRV, safeguards).
- Which assumptions, emission factors, and data sources derive from each methodology, ensuring technical consistency and avoiding duplication.
- How environmental integrity and non–double counting are guaranteed between the activities of both approaches.

GENERAL TECHNICAL GUIDELINES

1. Analysis of Agents and Causes of Deforestation and Degradation

CCMPs shall conduct a specific analysis of agents and causes of deforestation and degradation in stable forest areas, taking as reference the methodological structure of **Section 4.1.1** of this Blue Carbon Methodology and the analytical criteria of the Cercarbono REDD+ Methodology. This analysis shall include:

- Identification of direct drivers (agricultural expansion, logging, fire, infrastructure, mining).
- Identification of indirect or underlying drivers (tenure insecurity, poverty, markets, governance, public policies, incentives).
- Integration of spatial, temporal, and socio-economic information using official sources (NFMS, forest inventories, agricultural censuses, satellite imagery).
- Classification of biophysical, institutional, economic, and territorial factors determining the risk of deforestation or degradation.

The purpose of this analysis is to identify stable forest areas at potential risk of land-use change or carbon loss, forming the basis for avoided deforestation or degradation activities.

2. Definition of the Reference Region

According to the Cercarbono REDD+ Methodology, the definition of a reference region is mandatory for all CCMPs including avoided deforestation or avoided degradation activities in stable forest areas.

Each project shall delineate and document this reference region transparently, verifiably, and with technical justification, ensuring that:

- It is ecologically homogeneous and representative of the forest type targeted by the CCMP.
- It reflects historical and current patterns of deforestation and degradation within the relevant spatial and temporal context.
- It uses spatial and statistical information compatible with the national or subnational FREL/FRL approved by the jurisdiction or country under the UNFCCC.
- It ensures correspondence between the strata, categories, and analytical units employed by the project and those defined in the Cercarbono REDD+ Methodology or national forest monitoring frameworks.

Where national FREL/FRLs do not explicitly include the stable forest type considered by the project, a compatible sub-reference level must be developed, employing the same data sources, procedures, and assumptions established by the Cercarbono REDD+ Methodology and ensuring coherence with national forest monitoring systems (NFMS) and IPCC methodological guidance.

3. Baseline and Reference Levels

CCMPs shall develop their baseline for avoided emissions in accordance with the baseline reference framework of the Cercarbono REDD+ Methodology and its Guidelines for the Application of Models in Baseline Carbon Quantification for the Land Use Sector, considering the following parameters:

- Historical deforestation and degradation rates derived from a reference period of at least ten (10) years.
- Forest-type–specific emission factors (aboveground and belowground biomass, deadwood, and soil carbon).
- National or local parameters approved by the competent authority or documented through scientific sources.

The methodology must justify how activity data and emission factors are integrated from or derived consistently with those used to build the applicable FREL/FRL.

4. Quantification and Monitoring (MRV)

The Monitoring, Reporting, and Verification (MRV) system must remain fully compatible with the requirements of the Cercarbono REDD+ Methodology, ensuring alignment of indicators, frequency, and verification procedures.o.

5. Institutional and accounting integration

Institutional and accounting integration is essential to ensure that emission reductions and removals generated by CCMPs are recognized within national mitigation frameworks and maintain consistency with international carbon accounting standards.

Projects that incorporate REDD+ activities within stable forest areas must demonstrate alignment with national systems, including greenhouse gas inventories, forest monitoring mechanisms, and the reporting processes established under the country's Nationally Determined Contributions (NDCs).

This integration guarantees environmental integrity, avoids double counting, and supports transparency in the national and international climate reporting context.

- Emission reductions generated under REDD+ activities shall be reported under a framework compatible with national mitigation programs, consistent with environmental integrity and carbon accounting provisions.
- Projects must include evidence of coordination with national environmental or forestry authorities (e.g., registration records or letters of no objection).
- Reported results must be integrable into national GHG inventories and the progress reports of the country's Nationally Determined Contributions (NDCs).

