SILVADOR CLIMATE ACTION

Document Prepared by GreenRaise Consulting GmbH

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Silvador Company SRL and Forest Capital SRL (here on in Silvador) own private forestlands in Romania and are developing a forest carbon credit project to achieve greenhouse gas (GHG) emission reductions and removals through the conservation of logged to protected (LtPF) privately owned forests. The project will be implemented following the Verified Carbon Standard (VCS) VM0012 – Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2 methodology. The project area encompasses properties owned by Silvador and they have the authority to implement project activities on the properties, such as a carbon crediting project by directing forest planning. The project currently consists of a single Project Activity Instance (PAI).

The current geographic area is composed of 8 private forest parcels located in the counties of, Buzău, Dâmbovița, with 3 future instances to be located in Argeș, Prahova, and Teleorman. The PAI occupies 1,538 hectares (ha). The PAI areas are non-contiguous and are comprised of properties privately owned and operated by Silvador. All properties were managed for timber harvest prior to the implementation of the carbon crediting project and forest operations occurred under existing forest management plans.

Carbon emission offsets were calculated by comparing the project scenario which ceases all timber harvesting, to a baseline scenario which represents regular forest harvesting operations. Carbon pools will be estimated with the Operational-Scale Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) – Version 1.2, allowing for the calculation of carbon emission offsets. The baseline scenario for the project will be the continuation of allowable commercial harvesting for the next 30 years. The harvest schedule is implemented under the baseline scenario using the regional harvesting practices of thinning, sanitary, and hygienic cuttings.

The project scenario converts harvestable, managed forests to conserved forests by discontinuing timber cuttings within the PAIs. The project will undertake ongoing low levels of management activities for forest maintenance, ecological enhancement, and/or risk mitigation. Approximately 340,00 tonnes of carbon dioxide equivalent (tCO_2e) are anticipated to be reduced from the atmosphere over the 30-year project period.

No historic crediting period data is applicable at this time as the project is currently seeking initial validation and verification.See below table for audit history.

Table 1: Audit history summery

Audit Type	Period	Program	VVB Name	Number of years
Validation/ Verification	01-August-2020– 31-December-2022	VCS	Epic Sustainability Services Private Limited	Two Years Five Months
Monitoring Period	01-August-2020– 31-December-2022	VCS	Epic Sustainability Services Private Limited	Two Years Five Months
Total				Two Years Five Months

1.2 Sectoral Scope and Project Type

Agriculture Forestry and Other Land Use (AFOLU) Sectoral Scope 14

Improved Forest Management (IFM)

Logged to Protected Forest (LtPF)

The Silvador Climate Action (SCA) is a Grouped Project, allowing for the addition of PAIs following project validation.

1.3 Project Eligibility

Silvador is a legally registered commercial company with the primary business of owning, managing and harvesting forests. As per the Romainan Forestry Code, Law-46 of March 19, 2008 Forestry Code, Art 17 Sec (1), "Compliance with the forest regime is mandatory for all forest fund holders.[1]" This includes the compulsory preparation of Forest Management Plans, which are renewable every 10 years, and monitored, and enforced by the National Forests Administration-Romsilva[2].

All of the properties included in the SCA PAI encompass forest fund lands that were historically and currently managed for the harvest of wood products such as sawn timber, pulp, fuel wood, etc, and each are administered under an approved forest management plan.

The SCA will reduce net GHG emissions through the elimination of harvesting in the project area, thereby biomass carbon stocks are protected and increase as the forest continues to grow, converting logged forests to protected forests

[1] Law-46 of March 19, 2008 Forestry Code, see weblink: https://www-cdep-ro.translate.goog/pls/legis/legis_pck.htp_act_text?idt=87661&_x_tr_sl=auto&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=wapp

[2] Romsilva: https://www.rosilva.ro/

The SCA (and specifically the current PAI) satisfies the criteria for the VCS Improved Forest Management – Logged to Protected Forests (IFM-LtPF), as defined in the VCS Standard v4.4 and the applicability condition as described within the VCS-VM0012 methodology:

1. The project (and specifically the current PAI) meets the most recently approved criteria for VCS IMF-LtPF eligible projects.
2. The project (and specifically the current PAI) is within the Temperate Global Ecological Zone (as defined by Food and Agriculture Organization of the United Nations (FAO) (FAO, 2001), are forest lands remaining forest lands (as defined by IPCC (IPCC, 2003)), and which meet IPCC GPG LULUCF Tier III inventory and data requirements (IPCC, 2003).
3. The project (and specifically the current PAI) meets the most current approved VCS Standard requirements for ownership, by being able to demonstrate Proof of Right of Right of Use ownership of carbon rights in accordance with VCS requirements:
4. The SCA implementation does not violate any applicable laws in Romania, whether enforceable or not.
5. There are de minims (less than 5%) amounts of illegal, unplanned or fuelwood removals from the PAI in the baseline scenario.
6. The project (and specifically the current PAI) area does not encompass peatland forests as defined by IPCC GPG LULUCF. See Appendix 6 – Peatland Map
7. The project (and specifically the current PAI) area does not include wetlands.
8. There is no planned compensatory harvesting on other lands held by the owners of the PAI. Activity shifting leakage will be monitored and reported annually as required by VCS standards.
9. The owner of the PAI will not apply organic or inorganic fertilizer in the project scenario.

Future (new) PAI(s) will only be included in the project when the above (and those noted in Section 1.4.1) noted eligibility criteria are met.

1.4 Project Design

The SCA is a grouped project to allow multiple PAIs to be established within the project area (See Section 1.4.1 below). Conditions within the project area at the time of validation have been used to create the baseline scenario and determine project additionality. The baseline scenario and additionality assessments have been completed within one clearly defined geographic area for The SCA (Figure 2. Overview of the Silvador Climate Action). The current project will only include one project activity, and initially one PAI, implemented under the VM0012 methodology. Additional PAIs may be implemented following initial project validation. The table below outlines the project design regarding ownership and project contribution dates.

Table 2: Project Design Overview

Property Name (Current UP Name)	Property Name (Past UP Name)	Owner Name	Ownership Date (Date of acquisition)	Project Contribution Date
I Forest Capital	Hoboda	Silvador	October 2, 2020	November 1, 2020
I Forest Capital	Popescu	Forest Capital	August 28, 2020	September 1, 2020

I Forest Capital	Parte Din UP V	Forest Capital	March 25, 2020	August 1, 2020
Valea Tisei		Forest Capital	June 26, 2021	July 1, 2021
Continescu		Forest Capital	August 14, 2020	September 1, 2020
Barbu		Forest Capital	June 17, 2020	August 1, 2020
Manesti		Silvador	March 28, 2018	August 1, 2020
Cornatelu	Nietscu	Silvador	September 4, 2019	August 1, 2020

1.4.1 Eligibility Criteria for the Inclusion of New Project Activity Instances

Inclusion of additional PAI(s) in the SCA must adhere to the following eligibility criteria:

1. The PAI must meet the applicability conditions defined in the most recent version of the VCS methodology VM0012 – Improved Forest Management in Temperate and Boreal Forests (LtPF), or conditions specified in the applicable methodology selected.
2. The new PAI must utilize all technologies or measures used in this document and must satisfy the conditions of the selected methodology. Any novel technologies utilized shall be clearly identified and defined.
3. Technologies or measures shall be applied in a similar fashion as outlined in this project description document.
4. Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.
5. The PAIs will have characteristics with respect to additionality that are consistent with the initial instance of the project and geographic area. Such characteristics include financial and technical parameters or barriers.
6. Additional activity instances must also satisfy inclusion requirements as outlined in the VCS Standard v4.4, Section 3.6 (Project Design).
7. The PAI must use the GHG information systems and controls (or equivalent) in use by the Project Proponent, Project Developer and/or the Implementation Partner.

For clarity, the current PAI meets the eligibility criteria noted above.

1.4.2 GHG Information Systems and Controls

GHG Information systems include but may not be limited to the following:

1. Carbon Budget Model of the Canadian Forest Service (CBM-CFS3)
2. Harvested Wood Products model from GreenRaise (GreenRaise)
3. Emission model from GreenRaise
4. MARketz Tool from Zimmfor Management Services Ltd.
5. Uncertainty model from GreenRaise

GHG controls include but may not be limited to the following:

1. Standard Operating Procedure – Monitoring; from GreenRaise
   Standard Operating Procedure – Stakeholder Consultation + Engagement; from GreenRaise

1.5 Project Proponent

Table 3: Project Proponents Information

Organization name	Silvador Company SRL
Contact person	Vlad Chitulescu
Title	Director
Address	Bld, Libertatii nr.1 Targoviste, Dambovita, Romania, 130009
Telephone	+40 0740 208 268
Email	v.chitulescu@silvador.ro

Organization name	Forest Capital SRL
Contact person	Vlad Chitulescu
Title	Director
Address	Viforata, Silozului Nr.2 Aninoasa, Dambovita, Romania 130007
Telephone	+40 0740 208 268
Email	v.chitulescu@silvador.ro

1.6 Other Entities Involved in the Project

Table 4: Information of Other Involved Entities

Organization name	GreenRaise Consulting GmbH
Role in the project	Authorized Representative, Implementation Partner, Project Developer
Contact person	Jason Zimmerman, RPF
Title	Director
Address	1010 Vienna, Rudolfsplatz 9/8, Austria
Telephone	+1 604 619 1585
Email	jason@green-raise.com
Organization name	Global Forest Support GmbH.
Role in the project	Listing Representor, Authorized Representative
Contact person	Jason Zimmermann, RPF
Title	Director
Address	1010 Vienna, Rudolfsplatz 9/8, Austria
Telephone	+1 604 619 1585
Email	jason@globalforestsupport.com
Organization name	Zimmfor Management Services Ltd.
Role in the project	Implementation Partner, Project Developer
Contact person	Jason Zimmermann, RPF
Title	President
Address	2218-D Airport Drive, Campbell River, BC V9H 0E2, Canada
Telephone	+1 604 619 1585
Email	jason@zimmfor.com

1.6.1 Roles and Responsibilities

Listing Representor (Global Forest Support GmbH)

- Authorized by the Project Proponent to list the Project on the VCS Project Pipeline.

Authorized Representative (GreenRaise Consulting GmbH)

- Communicate with and provide instructions to the Verra Registry on behalf of the Project Proponent(s).
- Designate the account into which VCU's may be deposited

Implementation Partner (GreenRaise Consulting GmbH; Zimmfor Management Services Ltd.)

- Work in partnership with the Project Proponent(s) to obtain project validation
- Assist with obtaining verified carbon units through verification audits
- Perform project monitoring requirements (including field work and follow-up required reporting)

Project Developer (GreenRaise Consulting GmbH; Zimmfor Management Services Ltd.)

- Develop and provide all required deliverables for project validation/verification including but not limited to:
    - Project Description Document
    - Project Monitoring Report
    - AFOLU Non-permanence Risk Assessment
    - Completed VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities
    - Baseline and project carbon modelling
    - Stakeholder and Community Engagement reference materials
    - Standard Operating Procedures for project implementation and validation

1.7 Ownership

Forest Lands within The SCA are legally owned and operated on by the Project Proponents, Silvador SRL and Forest Capital SRL (collectively, "Silvador"). The two companies are owned by the same entity (refer to Section 1.5). The project activity and management of forest resources and implementation of forest operations and plans fall under the directives of Silvador management representatives. . Silvador consents to the implementation of the carbon crediting project on their privately owned lands.

The SCA area is part of a much larger privately owned land base. Notarized land sale contracts and land deed documents verifying ownership of the Silvador properties included in the project area were provided and land deed documents posted on the National Agency for Cadastre and Real Estate Advertising Institute[3]. Activities carried out by the agency include but are not limited to, the coordination and control of land and building registries for all of Romania. Implementation of land ownership registry, documentation, taxes, record keeping as such, and are governed under Law No.7 Of

[3] For Further Information, see The National Agency for Cadastre and Real Estate Advertising Institution: epay.ancpi.ro

March 13, 1996 (Republished) Cadastre and Real Estate Advertising[4]. Samples of specific properties included in the project are provided below. The notarized Extract of Land Deed for property information will be provided to the validation body for each land district parcel upon request (*Silvador_ForestCapital_Ownership.xlsx*) spreadsheet.

As linkage to VCS v4.4 section 3.7.1, the above noted evidence of ownership is equivalent to item 4, "*Project ownership arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions and/or removals (where the project proponent has not been divested of such project ownership)*."

VCUs generated as a result of the SCA will be owned by Forest Capital and Silvador. Amount of VCUs will be distributed to each owner according to land ownership percentage.

Table 5: Supporting Property Ownership Information (Sample)[5]

Cadastre Office	No.	Cadastral No	Land Section	Parcel No.	Ownership
Buzau	A1	25902	35, 36	1486, 1491	Forest Capital
Buzau	A1	22473	11	346	Silvador

1.8 Start Date

In 2020, Silvador/Forest Capital sent notification letters of the intent to implement a forest carbon project to each of the Forest Management Consultants (FMCs) responsible for managing the properties intended to be included in SCA. Effective August 1, 2020, harvesting activities were curtailed with the exception of low levels of management activities for forest maintenance and risk mitigation. As illustrated via the notification and the curtailment of harvesting activities the project start date is August 1, 2020.

1.9 Project Crediting Period

Project activities were initiated on 01 August of 2020 and will be completed on the 31 of July of 2050. The project crediting period will be a minimum of 30 years up to a maximum of 100 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The SCA estimates emission reductions/removals at 11,117 tonnes of CO2e annually.

Table 6: Project Scale

[4] Law No.7 of 13 March 1996: https://www.global-regulation.com/translation/romania/3748442/law-no.-7-of-13-march-1996-%2528republished%2529-cadastre-and-real-estate-advertising-nr.-7-1996%2529.html

[5] Refer to Appendix for a complete list of polygons.

Project Scale	
Project	X
Large project	

Table 7: Estimated GHG Emission Reductions and Removals

Year	Estimated GHG emission reductions or removals (tCO_2e)
01-August-2020 - 31-December-2020	15,428
01-January-2021 - 31-December-2021	-11,816
01-January-2022 - 31-December-2022	65,321
01-January-2023 - 31-December-2023	-25,594
01-January-2024 - 31-December-2024	11,699
01-January-2025 - 31-December-2025	12,336
01-January-2026 - 31-December-2026	12,459
01-January-2027 - 31-December-2027	18,012
01-January-2028 - 31-December-2028	10,885
01-January-2029 - 31-December-2029	14,241
01-January-2030 - 31-December-2030	12,869
01-January-2031 - 31-December-2031	20,431
01-January-2032 - 31-December-2032	11,302
01-January-2033 - 31-December-2033	10,293
01-January-2034 - 31-December-2034	12,511
01-January-2035 - 31-December-2035	9,037

Year	Estimated GHG emission reductions or removals (tCO_2e)
01-January-2036 - 31-December-2036	11,316
01-January-2037 - 31-December-2037	4,808
01-January-2038 - 31-December-2038	4,387
01-January-2039 - 31-December-2039	4,050
01-January-2040 - 31-December-2040	-17,757
01-January-2041 - 31-December-2041	15,062
01-January-2042 - 31-December-2042	11,082
01-January-2043 - 31-December-2043	10,878
01-January-2044 - 31-December-2044	12,680
01-January-2045 - 31-December-2045	16,245
01-January-2046 - 31-December-2046	12,917
01-January-2047 - 31-December-2047	12,491
01-January-2048 - 31-December-2048	13,636
01-January-2049 - 31-December-2049	19,551
01-January-2050 - 31-July-2050	13,219
Total estimated ERs	**343,978**
Total number of crediting years	**30**
Average annual ERs	**11,096**

1.11 Description of the Project Activity

The SCA emphasizes the protection of forests that are culturally and ecologically significant on private lands located in the counties of, Buzău and Dâmbovița, with future instances to be located in Argeș, Prahova, and Teleorman, Romania. The Project Proponent will implement the IFM project by reducing GHG emissions through deferral of timber harvest and other forestry related operations. Ecosystem protection is achieved through the conversion of industrial forests to protected forest, increasing carbon retention, and avoiding future GHG emissions from felling operations.

Novel technologies, products or services will not be required for project implementation. The SCA will be implemented following logged to protected forest conservation principles, which include forest health monitoring, and property supervision. Low levels of timber harvest may be required for forest health maintenance, as deemed necessary. Emissions from forest health management shall be tracked and accounted for in carbon flow projections.

As the Project Proponent, Silvador will oversee the implementation of the project, including all maintenance activities such as monitoring and subsequent verification events. Currently, no other entities (i.e., communities, other organizations) are directly involved in the implementation of the project, however, other entities could be included in the future as an additional proponent(s) as part of the grouped project.

The project is not located within a jurisdiction covered by a jurisdictional *REDD+* program. Under the framework of the United Nations Framework, REDD+ programs are designed to provide financial compensations in developing countries that are implementing reduced deforestation or degradation projects. Romania is not listed as a developing country[6], nor identified on the International Database on REDD+ projects and programs[7]

1.12 Project Location

The PAI is located within Silvador/Forest Capital privately owned forest lands. The geographic project area includes the counties of Argeș, Buzău, Dâmbovița, Prahova, and Teleorman. Areas bordering the project area include a mixture of private forest and state lands. The current extent of the PAI is described by the geodetic coordinates within the Table: Project Geography Boundary below, map(s) within Section 3.3 (Project Boundary) and in the associated KML file located within the Verra Registry.

Table 8: Project Geographic Boundary

	Extent Coordinates			
Coordinate System	North	South	East	West
GCS_WGS_84	45.274769	44.641421	26.700656	24.957056

[6] United Nations Developing Countries: https://www.un.org/ohrlls/content/list-ldcs

[7] Atmadja, S.; Komalasari, M.; Alusiola, R.; Barboza, I.; Sartika; L.; Theresia, V.; Simonet; G. 2023. The International Database on REDD+ projects and programs Linking Economics, Carbon and Communities (ID-RECCO) - Jurisdictional tables, V.5.0. URL: https://www.reddprojectsdatabase.org/

1.13 Conditions Prior to Project Initiation

Ecosystem type: The SCA area covers a large geographical area across multiple counties and is composed of a diverse mix of forest ecosystems, topography, and climatic conditions, which vary with elevations.

The forest lands in Buzău county is typically composed of Oak, Hornbeam, and Beech forests, located on mid slopes ranging between 140m-430m in elevation. Climatic designation according to the Köppen Geiger climate classification[8] is *Dfb*, or Hemiboreal. Summers here are warm but not hot, with average temperatures below 22'c. Annual rainfall amounts usually vary between 500-600mm. The predominant soil type is Luvisols.

Dâmbovița county forest lands contains species compositions composed primarily of Beech, Hornbeam, Oak, Acacia, and Pine. Slopes here are described as slight to moderate and terraced in some areas. Elevations range from 110m to 620m. The climatic conditions on average are Hemiboreal with precipitation averaging 650mm annually. The predominant soil types are Luvisols and Alluvial Protosols.

Conditions in all project lands prior to project initiation were composed of timber thinning, hygiene, and sanitary felling operations, as well as inventory tending operations, mapping, surveying etc. as outlined in the FMPs.

[8] https://en.wikipedia.org/wiki/K%C3%B6ppen_climate_classification

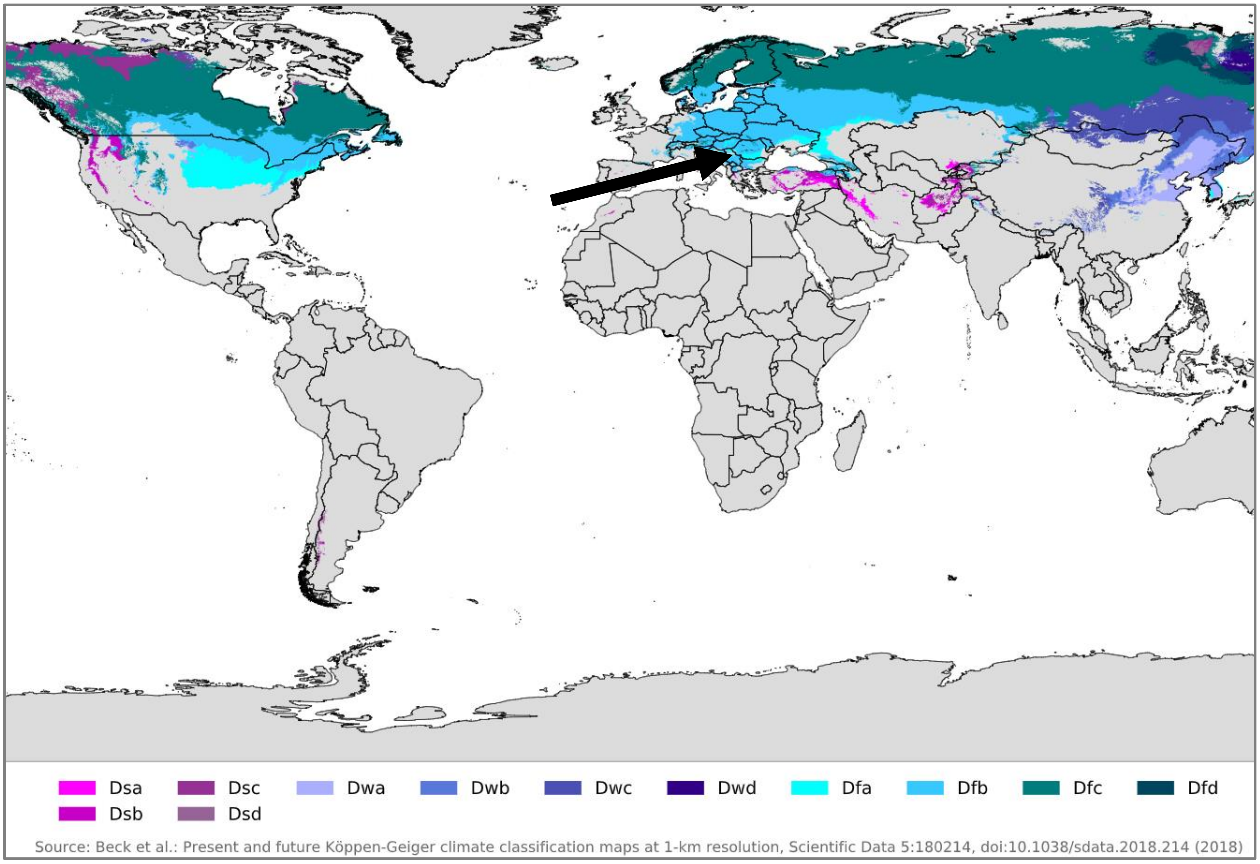

Figure 1: Koppen-Geiger classification Map, Humid continental climate, Romania

Current and historical land-use: The conditions existing prior to the initiation of The SCA are the same as the baseline scenario. Refer to Section 3.4 for a full description of the baseline scenario.

