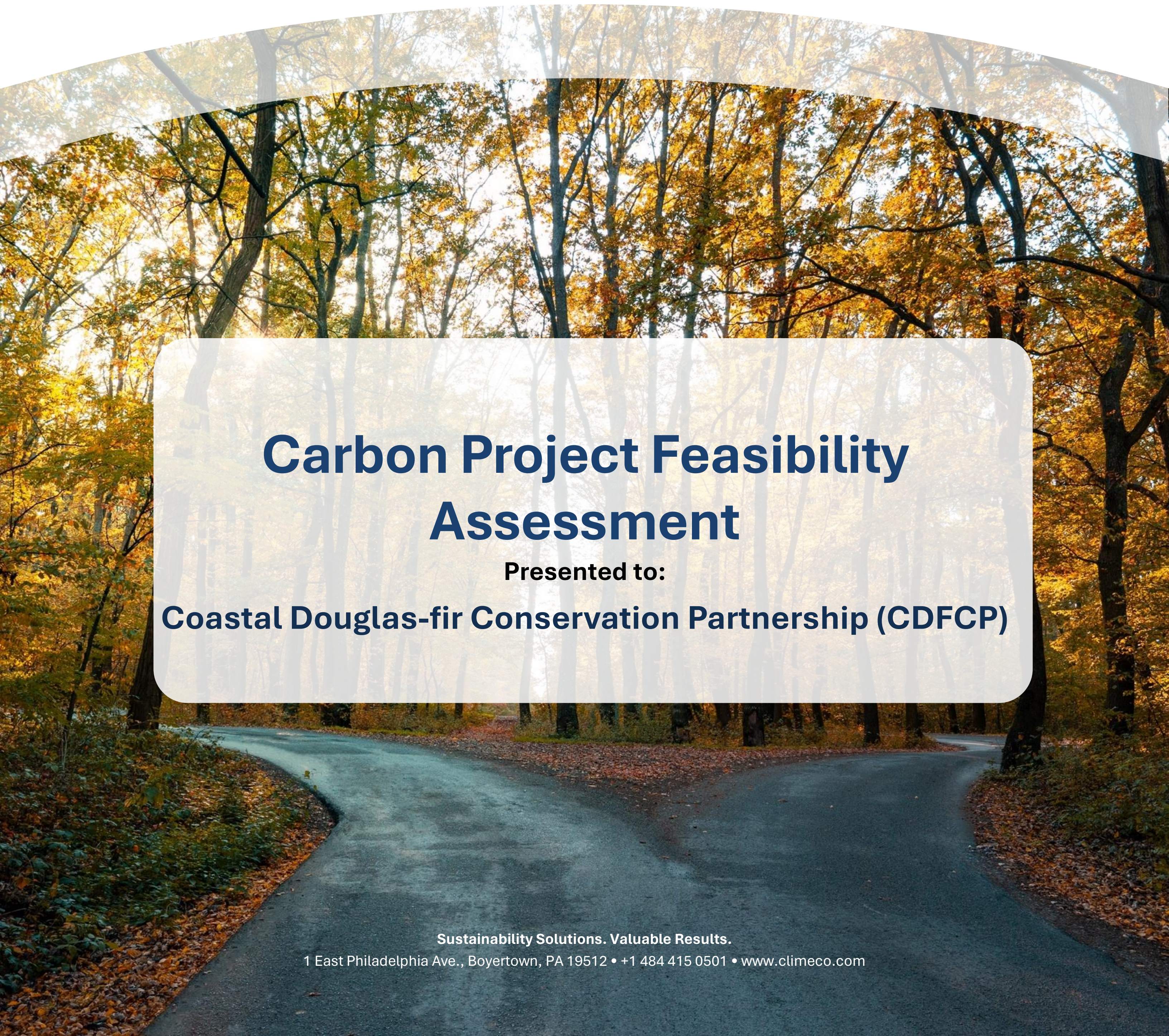
ClimeCo



Carbon Project Feasibility Assessment

Presented to:

Coastal Douglas-fir Conservation Partnership (CDFCP)

Sustainability Solutions. Valuable Results.

1 East Philadelphia Ave., Boyertown, PA 19512 • +1 484 415 0501 • www.climeco.com

Table of Contents

ClimeCo NBS Team

ClimeCo has assembled a talented team of professionals to carry out this feasibility assessment. The following are brief profiles of each team member:

Brad Seely (VP of Nature-Based Solutions, Project Development)

Experience: 15 years in developing carbon projects, ecosystem modelling, climate change impacts; PhD in biology from Boston University; Post-doctorate in Forest Management, University of British Colombia.

Juliana Magalhães (Sr. Project Associate of Nature-Based Solutions, Project Development)

Experience: 10 years in forest biomass mensuration and forest growth and yield modelling; PhD in Forest Sciences from the University of British Columbia (Canada), Post-doctorate in Forest Management, University of British Colombia.

Karina Salimbayeva (Sr. Project Associate of Nature-Based Solutions, Project Development)

Experience: 7 years in the environmental sector, including carbon project development and spatial analysis of forest dynamics; MSc in Ecology from the University of Alberta (Canada).

Disclaimer

Executive Summary

Forest carbon projects are initiatives aimed at reducing carbon dioxide emissions or capturing atmospheric carbon through forest management practices. By engaging in carbon markets, communities can access new economic opportunities and strengthen their resilience to climate change. This feasibility assessment focuses on land owned by the District of Metchosin and the Sunshine Coast Regional District to assess the feasibility of an aggregated forest carbon project.

The document is structured into sections for clarity. Section 2 elucidates the generation of carbon credits from forest projects and outlines the key steps in developing a forest carbon project. It emphasizes the difference between avoidance and removal credits, discusses compliance and voluntary carbon markets, with a specific focus on the Canadian Compliance Market. The types of forest carbon projects are detailed, along with the main requirements and eligible project activities. Additionally, a brief overview of major carbon registries and their requirements for aggregated projects is provided.

Section 3 presents the findings of two case studies estimating carbon credits for areas in the two Districts. Cost and revenue analyses were conducted for three different project sizes to determine the minimal area value needed for a profitable project.

In Section 4, the benefits of aggregated carbon projects are outlined, along with key considerations for local governments contemplating the development of such projects in the region.

Our comprehensive assessment suggests that avoided harvest projects appear most feasible, given the region's higher forested land compared to non-forested areas suitable for reforestation. Carbon projects must demonstrate additionality to qualify for marketable credits. It is advised that the District of Metchosin and the Sunshine Coast Regional District selects areas under deforestation pressure, either from commercial harvesting or development, to focus on preventing forest cover loss and generating avoidance credits. A minimum of 300 hectares is deemed necessary for the financial viability of an aggregated project in the region.

For local governments, establishing clear guidelines on eligibility criteria for aggregated forest carbon projects requires a thorough understanding of forest carbon standards and budgeting considerations. This feasibility assessment serves as a foundational document to assist decision-makers in evaluating the potential success of carbon projects and aligning them with strategic environmental objectives.

Section 1 – Introduction

1.1 Scope of Work

In December, 2023, the Coastal Douglas-fir Conservation Partnership (CDFCP) engaged ClimeCo to undertake a feasibility assessment to determine the potential for developing a grouped carbon offset project within the CDFCP's area of interest. The CDFCP's interest area includes Coastal Douglas-fir moist maritime biogeoclimatic subzone (CDFmm), the of the Coastal Western Hemlock very dry maritime variant (CWHxm1), as well as components of watersheds and islands that are related to CDFmm and CWHxm1 ecosystems. This work had three goals:

1.2 Goals

1. Conduct Feasibility Study

We performed a comprehensive feasibility study for two potential carbon projects in the District of Metchosin and the Sunshine Coast Regional District. We assessed the viability of implementing these carbon projects, considering factors such as additionality, economic feasibility, and potential returns.

2. Evaluate Implementation Costs

We evaluated the scale of implementation costs in relation to the potential returns. Special attention was given to exploring an aggregate approach, aiming to understand how combining resources can enhance efficiency and financial viability.

3. Design Local Government Guidelines

We provided clear guidelines to local governments regarding the eligibility criteria for aggregated carbon projects. This will contribute to a better understanding of when land can or cannot enter a project, facilitating smoother processes for all stakeholders involved.

1.3 Tasks

The guidelines for evaluating opportunities for carbon projects, specifically aggregated projects, build upon two tasks. The first task was a **mapping exercise** to (a) Evaluate relevant documents from the District of Metchosin and Sunshine Coast Regional District to assess on-ground conditions, vegetation, and potential challenges. (b) Utilize ArcGIS and the existing Vegetation Resources Inventory (VRI) database to estimate carbon storage of the analysed parcels, establishing a model for the grouped project.

The second task was an **estimate of implementation costs versus potential returns** in the aggregate approach based on potential carbon credit sales and other revenue streams. That includes all potential costs associated with project implementation, including registration fees, field studies, and land management expenses under different scenarios.

Section 2 – Understanding Carbon Offset Credits from Nature-Based Solutions

2.1 Carbon Credits from Nature-Based Solutions

Nature-Based Solutions (NBS) refer to strategies for managing natural systems to reduce carbon emissions and minimize adverse effects on ecosystem services. Forest carbon projects exemplify NBS applications. When structured appropriately, a forest ecosystem can be managed such that it generates carbon credits, A carbon credit is a transferable instrument certified by a government or independent bodies that represents an emission reduction, either from **removals** or **avoided emissions**, of one metric tonne of CO_2 or an equivalent amount of other greenhouse gases (GHGs). Carbon **offsets**, synonymous with carbon **credits**, are used to compensate for emissions occurring outside the project's boundaries. They serve as a valuable tool for NBS for several reasons:

- Carbon credits are bought by the private sector, directing capital to priority areas traditionally lacking funding.
- Carbon credits robust framework ensures rigorous measurement, reporting, and verification (MRV), guaranteeing genuine project benefits.
- Carbon credits can reduce compliance costs for entities mandated to decrease their carbon footprint.
- Carbon credits offer cost-effective mitigation options, thus aiding the transition to a low-carbon economy.
- Carbon credits diversify revenue sources for the forest sector beyond traditional activities like timber extraction (e.g. conservation-based management).

For a carbon project to effectively benefit the atmosphere, credits must meet specific criteria:

- **Real**: Carbon credits must originate from genuine, tangible projects.
- **Additional**: Carbon credits must exceed emission reductions or removals that would occur without revenue from carbon credit sales.
- **Verifiable**: Carbon credits must occur from emission reductions or removals that can be demonstrated.
- **Permanent**: Carbon credits must reflect emission reductions or removals that are durable and protected over time.

High-quality NBS projects have a measurable and verifiable atmospheric impact. They are founded on realistic and credible baseline scenario, also referred to as the “business as usual” scenario. A baseline is a reference state or emission values against which changes are measured. Determining whether a proposed project is additional hinges on comparing its outcome to the baseline scenario. Project activity must alter the conditions identified in the baseline scenario and result in emission reduction.

2.1.1 Estimating Carbon Credits

As demonstrated in Figure 1, carbon credits are generated from the difference in removals and avoided emissions between the **baseline scenario** (e.g. non-forested land, forested land under significant threat of permanent land use change, harvest in a working forest) and the **project activities** (e.g. planting trees, avoiding deforestation/degradation, reducing/deferring harvest, etc.). Different carbon source/sink pools can be used to calculate baseline emissions and project emissions reductions/removals. It depends on the project type (see Section 2.3 2.3 Forest Carbon Project Types) and the standard applied (see Section 2.4 2.4 Main Carbon Credit Registries). For instance, carbon source/sink pools of Improved Forest Management (IFM) projects can include wood products, above and below ground biomass, and dead wood. Secondary effects may also be considered, such as burning logging slash and fossil fuels, including carbon emissions related to machinery during site preparation, and emissions from clearing shrubs in the project area.

Figure 1. Carbon credits are based on the difference between baseline and project carbon emissions.

There is a risk of project activity displacing carbon emissions outside the project boundaries, also known as leakage. In the context of forest carbon projects, **activity shifting leakage** happens when changes in land management in one place shifts the emissions to another place. For instance, when decreasing deforestation in one location may increase deforestation in another location and when planting trees in one area may cause landowner to move subsistence farming or cattle ranching elsewhere. Moreover, project activity could change the supply and demand equilibrium, and that market dynamics may also lead to carbon emissions leaking beyond project boundaries. For instance, an Improved Forest Management (IFM) project is likely to cause **market leakage** when reducing harvest in one location can lead to increases elsewhere. To address this, prevailing standards require the monitoring of leakage emissions in nearby areas, also called "leakage belts", and adjusting credits to accommodate for anticipated leakage.