Annex 2. Guidelines For Quantifying Carbon Pools (in baseline and project scenarios)

These guidelines apply equally to both Baseline and Project scenarios, providing a unified computational structure while referring back to the main methodology section for measurement details.

These guidelines complement **Sections 7.2.1** and **8.1** of this methodology. They provide the equations, parameters, and units required to calculate annual changes in carbon stocks (ΔC) and their conversion to CO_2 equivalents (ΔCO_2) for all relevant vegetation and detrital pools in Mangrove (Eq. 8 and 17), Tidal Marsh (Eq. 9 and 18), and Seagrass (Eq. 10 and 19) blue carbon activitie.

Field and laboratory measurement methods, data sources, and parameter hierarchies (national inventories, Ramsar data, IPCC defaults, etc.) shall follow Sections **Sections 7.1.1** and **8.1** of this methodology to avoid duplication.

- **Above-ground tree biomass (CA_tree) — Mangrove**

$$\Delta \boldsymbol{CA}_{\boldsymbol{tree},\boldsymbol{BL/P},\boldsymbol{f},\boldsymbol{s},\boldsymbol{t}} = \boldsymbol{CA}_{\boldsymbol{t}} - \boldsymbol{CA}_{\boldsymbol{t-1}}$$

Equation 38

Variable	Description	Units
$\Delta CA_{tree,BL/P,f,s,t}$	Stock change in above-ground tree carbon (ΔCA_tree) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario	t C / ha year
CA_t	Carbon stock in above-ground tree biomass measured during year *t*.	t C / ha
CA_{t-1}	Carbon stock in above-ground tree biomass measured during the previous year (*t−1*).	t C / ha

Parameters for integration into the system/model:

- DBH: Diameter at breast height (cm)
- H: Total Tree height (m)
- p: Wood density (g cm^{-3})
- CF: Carbon fraction of dry biomass
- AGB: Above-ground dry biomass (t DM/ ha)
- CA_tree: Carbon stock, calculated as AGB × CF (t C / ha)

- **Below-ground tree biomass (CB_tree) — Mangrove**

$$\Delta \boldsymbol{CB}_{\boldsymbol{tree},\boldsymbol{BL/PS},\boldsymbol{f},\boldsymbol{s},\boldsymbol{t}} = \boldsymbol{CB}_{\boldsymbol{t}} - \boldsymbol{CB}_{\boldsymbol{t-1}}$$

Equation 39

Variable	Description	Units
$\Delta CB_{tree,BL/PS,f,s,t} =$	Stock change in below-ground tree carbon (ΔCB_tree) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
CB_t	Carbon stock in below-ground tree biomass measured during year *t*.	t C / ha
CB_{t-1}	Carbon stock in below-ground tree biomass measured during the previous year (*t−1*).	t C / ha

Parameters for integration into the system/model:

- R-S: Root-to-shoot ratio
- AGB: Above-ground biomass (t DM / ha)
- CF: Carbon fraction
- CB_tree: Carbon in below-ground biomass calculated as AGB × R:S × CF (t C / ha)

- **Shrub biomass (CA/CB_Shrub) — Mangrove**

$$\Delta CA_{shrub,BL/P,f,s,t} = CA_t - CA_{t-1}$$

Equation 40

$$\Delta CB_{shrub,BL/P,f,s,t} = CB_t - CB_{t-1}$$

Equation 41

Variable	Description	Units
$\Delta CA_{shrub,BL/P,f,s,t}$	Stock change in above-ground shrub carbon (ΔCA_shrub) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$\Delta CB_{shrub,BL/P,f,s,t}$	Stock change in below-ground shrub carbon (ΔCB_shrub) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C/ ha year
CA_t, CB_t	Carbon stock in shrub biomass (above or below ground) measured during year *t*.	t C/ ha
CA_{t-1}; CB_{t-1}	Carbon stock in shrub biomass (above or below ground) measured during the previous year (*t−1*).	t C/ ha