The geographical extent of the project instances contributes to a wide range of pre-project site conditions. The selected areas are within Silvador's operational timber harvest land base and were previously managed for timber harvest activities.

Historical land use surrounding the project area is primarily related to timber harvest operations. Silvador has maintained timber harvest operations in Romania for more than 10 years. The Project Proponent manages the harvesting operations of both entities on private lands.

The land within the project area has not been cleared of native ecosystems within 10-years of the project start date.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

In Romania the legal right to manage and harvest forest fund properties falls under Law 46/2008, (The Forestry Code). Under this law, its regulations, and ministerial orders, all forest property owners (public or private), must adhere to the following forestry regime obligations:

- Forested lands are to be placed under special administration
- Under special administration all forested lands greater than 10 hectares must have a management plan which is required to be followed. This includes forest stand regenerative efforts, harvest volume extraction availability, forest pest and disease control measures, protection from illegal harvesting, weather events, and fire prevention and extinguishing measures.
- Forest roads located on the property must be maintained and repaired.
- Owners must ensure harvest operations are conducted lawfully and in a sustainable manner after forest inventory valuations.
- Property boundaries are physically identified as per ownership deeds.
- Central public authorities responsible for forestry are notified within 60 days of ownership transfers of forest lands.

Prior to any timber harvesting, the contractor or landowner, is required to obtain legal harvest permits, certificates, and environmental approvals. The guidelines for timber harvesting are further outlined in the Forestry Code and the Ministerial Order 1540/2011 on harvesting rules. Proper forest management establishes the economic objectives of productive forest fund stands, while maintaining the biodiversity of natural ecosystems.

Project activities do not disobey any applicable laws and ordinances as outlined under the Romanian Forestry Code. All legal requirements have been fulfilled and described as part of the Silvador Forest Management Plan development. A more extensive list of legislation governs forest activities in Romania, which includes, but is not limited to, the laws and orders listed below:

Table 9: Legislation Governing Forest Lands

Legislation	General Description
Law 46/2008 (Forestry Code[9])	Legislation applicable to all forest fund properties in Romania, in particular the ownership rights, management processes and harvest stipulations required for sustainable forest management and environmental practices. Includes mandated Forest Management Plans on forested areas greater than 10 hectares and outlines specifications of plan developments and ownership obligations.

[9] For more specific details, the entire law can be found here: FOREST CODE (R) 19/03/2008 - Legislative portal (just.ro)

Legislation	General Description
Law No. 18 of 19 February 1991 on Land Fund, Chapter I, II, VI[10]	This law establishes the land tenure system in Romania. Lands are classified by categories and ownership rights and must be registered in accordance with law. Provisions that are relevant include Procedural provisions IV and V; Use of land for agricultural and silvicultural production, and Land use for agricultural and forestry production.
Ministerial Order Nr. 23/2009[11]	This regulation describes the security structures, organizations, and legal obligations of forestry personnel within the framework of forest management and service contracts for the protection of forest funds from illegal activities.
Ministerial Order Nr. 460/2010[12]	The general provision of this order is to establish the certification methodologies for forest management plan development, and the requirements of legal persons applying for the certification of management activities
Ministerial Order Nr. 1039/2010[13]	This order outlines approved methodologies for the technical experts approving and reviewing the quality of forest management planning activities and establishes the conditions of certification for those tasked with creating the management plans.
Ministerial Order Nr. 1540/2011[14]	The required terms, approvals, documents, permits, and collection methods for the harvesting and transportation of timber are outlined in this particular order.
Water Law No. 107/1996[15]	Law providing legal requirements regarding the provisions of water resource use, water management and associated activities, as well as penalties. Forestry aspects include water conservation, soil protection, pollution control, and protected zones around natural waterbodies.
Environmental Protection Law No. 137/1995[16]	Legal framework for the protection and regulations of activities affecting natural resources (water and land environments). Under this law, enforcement is carried out under the authority of the Ministry of Waters, Forests, and Environmental Protection.

[10] Specific details pertaining to private land funds and provisions can be found here: LAW 18 19/02/1991 - Legislative Portal (just.ro)

[11] Order No. 23 of December 15, 2009 details: https://legislatie.just.ro/Public/DetaliiDocument/114795

[12] Further details can be found here: ORDER 460 01/04/2010 - Legislative Portal (just.ro)

[13] Specific details and information outlined in Order here: ORDER 1039 01/07/2010 - Legislative Portal (just.ro)

[14] Specific details of Order can be found here: ORDER 1540 03/06/2011 - Legislative Portal (just.ro)

[15] Law No. 107 of September 25, 1996 Website: https://legislatie.just.ro/Public/DetaliiDocumentAfis/8565

[16] Law No. 137 of December 29, 1995 Website: https://legislatie.just.ro/Public/DetaliiDocumentAfis/6385

Legislation	General Description
Law no. 319/2006, on Work Health and Safety[17]	Law requiring any forest activities concerning health and safety to be monitored by a Labor Inspectorate. The legislation ensures that work environments are safe and outlines challenge procedures for violations of safety requirements.
NATURA 2000[18]	Natura 2000 is a series of ecologically sensitive networks protected throughout the European Union (EU). Its directives recognize and develop sustainable management strategies for birds, animals, and natural habitats via the Bird and Habitat Directives. It is a main driver for biodiversity and nature policies for countries in the EU but does not replace any legally required existing laws. Natura 2000 management plans created for forest lands and wildlife fauna are considered guidelines, not legal obligations.

[17] Law No. 319 of July 14, 2006 of Health and Safety at Work: https://legislatie.just.ro/Public/DetaliiDocument/73772

[18] European Commission Natura 2000 Website: Natura 2000 - European Commission (europa.eu)

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered, nor is it seeking to register under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related credit, including renewable energy certificates,

1.16.3 Supply Chain (Scope 3) Emissions

Silvador/Forest Capital are individual domestic suppliers of raw log materials within the counties of Buzău and Dâmbovița and is not a wholesaler, distributor, or retailer of manufactured wood products.

Supply Chain Scope 3 Emissions are considered the largest source of GHG emissions for companies and indirectly affect both upstream and downstream business activities throughout a supply chain. These activities are generally more complex to measure and track, as companies do not have direct control of other businesses, suppliers or organizations that are involved within the same supply chain.

The following below is a list of Scope 3 emission categories as defined by the Greenhouse Gas (GHG) Protocol[19]. The GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard was referenced to select the upstream and downstream categories that may potentially affect reporting companies with the implementation of the SCA.

[19] The Greenhouse Gas Protocol is the globally recognized standard for measuring and mitigating GHG emissions in both private and public business sectors. For more information see: https://ghgprotocol.org/about-us

Table 10 : Upstream and Downstream Supply Chain Catagorized Activities

Upstream Activities (Indirect Supply Chain Emissions)	Applicability	Downstream Activities (Indirect Supply Chain Emissions)	Applicability
1) Purchased Goods and Services	Applicable	9) Transportation & Distribution	N/A
2) Capital Goods	Applicable	10) Processing of Sold Products	N/A
3) Fuel and Energy Related	N/A	11) Use of Sold Products	N/A
4) Transportation and Distribution	Applicable	12) End of Life Treatment of Sold Products	N/A
5) Waste Generated in Operations	N/A	13) Leased Assets	N/A
6) Business Travel	Applicable	14) Franchises	N/A
7) Employee Commuting	Applicable	15) Investments	N/A
8) Leased Assets	Applicable		

*Scope 3 emission reporting is not a legal requirement for Silvador/Forest Capital

At this time Silvador/Forest Capital supplies roundwood to six manufacturing and sawmill companies and is involved in all activities related to maintaining forest stand health and maintenance. A public statement regarding Scope 3 emissions has been demonstrated by Silvador/Forest Capital via the company website as well as emails sent to current retailers regarding the project and the potential risk of double claiming. See Appendix 8 and website link[20] for substantiation.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The Project Proponent will contribute to sustainable development as defined by and tracked against the United Nations Sustainable Development Goals (SDGs). The Project Proponent's contribution to (at minimum) SDGs 12 (Responsible Consumption and Production), 13 (Climate Action), and 15 (Life on Land) is illustrated through the following initiatives:

1. Group Activity 1 - Sustainable Forest Management:
   This relates to on-going implementation, maintenance, and certification to a recognized third-party forest certification standard on privately owned forestlands. The certification requires measures to be implemented to protect water quality, biodiversity, wildlife habitat, species at risk and forests with exceptional conservation value. This sustainable forest management

[20] Silvador website: http://www.silvador.ro/

certification requires on-going monitoring, reporting and annual external audits (registration and surveillance) by accredited third parties.

2. Group Activity 2 - Climate Action Initiative:
   As outlined in this Project Description Document, the Project Proponent intends to implement a carbon offset project to create greenhouse gas (GHG) emission reductions and removals by converting privately owned operational forest lands to protected forest lands. By stopping timber harvest within the PAI, approximately 340,000 tonnes of carbon dioxide equivalent (tCO2e) will be reduced from the atmosphere during the life of the project. This project requires on-going monitoring, as well as validation/verification audits by accredited third parties.

Nationally stated sustainable development priorities have been communicated by the Government of Romania via the United Nations website and specifically within the Sustainable Development Strategy 2030, adapted by the Romanian Government through Government Decision 877/2018[21]. While this strategy intends to outline targets and measures with a focus on the economic, social, and environmental dimensions of the 17 SDGs, it is considered a shared responsibility between the international and national government members, inter-ministerial committees, and state institutions.

As the Project Proponent is not a member of government, ministry, or state institution, no monitoring or reporting provisions relating to The SCA potential contributions to achieving nationally stated sustainable development properties apply.

1.17.2 Sustainable Development Contributions Activity Monitoring

The SCA during this monitoring period results in contributions and benefits by providing climate improvement through the reduction and removal of GHGs with the implementation of a LtPF, sustainable forest management practices, and by providing plant and wildlife biodiversity through ecosystem management and conservation.

[21] For more detailed information visit: (2018). Transformation Towards a Sustainable and Resilient Romania-Romania's Voluntary National Review 2018. https://sustainabledevelopment.un.org/content/documents/19952Voluntary_National_Review_ROMANIA_with_Cover.pdf

Table 11: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	12.2	Responsible Consumption + Production: Increase in hectares of land certified to sustainable forest management standard	Implemented activities to increase	62% of project lands owned by Silvador are certified to the FSC Forest Management Standard	100% of forestlands owned by Silvador is certified to a recognized third-party sustainable management standard
2)	13.0	Climate Action: Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By conserving 1,538 ha of temperate boreal forest, The SCA has prevented the release of approximately 68,000 tCO2e into the atmosphere during the monitoring period	Prevent the release of approximately 340,000 tCO2e into the atmosphere
3)	15.2	15.2.1 Life on Land: Progress towards sustainable forest management.	Implemented activities to increase	Project has increased implementation of sustainable management of forest types by halting deforestation on 1,538 ha of land (~36,000 m^3 of avoided harvest during the monitoring period)	Continuation of halted deforestation on 1,538 ha of forested lands spanning project lifetime 30 yrs (~265,000 m^3 of avoided harvest throughout the lifetime of the project).

1.18 Additional Information Relevant to the Project

1.18.1 Leakage Management

The Project Proponent will provide evidence that no compensatory harvesting has been initiated to account for lost timber volumes incurred during the carbon project. Supporting evidence will show that no additional land acquisition will be made with the sole intention of replacing harvest which has been deferred through the creation of the SCA.
Further information regarding a leakage monitoring plan will be provided within the Section 5.3 (Leakage).

1.18.2 Commercially Sensitive Information [*]

Commercially sensitive information may have been excluded from the public version of the project description. This information pertains to the following:

a) Section 2.4; Due to confidentiality concerns, the names associated with comments received during the Local Stakeholder Consultation process will not be made publicly available, however comments will not be considered commercially sensitive; names will be provided to the VVB at the time of validation and will be made available at subsequent verification events.

1.18.3 Further Information

No further information beyond what has been provided within the sections of this project description document have bearing on the eligibility of the project, the net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

There are no known or anticipated potential negative and socio-economic impacts related to the SCA, specifically due to the nature of the initiative being the retention of natural forests. Following the procedures described within the GreenRaise, Greenhouse Gas – Stakeholder Consultation + Engagement (SOP) a Life Cycle and Aspects analysis was conducted (Appendix 11). Refer to Section 2.5 (AFOLU – Specific Safeguards) below for a full description of this process.

2.2 Local Stakeholder Consultation

Stakeholder consultation was conducted through direct emails contact to stakeholders, website feedback platforms, publicly attended townhall meetings, and local onsite verification validation interviews.

Consultation was conducted both via electronic documents delivered by email on November 23, 2022, as well as in-person "Town Hall" meetings in Romania held on:

- November 28th, 2022, within county of Dambovita at Aninoasa, Viforata, street Silozului nr.2
    - Approximately 40 invitations; 7 persons attended; all representatives from the forest economic sector.
- November 29th, 2022, within county of Prahova at Ploiesti street Buzaului nr.1
    - Approximately 40 invitations; 7 persons attended; all representatives from the forest economic sector.

Several other stakeholder consultation meetings were held throughout the week of January 8th during the project onsite verification and validation. Email notifications were sent out on January 3 and January 5th to approximately 35 stakeholders.

January 8th, 2024, Targoviste at Targoviste Bld.Libertatii nr.1 bloc B2, parter Romania 130009

- 20+ persons attended, representatives from the forest economic, environmental non-governmental organizations (NGO), and state forest agencies; validation/verification body (VVB) was present.

January 9th, 2024, Targoviste at Targoviste Bld.Libertatii nr.1 bloc B2, parter Romania 130009

- 10+ persons attended, representatives from the forest economic, environmental NGO, state forest agencies, and social community representatives; VVB was present.

January 10th 2024, Casa Padurarului, Sasensii Vechi Romania 127684

- 4 persons attended, social community representatives from Vechi; VVB was present.

January 11th 2024, City Hall, Primaria Tisau, No.6 Izvoru Tisau Romania

- 10+ persons attended, forest economic and social community representatives from Izvoru; VVB was present.

On February 16, 2024, a follow up town hall occurred at Targoviste Bld.Libertatii nr.1 bloc B2, parter. This gave an opportunity for those stakeholders who were unable to attend any previous meetings to learn about the project, provide input on project design and ask questions if any arose. An email invitation was sent February 8th, 2023 to approximately 45 stakeholders. 4 person attended and all were from Silvador Company SRL.

The meetings were organized and chaired by the Project Proponent and attended by the Project Developer and Implementation Partner. Attendance was taken at local Town Hall meetings and is kept on file. Stakeholder Information relating to the project design and implementation, results of monitoring, any risks, costs or benefits to local stakeholders, all relevant law and regulations covering workers' rights in Romania, and the validation and verification process was provided via the GreenRaise website (https://green-raise.com/projects/). Links to the Verra Project Registry will also be provided on the GreenRaise website at time of project listing document submission. If required throughout the life of the project, any additional information that is required to be communicated to local stakeholders will follow the same process of electronic correspondence via email and information provided via the GreenRaise website.

Online forms were made available on the GreenRaise website and were used to collect stakeholder comments and feedback. All responses from this form were automatically entered into a Consultation Database managed by GreenRaise. The feedback forms will remain accessible to the public throughout the lifetime of the project, allowing for continual stakeholder engagement.

All public comments received through the online comment form were recorded within the Consultation Database. Response, and any required project design updates to the project design relating to comments received from Stakeholders were also tracked within the Consultation Database. The Consultation Database is made available to the VVB during project Validation and Verification.

Response, and any updates to the project design relating to comments received from Stakeholders from Verra will also be tracked. To date, no comments have been received through the local stakeholder consultation process. If comments are received in the future, they will be summarized, along with the Project Proponent's response and made available within the monitoring reports. For privacy reasons, names related to public stakeholder information will not be shared publicly.

2.3 Environmental Impact

An environmental impact assessment was not required for the SCA as the project is a logged to protected activity and an impact assessment is not applicable. The regular forest management activities undertaken by Silvador and its affiliates are not subject to the provisions of environmental directive 85/337/EEC[22] or Law 292/2018[23] and do not fall under the Annex 2 list for required environmental impact assessments. Those requiring assessments are listed below:

- Projects regarding the restructuring of rural landed holdings
- Projects for use of uncultivated land or semi-natural surfaces for intensive agriculture purposes
- Water management projects for agriculture, including irrigation and drainage projects
- Initial afforestation and deforestation for the purpose of conversion to another type of land use
- Intensive livestock installations
- Intensive fish farming
- Reclamation of land from sea

2.4 Public Comments

The SCA Description Document and Monitoring Report has been listed on the Verra Project Registry for public comment from August 18, 2023 – September 17, 2023. No comments were received during the public comment period.

2.5 AFOLU-Specific Safeguards

A stakeholder (excluding an interested stakeholder) is designated as any person who can potentially be affected by the project.

With the intention to meet the VCS Non-Permanence Risk Tool requirements for Stakeholder Engagement (SE)[24], stakeholders were identified within a minimum of a 20km radius of the project area boundary.

Potential stakeholders are identified by the project proponent. A categorized description of peoples potentially impacted by the project is generated. Stakeholder contacts are chosen to:

- Cover national, state/provincial, and smaller scale levels,
- Provide a range of stakeholder organization sizes, from larger institutions through to small organizations and individuals,
- Provide a range in geographic coverage, with a focus on areas where forest management is likely a priority (i.e., where appropriate, focus on forested regions).

Information is collected with the goal to:

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[22] Directive - 97/11 - EN - EUR-Lex (europa.eu)

[23] For reference see Law 292/2018 pg.1, Article 1, Article 2, sec 2.and pg.21 Annex 2, Law no. 292/2018 of December 3rd, 2018. Website https://unece.org/sites/default/files/2021-06/frPartyVI.8h_25.06.2021_annex2.pdf

[24] As described under the most recent version of the VCS AFOLU Non-Permanence Risk Tool

- Identify digital contact information (i.e., email addresses), as the primary point of contact (to maximize the duration of consultation, to speed up the response process, and to facilitate responses and information sharing (refer to the *Stakeholder Communication* section for a description of how information will be presented in culturally appropriate manner, where required), and
- Provide a sufficient number of contacts, commensurate within available information and the size of the project areas.

Once potential stakeholders are identified, they were categorized as follows to ensure adequate representation has been achieved across the following groups:

1. Economic
    - Other Forest Owners (adjacent to the project area)
    - Forest Contractors
    - Representatives of Forestry Workers/Industry
2. Social
    - Non-government organizations
    - Households (as defined by the VCS AFOLU Non-Permanence Risk Tool v4.0)
    - Labour/ Trade Unions
    - Community Representatives
    - Recreation Representatives
    - Indigenous Representatives
3. Environmental
    - Non-government organizations
    - Local Communities
4. Forest Agencies
    - National/Federal
    - State/Provincial
5. Research Institutes and Universities

Table 12: Number of stakeholders identified by stakeholder group

Stakeholder Group	Number of Stakeholders Identified
Economic	17
Environmental	10
Social	7
Total:	34

The project area is non-contiguous, privately owned, and accessible by forestry roads. There are no communities or other ongoing public use for income or livelihood by any people living, or who are dependent on resources, within the PAI that would be affected by the project activities. The region has a well-developed industrial and communication infrastructure, a strong agriculture and tourism industry, and a wide range of skilled laborers within a diverse economy.

The group of stakeholders identified for SCA were inclusive of the following organizations (see Table: Stakeholder descriptions by stakeholder group). Representatives for the group's stakeholders identified ranged in gender, age, and ethnicity. As defined by the United Nations, Indigenous Peoples are those that "have retained social, cultural, economic, and political characteristics that are distinct from the those of dominant societies in which they live[25]." Romania is home to inhabitants that have centuries of cohabitation and settlement history which has resulted in an ethnical group majority with equal rights, therefore no such people are classified or identify as indigenous in Romania.

For privacy reasons, stakeholder names (including names of organizations) are not named within this project document, however, will be provided to the VVB at the time of validation and all subsequent verifications.

Table 13: Stakeholder descriptions by stakeholder group

Stakeholder Group	Stakeholder Descriptions
Economic	Wood Products manufacturer Protected Area Manager
Environmental	Environmental NGO Environmental Partnership Foundation State Owned Forest Management Company
Social	Political Representative Adjacent Neighbour

Interactions between the identified stakeholders are typical to those of the forest industry within Romania. Silavdor has relationships with adjacent neighbors, communities, and hunting officials to maintain access for recreational purposes as well as manage and provide access for firewood collection and hunting. Economic relationships extend to stakeholders such as wood buyers, forest contractors, and tree nurseries for purposes relating to the harvesting of wood products from lands owned by Silvador. Silvador has additional relationships with environmental stakeholders to ensure their management practices on their forest lands are up to date with all current environmental standards and best practices. These are just some examples of how the identified stakeholders interact with the project proponent.

[25] https://www.un.org/development/desa/indigenouspeoples/about-us.html

Table 14: Aspect Analysis Results below outlines the identified aspects, impacts, potential risks, risk category (based on Table 1 within the GreenRaise SOP), risk ranking (based on the Risk Ranking Matrix within the GreenRaise SOP) and mitigation measures applied (if any).

Table 14: Aspect Analysis Results

Activity	Aspect	Impact	Potential Risk to local Stakeholders (Stakeholder Category)	Risk Category	Risk Rating and Justification	Mitigation Measures (Implemented by project proponent)
Halting/ reduction of harvesting activities: Logged to Protected Forest (LtPF),	Reduced/ no requirement for harvesting labour	Loss of income/ livelihood	Loss of income to local communities could result in the degradation of local communities (i.e., reduction in community resources, loss of community members due to moving, etc.). (Social, Economic)	Social/ Socio economic	**Low** – Project Proponent will not be halting all operations, only a portion of operations within the project area.	Project Proponent will continue to offer employment opportunities on the remainder of their forest lands.
	Reduction/ no requirement for energy (fuel) consumption	Loss of income/ livelihood	Loss of income to local economy due to reduced need for fuel. (Social, Economic)	Social/ Socio economic	**Low** – Project Proponent will not be halting all operations, only a portion of operations within the project area	

Activity	Aspect	Impact	Potential Risk to local Stakeholders (Stakeholder Category)	Risk Category	Risk Rating and Justification	Mitigation Measures (Implemented by project proponent)
	Reduction of fuelwood produced	Loss of wood for heating/ fuel purposes	Loss of access to fuel source for home heating. (Social)	Social/ Socio economic	**Low** – Continued harvests in areas outside of the project areas are intended to produce fuelwood for local communities.	
	Public Access reduced or denied	Public recreation opportunities reduced or denied	Increase in illegal trespass instances. Reduced public health (mental and physical) due to reduced access to recreation. (Social, Economic)	Social/ Socio economic Traditional/ Human Rights	**Low** – Public access will not be reduced in project scenario.	
		Public access for foraging/ hunting purposes reduced or denied	Increase in illegal trespass instances. Reduced access to food sources. (Social, Economic)	Social	**Low** – Public access will not be reduced in project scenario	

Activity	Aspect	Impact	Potential Risk to local Stakeholders (Stakeholder Category)	Risk Category	Risk Rating and Justification	Mitigation Measures (Implemented by project proponent)
	Reduction in harvesting/ controlled burns for purposes of fire prevention	Increase risk of forest fire	Local communities exposed to higher risk of forest fire. Adjacent forest owners at risk of commodity loss due to forest fire spread. (Social, Economic, Environmental, Forest Agencies).	Environmental	**Low** – Project Proponent does not utilize controlled burns. Fire hazard assessments will continue to be conducted in areas where annual monitoring is conducted	
	Complete termination of project area maintenance	Road failure	Increased landslide risk to local communities. Watershed/ water quality degradation due to landslides and lack of sediment control. Loss of access to adjacent forest lands due to road failure. (Social, Economic, Environmental, Forest Agencies)	Environmental	**Low** – Project Proponent will continue maintenance of the project area, including roads (i.e., project area is included within Project Proponent's managed forest lands.	