Additionally, there exists the potential for project failure. One of the biggest challenges for NBS projects is the appropriate handling of natural risks (e.g., fire, pests, hurricanes, climate change), internal management risks (e.g., project management, financial viability), and external risks (e.g., community engagement, land tenure). To ensure credit permanence, certain standards mandate allocating a portion (e.g. 10-30%) of generated credits to an insurance **buffer pool.** Buffer credits cannot be sold. They are set aside and can be cancelled if a “reversal” occurs, meaning carbon stocks are unexpectedly lost. For instance, Verra manages a pooled buffer account. Every NBS project is required to deposit a risk-adjusted percentage of the emission reductions and removals achieved into that account. If and as reversals occur in any single project, the carbon losses are covered through the cancellation of an equivalent number of buffer credits from that account. This buffer pool mitigates reversals associated with natural disturbances (e.g., fire, floods, hurricanes) or human-induced disturbances (e.g., illegal logging), ensuring that each carbon credit will deliver 1 ton of CO_2 emissions removals or avoidance. Projects that perform well over a 5-year monitoring period can claim up to 15% of their buffer credits returned.

Anticipated uncertainties in estimating carbon credits from NBS projects are expected. These uncertainties stem from errors inherent in measuring and estimating carbon stored in biomass, as well as in mapping project areas. These errors are accounted for by deducting estimated error terms from calculated emission reductions and removals. By using conservative carbon estimates, uncertainty can be minimized.

2.1.2 Steps of a carbon project

NBS projects typically begin with a pre-feasibility assessment to conceptualize the project and draft a preliminary idea note. This is followed by a thorough **feasibility study** to evaluate the project's viability considering factors such as project type (See Section 2.3 Forest Carbon Project Types), size (project area), standard and methodology chosen (See Section 2.4 Main Carbon Credit Registries), legal framework, financial viability, local context, and environmental risks. Once the due diligence phase is passed, it is time to solidify all the aforementioned information into the **Project Design Document (PDD)**, as illustrated in Figure 2. PDD describes all the project activities, including details related to the emissions reductions or removals, and the parameters to measure benefits, which will be monitored throughout the project length.

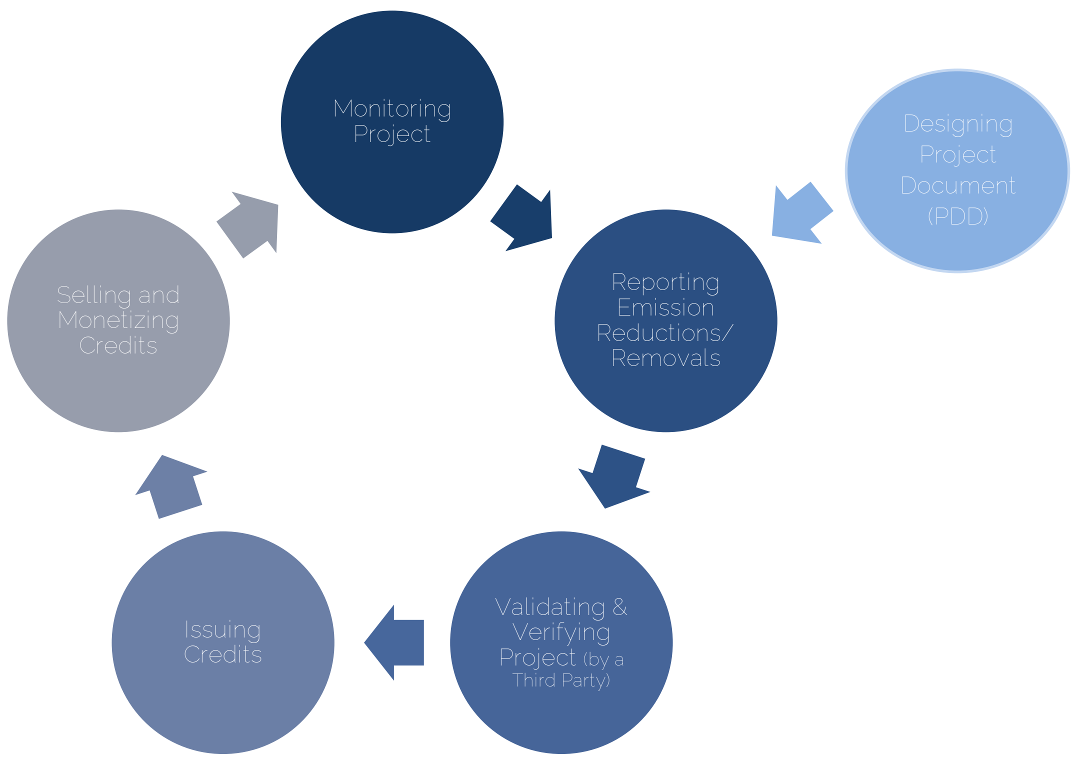


Figure 2. The Monitoring, Reporting and Verification cycle of a carbon project.

The length refers to the number of years, beginning from the project start date, that the project activity will be maintained. The **start date** of a NBS project is the date on which the project activities began generating GHG emission reductions or removals. For instance, for a reforestation project it would be the date trees were planted; for an avoided harvest project it would be the date an area was fenced or rangers start patrolling the area, and for a IFM project it would be the date when harvest stopped.

An independent third-party verifier plays a crucial role in ensuring the integrity and credibility of forest carbon projects. Before a project gets registered, verifiers assess the PDD to ensure they meet the requirements and methodologies of the relevant carbon standard or registry. This **validation** confirms the project has been properly designed to generate real and measurable emissions reductions or removals. Projects should complete validation within five to eight years of the project start date.

Once the project is validated, it is time to implement a rigorous monitoring, reporting and verification (MRV) to furnish stakeholders with dependable information and to mitigate the risk of inaccurate reporting. Robust MRV is crucial for the integrity of carbon markets and climate mitigation efforts.

Monitoring involves measuring and quantifying the amount of carbon removals or emissions avoided by the forest over time. It follows standardized protocols and guidelines, such as those from the Intergovernmental Panel on Climate Change, and typically includes A) field measurements of tree biomass, species composition, and growth rates; B) remote sensing data from satellites or aerial imagery to assess forest cover changes; and C) modeling techniques to estimate carbon stocks based on field data.

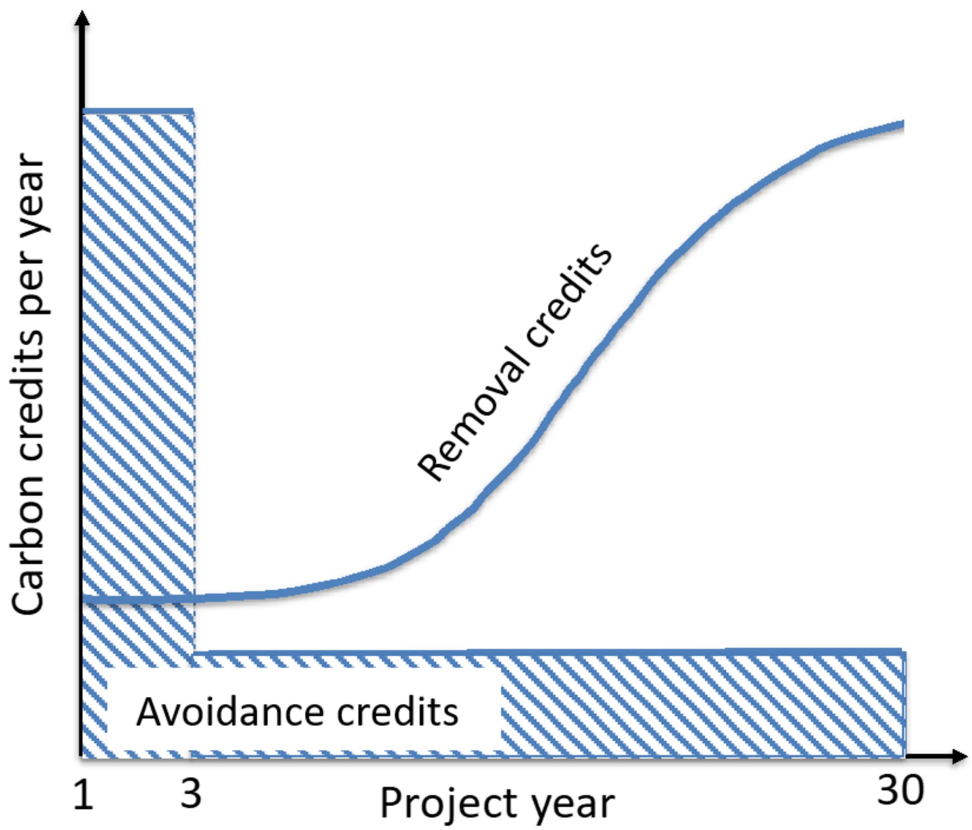
Then, project developers compile the monitoring data and report it to the relevant carbon registry or standard body following specific formats and requirements set by them. **Reporting** includes A) calculated net GHG removals or emissions reductions from the project; B) description of monitoring methods and data sources used; and C) assessment of potential risks of reversals (e.g. fire, disease).

Periodically, verifiers review and audit the project monitoring reports to ensure accuracy and conformance with the registry's standards. **Verification** involves A) checking monitoring and calculation methods for errors or omissions; B) assessing the risk of carbon reversals and sufficiency of buffer pools; and C) identifying any potential over-crediting or double-counting issues. After successful verification, the registry issues carbon credits to the project based on the verified net emissions reductions or removals. Verification is required periodically (e.g. annually for avoided harvest projects or very 5 years for reforestation projects) throughout the project's length. The time period for which GHG emission reductions or removals generated by the project are eligible for issuance is called **crediting period**. Credits are issued after each verification.

Payments from sale of credits issued are based on the actual amount of carbon removals or/and emissions avoided in each year, as verified through monitoring. Payments may be a fixed rate per ton of carbon or a percentage of credit sales revenue. Payment amounts can fluctuate based on carbon market prices if tied to credit sales revenue. Nevertheless, landowners may be able to negotiate payment terms like price floors or revenue sharing percentages. Furthermore, it is possible to negotiate up-front payments to help cover initial operational costs. The payment schedule and structure (upfront vs annual) are specified in the contract between the landowner and the carbon project developer. Longer contracts tend to have more annual payments spread out, while shorter contracts may provide a larger upfront payment.

2.1.3 Accrual of Carbon Credits

Figure 3 shows generalized carbon accrual curves for avoidance and removal credits, over a 30-year time horizon. For **avoidance credits** (e.g. credits issued from an avoided conversion or IFM project), there is a large tranche of credits that would be generated on a parcel in the first years, corresponding to the emissions from forest cover loss or preventing harvest that would have occurred in the baseline, but which would no longer occur in the carbon project. Thereafter, a lesser number of credits are generated reflecting the small relative difference in emission reductions between the baseline and project activity. In the case of **removal credits** (e.g. credits issued from a reforestation project or from an IFM project with enrichment planting), carbon credits accrue only very slowly initially when trees are small and slow growing. Once established, stands develop quickly as do their carbon stocks.



z

Figure 3. The annual flow of carbon credits over a 30-year period from a removal project activity (e.g. planting trees in a reforestation project or enrichment planting in a IFM project) and avoidance project activity (e.g. prevent forest cover loss in an avoided deforestation project)

2.2 Carbon Marketplace

The carbon marketplace is a system of trading instruments related to greenhouse gas emissions, such as carbon credits or offsets. There are two carbon markets: **compliance** and **voluntary**.

The idea of voluntary carbon markets has been around for decades, but it gained more attention and participation after the Kyoto Protocol in 1997, which was an international agreement to reduce emissions. However, not all countries joined the Kyoto Protocol, and its impact was limited. In 2015, the Paris Agreement was signed by 196 parties, with the goal of holding countries accountable for their actions on climate change and limiting global warming. The Paris Agreement encouraged the use of cap-and-trade systems, which set a limit on the total emissions allowed by participating entities and created a market for trading carbon credits. These are known as **compliance** markets, and they are mandatory in some jurisdictions (refer to Section 2.4.4 BC Offset Registry). National and subnational governments impose limits on major industrial emitters.

Voluntary markets, on the other hand, are where entities can choose to buy or sell carbon credits without being regulated by a cap-and-trade system. Companies or individuals buy carbon credits to demonstrate a commitment to reducing their carbon footprint and for corporate social responsibility goals. Demand for voluntary carbon credits should grow as governments and corporations strive to meet the goals of the 2015 Paris Agreement by mid-century or sooner. For instance, the new Carbon Offset and Reduction Scheme for International Aviation (CORSIA), a voluntary emissions offset system for airlines, should spur considerable demand for credits.