Parameters for integration into the system/model:

- Dry biomass: Shrub dry matter per hectare (t DM/ ha)
- CF: Carbon fraction
- R-S: Root-to-shoot ratio
- Carbon stock: Biomass × CF (t C / ha)

- **Dead wood (C_DW) — Mangrove / Tidal Marshes**

$$\Delta C_{DW,BL/PS,f,s,t} = C_{DW,t} - C_{DW,t-1}$$

Equation 42

Variable	Description	Units
$\Delta C_{DW,BL/PS,f,s,t}$	Stock change in dead wood carbon (ΔC_DW) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$C_{DW,t}$	Carbon stock in dead wood measured during year *t*.	t C / ha
$C_{DW,t-1}$	Carbon stock in dead wood measured during the previous year (*t−1*).	t C / ha

Parameters for integration into the system/model:

– V: Volume per hectare (m^3 / ha)
– p: Density by decay class (t m^3)
– CF: Carbon fraction
– C_DW: V × ρ × CF (t C / ha)

- **Litter (C_L) — Mangrove / Tidal Marshes**

$$\Delta C_{L,BL/P,f,s,t} = C_{L,t} - C_{L,t-1}$$

Equation 43

Variable	Description	Units
$\Delta C_{L,BL/P,f,s,t}$	Stock change in litter carbon (ΔC_L) for segment component f within segment s for either the baseline (BL) or project (P) scenario.	t C / ha year
$C_{L,t}$	Carbon stock in litter measured during year *t*	t C / ha
$C_{L,t-1}$	Carbon stock in litter measured during the previous year (*t−1*).	t C / ha

Parameters for integration into the system/model:

– MS: Dry mass (t DM / ha)
– CF: Carbon fraction
– C_L: MS × CF (t C / ha)

- **Herbaceous biomass (CA_herb, CB_herb) — Tidal Marsh**

$$\Delta CA_{herb,BL/P,f,s,t} = CA_t - CA_{t-1}$$

Equation 44

$$\Delta CB_{herb,BL/P,f,s,t} = CB_t - CB_{t-1}$$

Equation 45

Variable	Description	Units
$\Delta CA_{herb,BL/P,f,s,t}$	Stock change in above-ground herbaceous carbon (ΔCA_herb) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year

Variable	Description	Units
$\Delta CB_{herb,BL/P,f,s,t}$	Stock change in below-ground herbaceous carbon (ΔCB_herb) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
CA_t, CB_t	Carbon stock in herbaceous biomass (above or below ground) measured during year *t*.	t C / ha
$CA_{t-1}; CB_{t-1}$	Carbon stock in herbaceous biomass (above or below ground) measured during the previous year (*t*−*1*).	t C / ha

Parameters for integration into the system/model:

- MS_aerial: Above-ground dry mass (t DM / ha)
- R-S: Root-to-shoot ratio
- CF: Carbon fraction
- C_L: MS × CF (t C / ha)
- Carbon stock: calculated as MS × CF or × R:S × CF (t C / ha)

- **Seagrass biomass (CA_Seagrass, CB_Seagrass) — Seagrass Meadows**

$$\Delta CA_{Seagrass,BL/P,f,s,t} = CA_t - CA_{t-1}$$

Equation 46

$$\Delta CB_{Seagrass,BL/P,f,s,t} = CB_t - CB_{t-1}$$

Equation 47

Variable	Description	Units
$\Delta CA_{Seagrass,BL/P,f,s,t}$	Stock change in above-ground seagrass carbon (ΔCA_Seagrass) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$\Delta CB_{Seagrass,BL/P,f,s,t}$	Stock change in below-ground seagrass carbon (ΔCB_Seagrass) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$CA_t; CB_t$	Carbon stock in seagrass biomass (above or below ground) measured during year *t*.	t C / ha
$CA_{t-1}; CB_{t-1}$	Carbon stock in seagrass biomass (above or below ground) measured during the previous year (*t*−*1*).	t C / ha