Activity	Aspect	Impact	Potential Risk to local Stakeholders (Stakeholder Category)	Risk Category	Risk Rating and Justification	Mitigation Measures (Implemented by project proponent)
		Pest or Disease Outbreak	Spread of disease to local community forests/ adjacent forest lands. Watershed/ water quality degradation due to transition to low productivity stands. (Social, Economic, Environmental, Forest Agencies)	Environmental	**Low** – annual monitoring along with continual pest management within project area will continue to occur.	
		Public safety	Increase in accident or injury within project area accessible to public. (Social)	Social/ Socio - economic	**Low** – public access will not change due to the project scenario	
	Property rights are undefined/ disputed	Loss of property rights	Project encroaches on private property. Project encroaches on government property. Project relocates people off their lands. (Social, Economic)	Legal Social/ Socio economic	**N/A** – Project Proponent property rights have been verified and are not legally disputed	Additional measures: refer to *Respect for Local Stakeholder Resources: Property Rights (See below)*

Activity	Aspect	Impact	Potential Risk to local Stakeholders (Stakeholder Category)	Risk Category	Risk Rating and Justification	Mitigation Measures (Implemented by project proponent)
	Participation in project design, implementation, and/or consultation	Safety of local stakeholders	Increased risk to stakeholder safety due to opposing opinions, cultural/ religious differences, land holder grievances or disputes, government, or local oppression of freedom of expression. (Social, Research Institutes and Universities)	Social/ Socio economic	**Low** – Refer to Universal Control; There is no evidence of the suppression of freedom of speech within Romania.	Universal Control = All stakeholder contact information (Name, Address, etc.) will be kept confidential. Stakeholder responses will be number coded as to keep public record of responses anonymous.

Respect for Local Stakeholder Resources

AFOLU projects designed and implemented by GreenRaise will be done in a manner to avoid negative impacts to local stakeholders, including stakeholder resources such as property rights. Through the same process described to evaluate risks to local stakeholder (Aspect Analysis), impacts to local stakeholder property rights will be evaluated.

Where impacts are unavoidable, mitigation measures will be implemented.

In addition to evaluating impacts to local stakeholder property rights, the following measures will be implemented for each project to avoid damage to local ecosystems:

- Project proponents will not introduce invasive species or allow invasive species to thrive through project implementation.
- If required, the project proponent will justify the use of non-native species over native species.
- If required, the project proponent will justify and describe the possible adverse effects of the use of fertilizers, chemical pesticides, biological control agents and other inputs.

If required, justifications will be outlined within project specific PDDs.

Property Rights

In all cases, project proponents shall recognize, respect and support local stakeholders' property rights. Where feasible, the project proponent will also take measures to help secure local stakeholder property rights. In the event there are ongoing or unresolved conflicts over property rights, usage or resources, the project shall undertake no activity that could exacerbate the conflict or influence the outcome of an unresolved dispute.

At no time, will a project encroach on private, stakeholder, or government property. A project will not relocate people off their lands without consent. If required, the project proponent may affect property rights if free, prior, and informed consent is obtained, and a transparent agreement is reached that includes provisions for just and fair compensation.

Worker Relations

For projects under SD VISta, any workers or individuals involved in carrying out project activities shall receive orientation and training with an objective of building locally useful skills and knowledge to increase local participation in project implementation. Special attention shall be given to marginalized and/or vulnerable people.

All stakeholders shall be given an equal opportunity to fill all work positions (including management) where the job criteria are met.

2.5.1 Communication and Consultation

Ongoing Communication and Consultation

Throughout the lifetime of the project, the project proponent will continue to communicate and consult with local stakeholders in an on-going process. GreenRaise will maintain access to the online Stakeholder Feedback form (created during the Initial Stakeholder Consultation Process) through our website (www.green-raise.com/projects) to allow for on-going communication.

All comments received throughout the lifetime of the project will be recorded within the Consultation Database with corresponding actions or justification for inaction. The Database will be provided to the VVB during verification.

All information provided during the initial stakeholder consultation process, as well as any additional relevant information relating to project design or implementation will be provided through the GreenRaise website.

Documentation relating to results of monitoring and the process of the VCS Program validation and verification will be made available via the Verra Registry.

Communication of Site Visits

For all projects validated and verified under SD VISta (as is the case with SCA), the project proponent must provide timely information about the validation and verification body's (VVB) site visit before the site visit occurs. The project proponent shall facilitate direct and independent communication between them or their representatives and assessor.

2.5.2 Grievance Redress Procedure

GreenRaise has developed a Grievance Redress procedure which is outlined within the GHG – Stakeholder Consultation + Engagement SOP. Similar to the process for Stakeholder Consultation, the Grievance Procedures as well as a Grievance Submission Form are posted on the GreenRaise website (https://green-raise.com/projects/). All grievances submitted to GreenRaise will be tracked utilizing the Grievance Record Database.

The following processes are intended to facilitate receiving, hearing, responding to and attempting to resolve grievances, within a reasonable time period related to VCS and SD VISta projects developed by GreenRaise.

These procedures are to be applied to all GreenRaise VCS and SD VISta projects, however where appropriate, these procedures will be amended to take into account culturally appropriate conflict resolution methods.

These documented procedures, and documentation of disputes resolved through this procedure will be made publicly available on the GreenRaise website (https://www.green-raise.com/).

Contact Information

All grievances are requested to be submitted through the Grievance Submission form located on the GreenRaise website. Where local customs or circumstances do not allow for electronic submission, a paper version of the Grievance Submission Form can be provided. Please contact GreenRaise using the information provided on contact page of our website if you or someone you are representing requires an alternate form of submission.

Grievance Process

Stage 1 – Receive, Respond and Resolve

When GreenRaise receives a grievance related to a VCS Project, either directly or via a project proponent, GreenRaise will:

1. Acknowledge the grievance to the grievor, if not already done so by the project proponent and provide an initial response to the grievor within two weeks of the original grievance. GreenRaise will request the grievor complete the GreenRaise Grievance Submission Form if they have not already and including relevant evidence to support their concern. General information grievances received will be tracked within the GreenRaise Grievance Record Database and made publicly available.
2. Conduct a preliminary assessment to determine whether evidence provided in a grievance is or is not substantial, by assessing the evidence provided.
3. Dialogue with grievor with the aim to solve grievances assessed as substantial before further actions are taken.
4. While substantial grievances are pending, a precautionary approach towards the continued implementation of the project will be taken, which may include:
   a. Temporarily halting the sale of VCUs generated by the project, or
   b. Developing interim mitigation measures to effectively mitigate the grievance, until the grievance is resolved.
5. Where further investigation is required to resolve a substantial grievance, a desk or field review (as applicable) will be conducted within two months of the initial grievance.
6. Where a grievance is assessed as being substantial, mitigation measures will be developed, as applicable (e.g., mitigation measure revision or development, changes to project design or implementation). Mitigation measures may include steps to be taken by stakeholders, as well as the project proponent, to resolve the issue.
7. If a mitigation measure cannot be determined and/or enforced, Stage 2 – Mediation, shall be considered and managed accordingly.
8. Upon conclusion of the grievance review and mitigation process, the Grievance Record Database will be updated with relevant results of the grievance and any actions taken towards its resolution.
9. A separate grievance file will be maintained by GreenRaise to record detailed records of grievances received, correspondence, and actions taken.

Stage 2 – Mediation

If a grievance cannot be resolved by utilizing the procedure outlined within Stage 1, the grievance will be referred to by a neutral third-party4 for mediation.

Procedures for mediation will be developed and outlined by the neutral third-party.

Stage 3 – Arbitration or Adjudication

Any grievances that are not resolved through mediation will:

1. Be referred to arbitration, to the extent allowed by the laws of the relevant jurisdiction, or,
2. Be referred to competent courts in the relevant jurisdiction, without prejudice to a party's ability to submit the grievance to a competent supranational adjudicatory body, if any.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The VM0012 Improved Forest Management in Temperate and Boreal forests (LtPF) v1.2 methodology has been selected for project implementation. Additional tools utilized include:

- AFOLU Non-Permanence Risk Tool: VCS Version 4.0 (Procedural Document, 19 September 2019)

  No additional application conditions are required through the use of this tool.

- VT0001 – Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry, and Other Land Use (AFOLU) Project Activities – Version 3.0, Sectoral Scope 14. This tool is applicable under the following conditions:
  - AFOLU activities are the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced. The project activities do not violate and legislation.
  - The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity. Section 3.5 provided the stepwise approach and eligibility requirements.

3.2 Applicability of Methodology

Table 15: Compliance with VM0012 Methodology Criteria

	Summarized Methodology Applicability Criteria	Silvador Climate Action
1.	Project meets criteria for IFM-LtPF projects	The SCA meets specified criteria through the voluntary protection of privately owned forest lands within the project area.
2.	Project is located in Temperate or Boreal Domain Global Ecological Zones and meet Tier III inventory and data requirements	The SCA is located in the Temperate Ecological Zone. (see Appendix 5 Map) Silvador utilizes detailed site level inventory meeting Tier III criteria.
3.	Project meets VCS Standard requirements for ownership	Silvador can demonstrate Proof of Right and Right of Use.
4.	Annual illegal, unplanned and fuelwood removals are <5% of total annual harvest levels	The SCA has no illegal or unplanned harvesting and, de-minimis fuelwood removals.
5.	No managed peatland forests in project	The SCA areas do not contain managed peatland forests.
6.	Total percentage of wetlands in project area not expected to change due to project activities	Silvador will not materially alter the percentage of wetlands on the project area.
7.	No activity shifting leakage to other Silvador lands at the start of the project	Silvador can demonstrate that baseline activities are not being shifted to other conservation land holdings.
8.	Project does not include non-de minimis application of fertilizer in the project scenario	Silvador will not include any application of fertilizer in the project area.

3.3 Project Boundary

Table 16: Project Sources, Sinks, and Reservoirs

Source		Gas	Included?	Justification/Explanation
Baseline	Fuel Combustion by Vehicles/Equipment	CO_2	Yes	Source – Carbon emissions from harvesting equipment, log transport, and primary forest product manufacturing are listed as being an optional inclusion within VM0012 and will be included in The SCA.
	Above Ground Biomass (Live)	CO_2	Yes	Sink – Biomass re-growth after harvest disturbance. Source – Carbon flows resulting from timber harvest removals and adjacent biomass impacts during operations (shifted to other carbon pools). Source – Emissions from mortality and decay in remaining forests.
	Below Ground Biomass Pool (Live and Dead)	CO_2	Yes	Sink – Biomass re-growth after forest management activities. Source – Carbon flows resulting from forest management harvesting removals (shifting to other carbon pools). Source – Emissions from mortality and decay in remaining forests (shifted to other carbon pools).
	Dead Wood Pool	CO_2	Yes	Sink – Dead snags, coarse branches, and stems before and after forest management activities. Source – Decay of deadwood pool.
	Wood Products Pool	CO_2	Yes	Sink – Carbon in permanent storage in harvested wood products. Source – Emissions from decaying wood products.
Project	Fuel Combustion by Vehicles/Equipment	CO_2	Yes	Source – Carbon emissions from industrial equipment are expected to be minimal due to low levels of conservation harvesting for forest health maintenance.
	Above Ground Biomass (Live)	CO_2	Yes	Sink – Biomass re-growth after harvest disturbance. Source – Carbon flows resulting from timber harvest removals and adjacent biomass impacts during operations (shifted to other carbon pools).

Source		Gas	Included?	Justification/Explanation
				Source – Emissions from mortality and decay in remaining forests.
	Below Ground Biomass Pool (Live and Dead)	CO_2	Yes	Sink – Biomass re-growth after forest management activities. Source – Carbon flows resulting from forest management harvesting. removals (shifting to other carbon pools). Source – Emissions from mortality and decay in remaining forests (shifted to other carbon pools).
	Dead Wood Pool	CO_2	Yes	Sink – Dead snags, coarse branches, and stems before and after forest management activities. Source – Decay of deadwood pool.
	Wood Products Pool	CO_2	Yes	Sink – Carbon in permanent storage in harvested wood products. Source – Emissions from decaying wood products.
Sources Excluded from the Baseline and Project Scenarios				
Excluded	Above-ground Non-Tree Biomass (Live)	CO_2	No	Sources and sinks are *de minimus.*
Excluded	Litter Pool	CO_2	No	Litter is a short-lived transition pool, and differences between the project and baseline are *de minimus* over time.
Excluded	Soil Carbon Pool	CO_2	No	Soil carbon is a reservoir of long-lived carbon storage which is likely unaffected by timber harvesting.

For project instance, refer to the location maps below:

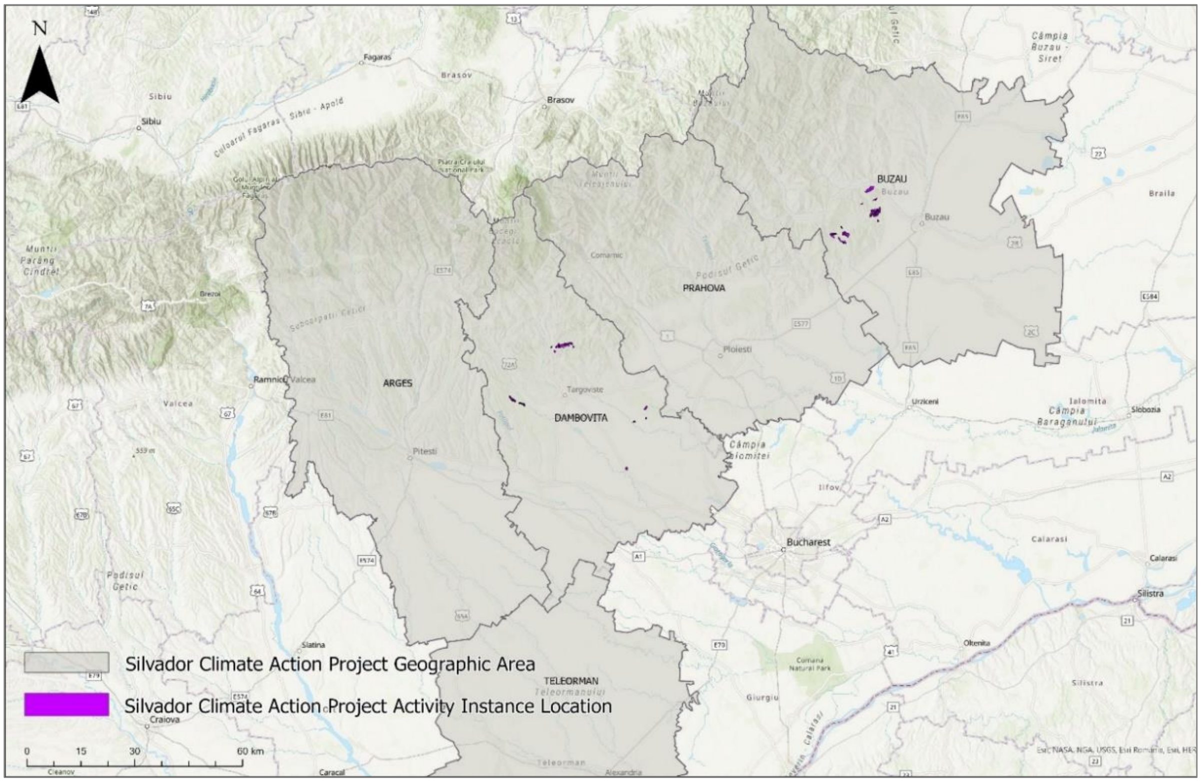


Figure 2: Overview of the Silvador Climate Action Project

Figure 3: Dâmbovița County (North) Project Forest Lands

Figure 4: Dâmbovița County (East) Project Forest Lands

Figure 5: Dâmbovița County (S Central) Project Forest Lands

Figure 6: Dâmbovița County (S East) Project Forest Lands

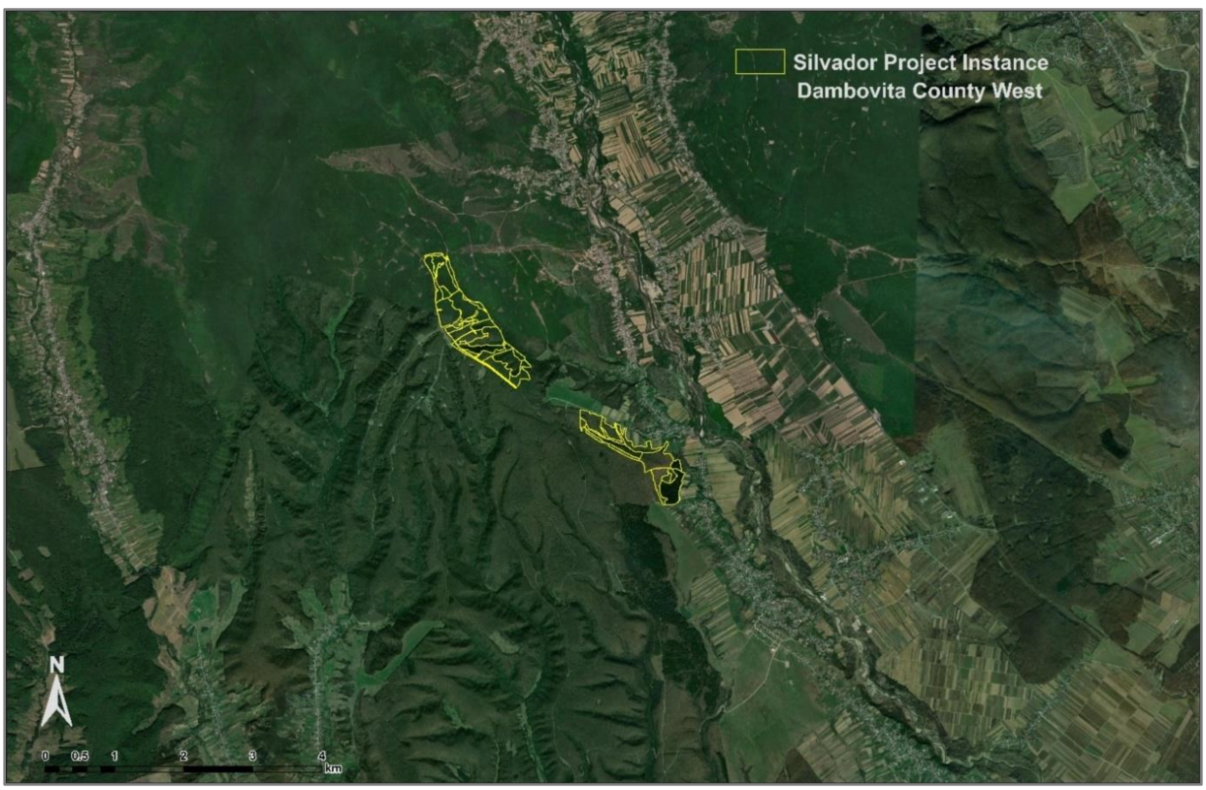


Figure 7: Dâmbovița County West Project Forest Lands

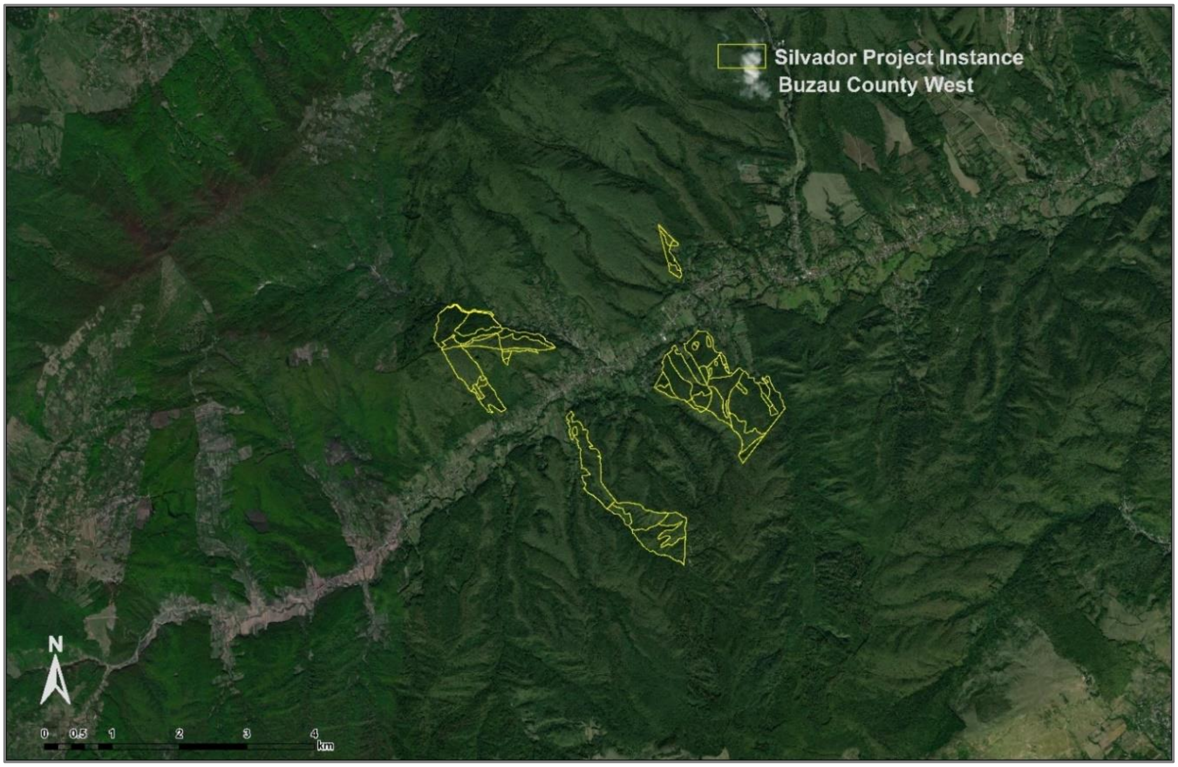


Figure 8: Buzău County West Project Forest Lands

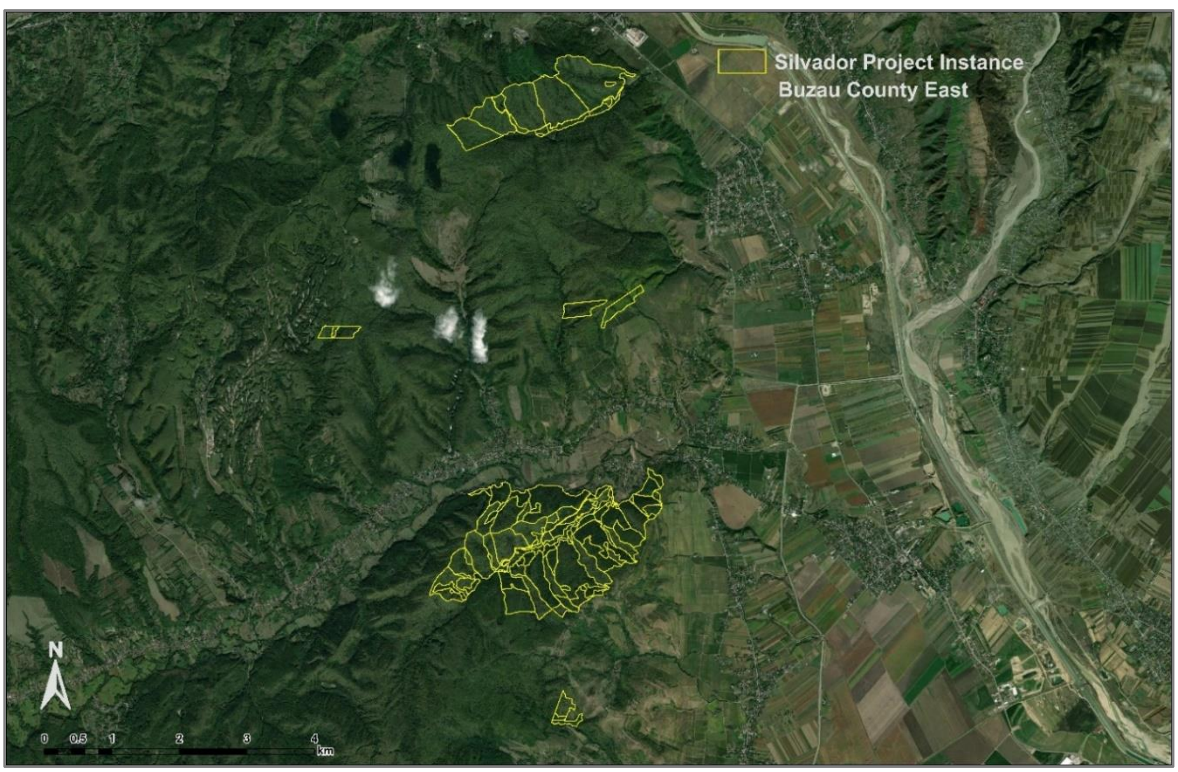


Figure 9: Buzău County East Project Forest Lands

3.4 Baseline Scenario

3.4.1 Step 1 Identify Plausible Alternative Baseline Scenarios to the VCS Activity

The SCA identified four potential baseline scenarios which were evaluated in the baseline selection process.

1. Historical Practice
   The VCS standard and VM0012 methodology require that the project proponent assess historical practice as a baseline scenario in Step 2a. The most recent forest management plans (FMP) have been created for the Silvador forested areas and developed for a ten-year period. Each area has an objective of sustainable harvest volume associated with it as well as a total planned annual timber harvest categorized. The current harvest plan created for the project area is further described in Step 2a.
2. Common Practices
   The common practice and applicable scenario maximize the allowable timber harvest from the forest fund property as outlined in the FMP document. Romanian forest management plans must be completed every 10 years (Romanian Forest Code, technical regulation no. 5/2005)., The common practice is to harvest the annual volume objectives detailed in the forest management plan (i.e. harvest quota). This can be done at a yearly set rate, or all in year X of the plan, however, must remain within the quota. This common practice follows guidelines outlined in the Forestry Code/1996.
3. Land acquisition for conversion to real estate development
   An alternative baseline scenario would be to sell the lands within the project area to gain financial returns from the development and sale of these properties. Some portions of the project area are adjacent to residential areas, making them suitable for primary and secondary residences or industrial developments. This scenario emphasizes maximizing real estate opportunities within best use areas. These areas include properties adjacent to villages, towns, and cities.
4. Acquisition for conversion to conservation lands
   The last suggested baseline scenario is the acquisition of the forest for conservation purposes. This scenario represents or is comparable to the project scenario without carbon crediting benefits. There is no credible market-based business model for this baseline scenario to provide financial returns for private investment capital as there are no material revenue returns from conservation activities like the project scenario. The inclusion of this scenario meets element 2.1.1 a), item ii) in the VCS Additionality Tool VT0001.

The italicized text below indicates VM0012 methodology or VCS requirements in the baseline scenario selection. Each prospective baseline scenario meets the following selection scenario eligibility criteria, except where noted and excluded:

1. *Including activities and areas where forests remain as forests* – this criterion eliminated the potential Baseline Scenario 3 “Acquisition for conversion to real estate development lands”.
2. *Comply with legal requirements for forest management and land use in the area* – all remaining baseline scenarios meet the minimum practice requirements of the Forestry Code/1996.

3. *Demonstrate that the "projected baseline scenario environmental practices equal or exceed those commonly considered a minimum standard among landowners in the area" (Voluntary Carbon Standard, 2008a)* – all the prospective baseline scenarios comply with or exceed minimum environmental requirements and performance of landowners in the area.

3.4.2 Step 2 – Selection of a single plausible Baseline Scenario for the Project

Project proponents shall select a single plausible baseline scenario for the project using the following steps:

3.4.3 Step 2a – The Historical Baseline Scenario – based on historical operating practices on the property:

2a.1 The project proponent has at least 5 years of historical harvest level data history.

Timber harvest projections for the project area were determined through forest management plans annually since 2012. The VM0012 methodology states that "projects may use a forward-looking forest management plan as the historical baseline data". The annual harvest volume has been determined by averaging forward looking harvest volumes. The project area is 1,538 ha, with an annual harvest reduction over the 30-year project period.

The baseline scenario established on actual property harvest history has been selected as the project proponent has at least 5 years historical harvest level data history. Step 2b and 2c will be omitted due to the acceptance of the historical baseline scenario in Step 2a.

3.4.4 Step 3 – Additionality Test

The project is additional as per Section 3.5 in a manner consistent with the baseline selection method.

3.5 Additionality

The project uses the Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities:

The SCA meets the eligibility requirements of this tool as:

1. The project activities are not in violation of any applicable law;
2. The project employs a stepwise method to determine the most plausible baseline scenario, which is consistent with the application of this tool.

3.5.1 Step 1a – Identification of plausible baseline scenarios

1. Historical Practice (selected baseline scenario)
2. Common Practice
3. Acquisition for conversion to real estate development lands
4. Acquisition for conversion to conservation lands

3.5.2 Step 1b – Legal tests

All plausible baseline scenarios could be undertaken within the legal requirements of private forestland or private rural residential land in Romania (refer to Section 3.4).

3.5.3 Step 1c – Selection of Most Plausible Baseline Scenario

See Section 3.4 for a description of the baseline selection process.

The outcome of the selection process is to select the "Historical Practice" using the forward-looking ten-year forest management plans.

3.5.4 Step 2 – Investment Analysis

Sub-step 2a&b: Determine appropriate analysis method

As a Logged to Protected Forest conservation project, the project scenario of the SCA will generate no material financial or economic benefits other than VCS related income. However, low levels of timber harvesting occurred in the project scenario during the first three years. Some revenues from timber sales were generated from this timber harvesting.

The Net Present Value (NPV) investment comparison analysis has been selected as the analysis method for additionality. The NPV of the project scenario is compared to the NPV of the selected baseline scenario. The NPV method works well when comparing projects with varying cash flows over time and is a commonly used method for analyzing forestry investments.

Sub-step 2c – Calculation and comparison of financial indicators

The 30-year period of the SCA was used to calculate the NPV of the carbon project scenario without the financial benefits from the VCS. Cash inflows are only realized during the first three years of the project from the sale of timber that was harvested. The cash outflows relate to the anticipated project costs, and the costs of the limited timber harvesting. The anticipated project costs include project implementation, registration, validation/verification, and issuance for the initial verification period, and project maintenance and verification fees for subsequent periods.

A 30-year period was used to calculate the NPV of the baseline ("Historical Practice") scenario. The cash inflows and cash outflows used in the analysis were provided by management and are reflective of the actual average revenues and costs that have been incurred while conducting timber harvesting operations in the project area. Historically, operations have been profitable and so for the purposes of the NPV analysis a consistent profit margin is realized.

The outcome of the NPV analysis is that the NPV for the baseline scenario is significantly positive, whereas the NPV for the project scenario is minimal. The difference is driven by consistent profit margins over the 30-year period of the baseline scenario, whereas lower profit margins in the project scenario only during the first three years, with all subsequent years having no profits and only costs associated with the project.

A discount rate of 7.5% was utilized in the analysis. This discount rate is reflective of average Romanian Bank Lending rate over the past 20 years, as well as customary rates used for forestry in Romania.

A detailed financial assessment is contained in the Excel document entitled '*Silvador – Investment Analysis for Additionality Assessment*'. This Excel document has been provided to the validation/

verification body for review. This detailed financial assessment contains confidential information, and for this reason is not included in this section.

The results of the NPV comparison analysis illustrate that the proposed carbon project, without the financial benefits from the sale of VCU's, is a financially unattractive alternative when compared to standard historical practice.

Sub-step 2d – Sensitivity analysis

A sensitivity analysis was performed by reducing both the amount and the frequency of the fixed costs of the carbon project scenario.

Despite these cost assumption changes, the NPV of the carbon project scenario was always much lower than the NPV of the baseline scenario.

The sensitivity analysis is included in the Excel document '*Silvador – Investment Analysis for Additionality Assessment*'. This Excel document has been provided to the validation/verification body for review.

For all reasonable variations in the cost assumptions for the carbon project scenario, it is concluded that the proposed VCS AFOLU project without the financial benefits from the VCS is unlikely to be financially attractive.

3.5.1 Step 3: Barrier Analysis (Supporting Information Only)

Additional barriers existing with those described in the Investment Analysis are described below.

Step 3a – Identify barriers that would prevent the implementation of the type of proposed project activity

There are barriers for AFOLU project activities undertaken and operated by private entities:

Similar conservation activities have only been implemented with grants, other non-commercial finance terms (FCC 2009), or with the financial incentives created by carbon credits. In this context similar activities are defined as activities of a similar scale that take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant geographical area. The project activity will be the second VCS project to be implemented in Romania. No similar project activities are currently operational in Eastern Europe with the Gold Standard or the Clean Development Mechanism.

Step 3b – Show that the identified barriers would not prevent the implementation of at least one of the alternative land use scenarios (except the proposed project activity)

The scenarios related to historical practice and common practice are not affected by funding barriers associated with landscape conservation. The historical and common practice scenarios generate income from timber harvest. The real estate development scenario would receive financial benefits from both the sale of the property and standing timber on the property. The project scenario is the only scenario which does not receive financial benefits from either property or timber sales. Therefore, the project scenario is unlikely to produce economic benefits or be financially attractive without the sale of carbon credits from the VCS AFOLU project.

3.5.2 Step 4: Common Practice Analysis

Silvador is the second IFM-LtPF carbon project proposed (by the project developer) in Romania and the second forest carbon project considered in Romania to date[26]. Conservation projects in Romania have been completed in the past with private and public money. An example of this is Foundation Conservation Carpathia[27], founded in 2009 by philanthropists and conservationists to protect privatized forest lands in the Făgăraș Mountains (FCC 2009). The maintenance costs of Carpathia are offset by leasing hunting rights, donations, and other revenue generating enterprises such as eco-tourism, and local farm production with the goal to return the landholdings to the public domain for permanent protection as a national park. In comparison, the SCA project is entirely funded by Silvador. No donations or other revenue streams have been received or implemented to minimize project costs, and the goal is to implement a carbon project on private land holdings for diversification of revenue streams and environmental stewardship.

There are no comparable projects that could be considered common practice, and which achieve similar scale or employ similar project activities. Similar acquisitions are only achieved with non-commercial funding and capital sources.

Based on the application of this VCS tool, The SCA is clearly additional based on Investment Analysis.

3.6 Methodology Deviations

A methodology deviation has been applied to the calculations for Market Leakage.

Refer to section 5.3.2 Market Leakage and Appendix 10 for the updated procedure regarding the calculation of a market leakage factor.

This alternative calculation method utilizing MARketz Tool is intended to achieve a higher level of accuracy as it relates to project details (scope and scale) for market leakage quantification compared to the options within the VM0012 methodology and meets the suitability criteria as set out in section 3.19 of the VCS-Standard-v4.4.

No other deviations were required in the implementation of the VM0012 methodology.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

The SCA is currently seeking initial validation and verification from August 1, 2020, to January 1, 2022. Project activities during this time period incorporated ongoing low levels of management activities for forest maintenance, ecological enhancement, and/or risk mitigations. No events occurred during this

[26] VCS Project Database

[27] https://www.carpathia.org/about/

monitoring period that have any impact on the GHG emission reductions or removals, as the ex-ante stocks are also the ex-post carbon stocks, due to the project start date commencing prior to validation.

Description of leakage monitoring and management can be found in Section 7.4. Non-permanence risk factors will be assessed at each monitoring period. The VCS non-permanence risk tool will be fully evaluated prior to each project verification.

5 REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

5.1.1 Validating Inventory Requirements

The SCA meets the Valid Starting Inventory Requirements from the methodology (methodology criteria in italics):

1. *Pertaining directly to the entire project area; the inventory data (updated for each Forest Management of the Forestry Fund Property document) covers the entire project area and meets this criteria.*
2. *Created, updated, or validated <10 years ago; and,*
3. *Documentation is available describing the methods used to create, update, or otherwise validate the starting inventory, including statistical analysis, field data, and/or other evidence.*

The Project Proponents inventory methods and related inventory updates are documented in the forest management documents that define the timber harvesting activities and allowable cuts; which therefore meets the criteria. Further to the above, the Project Proponent is currently in the process of updating the forest inventory of forest fund properties. Current work includes plot establishment and measurement protocols with the goal to validate/ refine forest stock parameters using LiDAR data and technologies.

5.1.2 Baseline Scenario Area Stratification

STEP 1 - Stratify to create homogeneous units.

The Project Proponent's forest inventory is encompassed in both a Geographic Information System (GIS), and forest management plan documentation. The forest inventory consists of multi storied structurally diverse stands and forest inventory units are based on the leading species, productivity class, and other stand attributes including operability etc. The Carbon modeling is specific to the forest lands intended for regulated harvesting.

For modelling purposes, inventory polygons were further refined into Analysis Units (AUs) based on leading species (Beech, Oak, other softwood), site class (grouped 0 to 2, 3, and 4 & 5 where 0 being highest growth and 5 being the lowest), and harvest regimes (Managed vs. Unmanaged (i.e. planned cutting (thinning and primary cutting vs. conservation or hygiene cutting)). Analysis units are grouped by leading species, yield classes, and forest management type.

Table 17: Description of Forest Analysis Units Defined in the Project Area

AU	Name	Description
B2M	Beech 2M	Leading Species Beech, Site Class Group 0, 1, 2, Managed
B2U	Beech 2U	Leading Species Beech, Site Class Group 0, 1, 2, Unmanaged
B3M	Beech 3M	Leading Species Beech, Site Class Group 3, Managed
B3U	Beech 3U	Leading Species Beech, Site Class Group 3, Unmanaged
B4M	Beech 4M	Leading Species Beech, Site Class Group 4, 5, Managed
B4U	Beech 4U	Leading Species Beech, Site Class Group 4, 5, Unmanaged
O2M	Oak 2M	Leading Species Oak, Site Class Group 0, 1, 2, Managed
O2U	Oak 2U	Leading Species Oak, Site Class Group 0, 1, 2, Unmanaged
O3M	Oak 3M	Leading Species Oak, Site Class Group 3<, Managed
O3U	Oak 3U	Leading Species Oak, Site Class Group 3<, Unmanaged
O4M	Oak 4M	Leading Species Oak, Site Class Group 4, 5, Managed
O4U	Oak 4U	Leading Species Oak, Site Class Group 4, 5, Unmanaged
S3	Softwood 3M	Leading Species Softwoods, Site Class Group 1, 2, 3, 4, 5, Managed
S3U	Softwoods 3U	Leading Species Softwoods, Site Class Group 1, 2, 3, 4, 5, Unmanaged

STEP 2 – Identify areas eligible for specific management activities.

The SCA area is subject to the Romanian Governments Forest Code framework as well as the implementation of numerous other ordinances. The overall forest management objective is to employ close to nature forest management practices throughout Romania's forest fund properties. To ensure baseline eligibility, the anticipated area should contribute to future diverse mixed stands, implement sustainable timber volume rates of cut in a harvest plan, and meet the following requirements:

1. Defined as forested areas (vs non-forested areas)
2. Considered merchantable and economically feasible to harvest
3. Not within a legally restricted or protected area

The areas contributing to the baseline projection scenario is consistent with the common forest practices in Romania.

5.1.3 Model Selection and Use

The Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) is an inventory-based, yield-curve-driven model that simulates the stand- and landscape-level C dynamics of above- and belowground biomass, dead organic matter (DOM; litter and dead wood) and mineral soil (Kurz et al., 2009). The CBM-CFS3 is a stand- and landscape-level modeling framework that can be used to simulate the dynamics of all forest carbon stocks required under the United Nations Framework Convention on Climate Change. It is compliant with the carbon estimation methods outlined in the guidelines of the Intergovernmental Panel on Climate Change. The model uses much of the same information that is required for forest management planning activities (e.g., forest inventory, growth and yield curves, natural and human-induced disturbance information, forest management schedule, and land-use). The Archive Index Database (AIDB) is the Microsoft Access database behind the CBM-CFS3 that stores default ecological information and parameters pertaining to the forest ecosystems of a country, among other functions.

The (CBM-CFS3) has been adapted, tested, and applied to forests around the world over the last 7 years in support of policy making and scientific research.

The appropriateness of the selected model was determined via the methodology requirements listed in VM0012-Improved Forest Management Projects in Temperate and Boreal Forests LtPF v1.2, Section 8.1.1 Model Selection and Use:

1. Well Established:
    - CBM-CFS3 was developed for carbon modelling purposes in 2001 by the Carbon Accounting Team of the Canadian Forest Service.
2. Generates values on an annual basis, or at intervals not exceeding 10 years:
    - CBM-CFS3 can generate values in annual time-steps.
3. Include a reasonable representation of mortality from stand-self thinning and natural disturbance agents that are regionally appropriate.
    - From the CB3-CFS3 User Guide: "The CBM-CFS3 allows users to explore a range of situations, including the effects of different levels of natural disturbances and management actions, and changes to growth and yield on forest ecosystem carbon stocks."
4. Output units expressed in carbon units (tC/ha) or as biomass (t/ha) and are calculated for each of the required carbon pools.
    - Output units of tC/ha are generated from CBM-CFS3 (refer to CMB outputs).
5. Well Documented and expert reviewed:

- Google Search results in ~39,000 articles referencing "Carbon Budget Model Canadian Forest Sector" with the most recent publication occurring in January of 2022.

6. Parameterized, calibrated, and tested for the specific conditions in the project.
    - Spatial Units and Boundaries within CBM-CFS3 model for Silvador are as follows:
        - Administrative Boundary: Romania
        - Ecological Boundary: CLU35 (default ecological boundary)
        - Spatial Unit Group: SPU Group 1
    - Recently National Forest Inventories (NFI) input data for 26 European Union (EU) countries was used to estimate the EU forest Carbon dynamics from 2000 to 2012, and updated in 2017, including the effects of natural disturbances and land-use change (Pilli et al., 2018). The overall purpose of this exercise was to increase the transparency of how the EU Archive Index Database (EU-AIDB) was parameterized while supporting both the policy making and research communities interested in applying the CBM-CFS3 with ecological parameters specific to the EU context. Currently the EU-AIDB incorporates 1034 spatial units representing the intersection of 204 European administrative regions, 35 ecological climatic units, and 192 main tree species parameters.

5.1.4 Preparation of Stand-level Carbon Curves in CBM

Growth and yield curves were developed for the purposes of carbon modelling. Data from Silvador's forest stand inventory, obtained from existing Forest Management Plans (FMPs), included mean annual increments (MAI) and site class were used to develop a representative yield curve for all forest polygons within Analysis Units (AUs).

Within the PAI inventory, polygons were comprised of multiple species and ages. Each polygon was categorized to have a leading species by designating an AU as described within Section 5.1.2. Due to the proportion of the area being within AUs B3 and O3 (20% and 49% respectively) and the S3M and S3U AUs making up only 8% of the PAI area, it was determined that 5 distinct growth and yield curves categories should be established:

1. B3M – Inclusive of B2M, B3M and B4M analysis units
2. B3U – Inclusive of B2U, B3U and B4U analysis units
3. O3M – Inclusive of O2M, O3M and O4M analysis units
4. O3U – Inclusive of O2U, O3U and O4U analysis units
5. S3 – Inclusive of S3M and S3U analysis units

Once the starting inventory was categorized into corresponding growth and yield curve categories, all inventory records were further analyzed for stand age. As the stands are multi-cohort a proportionally weighted age was applied to each polygon within the inventory records. The polygons were multiplied by their "new" age and corresponding mean annual increment (MAI) to determine a current standing volume. The age and standing volume were then plotted and a two order, polynomial trendline was applied to generate a resulting age to volume formula. This formula was applied to generate representative volumes from ages 5 – 200 (in 5-year intervals) and generate a yield curve for each associated AU. These manufactured growth curves were then checked against data received from the most current (2020) Romanian Forest Inventory and peer reviewed literature[28] to validate curve accuracy.