2.2.1 Carbon Credit Price

The valuation of carbon credits, particularly within the forest carbon credit market, is subject to a complex interplay of factors that can significantly influence price trends. Firstly, the absence of a futures market poses a considerable challenge to price discovery, as it limits visibility into future price movements and hinders the establishment of a transparent pricing mechanism. Secondly, project quality is a critical determinant of pricing; projects that demonstrate robust and verifiable environmental benefits command higher prices, reflecting their superior quality and impact. Lastly, the proprietary nature of transaction data contributes to opacity in pricing dynamics, as the lack of publicly reported financial data prevents a comprehensive analysis of market trends. These factors collectively underscore the need for enhanced transparency and standardization in the carbon credit marketplace to facilitate more predictable and equitable pricing structures.

Improving transparency in carbon credit pricing necessitates a multifaceted approach. Establishing a futures market for carbon credits could provide a forward-looking perspective on pricing trends, thereby enhancing market predictability. Furthermore, standardizing reporting requirements for project quality metrics would allow for more accurate comparisons and valuations across different projects. This could involve the development of universal benchmarks for environmental impact and verification processes. Additionally, mandating the disclosure of transaction data would shed light on proprietary dealings, enabling a more thorough understanding of market dynamics and helping to prevent price manipulation. These steps would collectively contribute to a more open and fair carbon credit marketplace.

2.2.2 Canadian Compliance Market

In 2016, the federal government initiated the Pan-Canadian Framework on Clean Growth and Climate Change[1] (referred to as the 'Framework'), aiming to devise a national strategy to achieve Canada's 2030 emission reduction goal, set at a 30% decrease in overall greenhouse gas (GHG) emissions using a 2005 baseline. It encompasses collective

[1] Available at En4-294-2016-eng.pdf (publications.gc.ca)

commitments from federal, provincial, and territorial governments and was developed in consultation with Indigenous peoples, the public, NGOs, and businesses. The Framework outlines over 50 measures targeting carbon pollution reduction, climate change resilience, clean technology advancement, and job creation. Key initiatives include carbon pricing and policies aimed at significant GHG emission reductions in sectors such as electricity, buildings, transport, industry, forestry, agriculture, and waste. The strategic environmental assessment anticipates direct outcomes like meeting Canada's 2030 climate target and indirect benefits such as reduced vulnerability to climate change impacts.

In 2018, the enactment of the Greenhouse Gas Pollution Pricing Act[2] (referred to as the Act) legalized both the Framework and the Carbon Pollution Pricing mechanism[3]. This Act ensures there is a price on carbon pollution across the country and consists of two primary components: Part 1 imposes a charge on 21 varieties of fuel and combustible waste (Fuel Charge), while Part 2 establishes an Output-Based Pricing System (OBPS) for all facilities emitting 50,000 tonnes or more per year of GHG in CO2 equivalent units, known as 'covered' entities. Facilities that emit over 10,000 tCO2e in regulated sectors can opt-in to the OBPS at any time. OBPS sectors are: oil and gas production, mineral processing, chemicals, pharmaceuticals, iron and steel, mining and ore processing, lime and nitrogen fertilizers, food processing, pulp and paper, automotive, electricity generation, and cement. The OBPS applies in regions failing to meet federal pricing and emissions reduction standards. BC, with its carbon tax linked to the federal carbon price, falls outside the purview of the OBPS.

The proposed federal Greenhouse Gas Offset Credit System Regulations[4] introduced a GHG offset system as a component of the government's carbon pollution pricing mechanism. Offsets serve as one compliance option for adhering to the government's emissions limit (or cap); covered entities surpassing the cap can opt to procure offsets equivalent to the excess emissions. During the compliance periods from 2019 to 2021, there were no constraints on the quantity of offsets usable, while the 2022 compliance period imposed a 75% limit. Entities can utilize offsets derived from the Federal GHG Offset System and Recognized Offset Units from approved provincial offset systems. On May 6th, 2024, Environment and Climate Change Canada (ECCC) published the Improved Forest Management on Private Land, Version 1.0 protocol (IFM Protocol)[5]. The IFM Protocol provides requirements for project implementation and the methodology for quantifying greenhouse gas (GHG) reductions from eligible IFM projects. ECCC continues to consult relevant stakeholders, including First Nations and Indigenous Peoples, on the development of the IFM on Public Lands protocol, which is expected to be developed and published later this year. On April 18th, Canada's British Columbia updated its offset regulation and published its second forest carbon offset protocol (FCOP 2.0)[6].

Since no forestry-based offsets have yet been developed for trade within the Canadian compliance market, prices remain uncertain. Nevertheless, it is anticipated that the Federal Government's projected carbon pricing trends under the Canadian Output Based Pricing System will establish a benchmark for offset prices. In this context, the pricing for the year 2022 stands at $50 CAD per ton of CO_2e, escalating by $15 annually until it reaches $170 CAD per ton in 2030.

---

[2] Available at Greenhouse Gas Pollution Pricing Act (justice.gc.ca)
[3] Available at Carbon pollution pricing: options for a Federal Greenhouse Gas Offset System - Canada.ca
[4] Available at Canada Gazette, Part 2, Volume 156, Number 12: Canadian Greenhouse Gas Offset Credit System Regulations
[5] Available at Improved forest management on private land (protocol version 1.0)
[6] Available at BC Forest Carbon Offset Protocol (FCOP 2.0)

Once operational, the Canadian compliance market will stimulate project development, thereby potentially restricting the supply for non-covered entities (companies not subject to emission limits), ultimately driving up voluntary credit prices as well. However, voluntary credits may trade at a discount to compliance credits since they are not mandatory and cater primarily to Environmental, Social and Governance (ESG) initiatives related to net-zero and carbon-neutral commitments rather than strict emission limits.

In 2024, the Canadian carbon compliance market continues to evolve, reflecting a global trend towards more robust carbon pricing and trading systems. As countries increasingly implement carbon border taxes, such as the European Union's Carbon Border Adjustment Mechanism (EU CBAM), there is a growing emphasis on emission monitoring and reporting. In Canada, the voluntary carbon offset market is gaining traction, with existing regimes aiming for higher emission reduction targets and extending coverage to more sectors to drive decarbonization efforts across various economic activities.

2.3 Forest Carbon Project Types

There are three different project types eligible to produce forest carbon credits in the compliance and voluntary market; Afforestation/Reforestation/Revegetation (ARR), Avoided Conversion or Reducing Emission from Deforestation and Degradation (REDD+), and Improved Forest Management (IFM) (Table 1). Project developers must be able to show that their forests are removing or avoiding emission of more carbon than a 'business-as-usual' scenario across the three forest project types. Each forest project has different costs and benefits, and approaches to carbon accounting.

Table 1. Types of forest carbon offset projects.

Project Type	Description	Eligible Project activities
Afforestation/ Reforestation/ Revegetation (ARR)	Project activities must increase tree and/ or shrub cover. Requires proof that project area is a non-forested land[7]. significant site preparation and maintenance.	Manual planting and broadcast seeding with significant site preparation and maintenance. Natural regeneration.
Avoided Conversion or Reduced Emissions from Deforestation and Degradation (REDD+)	Prevent conversion of forested land to non-forested land. Requires proof that project area is under significant threat of permanent land use conversion to be viable.	Reduce agricultural incursion, Prevent Forest cover loss, Sustainable Forest Management

[7] Areas subject to continuous cropping, in "settlements", or "other lands" land use category are eligible under the Verified Carbon Standard

Project Type	Description	Eligible Project activities
Improved Forest Management (IFM)	Increase or at a minimum maintain the current level of carbon stocking. Requires proof that project area is in a working forest[8].	Reduce timber harvest levels, Defer harvest, Extend rotation, Designate reserves, Release natural regeneration, Enrichment planting, Stand irrigation, Fertilization (See Section6.4 Forest Carbon Credit Methodologies).

2.4 Main Carbon Credit Registries

Carbon credit registries are centralized databases or platforms that track the ownership, issuance, and transfer of carbon credits. These registries serve as transparent and reliable mechanisms for monitoring and verifying the trading of carbon credits in compliance and voluntary markets. They record crucial information about the projects that generate carbon credits, such as the type of emission reduction activities undertaken, the amount of emissions reduced, and the corresponding credits issued. Registries require projects to undertake a formal validation and verification process to ensure veracity and accuracy of the resulting credits. In that way, carbon credit registries play a pivotal role in ensuring the integrity and accountability of carbon markets by facilitating the transparent accounting and auditing of carbon credits, ultimately contributing to global efforts to combat climate change.

2.4.1 Verra

Verra leads a world-wide carbon crediting program, the Verified Carbon Standard (VCS). Once credits have been certified, they are issued on the registry as Verified Carbon Units (VCUs). VCUs can be sold on the registry or the compliance and voluntary carbon market and retired by individuals and companies to offset emissions.

Permanence requirement: Agriculture, Forestry and Other Land Use (AFOLU) projects have a minimum crediting period of 20 years (and a minimum project length of 40 years) with the option of renewing up to four times for a total of 100 years. Based on a project's risk assessment, a percent of credits must be set aside as a buffer to compensate for unplanned reversals.

The requirements for aggregated projects are:

- **Predetermined eligibility**. The project proponent sets the geographic boundaries for the grouped project, including where new project activity instances (i.e., individual landowners) may be added, and establishes criteria for determining the eligibility of future instances.

[8] Forestland that is carefully managed to provide a continuous and sustainable supply of wood for various purposes, such as lumber, energy, paper, packaging, and other consumer goods. (https://nafoalliance.org/issues/working-forests/)

- **Complete initial validation**. The project proponent contracts an independent validation/verification body (VVB) to assess the grouped project and whether the eligibility criteria are appropriate for determining the validity of future instances.
- **Undergo verification**. The project proponent contracts a VVB to ensure the emission reduction or removals are real.
- **Add new instances**. The project proponent may include new project activity instances (i.e. areas) during a verification event.

Currently, there are three IFM projects registered under the VCS program within Canada, and two are in BC. There are eight projects under validation process.

2.4.2 British Columbia Offset Registry

The British Columbia Forest Carbon Offset Protocol (BC FCOP) is a financing tool to promote conservation or protection of the environment. It is the only methodology applicable to carbon-based forest projects on the BC Offset Registry. The protocol considers Afforestation/Reforestation, Conservation/Improved Forest Management and Avoided Conversion as eligible project types. In addition, the Protocol creates legal requirements that project proponents, validation bodies, and verification bodies must follow for the proponent to obtain offset units under the Greenhouse Gas Industrial Reporting and Control Act.

Permanence requirement: A crediting period length for an eligible project is 25 years from the project start date, unless the project proponent, in the project plan, chooses a shorter crediting period. The protocol requests a 100-year monitoring period beginning at the end of the crediting period to ensure permanence of GHG reductions and removals. Risk of reversal should be managed throughout both periods, and monitoring reports submitted at periodic intervals. To mitigate the risk of potential reversal events that can cause an impaired project reduction, project proponents are required to contribute a percentage of the net sequestration before risk of reversal during each project report period to the contingency account (buffer pool).

Aggregated Projects: The protocol permits aggregated forest carbon projects. Project instances must be homogenous, otherwise, non-homogenous project instances must be measured separately. Homogeneity in this instance means each project instance is in the same biogeoclimatic zone site series. Other requirements include the Project Plan which must consider the estimated project reduction for each instance. In the project plan, the project proponent must detail their monitoring and maintenance plan and identify the retention period for records associated with the project. The data collection and monitoring approach must be validated and must be followed throughout the crediting period and monitoring period. Project Instances added afterwards must be evaluated during the next Verification.

2.4.3 American Carbon Registry (ACR)

The American Carbon Registry is a registry for both the voluntary market and the California Air Resources Board compliance market. It was the first voluntary greenhouse gas registry in the world. Issued credits are called Emission Reduction Tons (ERTs). Although most ACR methodologies are designed for projects situated within the conterminous US, there is one IFM methodology specifically for Canadian Forestlands.

Permanence requirement: A crediting period of twenty (20) years and a minimum commitment of 40 years. Any potential loss of sequestered carbon must be addressed by means of either a buffer pool, insurance or other risk mitigation measures approved by ACR. The risk assessment is made following the ACR Tool for Risk Analysis and Buffer Determination.

Aggregated Projects: While aggregation is allowed, projects are advised against aggregating multiple forest types, or utilizing a geographic region that is overly large.

2.4.4 Climate Action Reserve (CAR)

CAR is a carbon registry that operates for the voluntary carbon market and serves as an Offset Project Registry for California's compliance cap-and-trade program.

Permanence requirement: Crediting period lengths depend on the project methodology. For most non- sequestration projects, there is a 10-year crediting period that may be renewed one time for a maximum of two 10-year periods, or 20 years total. For sequestration projects, the crediting period may be up to 100 years.

Aggregated Projects: There is no upper or lower limit on the total number of forest acres enrolled in an aggregate. However, an individual Forest Owner may enrol a single 5,000-acre area (≈2,000-ha), or multiple areas adding up to 5,000 acres. Each participant in the aggregate registers independently and holds a separate account on the Reserve software system.