Parameters for integration into the system/model:

- MS_aerial / MS_subterranean: Dry mass (t DM / ha)
- R-S: Root-to-shoot ratio
- CF: Carbon fraction
- Carbon stock: calculated as MS × CF (t C / ha)

- **Detritus (C_Detritus) — Marsh / Seagrass**

$$\Delta C_{Detritus,BL/P,f,s,t} = C_{Detritus,t} - C_{Detritus,t-1}$$

Equation 48

Variable	Description	Units
$C_{Detritus,BL/P,f,s,t}$	Stock change in detritus carbon (ΔC_Detritus) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$C_{Detritus,t}$	Carbon stock in detritus measured during year *t*.	t C / ha
$C_{Detritus,t-1}$	Carbon stock in detritus measured during the previous year (*t−1*).	t C / ha

Parameters for integration into the system/model:

– MS_detritus: Dry detrital mass (t DM / ha)
– CF: Carbon fraction
– C_Detritus: Calculated as MS_detritus × CF (tc /ha)

- **Sediment Organic Carbon (C_SedOC) — Seagrass**

$$\Delta C_{SedOC,BL/P,f,s,t} = C_{SedOC,t} - C_{SedOC,t-1}$$

Equation 49

Variable	Description	Units
$\Delta C_{SedOC,BL/P,f,s,t}$	Stock change in sediment organic carbon (ΔC_SedOC) for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$C_{SedOC,t}$	Sediment organic carbon stock measured during year *t*.	t C / ha
$C_{SedOC,t-1}$	Sediment organic carbon stock measured during the previous year (*t−1*).	t C / ha

- **Total Sediment Organic Carbon Stock**

$$C_{SedOC,total} = \sum_{j} C_{SedOC,j}$$

Equation 50

Variable	Description	Units
$C_{SedOC,total}$	The total organic carbon stock across all sediment layers for a given core, segment, or site.	t C / ha year
$C_{SedOC,j}$	The organic carbon stock in a single layer *j*, calculated as:	t C / ha

- **Sediment Organic Carbon Stock per Layer**

$$C_{SedOC,j} = BD \times d_j \times \frac{C\%}{100} \times \frac{10^4}{1000}$$

Equation 51

Variable	Description	Units
$C_{SedOC,j}$	Organic carbon stock in sediment layer *j*.	t C / ha
BD	Dry bulk density of the sediment (mass per unit volume).	g cm^{-3}
d_j	Thickness of sediment layer *j*.	cm
C%	Organic carbon concentration in the sediment layer.	%
10^4 / 1000	Conversion factor /Converts small-scale (cm, g) units to per-hectare and tons.).	-

Parameter used:

- BD: Bulk density (g / cm^{-3})
- d_j: Layer thickness (cm)
- C%: Organic carbon content (%)
- C_SedOC: Sediment organic carbon stock (t C / ha)

Allochthonous carbon adjustments shall follow SOC procedures already described in **Section 7.2.1**.

- **Soil Organic Carbon (C_SOC) Mangrove / Tidal Marsh / Seagrass Sediment**

$$\Delta C_{SOC,BL/P,f,s,t} = C_{SOC,t} - C_{SOC,t-1}$$

Equation 52

Variable	Description	Units
$\Delta C_{SOC,BL/P,f,s,t}$	Stock change in soil organic carbon (ΔC_SOC), including both autochthonous and allochthonous fractions, for segment component *f* within segment *s* for either the baseline (BL) or project (P) scenario.	t C / ha year
$C_{SOC,t}$	Soil organic carbon stock measured during year *t*.	t C / ha
$C_{SOC,t-1}$	Soil organic carbon stock measured during the previous year (*t–1*).	t C / ha

Parameters for integration into the system/model:

- D: Soil depth (cm)
- BD: Bulk density (g/cm^3)
- C%: Organic carbon content (%)