The CBM model was used to create a series of stand attribute curves for each analysis unit to predict/ simulate forest development, merchantable timber volume, and carbon storage and dynamics by carbon pool over time.

The objective was to calibrate the CBM forest type for each Analysis Unit to generally match the dominant species (mix) found in the carbon monitoring plots which are then being represented by the simplified AU groupings with forest types based on species composition, site productivity and management disturbance regime/ harvest history.

Theme groupings were used in combination with polygon area to match up the modeled inventory polygon to the correct carbon yield curve data. The CBM-CFS3 derived stand and carbon curves are modeled on an assumed fully stocked representative stand in each AU and applies carbon and merchantable volume outcomes for each polygon based on the applicable allometric formulas. The model includes discrete 'Runs' that represent the project (PRJ - deferred harvest) and specific baseline disturbances/ harvest activities (BSL – harvest).

The AIDB spatial units (SPU 1) Romania were used for all analysis units.

The CBM 'MAKELIST' is a preprocessing program that is used to format the inventory information for input into the CBM-CFS3 and to initialize the DOM carbon pools. These pools include carbon from aboveground and belowground dead tree biomass (e.g., coarse woody debris; litter, fibric, and humic layers; and mineral soil). MAKELIST uses the same algorithms and parameters as the CBM-CFS3 and simulates each stand record through a number of natural disturbance cycles (grow, burn, grow, burn, etc.) until the slow DOM carbon pool at the end of two successive rotations meets a user-defined criterion (for which the default tolerance is 0.1%). By default, the MAKELIST assumes that the historical natural disturbance regime is stand-replacing fire, and it therefore grows stands for 300 years for the particular disturbance period for the ecoregion.

5.1.5 Biomass Carbon Modeling

Total biomass flows for each analysis unit were calculated using equations embedded in the CBM-CFS3 and output by representative carbon curves and tracked by carbon pool (see Table 2 below – extracted from 2019 CBM-CFS3 users manual). The model simulates detailed forest growth and development over time and links this forest development to detailed biomass accumulation and decay functions to track carbon biomass by pool through time. The CBM converts the merchantable volume per ha

[28] https://roifn.ro/site/ and "Two large-scale forest scenario modelling approaches for reporting CO2 removal: a comparison for the Romanian forests" (sourced at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8379742/

reported by the growth curves (i.e., yield tables) to tonnes of Carbon (tC) through species-specific allometric equations[29] (used as Biomass Expansion and Conversion Factors, without any additional value of wood density). All model outputs are in tonnes of Carbon (tC). Effectively CBM modelling manages the carbon pools addressed in VM0012 Equations 1 through to 17b.

The CBM-CFS3 then simulates and tracks the fate of carbon in all applicable carbon pools over time by polygon, including for Wood Products pool after any scheduled event. Carbon calculations can then be summarized for the project and baseline scenarios for each project year across the project area.

Baseline emissions are calculated by applying a Baseline 'disturbances' to each polygon, and then modeling the baseline activities and the related carbon flows using CBM-CFS3. The methods described are equivalent to the equations and processes outlined in VM0012.

Data from the CBM-CFS3 output 'Delta Ecosystem Reports' were exported into excel spreadsheets for further analysis consistent with the VM0012 methodology. The reports consist of tables that contain the applicable carbon pools and include reference equations as presented in the methodology. Modelling covers all analysis units in both the project and baseline scenarios. Equations used may be referenced within this section or noted in Appendix 7 of this document.

[29] Boudewyn, P.A.; Song, X.; Magnussen, S.; Gillis, M.D. 2007. Model-based, volume-to-biomass conversion for forested and vegetated land in Canada. Nat. Resourc. Can., Can. For. Serv., Pac.For Cent., Victoria, BC. Inf. Rep. BC-X-411.

Table 18: CBM Carbon Pool Allocation as Detailed within Kurtz et al., 2009 (Table 2)

Table 2 – Correspondence between pools in the Carbon Budget Model of the Canadian Forest Sector 3—version 1.1 (CBM-CFS3) and recommended pools by the Intergovernmental Panel on Climate Change Good Practice Guidance (GPG) (IPCC, 2003). SW = softwood, HW = hardwood, DOM = dead organic matter.

CBM-CFS3 pool	Description	GPG pool
Merchantable + bark (SW or HW)	Live stemwood of merchantable size[a] plus bark	Aboveground biomass
Other wood + bark (SW or HW)	Live branches, stumps and small trees including bark	Aboveground biomass
Foliage (SW or HW)	Live foliage	Aboveground biomass
Fine roots (SW or HW)	Live roots, approximately <5 mm diameter	Belowground biomass
Coarse roots (SW or HW)	Live roots, approximately ≥5 mm diameter	Belowground biomass
Snag stems DOM (SW or HW)	Dead standing stemwood of merchantable size including bark	Dead wood
Snag branches DOM (SW or HW)	Dead branches, stumps and small trees including bark	Dead wood
Medium DOM	Coarse woody debris on the ground	Dead wood
Aboveground fast DOM	Fine and small woody debris plus dead coarse roots in the forest floor, approximately ≥5 and <75 mm diameter	Litter
Aboveground very fast DOM	The L horizon[b] comprised of foliar litter plus dead fine roots, approximately <5 mm diameter	Litter
Aboveground slow DOM	F, H and O horizons[b]	Litter
Belowground fast DOM	Dead coarse roots in the mineral soil, approximately ≥5 diameter	Dead wood
Belowground very fast DOM	Dead fine roots in the mineral soil, approximately <5 mm diameter	Soil organic matter
Belowground slow DOM	Humified organic matter in the mineral soil	Soil organic matter

[a] Definition of merchantable size dimensions are model parameters, see Table 3.
[b] Soil Classification Working Group (1998).

In regard to model outputs the Stock Change resultant 'Delta Total Ecosystem' (ΔtC yr-1) represents Total change in Ecosystem carbon stocks (all pools) as required in Equation 1 and 29 for the baseline and project respectively. The Stock Changes category of output variables contains information about changes in carbon stocks, reported in tonnes of carbon for each year, for the area selected by the user. A positive value (+) for annual change in carbon stock indicates a net gain in carbon stocks, a negative value (-) indicates a net loss, and a zero value indicates neither a gain nor a loss. For analyses of Total Delta Ecosystem, annual values greater than zero indicate that the ecosystem is functioning as a carbon sink, annual values below zero indicate that it is functioning as a carbon source, and an annual value of exactly zero indicates that the ecosystem is carbon-neutral (i.e., neither a source nor a sink).

5.1.6 Calculating Baseline Scenario Live Biomass Gain

For the Historic Baseline Scenario (as described in Section 3.4), a set of historic baseline activities (disturbances) was based on harvest details reported within existing FMPs. The annual harvest volume has been determined by forward looking harvest volumes within the same FMPs. All baseline management activities are assumed to occur/ begin at year 1 (2020).

Live biomass gain ($\Delta C_{BSL,G,t}$, Eqn 4, 5a-b) is calculated by CBM-CFS3 based on the project area and stratifications into analysis units. Regionally specific forest dynamics (Romania), and the related carbon curves discussed above, are tracked, and reported by carbon pool (e.g. Aboveground Live, Belowground Live), and reported in the Delta Ecosystem Reports. Additional details about related model default values, functionality, and parameters are found in Kull *et al.* (2019) & Kurz *et. al.* (2009).

$\Delta C_{BSL,G,t} = \Sigma(A_{BSL,i} \bullet G_{BSL,i,t}) \bullet CF$, where; **(4)**

$A_{BSL,i}$, = area (ha) of forest land in polygon, i – Values generated based on Project Proponent FMPs.

$G_{BSL,i,t}$ = annual increment rate in tree biomass (t d.m. ha^{-1} yr^{-1}), in polygon, i, - based on regionally specific forest dynamics (embedded within the CBM-CFS3 model)

CF = carbon fraction of dry matter t C t^{-1} d.m. - IPCC default value = 0.5

$G_{BSL,i,t} = G_{BSL,AG,i,t} + G_{BSL,BG,i,t}$, where; **(5a)**

$G_{BSL,AG,i,t}$ and $G_{BSL,BG,i,t}$ = annual above and belowground biomass increment rates (t d.m. ha^{-1} yr^{-1}) - based on regionally specific forest dynamics (embedded within the CBM-CFS3 model)

$G_{BSL,BG,i,t} = G_{BSL,AG,i,t} \bullet R_i$, where; **(5b)**

R_i = Root to shoot ratio - based on regionally specific forest dynamics (embedded within the CBM-CFS3 model)

Equations embedded within the CBM-CFS3 model cannot be altered by the user.

5.1.7 Calculating Baseline Scenario Live Biomass Loss

Live biomass loss ($\Delta C_{BSL,L,t}$, Eqn 6, 7, 8, 9) is calculated by CBM-CFS3 based on the project area stratifications, regionally specific forest dynamics and the related carbon curves discussed above. Default parameters and algorithms within CBM-CFS3 model and track all stand dynamics, including natural tree mortality, harvesting scenario felling/ removals, blowdown, and any other biomass loss. Generally, mortality related live biomass is shifted into dead biomass pools by CBM-CFS3 (Aboveground Standing Dead (snags), Aboveground Downed and Dead Wood (DOM), Belowground DOM), which are reported in the Delta Ecosystem Reports. Additional details about related model default values, functionality, and parameters are found in Kull *et al.* (2019) & Kurz *et. al.* (2009).

$\Delta C_{BSL,L,t} = \Sigma(LBL_{BSL,NATURALi,t} + LBL_{BSL,FELLINGS,i,t} + LBL_{BSL,OTHER,i,t}) \bullet CF$, where; **(6)**

$LBL_{BSL,NATURALi,t}$ = annual loss of live tree biomass due to natural mortality in polygon, i; t d.m. yr^{-1}

$LBL_{BSL,FELLINGS,i,t}$ = annual loss of live tree biomass due to commercial felling in polygon, i; t d.m. yr^{-1}

$LBL_{BSL,OTHER,i,t}$ = annual loss of live tree biomass from incidental sources in polygon, i; t d.m. yr^{-1}

CF = carbon fraction of dry matter; t C t^{-1} d.m. (IPCC default value = 0.5).

$LBL_{BSL,NATURALi,t} = A_{BSL,i} \bullet LB_{BSL,i,t} \bullet f_{BSL,NATURAL,i,t}$, where; **(7)**

$A_{BSL,i}$ = area (ha) of forest land in polygon, i – values generated based on Project Proponent FMP data.

$LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, i, for year, t – values generated based on regionally specific forest dynamics within CBM-CFS3.

$LB_{BSL,I,t}$ is calculated for year, t, beginning with biomass estimates in year t=1 (the project start year) and with annual biomass increments ($G_{BSL,I,t}$) added as per calculations in equation 5a.

$f_{BSL,NATURAL,i,t}$ = the annual proportion of biomass that dies from natural mortality in polygon , i (unitless; 0 < $f_{BSL,NATURALi}$ < 1), year, t. – based on regionally specific forest dynamics (embedded within the CBM-CFS3 model), where;

$$LBL_{FELLINGS,i,t} = A_{BSL,i} \bullet LB_{BSL,i,t} \bullet f_{BSL,HARVEST,i,t}, \text{ where;} \quad (8)$$

$A_{BSL,i}$ = area (ha) of forest land in polygon, i – values generated based on Project Proponent FMP data

LBBSL,i,t = average live tree biomass (t d.m. ha-1) in polygon, i, for year, t (see equation 7 for its calculation).

fBSL,HARVEST,i,t = the proportion of biomass removed by harvesting from polygon, i, (unitless; 0 < fBSL,HARVESTIi < 1), in year, t. Data for this variable is obtained through Project Proponent FMP data and historic harvest records.

Incidental loss (LBLBSL,OTHER,i,t; t d.m. yr-1) is the additional live tree biomass removed for road and landing construction in the polygon, i, and is calculated as a proportion of biomass removed by harvesting:

$$LBL_{BSL,OTHER,i,t} = A_{BSL,i} \bullet LB_{BSL,i,t} \bullet f_{BSL,DAMAGE,i,t}, \text{ where;} \quad (9)$$

$A_{BSL,i}$ = area (ha) of forest land in polygon, i;

$LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, i, for year, t

$f_{BSL,DAMAGE,i,t}$ = the proportion of additional biomass removed for road and landing construction in polygon, i, year, t (unitless; 0 < $f_{BSL,DAMAGE,i,t}$ < 1). Values for this variable are based on regionally specific forest dynamics embedded within CBM-CFS3.

5.1.8 Calculating Baseline Scenario Dead Organic Matter Dynamics

Dead organic matter dynamics ($\Delta C_{BSLDOM,t}$, Eqn 10, 11a-b, 12, 13, 14a-b, 15, 16, 17a-d) are calculated by CBM-CFS3 based on the project area stratifications, regionally specific forest dynamics and the related carbon curves discussed above. Default parameters and algorithms within CBM-CFS3 model track all stand dead wood dynamics, including standing dead, downed dead, and below ground dead organic matter. CBM-CFS3 uses the regionally specific variant data and related parameters to model and track dead organic matter between carbon pools (Aboveground Dead (i.e. Stem Snags), Belowground Dead, Aboveground Slow DOM (VM0012 calls this Lying Dead Wood)), and temperate related decay within each pool.

Additionally, CBM-CFS3 tracks dead organic matter dynamics related to harvesting (slash) or other events when applied. The project uses the default decay factors and dead matter dynamics that are set within the CBM-CFS3 model and specific to the variant dataset. The results of dead organic matter dynamics are reported in Delta Ecosystem Reports. Additional details about related model default values, functionality, and parameters are found in Kull *et al.* (2019) & Kurz *et. al.* (2009). Generally, carbon stocks are transitioned between dead biomass pools, and emitted as they decay.

Equations were applied as follows:

$$\Delta C_{BSL,DOM,t} = \Delta C_{BSL,LDW,t} + \Delta C_{BSL,SNAG,t} + \Delta C_{BSL,DBG,t}, \text{ where;} \quad (10)$$

$\Delta C_{BSL,LDW,t}$ = change in lying dead wood (LDW) carbon stocks in year, t; t C yr^{-1}

$\Delta C_{BSL,SNAG,t}$ = change in snag carbon stock in year, t; t C yr^{-1}

$\Delta C_{BSL,DBG,t}$ = change in dead belowground biomass carbon stock in year, t; t C yr^{-1}

$$\Delta C_{BSL,LDW,t} = \Sigma(LDW_{BSL,IN,i,t} - LDW_{BSL,OUT,i,t}) \bullet CF \quad (11a)$$

$$LDW_{BSL,i,t+1} = LDW_{BSL,i,t} + (LDW_{BSL,IN,i,t} - LDW_{BSL,OUT,i,t}) \text{ where;} \quad (11b)$$

$LDW_{BSL,,i,t}$ = The total mass of lying dead wood accumulated in polygon i , at time, t (t d.m.).

$LDW_{BSL,IN,i,t}$ = annual increase in LDW biomass for polygon i, year, t (t d.m yr^{-1}).

$LDW_{BSL,OUT,i,t}$ = annual loss in LDW biomass through decay, for polygon i, year, t, (t d.m yr^{-1})

$LDW_{BSL,IN,i,t}$ and $LDW_{BSL,OUT,i,t}$ are summed across polygons.

CF = carbon fraction of dry matter - *(IPCC default value = 0.5)*

$$LDW_{BSL,IN,i,t} = (LBL_{BSL,NATURALi,t} - LBL_{BSL,NATURALi,t} \bullet R_i) \bullet f_{BSL,BLOWDOWN,i,t} + ((LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i) + (LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet R_i)) \bullet f_{BSL,BRANCH,i,t} + ((LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet Ri) + (LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet Ri)) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet f_{BSL,BUCKINGLOSS,i,t} + SNAG_{BSL,,i,t} \bullet f_{BSL,SNAGFALLDOWN,i,t}, \text{ where;} \quad (12)$$

LBLBSL,NATURALi,t, LBLBSL,FELLINGS,i,t, and LBLBSL,OTHER,i,t are as calculated in equations 7, 8, and 9, respectively.

Ri is the root:shoot ratio in polygon, i (see equation 5b). fBSL,BLOWDOWN,i,t = the annual proportion of live aboveground tree biomass subject to blowdown in polygon, i, year, t (unitless; 0 < fBSL,BLOWDOWN,i,t < 1) – values generated based on regionally specific forest dynamics within CBM-CFS3.

fBSL,BRANCH,i,t = the annual proportion of aboveground tree biomass comprised of branches > 5 cm diameter in polygon, i (unitless; 0 < fBSL,BRANCH,i,t < 1) – values generated based on regionally specific forest dynamics within CBM-CFS3.

fBSL,BUCKINGLOSS,i,t = the annual proportion of the log bole biomass left on site after assessing and/or merchandizing the log bole for quality, in polygon, i (unitless; 0 < fBSL,BUCKINGLOSS,i,t < 1) – values generated based on regionally specific forest dynamics within CBM-CFS3

SNAGBSL,,i,t = the total mass of the snag pool in polygon, i, year, t (see equation 14b).

fBSL,SNAGFALLDOWN,i,t = the annual proportion of snag biomass in polygon, i, year, t, that falls over and thus is transferred to the LDW pool (unitless; 0 < fSNAGFALLDOWN,i,t < 1) – values generated based on regionally specific forest dynamics within CBM-CFS3

$$LDW_{BSL,OUT,i,t} = LDW_{BSL,,i,t} \bullet f_{BSL,lwDECAY,i,t}, \text{ where;} \quad (13)$$

$LDW_{BSL,,i,t}$ = the total amount of lying deadwood mass in polygon i, year, t (see equation 11b).

$f_{BSL,lwDECAY,i,t}$ = the annual proportional loss of lying dead biomass due to decay, in polygon i, year, t (unitless; ; 0 < fBSL,lwDECAY,i,t < 1) – values generated based on regionally specific forest dynamics within CBM-CFS3

$$\Delta C_{BSL,SNAG,t} = \Sigma(SNAG_{BSL,IN,i,t} - SNAG_{BSL,OUT,i,t}) \bullet CF \quad (14a)$$

$$SNAG_{BSL,i,t+1} = SNAG_{BSL,i,t} + (SNAG_{BSL,IN,i,t} - SNAG_{BSL,OUT,i,t}), \text{ where;} \quad (14b)$$

$SNAG_{BSL,i,t}$ = The total mass of snags accumulated in polygon i, at time t (t d.m.).

$SNAG_{BSL,IN,i,t}$ = annual gain in snag biomass for polygon i, year, t (t d.m yr^{-1}).

$SNAG_{BSL,OUT,i,t}$ = annual loss in snag biomass through decay, or falldown (i.e, transfer to the LDW pool)(t d.m yr^{-1})

CF = carbon fraction of dry matter *(IPCC default value = 0.5)*

$$SNAG_{BSL,IN,i,t} = (LBL_{BSL,NATURALi,t} - LBL_{BSL,NATURALi,t} \bullet R_i) \bullet (1 - f_{BSL,BLOWDOWN,i,t}), \text{ where; } (15)$$

$LBL_{BSL,NATURALi,t}$ is as calculated in equation 7

$1 - f_{BSL,BLOWDOWN,i,t}$ is the proportion of live tree aboveground biomass that dies in polygon, i, year, t, but remains as standing dead organic matter (i.e., snags) (unitless; $0 < f_{BSL,BLOWDOWN,i,t} < 1$) – values generated based on regionally specific forest dynamics within CBM-CFS3.

$$\Delta C_{BSL,DBG,t} = \Sigma(DBG_{BSL,IN,i,t} - DBG_{BSL,OUT,i,t}) \bullet CF \quad (17a)$$

$$DBG_{BSL,i,t+1} = DBG_{BSL,i,t} + (DBG_{BSL,IN,i,t} - DBG_{BSL,OUT,i,t}), \text{ where;} \quad (17b)$$

$DGB_{BSL,i,t}$ = The total quantity of dead belowground biomass accumulated in polygon i, at time, t (t d.m.).

$DBG_{BSL,IN,i,t}$ = annual gain in dead belowground biomass for polygon i, year, t (t d.m yr^{-1}). Dead belowground biomass develops as a result of mortality through natural causes or through harvesting activities.

$DBG_{BSL,OUT,i,t}$ = annual loss in dead belowground biomass through decay, (t d.m yr^{-1})

CF = carbon fraction of dry matter (IPCC default value = 0.5)

$$DBG_{BSL,IN,i,t} = [(A_{BSL,i} \bullet LB_{BSL,i,t} \bullet R_i) \bullet (f_{BSL,NATURAL,i,t} + f_{BSL,HARVEST,i,t} + f_{BSL,DAMAGE,i,t})], \text{ where;} \quad (17c)$$

$A_{BSL,i}$ = area (ha) of forest land in polygon, i; - values generated based on Project Proponent FMP data.

$LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, i, for year, t. $LB_{BSL,i,t}$ is calculated for year, t, beginning with biomass estimates in year t=1 (the project start year) and with annual biomass increments ($G_{BSL,i,t}$) added as per calculations in equation 5 a, b. This value is then multiplied by $A_{BSL,i}$, the area (ha) of forest land in polygon, i.

R_i is the root:shoot ratio in polygon, i (see equation 5b).

$f_{BSL,NATURAL,i,t}$ = the annual proportion of biomass that dies from natural mortality in polygon, i (unitless; 0 < fNATURALi < 1), year, t (see equation 7),

$f_{BSL,HARVEST,i,t}$ = the proportion of biomass removed by harvesting from polygon, i, (unitless; 0 < fHARVESTIi < 1), year, t (see equation 8),

$f_{BSL,DAMAGE,i,t}$ = the proportion of additional biomass removed or road and landing construction in polygon, i (unitless; 0 < fDAMAGE,i,t < 1), year, t (see equation 9)

$$DBG_{BSL,OUT,i,t} = DBG_{BSL,i,t} \bullet f_{BSL,dgbDECAY,i,t}, \text{ where;} \quad (17d)$$

$DBG_{BSL,i,t}$ = the total quantity of dead belowground in polygon i, year, t (see equation 17b).

$f_{BSL,dgbDECAY,i,t}$ = the annual proportional loss of dead belowground biomass due to decay, in polygon i, year, t (unitless; $0 < f_{BSL,lwDECAY,i,t} < 1$) – values generated based on regionally specific forest dynamics within CBM-CFS3

5.1.9 Harvested Wood Product Modeling

Step 1 utilizes CBM output reports that forecast species, product groups (e.g., Fuel Wood, Sawlogs) and related harvest volumes (m^3) for each planning period. These are then converted to Merchantable Carbon/ Wood Product pools using species specific wood densities in Tonnes of Carbon (tC) and satisfies the requirements of Step 1 of the methodology.