Section 3 – Evaluating Opportunities for Aggregated Carbon Projects based on two Case Studies

At present the carbon protocols suggested to landowners on the south-west coast of BC for aggregated (grouped) projects are provided through the Verified Carbon Standard (VCS), which is managed by Verra. Credits generated by these protocols would be sold into the voluntary market. There are three types of projects available through VCS (See Section 2.3 Forest Carbon Project Types);

- afforestation/reforestation/revegetation (ARR);
- avoided conversion (REDD+); and
- improved forest management (IFM).

Taking into consideration past forest management and the effects of climate change on the south-west coast landowners may favour an IFM carbon project over avoided deforestation, where land management activities may be more restricted.

The protocols for Improved Forest Management (IFM) enable working forests to transition to sustainable forests that are more resilient to climate change. This means they are appropriately stocked so that they can develop larger, older trees and maintain high growth rates. Forest management practices could include:

- Enrichment planting.
- Enhancing natural regeneration by the management of competing vegetation.
- Stand irrigation and/or fertilization.
- Reducing timber harvest levels.
- Deferring harvest by extending rotations.
- Altering fire severity by fuel load treatments.

If an aggregate project were to be established on the south-west coast of BC it would need to demonstrate additionality, like all carbon projects, by showing that the project area encompasses forests facing deforestation pressure from harvesting or development.

The following assessment is focused on land parcels owned by the District of Metchosin and the Sunshine Coast Regional District. **These local governments have not committed to implementing a carbon project**. This assessment has been undertaken as a means of investigating the potential for an aggregate (grouped) project in south-west BC of small landholdings, potentially led by local government or a non-profit organisation, that would generate income to enable sustainable forest management.

3.1 Mapping Forest Cover

3.1.1 Property Description - Study Area 1 – District of Metchosin

Buffer Land or Section 94 (PID = 030095875) is located in the District of Metchosin. The property covers 46 hectares of secondary-growth forest (Figure 4). Metchosin Creek flows through the property. The elevation of the property ranges from approximately 80 to 120 metres above sea level. The northern end of the parcel is zoned as Commercial Recreation (CR) 2 and the southern end is zoned as CR 3. CR2 allows for subdivisions of 3.9 hectares and CR3 allows for subdivisions of 2 hectares. The land is immediately adjacent to the City of Langford, where parcels are actively being cleared/developed for either a residential subdivision or an industrial park.

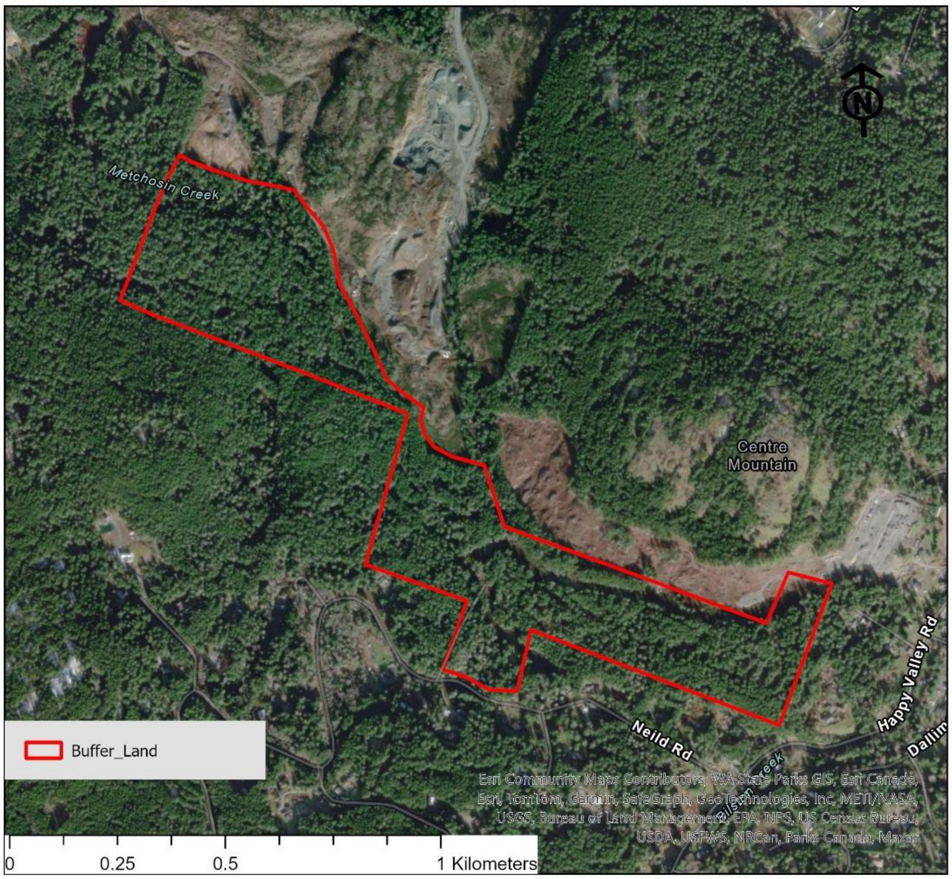


Figure 4. Project Location – Buffer Land.

3.1.2 Property Description - Study Area 2 – Sunshine Coast Regional District

Hillside 1 (PID = 005363942) and Hillside 2 (PID = 017866561) are located in the Sunshine Coast Regional District. The two sites are both secondary-growth forests where Hillside 1 is 63.3 hectares (156.5 acres) and Hillside 2 is 50.1 hectares (123.69 acres) (Figure 5). The site was harvested between 60-140 year ago, and part of the site has been used for gravel extraction. In the Sunshine Coast Regional District Zoning Bylaw 722 Hillside 1 land use zoning is Rural Residential Two (RU2) and it is classified as zoning subdivision I which sets a minimum land parcel at 4 ha. Hillside 2 land use zoning is Industrial Seven (I7); Industrial Eleven (I11) and Rural Residential Two (RU2). Its zoning Subdivision is I (minimum parcel 4 ha) and F (minimum parcel 8000m^2).

It is understood that there are currently no resources allocated to the management of these parcels, but the future intent is to use the area as an demonstration forest defined in Zoning Bylaw 722 as land administered by a public authority and used to promote public education and awareness of forests and integrated forest resource management including water management, timber harvesting, reforestation, spacing, thinning and other forest management practices, fish and wildlife management and outdoor recreation.

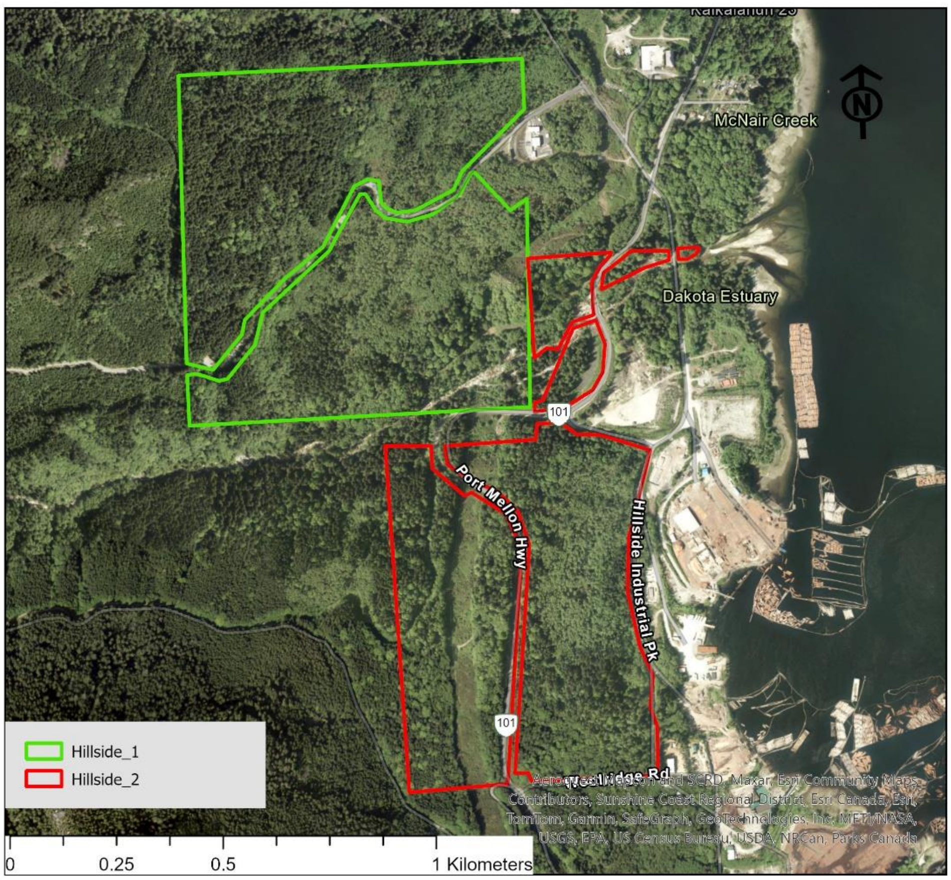


Figure 5. Project Location – Hillside 1 and Hillside 2.

3.1.3 Stand Composition

To facilitate carbon modelling, Vegetation Resources Inventory (VRI) data was accessed to estimate predominant forest stands of study areas[9]. A stand is defined as a contiguous area that contains a number of trees that are relatively homogeneous or have a common set of characteristics. In VRI dataset, stands represent inventory polygons containing detailed information on forest attributes such as species composition, age, height, and volume. For the purpose of this analysis, VRI stand polygons were overlayed with study areas in ArcGIS to extract the total and averages of target forest attributes.

The ecological community present on 90% of Study Area 1 – the Buffer Land property is Douglas-fir/ dull Oregon-grape (*Pseudotsuga menziesii/ Mahonia nervosa*) which is part of the Coastal Douglas-fir (CDFmm) subzone. The Conservation Data Centre (CDC) indicates on the BC Species and Ecosystem Explorer that this ecological community is on the BC Red-list and is also considered to be globally imperilled.

The forest cover of Study Area 2 – Hillside 1 and Hillside 2 sites are mixed coniferous and deciduous. Overall, the stand is dominated by Douglas-fir and western hemlock, with a deciduous component primarily of red alder and big leafed maple. These properties are located in the coastal western hemlock zone (CWHxm1), which is one of Canada's wettest climates and most productive forest areas[10].

Terrestrial Ecosystem Mapping (TEM) indicates that there is the potential for the following red and blue listed ecosystems in Study Area 2. The classification of forested ecosystems beyond the riparian zone takes into consideration their structural stage when determining if they would be considered at risk therefore their status should be confirmed through field survey completed by a Registered Professional Biologist (RPBio):

Hillside 1

- Sitka spruce / salmonberry Very Wet Maritime – red listed

Hillside 2

- western redcedar / sword fern Dry Maritime – red listed
- western hemlock / flat-moss – blue listed
- western redcedar / three-leaved foamflower Dry Maritime – blue listed
- black cottonwood – red alder / salmonberry – blue listed

The dominant stand types were selected and examined for factors such as site index, age, and species cover (%) (Table 2). Site index is simply defined as the average height at some fixed age (commonly 50 years at breast height) attained

[9] VRI - 2023 - Forest Vegetation Composite Rank 1 Layer (R1) - https://open.canada.ca/data/en/dataset/2ebb35d8-c82f-4a17-9c96-612ac3532d55
[10] Coastal western hemlock zone - Province of British Columbia

by dominant and co-dominant site trees selected to reflect site potential[11]. Assessing the site index provided information on the ability of study areas to support tree growth and development. Age was evaluated to understand the development stage of the stands, providing insights into their growth trajectory and potential for future timber yield. Additionally, species cover (%) was analyzed to determine the dominance and distribution of different tree species within the stands. This examination aimed to gather comprehensive information essential for carbon modelling described in Section 3.2.3.

Table 2. A description of the stands used to stratify the forest land base and facilitate carbon modelling

Property	Stand Type	Description	Age	SI	SP1	SP2	SP3	SP1 (%)	SP2 (%)	SP3 (%)	Area (ha)
Study Area 1 – District of Metchosin											
Buffer Land	1	Conifer Dominated	84	25.5	Fdc	Plc		0.9	0.1		13.3
Buffer Land	2	Conifer Dominated	91	26.3	Fdc	Cw		0.95	0.05		33.3
Study Area 2 – Sunshine Coast Regional District											
Hillside 1	1	Mixed Coniferous/ Deciduous	59	34.7	Fdc	Dr	Cw	0.5	0.4	0.1	22.3
Hillside 1	2	Deciduous Dominated	49	22	Dr	Fdc	Mb	0.8	0.1	0.1	34.8
Hillside 1	3	Conifer Dominated	79	29.9	Hw	Cw	Dr	0.7	0.15	0.15	4.9
Hillside 2	1	Deciduous Dominated	95	27.5	Dr	Mb	Hw	0.7	0.2	0.1	34.5
Hillside 2	2	Conifer Dominated	139	28.4	Fdc	Hw	Mb	0.8	0.1	0.1	1.9
Hillside	3	Conifer Dominated	79	29.9	Hw	Cw	Dr	0.7	0.15	0.15	5.6

* SI = Site Index; SP = Species
* Fd = Douglas-fir, Hw = western hemlock, Cw = western red cedar, Dr = red alder, Mb = bigleaf maple

3.2 Estimating Carbon

3.2.1 The Baseline Scenario

The baseline scenario is the hypothetical description of what the most likely land management on the site would have been in the absence of the carbon project (business-as-usual).

[11] Making sense of site index estimates in British Columbia: A quick look at the big picture

The baseline should include the actors, drivers of land use change, and trends in degradation or deforestation. This information should be backed up with historical data and trends, challenging common perceptions with objective evidence (e.g., through a comparison of deforestation trends in the last ten versus five years). Areas already designated as protected forests should be removed from baseline. It is necessary to demonstrate that the project area is under deforestation pressure or has been degraded historically. The main eligibility of IFM methodologies is a managed forest, and many methodologies even require proof of a harvesting scenario.

Study Area 1 – District of Metchosin

The Buffer Land has been owned by the District of Metchosin, since 2017. The land is immediately adjacent to the City of Langford, where parcels are actively being cleared/developed for either a residential subdivision or an industrial park. It indicates a trend towards urban expansion or industrialization in the area. This proximity may increase the likelihood of forest clearing on the Buffer Land for the purpose of commercial recreation. According to the Official Community Plan Bylaw of District Metchosin, commercial recreation zoning allows for the development and expansion of commercial recreational facilities including but not limited to golf courses, campgrounds, riding stables or similar uses[12]. Therefore, the most likely baseline scenario would be the clearing of forested lands for recreational uses. It should be noted that such clearing of forest land can still be compatible with IFM principles if it aligns with sustainable forest management goals. Recreation can be considered as one of the multiple forest services provided by a forest ecosystem.

Study Area 2 – Sunshine Coast Regional District

Hillside 1 and Hillside 2 are in the ownership of the Sunshine Coast Regional District. The sites have been harvested at different times resulting in second-growth forests aged from 60-140 years old. Part of the site has been used for gravel extraction. Both Hillside 1 and Hillside 2 are zoned for the purpose of residential, rural and resource use. According to the Sunshine Coast Regional District Zoning Bylaw 722[13], rural residential zoning allows for forest management as the permitted principal use. Forest management includes, but is not limited to, the growing and harvesting of wood for fuel and lumber, and other forms of timber production and harvesting. In addition, Hillside 2 permits land uses for industrial purposes which include wood processing. Therefore, the most likely baseline scenario would be timber harvesting in conjunction with wood processing. The recent high demand and prices for timber would have also presented a compelling opportunity to help offset land purchase and development costs through timber extraction.

3.2.2 The Project Scenario

The Project Scenario is the intervention that will be undertaken to reduce or prevent carbon emissions. In this case, avoided clearing/harvesting is the project scenario. The emissions avoided to be released into the atmosphere if trees

[12] Official Community Plan Bylaw - Consolidated September 2020
[13] The Sunshine Coast Regional District Zoning Bylaw 722

were removed will be compared to the baseline scenario (emissions from. clearing/harvesting) to calculate the amount of carbon stored and subsequently carbon credits.

Study Areas:

1. District of Metchosin: Focus on preserving forests adjacent to urban areas threatened by development, avoiding the clearing of forested land for commercial recreational uses. Forests will be managed using methods that prioritize biodiversity conservation and habitat restoration.
2. Sunshine Coast Regional District: Implement avoidance project activities in second-growth forests (e.g. preventing forest cover loss or depletion of forest inventories). Timber harvesting and wood processing activities will not be emphasized. Forests will be managed using methods that prioritize biodiversity conservation and habitat restoration.

In both cases, the project scenario assumes that the Sunshine Coast Regional District and the District of Metchosin will retain and protect the existing forest over the duration of the carbon project (for example 20 years), at a minimum. Under this scenario, the forest would continue to grow and sequester additional carbon in biomass and coarse woody debris. This assumes no significant unplanned forest clearing but does not preclude activities such as trail development; removal of danger trees; wildfire management works or other uses that do not materially affect the total forest carbon stocks.

3.2.3 Carbon Modelling

Based on the range of metrics evaluated to this point, the next step is to model carbon sequestration dynamics influenced by different forest management treatments. Two key components of carbon modelling: stand-level and landscape-level modelling. Stand-level modelling focuses on the growth and development of individual forest stands (Table 2), providing detailed insights into carbon dynamics within specific part of the study areas. Stand-level data serve as building blocks for landscape-level models allowing to analyze carbon dynamics across the entire area.

Models were applied to both baseline scenario, which represents the expected projection of carbon dynamics without intervention, and project scenarios, which outline the potential impacts of avoided harvesting practices. The primary difference between these scenarios is the carbon credits generated by the project, reflecting the additional carbon stored due to project activities (Figure 1).

3.2.3.1 Analysis units

For each study area, the dominant stand types were selected (Table 2) and used as analysis units for the Table Interpolation Program for Stand Yields (TIPSY) modelling. TIPSY is a growth and yield program that provides public access to managed stand yield tables generated by TASS and SYLVER[14]. TIPSY has been operating since 1991, and continues to be the primary vehicle for most operational applications of stand simulation in B.C. The growth of managed stands starting at age zero was projected to develop annual yield curves. Output tables used age ranging from 0 to 200[15].

[14] Table Interpolation Program for Stand Yields (TIPSY)
[15] CDFCP_Carbon_Modelling.xlsx

3.2.3.2 Stand-level modelling

Carbon dynamics within each of the analysis units were simulated with the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) model. Specifically, TIPSY-generated yield data was integrated into CBM-CFS3 to model carbon dynamics under different management treatments, no harvest, and clearing (removal of most organic material) (Table 3). By comparing carbon dynamics between those scenarios, the effectiveness of avoided harvesting practices in enhancing carbon storage is evaluated in the later steps. The CBM-CFS3 output from each combination of analysis unit and treatment was summarized in a database of carbon accrual by age and ecosystem component, on a per-hectare basis. An additional data field was calculated called ecosystem C storage comprised of above and below-ground tree biomass, dead below-ground biomass (in the case of harvesting), soil carbon, and above-ground litter. These components of the forest represent most common pools of carbon in forest carbon projects. Based on the age of stand type, points along the carbon accrual curves were selected and referenced as a starting point for the baseline and project scenarios, from which subsequent losses and gains are calculated. For example, the starting point for the baseline and project scenarios of Buffer Land – Stand 1 is Age 84 reflecting the potential age of the stand when different management treatments are applied.

Table 3. Stand treatments simulated for each analysis unit using the CBM-CFS3 model.

Treatment	Disturbance Impacts	Regeneration	Scenario Application
No harvest	None	Natural[1]	Retained areas: project and baseline
Clearing	Whole tree harvest, stump removal, removal of coarse woody debris	None	Baseline: 25% of the forest will be cleared

[1]Regeneration characteristics for each stand type are shown in Table 2.

3.2.3.3 Landscape-scale modelling

After collecting stand-level carbon information for each combination of analysis unit and treatment, a landscape-scale model was developed to aggregate ecosystem carbon storage for study areas, in both the project and baseline scenarios. The model involved: 1. Extracting the previously calculated ecosystem C from the carbon curve database developed from the stand-level modelling exercise (this database contained information on carbon density across various stand types and ages); 2. Multiplying this carbon density information by the forested area to calculate the total carbon content for each analysis unit; 3. Summing the results to calculate the total carbon content for the entire study area. (See Appendix 6.2 - Carbon Modelling Results)

Following the establishment of the landscape-scale model, a 20-year simulation was conducted to project the long-term impact of forest clearing and of future growth (in areas where the forest was retained) on ecosystem C content, in both the baseline and project scenario.[16] The annual change in ecosystem C storage in the baseline was subtracted from its associated value in the project scenario to determine the annual net CO2e benefit for each study area. This

[16] CDFCP_Carbon_Modelling.xlsx

also includes additional deductions for harvested wood products (10%) and uncertainty and leakage (discounted by 15%). The resulting value was converted to metric tons of CO2 using the conversion factor 0f 44/12, this factor accounts for the molar mass of CO2 (44 g/mol) and the molar mass of C (12 g/mol). The net difference in the amount of carbon emissions between the baseline and project scenarios directly translates into marketable credits (Table 4-5).

- **Harvested Wood Products (HWP):** When trees are harvested, not all the carbon within them is immediately released into the atmosphere. Some of it may be stored in wood products like lumber or furniture. To account for this, a deduction of 10% is applied to the net carbon benefit calculation. This deduction acknowledges that a portion of the harvested carbon remains stored in wood products rather than being released as CO2 immediately.
- **Uncertainty & Leakage:** Uncertainty refers to the variability and limitations in the carbon accounting models and data inputs. Leakage concerns the possibility that efforts to reduce emissions in one area may unintentionally lead to increased emissions in another area, typically due to changes in land use or management practices. For example, forest protection efforts in study areas may lead to increased logging or deforestation in nearby areas. To address these factors, a discount of 15% is applied to the net carbon benefit calculation. This discount serves as a precautionary measure to account for uncertainties and potential leakage effects, ensuring that the calculated benefits are conservative estimates that account for these uncertainties.

Table 4. The annual net CO2e benefit in Study Area 1

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
0					
1	84.2	-2,140.0	141.8	312	6,490
2	89.6	-66.8	0	23	488
3	86.2	-45.6	0	20	411
4	91.6	-24.6	0	17	362
5	88.2	-14.8	0	15	321
6	78.4	-12.8	0	14	284
7	89.9	3.0	0	13	271
8	80.1	1.4	0	12	245
9	80.9	6.7	0	11	231
10	96.7	22.4	0	11	231
11	82.6	15.3	0	10	210
12	83.4	18.7	0	10	201
13	88.5	25.1	0	10	198
14	84.9	24.7	0	9	188

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
15	85.6	27.2	0	9	182
16	86.3	29.6	0	9	177
17	87.0	31.7	0	8	172
18	87.7	33.7	0	8	168
19	88.4	35.6	0	8	164
20	89.0	37.3	0	8	161

Table 5. The annual net CO2e benefit in Study Area 2

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
0					
1	174.5	-3,801.8	256.5	558	11,593
2	175.1	-125.0	0	45	935
3	189.1	-67.1	0	38	799
4	176.7	-43.2	0	33	685
5	186.9	-11.7	0	30	619
6	176.7	-1.7	0	27	556
7	195.7	26.0	0	25	529
8	181.6	26.0	0	23	485
9	182.9	35.5	0	22	460
10	191.1	48.7	0	21	444
11	193.2	56.2	0	21	427
12	175.1	47.7	0	19	397
13	196.7	68.4	0	19	400
14	138.7	28.9	0	16	342
15	136.8	31.1	0	16	330
16	133.5	31.8	0	15	317
17	114.3	20.3	0	14	293
18	114.2	22.8	0	14	285
19	111.8	23.4	0	13	276
20	98.1	15.3	0	12	258

3.3 Estimating Costs and Revenue

The final part of the feasibility analysis involved estimating costs associated with implementing forest carbon projects within the designated study areas. Additionally, a comparative analysis will be conducted to evaluate the viability of running these projects independently versus adopting an aggregate approach, potentially supported by an anchor project.

3.3.1 Cost Estimation

Understanding the financial implications of implementing forest carbon projects is crucial for assessing their feasibility and long-term sustainability. This section covers the major estimated costs associated with various aspects of project setup and implementation. These costs encompass land acquisition, baseline studies, technology and equipment procurement, personnel expenses, any project activities, monitoring and reporting efforts, and community engagement initiatives. A detailed breakdown of these costs will provide insights into the financial requirements of executing forest carbon projects within the designated study areas. The following table presents a summary of the estimated costs for each component of the forest carbon projects:

Table 6. Typical Forest Carbon Project Costs.

Project Setup Costs	**Descriptions**
Land Acquisition	The costs associated with acquiring land for the project, including legal fees, land surveys, and any necessary permits. Given that the properties are owned by Sunshine Coast Regional District and the District of Metchosin, land acquisition costs will not be included in the financial assessment of Study Area 2.
Project Development	The project development expenses relate to: • Carbon modelling activities to estimate baseline carbon stocks, project emissions, and sequestration potential, informing project design and implementation strategies. • Technology and equipment required for assessing carbon sequestration and emissions, such as remote sensing devices, drones, and software. • Staffing and coordination, including project management, coordination between stakeholders, and administration. That also includes the costs associated with drafting the Project Design Document (PDD) and ongoing follow-up activities, including documentation, verification, and certification processes. In the first year of the project, it is expected that costs will be US $100,000 (**CAD$ 138,000**) for project development. The second year comes to US $75,000 (**CAD$ 103,500**) since the majority of project development activities like carbon modelling, PDD drafting, and stakeholder engagement are completed. The following years require US $50,000 (**CAD$ 69,000**) annually for the project management and administration tasks.