The following product groups and percentages were provided by the Project Proponents based on historical harvest and sales records and are assigned to the following product type (k) categories:

1. Sawlogs
2. Fuelwood
3. Pulpwood

For the purposes of Step 2 (Carbon contained in harvested timber after milling, ($C_{BSL,MILL,h}$; tC, Equation 21) Forest Product Conversion Factors for the UNECE Region published by the United Nations Economic Commission for Europe (UNECE/FAO. 2010) ($f_{RND,k}$, $r_{RND,k}$) was used to determine the total carbon in harvested timber that will enter the wood products pool by product type accounting for mill efficiencies and estimated product disposition percentages. The gross quantity of carbon contained in harvested timber for each of the four product types (k) described in Step 1 must be decremented (process of decreasing or becoming gradually less) to account for losses during processing. This loss is calculated within *VM0012-BSL HWP70ST-30PLP* excel spread sheet specifically tab 'Step 2 (Mill)'.

VM0012 requires calculation of 3 harvested wood pools:

1. Short-lived wood products (SLF), which are defined as wood products in use for <3 years; and assumed to be emitted immediately.
2. Medium-lived wood products (MLF), which are defined as wood products in use for 3-100 years; and assumed to be emitted on a 20-year straight line decay curve.
3. Long-lived wood products (LLF), which are wood products in use for 100+ years.

Note: products in landfill are assumed to be "in use" and treated as per these 3 HWP pools.

For the final step 3 (Carbon storage in medium-term and long-term wood products, $C_{BSL,STORHWP,t}$, Equation 23) the total carbon lost in short-lived products (SLF – $P_{BSL,SLF,k}$, Equation 22a) and stored in medium-term (MLF - $P_{BSL,MLF,k}$, Equation 22c) and long-term (LLF - $P_{BSL,LLF,k}$, Equation 22b) products used Smith, et al (2006) reference tables and factors to calculate the result is a fraction of the Wood Products pool being emitted or stored annually based on each 'In-Use' category based on product, decay and storage factors. These values are summed for every year (t) utilizing a cohort approach.

The annual change in carbon storage in harvested wood products (ΔCBSL,STORHWP,t; t C yr-1, Equation 19) is calculated from the annual results of Equation 23.

These HWP modelling calculations are applied equally to any timber harvesting in either the Baseline or Project Scenario as follows:

$\Delta C_{BSL,STORHWP,t} = (C_{BSL,STORHWP,t2} - C_{BSL,STORHWP,t1}) / T$, where; (19)

$C_{BSL,STORHWP,t2}$ = carbon storage in harvested wood products at t=2; t C

$C_{BSL,STORHWP,t1}$ = carbon storage in harvested wood products at t=1; t C

T = number of years between monitoring t1 and t2

t : 1,2,3…t years elapsed since the project start date

$C_{BSL,TIMBER,h} = \Sigma[(LBL_{BSL,FELLINGS,i,h} - LBL_{BSL,FELLINGS,i,h} \bullet R_i + LBL_{BSL,OTHER,i,h} - LBL_{BSL,OTHER,i,h} \bullet R_i) \bullet (1 - f_{BSL,BRANCH,i,h}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,h})] \bullet CF$, where; (20)

$C_{BSL,TIMBER,h}$= carbon contained in timber harvested in period h (summed for all harvested polygons, i); t

$LBL_{BSL,FELLINGS,i,h}$ = annual removal of live tree biomass due to commercial felling in polygon, i; t d.m. (equation 8)

$LBL_{BSL,OTHER,i,h}$ = annual removal of live tree biomass from incidental sources in polygon, i; t d.m. (equation 9)

R_i is the root:shoot ratio in polygon, i (see equation 5b)

$1 - f_{BSL,BRANCH,i,h}$ the proportion of live tree biomass remaining after netting out branch biomass, in polygon i (unitless; $0 < f_{BRANCH,i,t} < 1$) (see equation 12)

$1 - f_{BSL,BUCKINGLOSS,i,h}$ = the proportion of the log bole remaining after in-woods log processing/bucking for quality, length, etc., in polygon, i (unitless; $0 < f_{BUCKINGLOSS,i,t} < 1$) (equation 12)

h = harvest period ; yr

$C_{BSL,MILL,h,k} = (C_{BSL,TIMBER,h,k} \bullet f_{RND,k} \bullet r_{RND,k})$, where; (21)

$C_{BSL,MILL,h,k}$ = carbon contained in harvested timber after milling in period h, for product type k; t C

$C_{BSL,TIMBER,h,k}$ = carbon contained in timber harvested in period h, for product type k; t C – values generated from CBM-CFS3 outputs (total Softwood Merch, Softwood “other”, Hardwood Merch, Hardwood “other”).

k = wood product type – (softwood saw log, softwood pulpwood, hardwood saw log, or hardwood pulpwood); - *proportions determined by project proponent via FMP data and historic harvest records.*

$f_{RND,k}$ = fraction of growing stock volume removed as roundwood for product type k.

- To account for losses including bark and milling waste, forest product conversion factors were extracted from UNECE DP49, Figure 3.1 (UNECE/FAO. 2010).

$r_{RND,k}$ = ratio of industrial roundwood to growing stock volume removed as roundwood for product type k.

- To account for losses including bark and milling waste, forest product conversion factors were extracted from UNECE DP49, Figure 3.1 (UNECE/FAO. 2010).
- Values for forest product conversion factors for coniferous sawnwood:

  - Sawdust: 7%
  - Shavings: 8%
  - Chips/slabs: 29%
  - Chips: 6%

$P_{BSL,SLF,k} = 1\text{-}P_{3\text{-}year}$ (22a)

- P-SLF Values used:
  - Softwood Sawlog – 0.505
  - Hardwood Sawlog – 0.5
  - Softwood Pulp – 0.683
  - Hardwood Pulp – 0.504

$P_{BSL,LLF,k} = P_{100\text{-}year}$ (22b)

- P-LLF Values used:
  - Softwood Sawlog – 0.095
  - Hardwood Sawlog – 0.035
  - Softwood Pulp – 0.006
  - Hardwood Pulp – 0.103

$P_{BSL,MLF,k} = P_{3\text{-}year} - P_{100\text{-}year}$ (22c)

- P-MLF Values used:
  - Softwood Sawlog – 0.40
  - Hardwood Sawlog – 0.465
  - Softwood Pulp – 0.311
  - Hardwood Pulp – 0.393

$C_{BSL,STORHWP,t,} = \Sigma\ \Sigma\ ((\ C_{BSL,MILL,h,k} \bullet P_{LLF,k}) + [(C_{BSL,MILL,h,k} \bullet P_{MLF,k}) \bullet ((20\text{-}h) / 20)])$ (23)

$C_{BSL,STORHWP,t,}$ = carbon stored in harvested wood products in year t summed for all product types k and then over all harvest periods h; t C

k = wood product type – *(softwood saw log, softwood pulpwood, hardwood saw log, or hardwood pulpwood); proportions determined via FMP data*

h = year of harvest (the term (20-h) should not be allowed to drop below 0)

5.1.10 Fossil Fuel Emissions Associated with Logging, Transport, and Manufacture

The SCA has chosen to include the 'optional' pool of fossil fuel emissions (VM0012 Table 2). The annual change in fossil fuel emissions ($\Delta C_{BSL,\ EMITFOSSIL,t}$, Eqn. 24,25,26,27) from harvesting and processing of the various wood products applies to fuel emissions associated with harvesting of raw material (i.e., clear felling), transport of raw material (trucking and haul distance) and manufacturing of raw material (into product groups).

Default values in VM0012 Table 4 have been used. All calculations in support of this is within: *Emissions_BSL_Estimate* spreadsheet (proprietary).

Existing FMPs that forecast species, product groups (e.g., CNS - Chip 'n Saw) and related harvest volumes (m^3) for each planning period were used for the following calculations. Results are then converted to Merchantable Carbon pool using species specific wood densities along with a Carbon Fraction (CF = 0.5) providing Tonnes of Carbon (tC) harvested for each planning period. This is equivalent to $C_{BSL,TIMBER,h}$ as represented by Eq. 20 being the carbon contained in timber harvested in period h.

The annual change in fossil fuel emissions from harvesting and processing of the various wood products ($\Delta C_{BSL,EMITFOSSIL,t}$) are calculated as:

$$C_{BSL,EMITFOSSIL,t} = C_{BSL,EMITHARVEST,t} + C_{BSL,EMITMANUFACTURE,t} + C_{BSL,EMITTRANSPORT,t} \quad \text{where:} \qquad (24)$$

$C_{BSL,EMITHARVEST,t}$ is the annual fossil fuel emissions associated with harvesting of raw material (t C yr^{-1})

$C_{BSL,EMITMANUFACTURE,t}$ is the annual fossil fuel emissions associated with the manufacturing of raw material (t C yr^{-1})

$C_{BSL,EMITTRANSPORT,t}$ is the annual fossil fuel emissions associated with the transport of raw material (t C yr^{-1})

$$C_{BSL,EMITHARVEST,t} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet Ri + LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet Ri) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet CF \bullet c_{HARVEST}, \text{ where;} \qquad (25)$$

$c_{HARVEST}$ is the carbon emission intensity factor (t C emitted/t C raw material) associated with harvesting. All timber in the PAI is harvest via thinning and final felling and the 'clearcutting' default value for cHARVEST is used (*VM0012 Table 4)* all other terms are as defined in equation 20.

$$C_{BSL,EMITTRANSPORT,t} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet Ri + LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet Ri) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet CF \bullet \Sigma(f_{BSL,TRANSPORTk} \bullet d_{TRANSPORTk} \bullet c_{TRANSPORTk}), \text{ where;} \qquad (26)$$

$f_{BSL,TRANSPORTk}$ = the fraction of raw material transported by transportation type, k. (unitless; $0 < f_{BSL,TRANSPORTk} < 1$).

$d_{TRANSPORTk}$ = the distance transported by transportation type, k. (km); these values were generated via proponent historic harvest levels as average distances from the forest fund property to the customer location – this estimate is conservative in nature. The average speed is travelled by logging trucks is 60 km/hr.

$c_{TRANSPORTk}$ is the carbon emission intensity factor (kg C emitted/t C raw material) associated with transportation type, k - *VM0012 Table 4 default value for Truck ($7.0 * 10^{-5-}$) utilized.*

$$C_{BSL,EMITMANUFACTURE,t} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet Ri + LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet Ri) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet \Sigma(f_{BSL,PRODUCTk} \bullet c_{MANUFACTUREk}) \bullet CF, \text{ where;} \qquad (27)$$

$c_{MANUFACTURE k}$ is the carbon emission intensity factor (t C emitted/t C raw material) associated with manufacture of product type, k; - *VM0012 Table 4 default value for Sawnwood (0.04), chemical pulp (0.13) and veneer (0.06) were utilized.*

All other terms are as defined in equation 19.

5.2 Project Emissions

In regard to model outputs the Stock Change resultant 'Delta Total Ecosystem' (ΔtC yr^{-1}) represents Total change in Ecosystem carbon stocks as required in Equation 1: annual change in living tree biomass ($\Delta C_{BSL,LB,t}$) (Refer to Sections 5.1.10 & 5.1.7) and annual change in dead organic matter ($\Delta C_{BSL,DOM,t}$) (Refer to Section 5.1.8). CBM also provides the required output for the annual change in carbon stocks associated with harvested wood products ($\Delta C_{BSL,HWP,t}$) (Refer to Section 5.1.9).

The Stock Changes category of output variables contains information about changes in carbon stocks, reported in tonnes of carbon for each year, for the area selected by the user. A positive value (+) for annual change in carbon stock indicates a net gain in carbon stocks, a negative value (-) indicates a net loss, and a zero value indicates neither a gain nor a loss. For analyses of Total Delta Ecosystem, annual values greater than zero indicate that the ecosystem is functioning as a carbon sink, annual values below zero indicate that it is functioning as a carbon source, and an annual value of exactly zero indicates that the ecosystem is carbon-neutral (i.e., neither a source nor a sink). Refer to the *GHG Estimate calculation* spreadsheet provided.

Project activities affecting GHG emissions were carried out during the initial project period (2020-2022) however, no project scenario activities were projected on an *ex-ante* basis. Future years may include various project forest management activities that affect *ex-post* carbon stocks which will be monitored and reported on in future verifications (e.g., salvage due to significant fire or forest health loss). Project activities will be based on actual monitoring results (see Monitoring Section 6) and any resulting emissions netted against emission reductions.

The methods described are equivalent to the equations and processes outlined in VM0012.

5.2.1 Development of Project Scenarios and Assumptions

The project scenario is modeled as conservation, LtPF, with a focus on maintaining forest health if required. No other activities affecting carbon stocks are scheduled on an *ex-ante* basis, aside from normal forest growth and development as modeled by CBM-CFS3 EUAID (SPU 1).

5.2.2 Determination of Actual Onsite Carbon Stocks

Ex-ante Project Scenario carbon stocks are calculated in the same manner as the baseline emissions discussed in Section 5.1 (Baseline Emissions). Calculations are completed using the same forest inventory data, analysis units and polygons, and modeling tools under the Project Scenario activities.

5.2.3 Ex-Post Calculations of Carbon Stocks

Ex-post carbon stocks in the Project Scenario are determined at each verification following the steps outlined in VM0012. Each monitoring report will detail the data and calculations for *ex-post* onsite carbon stocks at the time of verification. However, as the project start date (2020) is prior to validation, the initial period (2020-2022) *ex-ante* carbon stocks are also the *ex-post* carbon stocks.

Project carbon stocks from 2023 forward are on an estimated *ex-ante* basis.

The *ex-post* carbon Quantifications are made for the Baseline and Project Scenarios as outlined in Section 7.2.7 and 7.3.6 respectively, with updates to carbon inventory, spatial data, project instances, and other data for each verification period.

For the 2020-2022 period, the carbon stocks are calculated from the latest set of inventory and spatial data, which inherently include *ex-post* monitoring for that period.

110 permanent carbon plots were established in 2022 and 2024 (See Section 6.3.2) with representation across all analysis units to monitor inventory and model accuracy. Additional permanent sample plots may be installed to improve inventory accuracy, spatial coverage, and Analysis Unit representation as deemed necessary. The initial *ex-post* carbon stock spatial forest inventory and analysis is using the latest available ortho-imagery, and other GIS datasets, in conjunction with site visits from Project Proponent staff to confirm the status of project activities and disturbances. The modeling related to these data has been applied across both the Project Scenario and Baseline Scenarios. The uncertainty calculations in the first verification period are up to date for the latest inventory plot data and modeling results.

In future verification periods, the project will calculate *ex-post* carbon stocks by addressing any spatial changes to the project area, then updating the forest inventory and carbon modeling results, including for any other monitoring results or updates.

Additional carbon plots may be installed to improve inventory accuracy, spatial coverage, and/or Analysis Unit representation. *Ex-post* carbon calculations will be undertaken using the latest imagery, LiDAR, and GIS datasets for the project area. Project activities and disturbances will be monitored by remote sensing or field visits and updated into the forest inventory prior to the following verification period. All modeling and inventory updates and calibrations will be applied equally across the Project and Baseline Scenarios. The uncertainty factor, leakage assessments, and non-permanence risk factors will be recalculated using the latest forest inventory, plot data, and project information.

5.3 Leakage

5.3.1 Activity Shifting Leakage

VM0012 does not provide specific equations nor methods for calculating net emissions related to activity shifting leakage. VCS requires that “IFM project developers must demonstrate that there is no leakage within their operations – i.e., on other lands they manage/ operate outside the bounds of the VCS carbon project”. The methodology requires monitoring and reporting on evidence demonstrating no activity shifting is occurring in order to demonstrate compliance with VCS.

STEP 1 - the locations and descriptions of all forestlands within the project over which the Project Proponent has ownership is available. Silvador owns 3,403 hectares of forest lands including project instances. Of this 1,865 ha is potentially subject to Activity Shifting.

STEP 2 –demonstrate that there is no activity shifting leakage to areas that are outside the project instances and that have not materially changed as a result of the project activity (e.g., harvest rates have not been increased).

Due to the project lands being managed under private forest land legal requirements, approved harvest management plan volume levels are non-transferrable to other properties as per Law 46/2008 Forestry Code. For monitoring areas outside of the PAI, cumulative volume comparisons that are above the legal FMP volume will be considered activity shifting leakage.

5.3.2 Market Leakage

The VM0012 LtPF methodology provides the following definition (Section 8.3.2): market leakage risk occurs when a project significantly reduces the production of a commodity causing a change in the supply and market demand equilibrium that results in a shift of production elsewhere to make up for the lost supply.

For the calculation of Market Leakage, a methodology deviation as noted in section 3.2 has been utilized. In this regard the MARketz tool has been populated for the Silvador Project. Full details supporting the development and use of the MARketz tool is provided in the appendices. The intent is to rank each assessment as a low (1), moderate (5) or high risk (9) of market leakage.

Below is a summary of the market assessment tool:

1. Market Determination: the market determination assessment and quantification of a Domestic Leakage Factor seeks to define the proportion of potential leakage that will occur in domestic markets versus international markets. The database used to for this section contains details of the following topics: Industrial roundwood removals coniferous and non-coniferous wood, Sawlogs, Veneer logs, and Pulpwood round, production. An international leakage discount factor is determined and applied to all other assessments.
2. Market Equilibrium: this assessment seeks to determine the effects the project will have on the production and consumption within the host country, while taking a comprehensive set of global economic factors into account. The Global Forest Products Model (GFPM, v2020[30]) developed by Buongiorno et al. is utilized.
3. Barriers - A. Distribution Barrier – Cost of Transportation: the assessment is conducted to determine the potential spatial extent of market leakage effects as determined by the cost of transporting wood products. Where the cost of transportation increases by 15% or more this represents a market barrier, which determines the risk of market leakage.
4. Barriers - B. Regulatory Barrier – Jurisdiction: this assessment is conducted to determine the potential legal extent of market leakage effects as determined by ownership type within the

[30] https://buongiorno.russell.wisc.edu/gfpm/

project country. Based on the split between quota-based ownership and non-quota based ownership, a market leakage risk is determined.

5. Product Substitutability: the purpose of assessing product substitutability is to determine if a different product can be used in place of ones that would be generated in the baseline scenario. If there is high substitutability, there is a higher risk of market leakage due to the product being easily replaced with another product.
5. Land/Carbon Impact - A. Percent of National Inventory: the assessment is conducted to determine the scale of the carbon project compared to the national harvest volumes of the host country. The result of this assessment provides a scaled or proportional analysis of the implementation of the project scenario as it relates to national resources.
6. Land/Carbon Impact - B. Biomass Ratio of Project: the assessment of the biomass ratio of the project compared to the national leakage area follows the biomass ratio assessment commonly used within several AFOLU methodologies. For the project area biomass ratio is derived by comparing relative biomass pools (i.e. Merch vs all Above Ground Biomass pools). This ratio is then compared to the same national biomass pools.

Market Leakage Determination

Market leakage risk occurs when a project significantly reduces the production of a commodity causing a change in the supply and market demand equilibrium that results in a shift of production elsewhere to make up for the lost supply. Within the MARketz tool a score of each assessment is gathered on the Market Score Card within the excel workbook which has been provided during validation and verification. The market score card calculates the overall weighted score of all the assessments, produces the resulting assessment score as a percentage, and the corresponding Market Leakage Factor.

5.4 Estimated Net GHG Emission Reductions and Removals

Estimated net GHG emission reductions and removals are calculated based on estimated baseline and project emissions, calculated as described in Sections 5.1 (Baseline Emissions) and Section 5.2 (Project Emissions).

5.4.1 Calculation of Emissions Reductions

Gross carbon emissions reductions ($ER_{y,GROSS}$; t CO_2e yr^{-1}) created by the SCA were calculated annually as the difference between the baseline and project scenario emission reductions/emissions:

$$ER_{y,GROSS} = (\Delta C_{BSL,t} - \Delta C_{PRJ,t}) \bullet 44/12 \qquad (57)$$

Where,

$\Delta C_{BSL,t}$ = total baseline scenario emissions calculated from equation 1 (t C yr^{-1}).

$\Delta C_{PRJ,t}$ = total project scenario emissions calculated from equation 29 (t C yr^{-1}).

44/12 = factor to convert C to CO_2e

The annual net GHG emissions reductions are calculated each year using Equation 58.

$$ER_y = ER_{y,GROSS} - LE_y \quad (58)$$

where:

ER_y = the net GHG emissions reductions and/or removals in year y (the overall annual carbon change between the baseline and project scenarios, net all discount factors except the permanence buffer) (t $CO_2e\ yr^{-1}$).

$ER_{y,GROSS}$ = the difference in the overall annual carbon change between the baseline and project scenarios (t $CO_2e\ yr^{-1}$).