Project Setup Costs	Descriptions
Forest Inventory	The costs associated with conducting forest inventory assessments to quantify tree species, density, and other relevant forest characteristics. These costs may include fieldwork, data analysis, and reporting. It is expected to cost US$ 70,000 (**CAD$ 96,600**) to develop a forest inventory database, but the costs mainly depend on project size and forest heterogeneity.
Validation & Verification	Budget for validation and verification activities to ensure the accuracy and credibility of project data and methodologies. Costs may include third-party audits, certification fees, and documentation. Expect US $50,000 - 80,000 (**CAD$ 69,000 – 110,000**) per verification event, at least once every 3 years. More frequent verifications can generate revenues sooner if expected GHG benefits make the expense worthwhile.
Registry Fee	Include the cost of registering the project with relevant carbon registries or platforms. For VCS, US$500 (**CAD$ 700**) for the first year. Additional fees apply for transfers between registry accounts.
Issuance Fee	Budget for the issuance fee associated with issuing carbon credits or offsets. For VCS, US $0.18 (**CAD$ 0.25**) per carbon credits issued.

Allowing projects to register as part of a group or bundling multiple instances of eligible project activities together can significantly reduce the costs associated with various project setup expenses. For example, this aggregated approach enables shared access to carbon modelling and technology and equipment resources, maximizing efficiency and minimizing costs. Similarly, costs associated with staffing and coordination can be optimized across multiple projects, ensuring effective project management and stakeholder engagement. Finally, there are reduced costs for validation and verification and shared registry fees.

3.3.2 Revenue Estimation

In this section, we apply all the discussed project setup costs to Study Area 1 and Study Area 2 to estimate the expected revenue under both the individual vs. aggregated approach. These financials are modelled by projecting the future sale of carbon credits based on estimated timing and market[17]. Subsequently, net cash flow analysis involves subtracting the total project costs from the projected revenue generated by carbon credits sales (Figure 6). This calculation provides insights into the project's financial viability and potential profitability over time.

[17] For more details, refer to CDFCP_Proforma v.2.xlsx

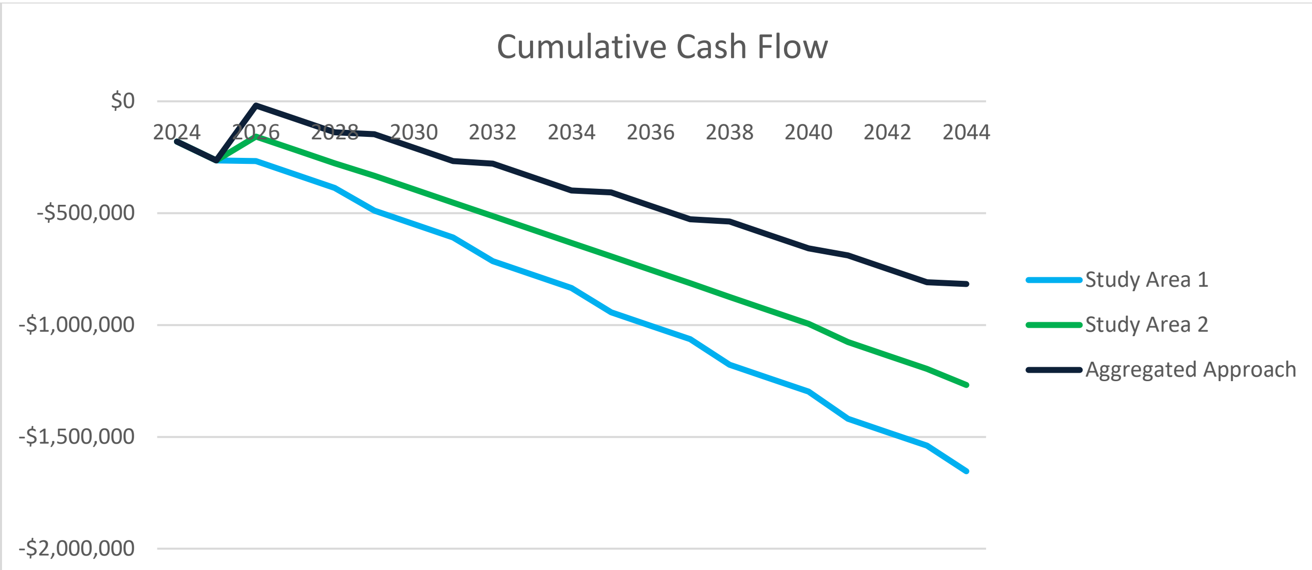


Figure 6. Cumulative Cash Flow under individual vs aggregated approach with Study Area 1 and Study Area 2.

3.3.2.1 Viability of Independent Projects

As independent projects, both Study Area 1 and Study Area 2 will face challenges in achieving long-term profitability, The high setup costs and lower revenue projections contribute to limited cash flow generation for individual projects. This suggests potential difficulties in covering initial investments and achieving positive returns within expected timelines, especially considering the limited size of study areas and low deforestation threat (only 25% was expected to be cleared in the baseline scenario, additional analysis with a 50% clearing rate is demonstrated in the Appendix Section 6.3).

3.3.2.2 Aggregated Approach

Overall, pooling the projects together should facilitate financial viability and maximize carbon sequestration potential. In this case, however, the aggregated approach will face similar challenges as individual projects due to the limited size of study areas and low deforestation threat (See Appendix for 50% clearing scenario). In Figure 6, the total area for the aggregated approach is 150 ha (sum of Study Area 1 and Study Area 2) and the activity area (25% of cleared forest) is 36.6 ha. To achieve long-term profitability, we suggest increasing the total area by identifying additional sites to include in the group project. Under the VCS program, the project proponent sets the geographic boundaries for the grouped project, including where new project activity instances may be added, and establishes criteria for determining the eligibility of future instances. For this analysis, we predict adding new project sites with comparable deforestation threats to simplify carbon modelling. In Figure 7, the cumulative cash flow is modelled under the total area of 150ha, 300ha and 450ha with the assumption that around 25% of forest will be cleared.

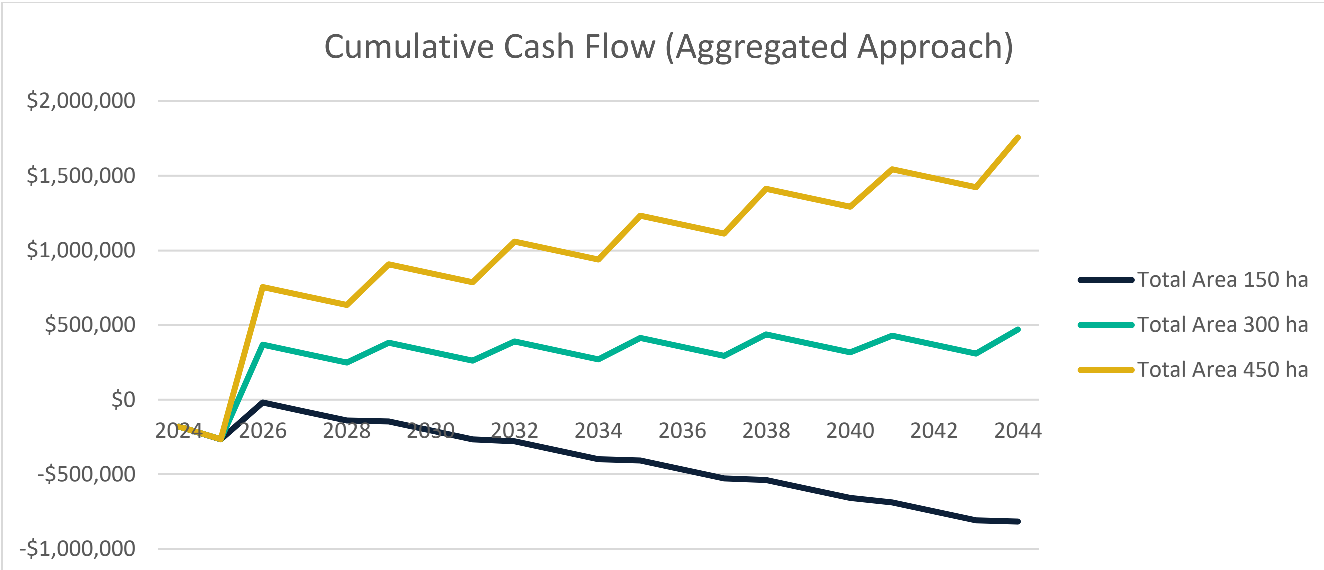


Figure 7. Cumulative Cash Flow under aggregate approach with the projected addition of new project sites – Total Area 150 ha (Study Area 1 and Study Area 2), Total Area 300 ha, or Total Area 450 ha.

Increasing the total area of this aggregated project to a minimum of 300 hectares is essential to achieving financial viability under the assumption that only 25% of the forest within those areas will be cleared. It's important to note that this expansion doesn't necessarily mean that the area needs to be increased from the start; project instances can be added later on as part of the project's eligibility criteria (See Section 4 for more details on new project instances).

In addition, if Study Area 1 and Study Area 2 can demonstrate that about 50% of their forest area is under threat of being cleared, the expected revenue should cover the initial expenses to implement the project (Appendix 6.3, Figure 10). This higher deforestation threat scenario (baseline) may significantly improve the project's financial outlook and increase the likelihood of achieving profitability within expected timelines.

.

Section 4 – Guidelines for Designing Aggregated (Grouped) Carbon Projects

Aggregated projects combine various instances of project activities into one cohesive entity that expands by incorporating new instances progressively. By adhering to aggregated projects, proponents can bypass the necessity of undergoing complete validation for each additional instance integrated into the project. This flexibility enables projects to expand gradually over time and lowers transaction expenses.

The main benefits of aggregated projects are:

- Reduction of transaction costs, investment risks, and uncertainties for individual participants.
- Faster approval process as many instances can be validated at the same time.
- Broaden access for smaller landowners that might not be feasible on their own.
- Emission reductions can be continually increased post-registration by adding instances later.
- Support different project activities with significant co-benefits, particularly at the social level.

Below are guidelines that a local government or a not-for-profit organisation should consider if they wanted to establish an aggregate carbon offsetting project on the west coast of BC.

4.1 Establish the eligibility criteria for adding new instances

Forest carbon standards, such as Verra and the American Carbon Registry, require eligibility criteria to be met. When new instances (e.g., additional land parcels) are added to an existing aggregated carbon project, the standards typically consider the following factors:

- Project Boundaries: Clearly define project boundaries, specifying which land areas are part of it.
- Consistency: Ensure that new instances align with the overall project objectives and methodologies.
- Additionality: Demonstrate that each new instance contributes to additional carbon sequestration or emission reduction beyond what would have occurred without the project.
- Baseline Determination: Maintain consistency in the baseline across all instances.
- Project Activities: Different project activities (e.g., tree planting, preventing forest cover loss, deferring harvest) can coexist within the same aggregated project, provided they meet the standards' requirements.

4.2 Avoid issues with proof of right

A key feature of any carbon project is the principal of 'Proof of Right' (PoR). All projects must prove the entitlement of an entity to all GHG emission reductions or removals produced by the project or program throughout the credit or verification period. In an aggregated project, each participant will have to provide PoR for their respective land parcels within the carbon project. Ideally, to minimize the potential for legal conflicts with landowners, the coordinator of the aggregate project should obtain clear ownership of carbon rights via a legally binding agreement with each landowner to prevent ambiguity regarding offset ownership.

4.4 Strategize for financial success

Under a grouped project, additional instances of the project activity (See Table 1. Types of forest carbon offset projects.), which meet pre-established eligibility criteria, may be added after the project is successfully validated. When designing an aggregate project, two decisions require careful consideration: 1. Initial property selection, and 2. The build-out process.

4.4.1 Initial property selection

It is suggested that property selection be based on:

- The absolute **number of credits** generated across project length. It is important to note the difference between project length and project crediting period. Project length refers to the number of years, beginning from the project start date, that the project activity will be maintained. Crediting period refers to the period for which the project is eligible for credit issuance. Some registries may allow crediting period renewal. Nevertheless, in some cases, project length can be longer than project crediting period, which implies operational costs (e.g. monitoring, emission reversals mitigation, etc)
- The **temporal pattern** of credit generation (see Section 2.1.3 Figure 3**Error! Reference source not found.**). For instance, avoided harvest activity delivers immediate benefits but credits are much reduced over the long-term. Under reforestation, credits build progressively over time yield higher long-term benefits. This can pay off if carbon credit values increase significantly over time, which is expected.
- The **geographical location**. It should be considered whether it is better to select a property located in an area that has already experienced, or will experience, development pressure, or areas that are more 'pristine' and whose overall integrity is better preserved.
- The **co-benefits**, such as habitat value or water quality, the selected properties can deliver. Project co-benefits, along with location, project activity, influence the sale price of carbon credits. In the case of the south-west coast of BC, a carbon project would have considerable appeal because The CDFmm subzone has the highest number of species and ecosystems at risk in B.C., many of which are ranked globally as imperilled or critically imperilled. There are 271 known Red and Blue listed species within the CDF, and 110 species at risk[18].

4.4.2 The build-out process

One approach for building a successful aggregated project is to develop a strategy that separates the decision-making process into its ***temporal*** and ***spatial*** components. A build-out strategy should be considered to maximize return on investment while ensuring that project risks are managed and held to acceptable levels. A hierarchical approach is suggested to order priorities and integrate both the temporal and spatial components of the project build-out.

4.4.2.1 Time

If short-term return on investment is the predominant goal, then a strategy focused on avoidance credits makes the most sense. In this approach, property selection is exclusively on forested land areas under significant threat of

[18] Available at BC Species & Ecosystems Explorer

permanent land use conversion, beginning with the largest areas available (See Section3.3.2.2 Aggregated Approach) and aggregating new instances progressively thereafter. Because of the pronounced decrease in credits throughout project length, maintaining a healthy project cash flow depends on regular recruitment. Owner attrition (defaulting of responsibilities) is always a risk in aggregated (grouped) projects. Nevertheless, project finances are less impacted by any given attrition event with the earlier gain from avoidance credits, at least once its initial credit flow has declined, when emissions from land use conversion no longer occur in the baseline (see Section 2.1.3 Figure 3).

Basing a build-out strategy largely on removal credits is challenging and high risk. For instance, property availability for reforestation is less in BC than for land use conversion. For a given property, attrition that occurs early has a much smaller impact on project finances than if it occurs later, as depicted on Figure 2. Credit losses from late-stage attrition would take much longer to recoup by recruiting new project instances. Therefore, the most effective strategy for forest carbon project developers to hedge financial risk is a mixed portfolio of avoidance and removal credits. Avoidance credits can generate short-term income meanwhile removal credits balance the potential long-term reduction in credit flows.

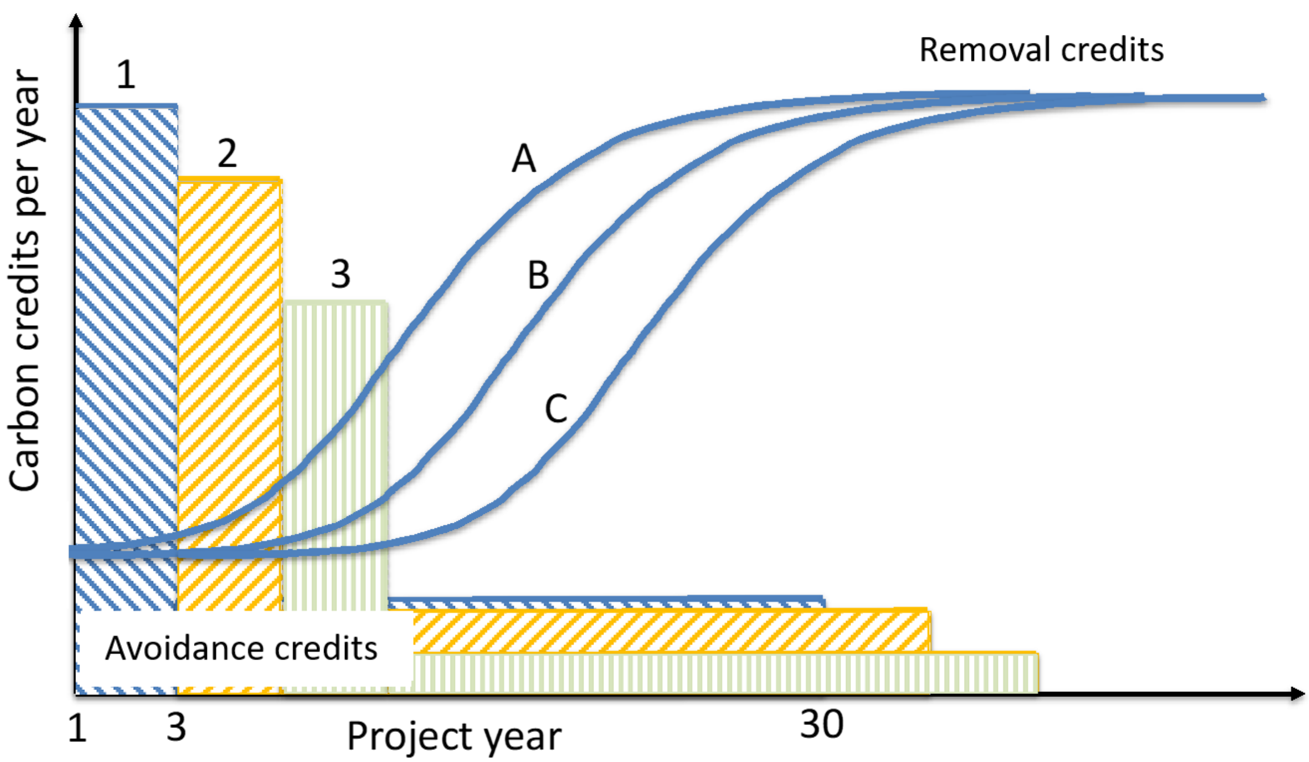
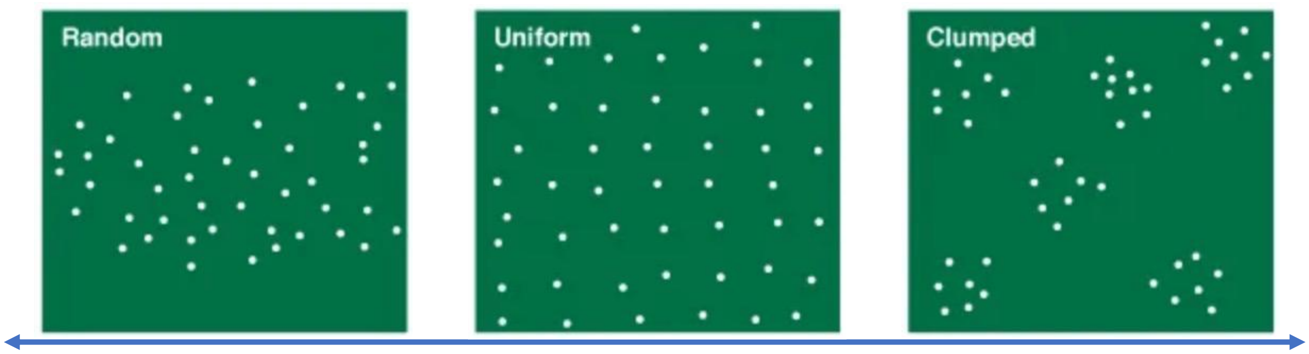


Figure 8. The carbon credit flows anticipated with the progressive addition of project instances (properties) under project activities that avoid emissions (Columns 1-3) and remove (Curves A-C). Axes are not to scale.

4.4.2.2 Space

Spatial configuration affects the risk that unplanned reversals will have a catastrophic impact on carbon stocks. For example, a series of contiguous ("clumped") properties (see Figure 9) could all be lost in a single catastrophic wildfire. Conversely, connectivity and interior forest habitat are maximized by close localized grouping of properties. Widely distributed properties (either uniform or random) will have low connectivity, but the trade-off is that they are not likely to be affected simultaneously by a single disturbance event.

Potential property Distributions



Random:
- Unplanned reversals affecting significant carbon stocks (variable to low risk)
- Connectivity (variable to low)
- Edges (high)
- Interior habitat (Low)

Uniform:
- Unplanned reversals affecting significant carbon stocks (low risk)
- Connectivity (low)
- Edges (high)
- Interior habitat (low)

Clumped:
- Unplanned reversals affecting significant carbon stocks (high risk)
- Connectivity (high)
- Edges (low)
- Interior habitat (high)

Figure 9. Conceptual distributions of properties enrolled in an aggregate (grouped) carbon project. Each has benefits and costs.

4.5 Pursue the voluntary market

NBS projects can participate in the compliance market, but the voluntary market may be more attractive due to its simpler procedures and broader eligibility. In fact, NBS projects are highly valued in the voluntary market for their co-benefits. Below are arguments, based on Ecosystem Marketplace[19] (EM), a leading global source of information on environmental finance, markets, and payments for ecosystem services, in favour of the voluntary carbon market:

[19] Available at: A Green Growth Spurt, State of Forest Carbon Finance 2021 - Ecosystem Marketplace %

- Strong growth has been forecasted as demand from corporations with sustainability goals surges to 1 billion metric tons of carbon dioxide equivalent (Gt CO_2e) in 2030 and 5.2 Gt CO_2e in 2050.
- Robustness of the voluntary carbon market despite significant economic and political headwinds. EM reports traded carbon credits volume in the Forestry and Land Use category in 2021 and 2022 were approximately 242 and 113 million tCO_2e, respectively. Furthermore, Forestry and Land Use is the most prevalent category for new projects in 2022 and 2023, around 300 new projects in each year[20].
- Carbon credits prices trending positively. Although volume decreased from 2021 to 2022, EM reports an increase of 75% in carbon credit price of the Forestry and Land Use category, from USD $5.78 in 2021 to USD $10.14 in 2022, and a preliminary price of USD $11.21 for 2023. One of the most consistent themes in EM analysis is the importance of robust "beyond-carbon" environmental and social benefits associated with a VCM project, often referred to as "co-benefits" or "core benefits".

4.6 Choose a world-wide registry and well-established methodology

Well-established voluntary standards and associated methodologies are essential for ensuring project integrity and securing full market value. CAR[21] has a protocol for Canada grassland and is developing one for Biochar, but it does not have a specific forest protocol for Canada. Recently, the British Columbia Carbon Registry approved the Forest Carbon Offset Protocol (FCOP 2.0) and accepting new projects in B.C. that meet the criteria.[22] Here we focus on two registries suitable for an aggregate carbon project on the south-west coast of BC - Verra and The American Carbon Registry. A summary of the IFM methodologies from both registries are available in Section 6.4 Forest Carbon Credit Methodologies.

[20] Available at: 2023 State of the Voluntary Carbon Markets Report
[21] Available at: Protocols - Climate Action Reserve : Climate Action Reserve
[22] The British Columbia Carbon Registry - Developing emission offset projects

Section 5 – Company Overview

ClimeCo is a global leader in the management and development of environmental commodities. We were selected as one of Inc. Magazine's 2023 Best Workplaces, ranked #1 for Professional/Advisory Services in the Real Leaders Impact Awards, named to the Inc. Magazine 2021 Best in Business List for Environmental Services, and ranked on Inc. Magazine's 5000 List of America's Fastest-Growing Private Companies in 2020. ClimeCo combines unrivaled commodity market expertise with engineering and Environmental, Social, and Governance (ESG) advisory to help clients maximize their environmental assets and minimize regulatory costs.

From policy advisory to risk management, offsets sourcing to project development, we provide comprehensive, vertically integrated solutions to help enhance our customers' sustainability impact—whether they respond to emissions regulations or satisfy voluntary sustainability goals.

5.1 Who We Are

When ClimeCo started, our goal was simple - we wanted to build real projects that reduced greenhouse gases, creating value for the environment and companies that reduced their emissions. We wanted ClimeCo to make a difference and have a positive impact on the world.

We are proud of the company we have built, the culture we have developed, our clients who we cherish, and, yes, the incredible volumes of greenhouse gases that we have reduced. Being recognized as the leading producer of carbon credits within the Climate Action Reserve is a title that we feel speaks volumes about how our clients trust us as their business partners. Because of our focus and dedication, ClimeCo is well-positioned for continued significant growth as we launch new partnerships and bring additional capital to the markets.

ClimeCo is committed to making a difference today for a better world tomorrow. Founded in 2009, ClimeCo pioneered the development of emission-reduction projects at U.S. bio-digester and nitric acid plants and has rapidly evolved into a global solutions and environmental commodity company.

ClimeCo has gained its reputation as a firm that can turnkey complex projects while assisting clients with maximizing financial returns by identifying strategic environmental offtake sales.

In addition to our vast carbon project profile, ClimeCo has made significant investments in other environmental commodity markets, including plastic credits, Renewable Energy Credits (RECs), criteria air pollutants, and water quality credits. ClimeCo provides a global portfolio of projects with diverse geography, environmental impacts, and co-benefits. Our turnkey project development expertise in these markets is enhanced by an in-house regulatory support group and access to project financing.