LE_y = Leakage in year y (t $CO_2e\ yr^{-1}$), as calculated in equation 56b below.

$$LE_y = MLF_y \bullet ER_{yGROSS} \quad (56b)$$

Ex-ante net GHG emissions are calculated below:

Table 19: Net GHG Emissions

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
01-August-2020 - 31-December-2020	-10,990	4,438	1,543	13,885
01-January-2021 - 31-December-2021	7,805	-4,012	-1,182	-10,635
01-January-2022 - 31-December-2022	-49,978	15,343	6,532	58,789
01-January-2023 - 31-December-2023	-4,579	-30,173	-2,559	-23,034
01-January-2024 - 31-December-2024	-7,750	3,950	1,170	10,529
01-January-2025 - 31-December-2025	-8,560	3,777	1,234	11,102
01-January-2026 - 31-December-2026	-9,048	3,411	1,246	11,213
01-January-2027 - 31-December-2027	-14,839	3,173	1,801	16,211
01-January-2028 - 31-December-2028	-7,714	3,171	1,088	9,796
01-January-2029 - 31-December-2029	-11,215	3,026	1,424	12,817
01-January-2030 - 31-December-2030	-10,038	2,832	1,287	11,583
01-January-2031 - 31-December-2031	-17,905	2,526	2,043	18,388
01-January-2032 - 31-December-2032	-9,023	2,279	1,130	10,171
01-January-2033 - 31-December-2033	-8,026	2,267	1,029	9,264
01-January-2034 - 31-December-2034	-10,336	2,174	1,251	11,260
01-January-2035 - 31-December-2035	-7,025	2,012	904	8,133
01-January-2036 - 31-December-2036	-9,505	1,811	1,132	10,184
01-January-2037 - 31-December-2037	-3,091	1,716	481	4,327
01-January-2038 - 31-December-2038	-2,688	1,699	439	3,949
01-January-2039 - 31-December-2039	-2,419	1,631	405	3,645
01-January-2040 - 31-December-2040	19,327	1,569	-1,776	-15,982
01-January-2041 - 31-December-2041	-13,651	1,411	1,506	13,556
01-January-2042 - 31-December-2042	-9,739	1,344	1,108	9,974
01-January-2043 - 31-December-2043	-9,547	1,331	1,088	9,790
01-January-2044 - 31-December-2044	-11,405	1,275	1,268	11,412
01-January-2045 - 31-December-2045	-15,020	1,225	1,624	14,620
01-January-2046 - 31-December-2046	-11,728	1,189	1,292	11,625
01-January-2047 - 31-December-2047	-11,348	1,143	1,249	11,242
01-January-2048 - 31-December-2048	-12,502	1,134	1,364	12,273
01-January-2049 - 31-December-2049	-18,463	1,087	1,955	17,596
01-January-2050 - 31-July-2050	-12,165	1,055	1,322	11,897
Total	**-303,163**	**40,815**	**34,398**	**309,580**

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	Spatial Inventory data ($A_{BSL,i}$, $A_{PRJ,i}$),i
Data unit	Hectares (Ha)
Description	Respective areas of baseline and project polygon, i for all project instances
Source of data	GPS Coordinates, inventory records, spatial data using a Geographic Information System (GIS)
Value applied:	Each polygon has an area
Justification of choice of data or description of measurement methods and procedures applied	GIS spatial delineation of project areas and tabular forest inventory classes. An GIS software program is used to integrate data from various sources. and its derivatives (areas, perimeters etc.)
Purpose of Data	Required for baseline and project calculations
Comments	Includes delineation of project areas and polygons

Data/Parameter	CF
Data unit	t C t^{-1} d.m
Description	Carbon fraction of dry matter
Source of data	As per CBM CFS3 EU-AIDB
Value applied:	0.50
Justification of choice of data or description of measurement methods and procedures applied	Best available data
Purpose of Data	Required for baseline carbon and project calculations

Comments	Embedded in CBM CFS3 EU-AIDB SPU 1

Data / Parameter	BEF
Data unit	Unitless
Description	Biomass expansion factors for conversion of productivity metrics to biomass
Source of data	CBM-CFS3 default values.
Value applied:	CBM-CFS3 calculates the Biomass Expansion Factor as a function of jurisdiction, ecozone and tree species.
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 data is widely reviewed and accepted. Value determined using approach described in the VM0012 Methodology
Purpose of Data	Calculation of baseline and project emissions
Comments	

Data / Parameter	R_i
Data unit	Unitless
Description	Root to shoot ratio in polygon, i
Source of data	CBM-CFS3 default values.
Value applied:	CBM-CFS3 variants calculates belowground biomass as a function of tree species and tree size.
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 data is widely reviewed and accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	Root allocation can vary by site productivity.

Data / Parameter	$f_{BSL,NATURAL,i,t}$, $f_{PRJ,NATURAL,i,t}$
Data unit	unitless (0 < $f_{BSL,NATURALi}$, $f_{PRJ,NATURAL,i,t}$ < 1)
Description	The proportion of biomass that dies from natural mortality in polygon, i, year, t, in the baseline and project cases, respectively.
Source of data	Modeled by CBM-CFS3.
Value applied:	Default settings in CBM-CFS3.
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for baseline and project calculations.
Comments	

Data / Parameter	$f_{BSL,DAMAGE,i,t}$, $f_{PRJ,DAMAGE,i,t}$
Data unit	unitless (0 < $f_{BSL,DAMAGEi,t}$ $f_{PRJ,DAMAGE,i,t}$ < 1)
Description	The proportion of additional biomass removed by for road and landing construction in polygon, i, year, t, in the baseline and project cases, respectively.
Source of data	As described in the management plan for road development. Monitoring data on an *ex-post* basis in the project scenario.
Value applied:	Variable on an *ex-post* basis in the project scenario - digitized in the project scenario on an *ex-post* basis if visible in remote sensing or captured by standing stocking estimates. Captured within the clearing component of the baseline scenarios.
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on expert opinion based on regional experience.
Purpose of Data	Required for calculation of baseline and project emissions.

Comments	

Data / Parameter	$f_{BSL,BLOWDOWN,i,t}$, $f_{PRJ,BLOWDOWN,i,t}$
Data unit	unitless ($0 < f_{BSL,BLOWDOWNi,t}$, $f_{PRJ,BLOWDOWN,i,t} < 1$)
Description	The proportion of live aboveground tree biomass subject to blowdown in polygon, i, year, t, in the baseline and project cases, respectively.
Source of data	Included within the natural mortality factors calculated in $f_{BSL,NATURAL,i,t}$, $f_{PRJ,NATURAL,i,t}$ by CBM-CFS3. Also captured by spatial monitoring if >4ha, which would be incorporated as a new polygon on an *ex-post* basis.
Value applied:	Zero for the baseline and project *ex-ante* calculations (part of the natural mortality modeling in CBM-CFS3).
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	$f_{BSL,BRANCH,i,t}$, $f_{PRJ,BRANCH,i,t}$
Data unit	unitless ($0 < f_{BSL,BRANCHi,t}$, $f_{PRJ,BRANCH,i,t} < 1$)
Description	The proportion of aboveground tree biomass comprised of branches > 2 in diameter in polygon, i, year, t, in the baseline and project cases, respectively.
Source of data	Calculated within CBM-CFS3.
Value applied:	Variable, see source data.

Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	$f_{BSL,BUCKINGLOSS,i,t}$, $f_{PRJ,BUCKINGLOSS,i,t}$
Data unit	unitless (0 < $f_{BSL,BUCKINGLOSSi,t}$ $f_{PRJ,BUCKINGLOSS,i,t}$ < 1)
Description	The proportion of the log bole biomass left on site after assessing and/or merchandizing the log bole for quality, in polygon, i, year, t, in the baseline and project cases, respectively.
Source of data	CBM-CFS3 EU-AIDB default values for SPU 1
Value applied:	CBM-CFS3 EU-AIDB default values for SPU 1
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	$f_{BSL,SNAGFALLDOWN,i,t}$, $f_{PRJ,SNAGFALLDOWN,i,t}$
Data unit	unitless (0 < $f_{BSL,SNAGFALLDOWNi,t}$ $f_{PRJ,SNAGFALLDOWN,i,t}$ < 1)
Description	The proportion of snag biomass in polygon, i, year, t, that falls over, in the baseline and project cases, respectively.
Source of data	Modeled by CBM-CFS3-EU-AIDB.
Value applied:	Variable, depending on species and dbh. Modeled by species and age class within CBM-CFS3 EU-AIDB.

Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	$f_{BSL,LWDECAY,i,t}$, $f_{PRJ,LWDECAY,i,t}$
Data unit	unitless ($0 < f_{BSL,LWDECAYi,t}$ $f_{PRJ,LWDECAY,i,t} < 1$)
Description	The annual proportional loss of lying dead biomass due to decay, in polygon i, year, t in the baseline and project cases, respectively.
Source of data	Modeled by CBM-CFS3-EU-AIDB.
Value applied:	CBM-CFS3 default values for SPU 1
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	$f_{BSL,SWDECAY,i,t}$, $f_{PRJ,SWDECAY,i,t}$
Data unit	unitless ($0 < f_{BSL,SWDECAYi,t}$ $f_{PRJ,SWDECAY,i,t} < 1$)
Description	The proportional loss of snag biomass due to decay, in polygon, i, year, t, in the baseline and project cases, respectively.
Source of data	Modeled by CBM-CFS3-EU-AIDB.
Value applied:	CBM-CFS3 default values for SPU 1

Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	$f_{BSL,DBGDECAY,i,t}$, $f_{PRJ,DBGDECAY,i,t}$
Data unit	unitless (0 < $f_{BSL,DGBDECAYi,t}$ $f_{PRJ,DBGDECAY,i,t}$ < 1)
Description	The proportional loss of dead belowground biomass due to decay, in polygon i, year, t, in the baseline and project cases, respectively.
Source of data	Modeled by CBM-CFS3-EU-AIDB.
Value applied:	CBM-CFS3 default values SPU 1
Justification of choice of data or description of measurement methods and procedures applied	CBM-CFS3 is widely accepted.
Purpose of Data	Required for calculation of baseline and project emissions.
Comments	

Data / Parameter	E_M
Data unit	%
Description	An estimate of model error based on the relative area-weighted difference between model-predicted values of carbon storage and those values measured in field plots.
Source of data	Model output and field data (see Equation 60a).
Value applied:	Percent Calculated

Justification of choice of data or description of measurement methods and procedures applied	Value determined using approach described in the VM0012 Methodology.
Purpose of Data	Calculation of Uncertainty.
Comments	

Data / Parameter	E_I
Data unit	%
Description	An estimate of Inventory sampling error calculated as the 90% confidence limit of the area-weighted differences between the model-predicted values of carbon storage and those values measured in field plots.
Source of data	Model output and field data (see Equation 60c).
Value applied:	Percent Calculated
Justification of choice of data or description of measurement methods and procedures applied	Value determined using approach described in the VM0012 Methodology.
Purpose of Data	Calculation of Uncertainty.
Comments	

Data / Parameter	E_P
Data unit	%
Description	An estimate of total project error used to determine the uncertainty factor.
Source of data	Model output and field data (see Equation 60f).
Value applied:	Percent Calculated

Justification of choice of data or description of measurement methods and procedures applied	Value determined using approach described in the VM0012 Methodology.
Purpose of Data	Calculation of Uncertainty.
Comments	

Data / Parameter	$E_{Ry,ERR}$,
Data unit	%
Description	The uncertainty factor calculated for year 'y' (See Section 6.5).
Source of data	Model output and field data (see Equation 60f).
Value applied:	%
Justification of choice of data or description of measurement methods and procedures applied	Value determined using approach described in the VM0012 Methodology.
Purpose of Data	Calculation of baseline and project emissions and calculations of VCUy.
Comments	

Data / Parameter	MLF_y
Data unit	%
Description	The market leakage factor determined for year 'y'
Source of data	Determined based upon the approach defined in Section 5.3
Value applied:	Percent Calculated
Justification of choice of data or description of measurement methods and procedures applied	Value determined using the MARketz Tool as detailed in the appendices.

Purpose of Data	Calculation of leakage.
Comments	

6.2 Data and Parameters Monitored

Data / Parameter	$A_{PRJ,i}$
Data unit	Hectares (ha)
Description	Area of forest land in polygon, i
Source of data	Latest version of the spatial inventory data.
Description of measurement methods and procedures applied	GIS inventory data updated annually from Remote Sensing data, GPS data, combined with Silvador forest inventory spreadsheets and management plans. Updated yearly by Project Proponent, monitored by the Project Developer.
Frequency of monitoring/recording	Prior to every verification period. Yearly for spatial change monitoring.
Value applied:	Inventory data, hectares.
Monitoring equipment	Visual, satellite, aerial photos, GPS survey data.
QA/QC procedures applied	Standard GIS QA/QC procedures. GreenRaise. – Greenhouse Gas Monitoring Standard Operating Procedures (SOP).
Purpose of data	Calculation of project emissions in project area instances.
Calculation method	GIS software processes calculate areas.
Comments	Includes delineation of project areas and polygons

Data / Parameter	$APSP_{,i}$,
Data unit	Hectares (ha)

Description	Area of permanent sample plot in polygon, i
Source of data	Field measurement.
Description of measurement methods and procedures applied	Fixed radius permanent sample plot design. See GreenRaise Greenhouse Gas Monitoring SOP for procedures applied for plot sampling procedures. Completed by Project Developer.
Frequency of monitoring/recording	Plot measurements are repeated on 5-year intervals.
Value applied:	See compiled plot data MS Excel File. Plot is recorded in m^2 and converted to hectares.
Monitoring equipment	GPS, measuring tape, forest measuring tools/instruments
QA/QC procedures applied	GPS of plot center. GreenRaise. Standard Operating Procedures (SOP) followed, including QC/QA plot check processes.
Purpose of data	Required for calculations of mean aboveground biomass and in the determination of Uncertainty Factor.
Calculation method	x m^3 * 1000 = x ha
Comments	

Data / Parameter	$DBH_{i,t}$
Data unit	Centimeters (cm)
Description	Diameter at breast height measured for each tree in the sample plot at time, t
Source of data	Field measurements in sample plots.
Description of measurement methods and procedures applied	Field measurements in permanent sample plots. Measurement of all trees ≥ 5cm in DBH at 1.3m above ground completed by Project Developer.
Frequency of monitoring/recording	Individual plot tree re-measurements are repeated on 5-year intervals.

Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	Forest measuring tools designed for measuring tree diameter.
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for calculations in aboveground biomass and in the determination of Uncertainty Factor.
Calculation method	n/a - Measured.
Comments	

Data / Parameter	$Height_{i,t}$
Data unit	Meters (m)
Description	Tree height measured for each tree in the sample plots at time, t
Source of data	Field measure in sample plots.
Description of measurement methods and procedures applied	Field measurements in permanent sample plots. Measurement of trees ≥ 5cm DBH. Completed by Project Developer.
Frequency of monitoring/recording	Individual plot tree re-measurements are repeated on 5-year intervals.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	Instruments designed for measuring tree height.
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for calculations of mean aboveground biomass and in determination of Uncertainty Factor.
Calculation method	n/a - Measured

Comments	

Data / Parameter	$B_{AG\ i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Aboveground live tree biomass in polygon, i, year, t, in the project.
Source of data	Permanent sample plots (PSP) data.
Description of measurement methods and procedures applied	Calculated from $Height_{i,t}$, $DBH_{i,t}$, and $APSP_i$, Completed by Project Developer.
Frequency of monitoring/recording	Upon establishment of PSP. Every 5 years, thereafter.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Above ground biomass for each permanent sample plot will be calculated using m^3/ha and supporting CBM-CFS3 data (Boudewyn 2007 equations).
Comments	

Data / Parameter	$B_{BG\ i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Average belowground live tree biomass in polygon, i, year, t, in the project.

Source of data	Estimated using info from above ground biomass calculations within permanent sample plots from $B_{AGi,t}$.
Description of measurement methods and procedures applied	Calculated using plot data in CBM-CFS3 EU-AIDB. Completed by Project Developer.
Frequency of monitoring/recording	Upon establishment of PSP. Every 5 years, thereafter.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Below ground biomass for each permanent sample plot will be calculated using m^3/ha and supporting CBM-CFS3 data (Boudewyn 2007 equations).
Comments	

Data / Parameter	$B_{TOTAL\ i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Average total live biomass in polygon, i, for year, t.
Source of data	Derived from average above and below ground biomass calculations within permanent sample plots.
Description of measurement methods and procedures applied	Sum of $B_{AGi,t}$ and $B_{BGi,t}$. Completed by Project Developer.
Frequency of monitoring/recording	Upon establishment of PSP. Every 5 years, thereafter.

Value applied:	Calculated using plot data and supporting CBM-CFS3 data (Boudewyn 2007 equations).
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for above and below ground living tree biomass and in the determination of Uncertainty Factor.
Calculation method	Sum of $B_{AGi,t}$ and $B_{BGi,t}$ values.
Comments	Calculated

Data / Parameter	$CLB_{i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Total carbon storage in live tree biomass in polygon, i, year, t, tC in the project case.
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Calculated from $B_{TOTALi,t}$ and CF, sum of $B_{AG\ i,t}$ and $B_{BG,\ i,\ t}$. Completed by Project Developer.
Frequency of monitoring/recording	Upon establishment of PSP. Every 5 years, thereafter.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.

Calculation method	As calculated by supporting CBM-CFS3 data (Boudewyn 2007 equations). and plot data, or $B_{TOTALi,t}$ * CF
Comments	

Data / Parameter	$CDOM_{i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Total carbon storage in dead organic matter in polygon, i, year, t,
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Calculated from $DOM_{SNAGi,t}$ and $DOM_{LDWi,t}$ and CF. Completed by Project Developer.
Frequency of monitoring/recording	Upon establishment of PSP. Every 5 years, thereafter.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	As calculated from plot data, decay rate constraints and supporting CBM-CFS3 data (Boudewyn 2007 equations). Or ($DOM_{SNAGi,t}$ + $DOM_{LDWi,t}$)* CF
Comments	Calculated

Data / Parameter	$f_{PRJ,NATURAL,i,t}$
Data unit	unitless (0 < $f_{PRJ,NATURAL,i,t}$ < 1)

Description	The proportion of biomass that dies from natural mortality in polygon, i, year, t, in the project scenario.
Source of data	Permanent sample plots, remote sensing.
Description of measurement methods and procedures applied	Height and dbh of dead trees in permanent sample plots will be recorded. Areas of stand replacing natural disturbance events will be delineated if >1.0 hectares. Completed by Project Developer.
Frequency of monitoring/recording	Annually in the case of natural disturbance events, every 5 years in the case of individual plot trees
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a - measured
QA/QC procedures applied	GreenRaise Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for project calculations
Calculation method	Observation in plot, and/or calculated by supporting CBM-CFS3 data (Boudewyn 2007 equations) and/or GIS/GPS delineation.
Comments	

Data / Parameter	$f_{PRJ,HARVEST,i,t}$
Data unit	unitless ($0 < f_{PRJ,HARVEST,i,t} < 1$)
Description	The proportion of biomass removed by harvesting from polygon, i, in year, t, in the project scenario.
Source of data	Project Proponent harvesting records, inventory data.
Description of measurement methods and procedures applied	Volume derived from harvesting records. Modeled estimates of total biomass in polygon, i, used to derive parameter. Completed by Project Proponent.

Frequency of monitoring/recording	Annually
Value applied:	See harvest area.
Monitoring equipment	GPS, remote sensing
QA/QC procedures applied	Data will be verified by ground-truthing and comparison with remote sensing information.
Purpose of data	Required for project calculations.
Calculation method	Modeled by CBM-CFS3 based on actual removals.
Comments	

Data / Parameter	$f_{PRJ,DAMAGE,i,t}$
Data unit	unitless ($0 < f_{PRJ,DAMAGE,i,t} < 1$)
Description	The proportion of additional biomass removed for road and landing construction in polygon, i, year, t, in the project case.
Source of data	Remote sensing, inventory data.
Description of measurement methods and procedures applied	Removals derived from remote sensing data and construction records. Completed by Project Proponent yearly.
Frequency of monitoring/recording	Annually
Value applied:	See GIS delineations construction records.
Monitoring equipment	GPS, satellite imagery, aerial photos,
QA/QC procedures applied	Data will be verified by ground-truthing and comparison with remote sensing information.
Purpose of data	Required for project calculations.

Calculation method	Areal estimate of removals is multiplied by average carbon density within a polygon.
Comments	

Data / Parameter	$DOM_{SNAG,i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Total mass of dead organic matter contained in standing dead wood in polygon, i, year, t in the project case.
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Calculated from Height, $_{i,t}$, $DBH_{i,t}$, and $APSP_{,i}$ of dead trees measured in permanent sample plots. Completed by Project Developer.
Frequency of monitoring/recording	Every 5 years.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a - measured
QA/QC procedures applied	GreenRaise. Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Calculated by supporting CBM-CFS3 data (Boudewyn 2007 equations) from plot data.
Comments	Calculated

Data / Parameter	$DOM_{LDW,i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)

Description	Total mass of dead organic matter contained in lying dead wood in polygon, i, year, t in the project case.
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Calculated from the line intersect method (GreenRaise-Greenhouse Gas – Monitoring Standard Operating Procedures (SOP)). Completed by Project Developer.
Frequency of monitoring/recording	Every 5 years.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	n/a - measured
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Calculated using the following field- measured parameters Li,t, dni,t, DLDWc,i,t , and N,t
Comments	Calculated

Data / Parameter	VLDW,i,t
Data unit	m3 ha-1
Description	Total volume of dead organic matter contained in lying dead wood in polygon, i, year, t in the project case.
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Calculated from the line intersect method (GreenRaise-Greenhouse Gas – Monitoring SOP). Completed by the Project Developer.
Frequency of monitoring/recording	Every 5 years.

Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	Tape and visual inspection.
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring SOP.
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Calculated using the following field- measured parameters $L_{i,t}$, $d_{ni,t}$, $D_{LDWc,i,t}$, and N_t
Comments	

Data / Parameter	$L_{i,t}$
Data unit	Meters (m)
Description	Calculation of lying dead wood: Length of the transect used to determine volume of lying dead wood in the sample plot, at time, t (4*25m=100m). Completed by Project Developer.
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Field measurements
Frequency of monitoring/recording	Every 5 years.
Value applied:	100meter transect
Monitoring equipment	Metric measuring tape.
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of carbon stocks and Uncertainty Factor.
Calculation method	n/a - measured

Comments	

Data / Parameter	$D_{n,i,t}$
Data unit	Centimeters (cm)
Description	Calculation of lying dead wood: Diameter of each piece n of dead wood inside the sample plot at time, t).
Source of data	Permanent sample plots.
Description of measurement methods and procedures applied	Lying dead wood to be sampled as described in the GreenRaise Monitoring (allometric Romanian equation applied to all lying dead wood scanned pieces within plot). Minimum measurement, diameter of pieces must not be less than 5 cm. Completed by Project Developer.
Frequency of monitoring/recording	Every 5 years.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	Instrument/tool designed for measuring distance and tree diameter.
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	n/a - measured
Comments	

Data / Parameter	$N_{,t}$
Data unit	unitless
Description	Calculation of lying dead wood: Diameter of each piece n of dead wood along the in the sample plot at time, t).