ClimeCo has also made significant investments in Canada, focusing primarily on the growing carbon markets. To support these efforts, ClimeCo launched ClimeCo Canada, ULC, in 2017, based in Calgary, AB.

Section 6 – Appendix

6.1 Glossary

The definitions of technical terms are listed in https://www.climeco.com/glossary/

6.2 Carbon Modelling Results

Total carbon estimated in study areas:

Table 7. Annual carbon stored in Study Area 1, also known as Buffer Land

Year	Total Area (ha)	Total C (t)	Avg C density (t C/ha)
0	46.6	28,800.0	617.4
1	46.6	28,884.2	619.2
2	46.6	28,973.9	621.1
3	46.6	29,060.1	623.0
4	46.6	29,151.7	625.0
5	46.6	29,239.9	626.8
6	46.6	29,318.3	628.5
7	46.6	29,408.2	630.5
8	46.6	29,488.3	632.2
9	46.6	29,569.2	633.9
10	46.6	29,665.9	636.0
11	46.6	29,748.5	637.8
12	46.6	29,831.9	639.5
13	46.6	29,920.3	641.4
14	46.6	30,005.2	643.3
15	46.6	30,090.8	645.1
16	46.6	30,177.1	646.9
17	46.6	30,264.1	648.8
18	46.6	30,351.7	650.7
19	46.6	30,440.1	652.6
20	46.6	30,529.1	654.5

Table 8. Annual carbon stored in Study Area 2, also known as Hillside 1 and Hillside 2

Year	Total Area (ha)	Total C (t)	Avg C density (t C/ha)
0	103.8	57,515.0	554.0
1	103.8	57,689.5	555.7
2	103.8	57,864.6	557.4
3	103.8	58,053.7	559.2
4	103.8	58,230.4	560.9
5	103.8	58,417.4	562.7
6	103.8	58,594.0	564.4
7	103.8	58,789.7	566.3
8	103.8	58,971.3	568.0
9	103.8	59,154.3	569.8
10	103.8	59,345.4	571.6
11	103.8	59,538.6	573.5
12	103.8	59,713.7	575.2
13	103.8	59,910.4	577.1
14	103.8	60,049.0	578.4
15	103.8	60,185.8	579.7
16	103.8	60,319.4	581.0
17	103.8	60,433.7	582.1
18	103.8	60,547.9	583.2
19	103.8	60,659.7	584.3
20	103.8	60,757.8	585.2

Baseline Scenario with the assumption that 50% of the forest will cleared:

Table 9. The annual net CO2e benefit in Study Area 1

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
0					
1	84.2	-4,364.2	283.7	625	12,980
2	89.6	-223.3	0	47	975
3	86.2	-177.3	0	40	821
4	91.6	-140.8	0	35	724

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
5	88.2	-117.7	0	31	642
6	78.4	-104.0	0	27	569
7	89.9	-83.9	0	26	542
8	80.1	-77.3	0	24	491
9	80.9	-67.6	0	22	463
10	96.7	-51.8	0	22	463
11	82.6	-52.1	0	20	420
12	83.4	-45.9	0	19	403
13	88.5	-38.3	0	19	395
14	84.9	-35.6	0	18	375
15	85.6	-31.1	0	18	364
16	86.3	-27.2	0	17	354
17	87.0	-23.5	0	17	344
18	87.7	-20.2	0	16	336
19	88.4	-17.1	0	16	329
20	89.0	-14.3	0	16	322

Table 10. The annual net CO2e benefit in Study Area 2

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
0					
1	174.5	-7,778.1	513.1	1,116	23,187
2	175.1	-425.1	0	90	1,871
3	189.1	-323.4	0	77	1,597
4	176.7	-263.1	0	66	1,209
5	186.9	-210.3	0	60	1,238
6	176.7	-180.1	0	54	1,112
7	195.7	-143.7	0	51	1,058
8	181.6	-129.6	0	47	970
9	182.9	-111.9	0	44	919

Year	Project Annual Change in Tot C (t)	Baseline Annual Change in Tot C (t)	HWP (t C)	Uncertainty & Leakage Discount (t C)	Net benefit (t CO2e) or Carbon Credits
10	191.1	-93.8	0	43	888
11	193.2	-80.8	0	41	854
12	175.1	-79.6	0	38	794
13	196.7	-59.8	0	38	799
14	138.7	-80.9	0	33	684
15	136.8	-74.7	0	32	659
16	133.5	-70.0	0	31	634
17	114.3	-73.8	0	28	586
18	114.2	-68.6	0	27	570
19	111.8	-65.1	0	27	551
20	98.1	-67.6	0	25	516

6.3 Revenue Estimation with 50% clearing of forest

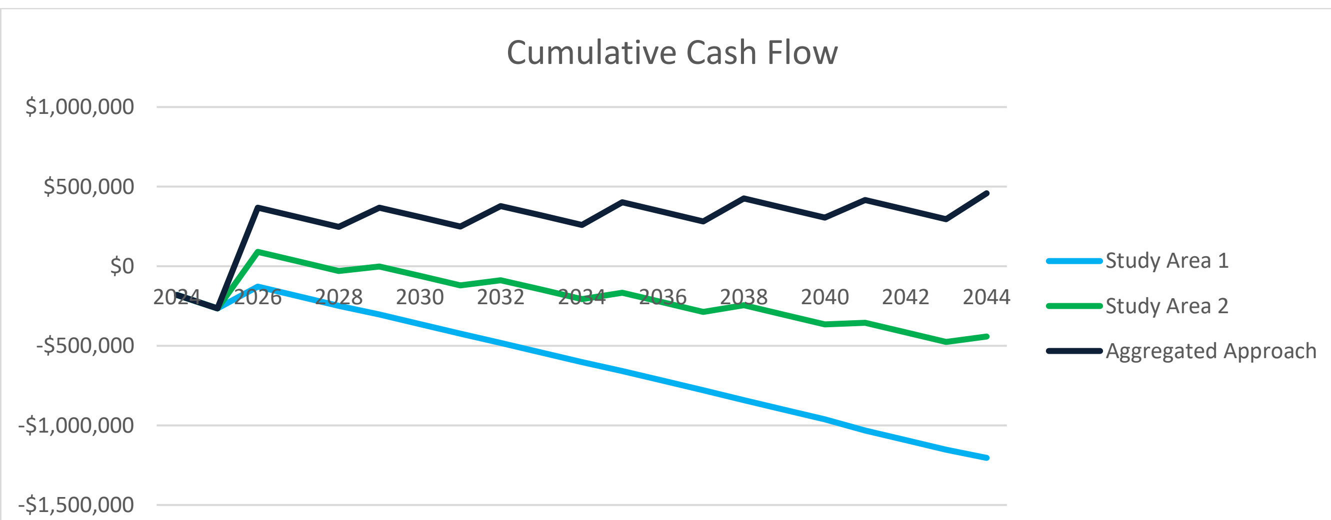


Figure 10. Cumulative Cash Flow under individual vs aggregated approach with Study Area 1 and Study Area 2

6.4 Forest Carbon Credit Methodologies

Criteria/ Registries and Methodologies	VERRA/VCS						ACR
	VM0003[23]	VM0010[24]	VM0012[25]	VM0034[26]	VM0035[27]	VM0045[28]	IFM on Canadian Forestlands
Baseline	Managed forest with clear cutting or patch cutting	Managed forest with planned timber harvest	Managed forest	Projects located in Canada, starting after Nov 29, 2007 with activities complying with provincial regulations	Managed forest with all logging activities together, happening at a certain expected performance level	Managed forest with harvest scenario	Legally permissible harvest scenario that would maximize NPV of perpetual wood products harvest
Project activity	Extending the rotation age of a forest or patch of forest before harvesting	Limited to activities that constrain commercial timber harvest or forest degradation	Managing for biodiversity, ecosystem function and carbon retention.	Improved forest management, reforestation and avoided conversion	Directional felling, improved log bucking, improved harvest planning, skid trail planning and/or monocable winching, and reduction in width of haul roads and size of log landings	Enrichment planting, release of natural regeneratio n, stand irrigation and/or fertilization	Must exceed the common practice of similar landowners managing similar forests in the region

[23] Methodology for Improved Forest Management Through Extension of Rotation Age Version 1.3
[24] Methodology for Improved Forest Management: Conversion from Logged to Protected Forest Version 1.3
[25] Improved Forest Management in Temperate and Boreal Forests (LtPF) Version 1.2
[26] Canadian Forest Carbon Offset Version 2.0
[27] Methodology for Improved Forest Management through Reduced Impact Logging Version 1.0
[28] Methodology for Improved Forest Management Using Dynamic Matched Baselines from National Forest Inventories Version 1.0

Criteria/ Registries and Methodologies	VERRA/VCS						ACR
	VM0003[29]	VM0010[30]	VM0012[31]	VM0034[32]	VM0035[33]	VM0045[34]	IFM on Canadian Forestlands
Applicability	Forests which are not subject to timber harvesting, or managed without an objective for earning revenue through timber harvesting in the baseline scenario are not eligible under this methodology	Under the project scenario, forest use must be limited to activities that do not result in commercial timber harvest or forest degradation	Must meet the criteria of Logged to Protected Forest and must demonstrate that there will be no activity shifting to other lands owned by the project proponents	Forests in Canada	Projects which implement reduced impact logging practices to reduce emissions in one or more of three GHG emission source categories (i.e., timber felling, skidding and hauling)	The project activity cannot involve reducing the intensity of timber harvest.	Forestlands with 1) freehold title, Indigenous title, or timber rights and 2) offsets title
Leakage	Market leakage[35] must be calculated and activity shifting[36] leakage is not permitted	Market leakage is the net emissions from planned harvest in the baseline multiplied by a leakage factor and no activity shifting leakage is allowed	Market leakage must be calculated and activity shifting leakage is not permitted	Market and Activity shifting leakage must be calculated	Leakage is assumed to be zero because there is no difference in harvest levels between the baseline and project scenarios	Leakage is a combination of activity-shifting and market	Activity shifting leakage beyond *de minimis* not permitedMarket leakage must be calculated

[29] Methodology for Improved Forest Management Through Extension of Rotation Age Version 1.3
[30] Methodology for Improved Forest Management: Conversion from Logged to Protected Forest Version 1.3
[31] Improved Forest Management in Temperate and Boreal Forests (LtPF) Version 1.2
[32] Canadian Forest Carbon Offset Version 2.0
[33] Methodology for Improved Forest Management through Reduced Impact Logging Version 1.0
[34] Methodology for Improved Forest Management Using Dynamic Matched Baselines from National Forest Inventories Version 1.0
[35] Market leakage corresponds to market responses to change in harvesting levels. It happens outside both the project area and the project proponent's operations.
[36] Activity shifting leakage happens when there is an increase in GHG emissions from areas outside the project area but within the project proponent's operations.

Criteria/ Registries and Methodologies	VERRA/VCS						ACR
	VM0003[37]	VM0010[38]	VM0012[39]	VM0034[40]	VM0035[41]	VM0045[42]	IFM on Canadian Forestlands
Included Pools	AGB, BGB, Harvested wood products	AGB, deadwood-Logging slash (included in baseline), Harvested wood products	AGB, BGB, Deadwood, Harvested wood products	AGB, BGB, Deadwood, Soil	AGB, BGB, Deadwood	AGB, BGB, Deadwood, Harvested wood products	AGB, BGB, Stading deadwood, Harvested wood products
External quality rating of projects per methodology							
BeZero[43]	No project rated by BeZero	Hubei Hongshan IFM Project-BB[44]: project has notable additionality risk, and notable risk of over-crediting	Darkwood Forest Carbon Project-BBB[45]: project has strong additionality, effectively mitigated Non-permanence risk, proponent has forest management experience, but potentially overestimated baseline, notable risk of over-crediting, potential for activity shifting, and notable risk from a policy perspective	No project rated by BeZero	No project rated by BeZero	No project rated by BeZero	No project rated by BeZero

[37] Methodology for Improved Forest Management Through Extension of Rotation Age Version 1.3
[38] Methodology for Improved Forest Management: Conversion from Logged to Protected Forest Version 1.3
[39] Improved Forest Management in Temperate and Boreal Forests (LtPF) Version 1.2
[40] Canadian Forest Carbon Offset Version 2.0
[41] Methodology for Improved Forest Management through Reduced Impact Logging Version 1.0
[42] Methodology for Improved Forest Management Using Dynamic Matched Baselines from National Forest Inventories Version 1.0
[43] Global carbon project rating agency based in London that provides a publicly available, risk-based framework for assessing carbon efficacy (https://bezerocarbon.com/)
[44] BB - moderately low likelihood of achieving 1 tonne of CO_2e avoidance or removal
[45] BBB - moderate likelihood of achieving 1 tonne of CO_{2e} avoidance or removal