Source of data	Permanent sample plots field measurement.
Description of measurement methods and procedures applied	Total number of wood pieces in the sample plot, in time t, Completed by Project Developer.
Frequency of monitoring/recording	Every 5 years.
Value applied:	See compiled plot data MS Excel File.
Monitoring equipment	Visual observation.
QA/QC procedures applied	GreenRaise Greenhouse Gas – Monitoring Standard Operating Procedures (SOP).
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	n/a - measured
Comments	

Data / Parameter	E_M / Mean model error for the project
Data unit	%
Description	An estimate of model error.
Source of data	Model output and field data.
Description of measurement methods and procedures applied	Calculated value determined difference between of model-predicted values of carbon storage and those values measured in field plots (see Equation 60a). Completed by Project Developer.
Frequency of monitoring/recording	At each verification.
Value applied:	-5.83%
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	n/a

Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Equation (60a).
Comments	

Data / Parameter	E_I / Inventory error for the project
Data unit	%
Description	An estimate of inventory sampling error.
Source of data	Model output and field data.
Description of measurement methods and procedures applied	Calculated as the 90% confidence limit of the area-weighted differences between the model-predicted values of carbon storage and those values measured in field plots. Completed by Project Developer.
Frequency of monitoring/recording	At each verification.
Value applied:	15.74%
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	n/a
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Equation (60c).
Comments	

Data / Parameter	E_P / Estimated project error
Data unit	%

Description	An estimate of total project error calculated as the sum of the model and inventory error terms.
Source of data	Model output and field data.
Description of measurement methods and procedures applied	Calculated as the sum of EM and EI (Equation 60e). Completed by Project Developer.
Frequency of monitoring/recording	At each verification.
Value applied:	9.92%
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	n/a
Purpose of data	Required for determination of Uncertainty Factor.
Calculation method	Equation (60f).
Comments	

Data / Parameter	$ER_{y,ERR}$ / Uncertainty Factor
Data unit	%
Description	The uncertainty factor calculated for year ‘y’
Source of data	Model output and field data.
Description of measurement methods and procedures applied	Calculated value. Completed by Project Developer.
Frequency of monitoring/recording	At each verification and applied annually until the next verification.
Value applied:	1.5%
Monitoring equipment	n/a – calculated value

QA/QC procedures applied	n/a
Purpose of data	Required for project calculations.
Calculation method	Section 8.5.3 of the VM0012 methodology (Table 6)
Comments	

Data / Parameter	MLF_y
Data unit	Unitless
Description	The market leakage factor determined for year 'y'
Source of data	Model output and field data.
Description of measurement methods and procedures applied	Determined based upon the approach defined in Section 3. Completed by Project Developer.
Frequency of monitoring/recording	At each verification
Value applied:	10%
Monitoring equipment	n/a – calculated value
QA/QC procedures applied	n/a
Purpose of data	Required for calculation of leakage.
Calculation method	Value determined using the MARketz Tool as detailed in the appendices.
Comments	

6.3 Monitoring Plan

The objective of the SCA monitoring plan is to reliably monitor changes in carbon stocks related to the calculation of VCU's prior to each verification. In particular, the program will reliably monitor changes in spatial forest inventory conditions and collect field data on carbon stocks (as per GreenRaise Monitoring SOP) to compare against modeled carbon stocks and to calculate the uncertainty factor.

Ongoing monitoring is the primary operational task for the project, which will be completed by the Project Proponent and supported by the Project Developer and Implementation Partner. Additional field monitoring may require the hiring of external field crews, all of which will be experienced in forest mensuration. The Project Proponent's onsite supervisor, Project Developer and Implementation Partner will be responsible for the adequate training of these external contractors, ensuring that all individuals involved are familiar with the sampling standard operating procedures.

At each verification, reported on an annualized basis, the project will make the following inventory updates, as applicable:

1. Collect geo-referenced information on new project activities, including any forest management or silvicultural activities on any project instance that materially affects GHG emissions.
2. Annually monitor for forest disturbances through remote sensing, field observation, and/ or aerial observation and incorporate into GIS systems.

The inventory will be updated at a minimum, for:

- Natural disturbance events > 4 hectares (for example, fires, high mortality pest and disease areas, blowdown areas, slides, etc.).
- Project activities (e.g., timber harvesting/ thinning, road construction/ reclamation, reforestation/restoration, etc.). A minimum polygon size of 1 hectare can be used but is not a mandatory minimum.
- Unplanned anthropogenic disturbances (for example, non-de minimis illegal or unplanned harvests) affecting a non-de minimis amount of carbon stocks.

These monitored spatial elements will be updated in the Project Proponent's GIS inventory database (or equivalent) annually, or at minimum at each verification on an annualized basis.

6.3.1 Other Monitoring Requirements:

The Project Proponent will also document the following:

1. Activity shifting leakage (monitored annually, reported at each verification) – the project will report and assess the activity shifting leakage risks based on the timber harvest levels on lands owned or controlled by the Project Proponent that are outside the project area.
2. Market leakage calculations (at each verification, applied annually) - market leakage calculations will be confirmed at each verification using the latest plot inventory data and best available regional leakage area analysis.
3. Loss events (monitored annually as per GreenRaise SOP, reported as per VCS Standard v4.4)- the project will monitor and report any deficits in carbon stock pools >5% of previously verified emissions, reductions, and removals.

At verification, the project will update the inventory, uncertainty calculations, and carbon calculations from field plot measurement data as outlined in Sections 6.2 and 6.3.2. The project may also undertake the following monitoring related tasks as appropriate:

1. Refine the project analysis units based on new forest inventory data or to meet the needs of future project instances.
2. Refine or calibrate carbon models based on updated inventory data, as appropriate.
3. Update or modify inventory polygons based on updated remote sensing, forest inventory data, or field truthing, or as a result of project activities or disturbances.

All inventory, data, and modeling changes must be applied equally to the baseline and project carbon calculations, as applicable.

6.3.2 Carbon Stock Field plot Monitoring

The SCA was initiated in 2020 with monitoring inventory work completed in October of 2024 Plot data was collected using both the ZEB Horizon 3D Point LiDAR unit and other forestry measurement instruments/tools. .Plots were geo-located in a random plot network for monitoring changes in stand-level forest volume and merchantable timber. A total of 110 field plots have been established within 14 analysis units. See the table : below for locations:

Table 20: Project Plots Geographic Location

	Plot Location Coordinates GCS_WGS_84		
Plot Number	Analysis Unit	North	East
B2-1	B2U	44.649	25.932
B2-2	B2M	45.206	26.662
B2-3	B2M	45.046	25.483
B2-4	B2U	45.047	25.479
B3-1	B3M	45.052	25.486
B3-2	B3U	45.050	25.472
B3-5	B3M	45.202	26.648
B3-6	B3U	45.206	26.664
B3-7	B3M	45.048	25.497
B3-8	B3M	45.153	26.526
B3-9	B3M	45.052	25.498
B3-10	B3M	45.169	26.547
B4-1	B4U	45.214	26.684

	Plot Location Coordinates GCS_WGS_84		
Plot Number	Analysis Unit	North	East
B4-2	B4U	45.210	26.670
B4-4	B4M	45.050	25.495
O2-1	O2U	45.263	26.654
O2-3	O2M	45.153	26.654
O2-4	O2M	45.164	26.518
O2-5	O2U	45.262	26.657
O3-3	O3U	44.852	25.728
O3-4	O3M	45.199	26.647
O3-5	O3M	45.264	26.660
O3-6	O3M	45.168	26.545
O3-7	O3M	45.168	26.502
O3-10	O3M	45.198	26.663
O4-1	O4M	45.265	26.664
O4-2	O4M	45.268	26.671
O4-3	O4U	45.236	26.674
S3-1	S3M	45.212	26.664
S3-2	S3M	45.212	26.669
S3-3	S3U	45.173	26.545
B2-10u	B2M	45.054	25.469
B2-10ua	B2M	45.053	25.470
B2-11u	B2M	45.049	25.482
B2-12u	B2M	45.051	25.477
B2-13u	B2U	44.649	25.932
B2-6u	B2M	45.050	25.475
B2-7u	B2M	45.050	25.485
B2-8u	B2M	45.055	25.471
B2-9u	B2M	45.050	25.478

	Plot Location Coordinates GCS_WGS_84		
Plot Number	Analysis Unit	North	East
B3-11u	B3M	45.047	25.494
B3-13u	B3M	44.928	25.301
B3-13ua	B3M	44.928	25.301
B3-14u	B3M	44.945	25.274
B3-15u	B3M	45.209	26.670
B3-16u	B3M	45.171	26.535
B3-17u	B3M	45.203	26.648
B3-18u	B3M	45.178	26.493
B3-19u	B3M	45.179	26.493
B3-20u	B3M	44.941	25.273
B3-21u	B3M	45.051	25.486
B3-22u	B3M	44.951	25.268
B3-22ua	B2M	44.951	25.268
B3-23u	B3M	44.946	25.272
B3-24u	B3M	44.941	25.276
B3-25u	B3U	45.049	25.502
B3-26u	B3U	45.047	25.502
B3-28u	B3U	45.049	25.504
B3-29u	B3U	44.826	25.680
B3-30u	B2U	44.826	25.675
B3-31u	B3U	44.825	25.680
B4-5u	B4M	45.049	25.494
B4-6u	B4U	45.207	26.667
O2-10u	O2U	45.264	26.653
O2-11u	O2U	45.265	26.653
O2-6u	O2M	45.152	26.536
O2-7u	O2M	45.176	26.509

	Plot Location Coordinates GCS_WGS_84		
Plot Number	Analysis Unit	North	East
02-8u	02M	45.209	26.665
02-9u	02M	45.151	26.538
03-11u	03M	45.263	26.647
03-12u	03M	45.266	26.657
03-13ua	03M	44.718	25.620
03-14u	03M	45.183	26.670
03-15u	03M	45.201	26.644
03-16u	03M	45.263	26.658
03-17u	03M	45.176	26.543
03-18u	03M	45.049	25.487
03-20u	03M	45.210	26.653
03-20ua	03U	45.209	26.652
03-21u	03M	45.171	26.541
03-22u	03M	45.169	26.556
03-23u	03M	45.166	26.550
03-24u	03M	45.203	26.674
03-25u	03M	45.183	26.667
03-26u	03M	45.204	26.660
03-27u	03M	45.037	25.452
03-28u	03M	45.265	26.660
03-29u	03M	45.038	25.453
03-30u	03M	45.176	26.543
03-32u	03U	44.852	25.726
03-33u	03U	45.164	26.551
03-34u	03U	45.205	26.680
03-35u	03U	45.200	26.662
03-36u	03U	44.931	25.295

	Plot Location Coordinates GCS_WGS_84		
Plot Number	Analysis Unit	North	East
03-37u	03U	45.202	26.659
03-38u	03U	44.924	25.310
03-39u	03U	45.186	26.667
04-10u	04U	45.211	26.675
04-11u	04M	45.238	26.671
04-12u	04M	45.266	26.666
04-13u	04M	45.210	26.673
04-5u	04M	45.266	26.676
04-6u	04M	45.269	26.670
04-9u	04U	45.238	26.677
S3-4u	S3M	44.926	25.311
S3-5u	S3M	45.207	26.673
S3-6u	S3M	45.041	25.521
S3-7u	S3M	45.213	26.655
S3-8u	S3M	45.214	26.663
S3-9u	S3U	45.213	26.674

All historical Silvador and Forest Capital Forest Carbon Project monitoring has been incorporated into the property inventory and GIS data updates used in this project design document.

The new plot monitoring program for carbon stocks established permanent sample plots within the analysis units. At each plot over story tree, dead standing tree, and lying deadwood data were collected. As part of ongoing project monitoring, the project will periodically review the need for additional permanent sample plots or incorporation of other forest and carbon inventory updates or improvements over time. The methodology does not specify a number of plots, rather an error over the target (10% @ 90%CI) being accounted for in the uncertainty factor deduction (Section 0).

6.3.3 Monitoring Carbon Plot Sampling Design Overview

The establishment of permanent monitoring sample plots was initiated in 2022 by the Project Proponent. A total of 110 PSPs were planned for establishment distributed among 14 analysis units within the project area. Plot monitoring and measuring techniques were completed as per the GreenRaise Greenhouse Gas Monitoring SOP.

Plot Layout - Permanent plot locations were located using geographic coordinates randomly selected via GIS analysis tools. A minimum buffer distance of 50m was also implemented between plots to ensure an appropriate distribution.

Size and Shape of Sample Plots – Permanent sample plots will be circular with a fixed radius of 11.28m (400m^2).

Plot measurements – plots are installed, measured, and re-measured following the latest version of the GreenRaise – Greenhouse Gas Monitoring SOP as well as sampled for Coarse Woody Debris (CWD) for carbon accounting in specific portions of Silvador's managed lands. Plot measurements include live trees (aboveground live biomass); standing dead trees (aboveground dead biomass); and lying dead wood (aboveground dead biomass).

Given the dynamics of forest processes, the permanent plots will be re-measured at intervals not exceeding 5 field season years, beginning at the year of installation. As noted, permanent plots may be established over multiple years, and such re-measurement schedules will be tracked for each plot based on its establishment year.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	$A_{PRJ,i}$
Data unit	Hectares (ha)
Description	Area of forest land in polygon, i
Value applied:	1,538 ha
Comments	Total area of project instances for this monitoring period.

Data / Parameter	$A_{PSP,i}$,
Data unit	Hectares (ha)
Description	Area of permanent sample plot (PSP) in polygon, i
Value applied:	0.04 ha. With use of the plot multiplier the hectares are used for calculation in Uncertainty Factor.
Comments	Calculated statistical uncertainty in forest carbon inventories compared to CBM CFS3 EU AIDB model outputs.

Data / Parameter	$DBH_{i,t}$
Data unit	Centimeters (cm)
Description	Diameter at breast height measured for each tree in the sample plot at time, t
Value applied:	See compiled plot data MS Excel File *tree_data_carbon_final*

Comments	Diameters measured in each permanent sample plots contribute to factors used to calculate above ground carbon stores measured in analysis unit plot observations.

Data / Parameter	Height $_{i,t}$
Data unit	Meters (m)
Description	Tree height measured for each tree in the sample plots at time, t
Value applied:	See compiled plot data MS Excel File.
Comments	Tree heights measured in each permanent sample plot contribute to parameters used to calculate above ground carbon stores measured in analysis unit plot observations.

Data / Parameter	BAG i,t
Data unit	t d.m. ha-1 (d.m. = dry matter)
Description	Aboveground live tree biomass in polygon, i, year, t, in the project case.
Value applied:	See compiled plot data MS Excel File.
Comments	Volume is initially calculated to merchantable volume as per published Boudewyn et el 2007 allometric volume calculations. Then the calculation of above ground live tree biomass carbon stocks (Height, DBH, APSP,i) is carried out. Parameters used for uncertainty calculations.

Data / Parameter	BBG i,t
Data unit	t d.m. ha-1 (d.m. = dry matter)
Description	Average belowground live tree biomass in polygon, i, year, t, in the project.

Value applied:	See compiled plot data MS Excel File.
Comments	Calculation of below ground tree biomass carbon stocks, Parameters used for uncertainty calculations.

Data / Parameter	$B_{TOTAL\ i,t}$
Data unit	t d.m. ha-^{1} (d.m. = dry matter)
Description	Average total above and below ground live biomass in polygon, i, for year, t.
Value applied:	Calculated using plot data and applicable Boudewyn values
Comments	Calculation of above and below ground tree biomass carbon stocks, Parameters used for uncertainty calculations. Sum of BAGi,t and BBGi,t.

Data / Parameter	$CLB_{i,t}$
Data unit	t d.m. ha-^{1} (d.m. = dry matter)
Description	Total carbon storage in live tree biomass in polygon, i, year, t, tC in the project case.
Value applied:	See compiled plot data MS Excel File.
Comments	Calculation of live tree biomass carbon stocks, pparameters used for Uncertainty calculation.

Data / Parameter	$CDOM_{i,t}$
Data unit	t d.m. ha-^{1} (d.m. = dry matter)
Description	Total carbon storage in dead organic matter in polygon, i, year, t,
Value applied:	See compiled plot data MS Excel File.

Comments	Annual change in dead organic matter carbon stocks. Parameters used in Uncertainty calculation.

Data / Parameter	$f_{PRJ,NATURAL,i,t}$
Data unit	unitless ($0 < f_{PRJ,NATURAL,i,t} < 1$)
Description	The proportion of biomass that dies from natural mortality in polygon, i, year, t, in the project case.
Value applied:	See compiled plot data MS Excel File
Comments	Annual change in natural mortality in carbon stocks. Factor in uncertainty calculation.

Data / Parameter	$f_{PRJ,HARVEST,i,t}$
Data unit	unitless ($0 < f_{PRJ,HARVEST,i,t} < 1$)
Description	The proportion of biomass removed by harvesting from polygon, i, in year, t, in the project scenario.
Value applied:	Volumes, modeled by CBM-CFS3 based on actual removals.
Comments	Parameters used for project emission calculations

Data / Parameter	$f_{PRJ,DAMAGE,i,t}$
Data unit	unitless ($0 < f_{PRJ,DAMAGE,i,t} < 1$)
Description	The proportion of biomass removed for road and landing construction in polygon, i, year, t, in the project case.
Value applied:	Volumes, based on monitored removals. Change in carbon stocks annually.
Comments	Parameters used for project emission calculations

Data / Parameter	$DOM_{SNAG,i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Total biomass of dead organic matter in standing dead wood in polygon, i, year, t in the project scenario.
Value applied:	Change in carbon stock annually
Comments	Parameters used for uncertainty calculations.

Data / Parameter	$DOM_{LDW,i,t}$
Data unit	t d.m. ha^{-1} (d.m. = dry matter)
Description	Total mass of dead organic matter contained in lying dead wood in polygon, i, year, t in the project case.
Value applied:	See compiled plot data MS Excel File.
Comments	Parameters used for uncertainty calculations.

Data / Parameter	VLDW,i,t
Data unit	m3 ha-1
Description	Total volume of dead organic matter contained in lying dead wood in polygon, i, year, t in the project case.
Value applied:	See complied plot data MS Excel File
Comments	Parameters used in uncertainty calculation.

Data / Parameter	$L_{i,t}$
Data unit	m

Description	Used in calculation of mean mass of dead organic material, lying dead wood: Length of the transect used to determine volume of lying dead wood in the sample plot, at time, t (4*25m=100m)
Value applied:	100m transect
Comments	Parameters used in uncertainty calculations.

Data / Parameter	$D_{n,i,t}$
Data unit	cm
Description	Diameter of each piece n of dead wood along the transects in the sample plot at time, t). Used in calculation of lying dead wood
Value applied:	See compiled plot data MS Excel File.
Comments	Parameters used in uncertainty calculations.

Data / Parameter	$N_{,t}$
Data unit	unitless
Description	Calculation of dead organic material. Diameter of each piece n of dead wood along the transects in the sample plot at time, t).
Value applied:	See compiled plot data MS Excel File.
Comments	Parameters used in uncertainty calculations.

Data / Parameter	E_M / Mean model error for the project
Data unit	%
Description	An estimate of model error.

Value applied:	-5.83%
Comments	Equation (60a).

Data / Parameter	E_I / Inventory error for the project
Data unit	%
Description	An estimate of inventory sampling error.
Value applied:	15.74%
Comments	Equation (60f).

Data / Parameter	E_P / Estimated project error
Data unit	%
Description	An estimate of total project error calculated as the sum of the model and inventory error terms.
Value applied:	9.92%
Comments	Equation (60f).

Data / Parameter	$ER_{y,ERR}$ / Uncertainty Factor
Data unit	%
Description	The uncertainty factor calculated for year 'y'
Value applied:	1.5%
Comments	Parameters used in project emission calculations
Data / Parameter	ERy,err

Data unit	Percentage
Description	The uncertainty factor calculated for year 'y'
Value applied:	1.5%
Comments	Parameters used in final VCU_y calculations

7.2 Baseline Emissions

7.2.1 Overview of Baseline and Project Scenarios using Inventory, CBM-CFS3 outputs and Microsoft Excel Applications

The SCA meet the Valid Starting Inventory Requirements from the methodology (methodology criteria in italics):

1. *Pertaining directly to the entire project area; the Silvador inventory data covers the entire project area, and meets this criteria.*
2. *Created, updated, or validated <10 years ago; and,*

The latest base inventory (2022 field season) was created and received approval under the Romania Forest Fund in 2022. The inventory meets these criteria.

3. *Documentation is available describing the methods used to create, update, or otherwise validate the starting inventory, including statistical analysis, field data, and/or other evidence.*

The inventory methods and related inventory updates are regulated by the provisions of the Forestry Code (Law 46/2008 with subsequent completions and modifications, respectively Law 175/2017).; which therefore meets the criteria.

STEP 1 - Stratify to create homogeneous units.

The Silvador forest inventory is contained within a Geographic Information System dataset and the social and economic forest functions are outlined in the FMP documents. Each property is associated within their own forest management requirements of the Forestry Code (Law 26/1996) and in total covers an area of 1,538 ha. The Inventory covers the properties of the following:

- UP I Constantinescu
- UP I Forest Capital (Hodoba, Popescu, Barbu)
- UP I Manesti
- UP I Nitescu
- UP I Valea Tisei
- UP V Barbu

The polygons are homogeneous based on forest cover species, productivity class, and other stand attributes including operability. The carbon modeling is specific to the forest lands intended for regulated harvesting. Romanian forestry law regulates minimum harvest age and harvest intensity. Regulation of primary forest products and additional harvest opportunities are feasible on constrained sites and forests under the special conservation regime and covers and thinning and conservation cutting.

For modelling purposes, inventory polygons were further refined into Analysis Units (AUs) based on leading species, site class and intended legal harvest regime. Or more specifically, leading species (Beech, Oak, other softwood), site class (groupings 0 - 2, 3, and 4 & 5) where 0 being highest growth and 5 being the lowest, and harvest regimes (Managed vs. Unmanaged (i.e. planned cutting (thinning and primary cutting vs. conservation or hygiene cutting)).

Carbon curves were then developed for and assigned to each of the analysis units.

Theme groupings were used in combination with polygon area to match up the modeled inventory polygon to the correct carbon yield curve data. The CBM-CFS3 derived stand and carbon curves are modeled on an assumed fully stocked representative stand in each AU and applies carbon and merchantable volume outcomes for each polygon based on the applicable allometric formulas within the model. The model includes discrete 'Runs' that represent the project (PRJ - deferred harvest) and specific baseline disturbances/ harvest activities (BSL – harvest).

The CBM-CFS3 then simulates and tracks the portion of carbon in all applicable carbon pools over time by polygon, including for Wood Products pool after any scheduled event. Carbon calculations can then be summarized for the project and baseline scenarios for each project year across all project instances.

Baseline emissions are calculated by applying a Baseline 'disturbances' to each AU, and then modeling the baseline activities and the related carbon flows using CBM-CFS3. The methods described are equivalent to the equations and processes outlined in VM0012.

7.2.2 Calculating Baseline Scenario Live Biomass Gain

For the Historic Baseline Scenario (as described in Section 3.4), a set of historic baseline activities (disturbances) was based on harvest details within the Forest Fund documents. The annual harvest volume has been determined by forward-looking harvest volumes and are driven by site productivity and market demand. All baseline management activities are assumed to occur/ begin at year 1 (2020).

Live biomass gain ($\Delta C_{BSL,G,t}$, Eqn 4, 5a-b) is calculated by CBM-CFS3 based on the project area (instances) & stratifications into analysis units. Regionally specific forest dynamics within the EU Archive Index Database and the related carbon curves discussed above, are tracked, and reported by carbon pool (Aboveground Live, Belowground Live), and reported in the Delta Ecosystem Reports. Additional details about related model default values, functionality, and parameters are found in Kull *et al.* (2019) & Kurz *et. al.* (2009).

7.2.3 Calculating Baseline Scenario Live Biomass Loss

Live biomass loss ($\Delta C_{BSL,L,t}$, Eqn 6, 7, 8, 9) is calculated by CBM-CFS3 based on the project area stratifications, regionally specific forest dynamics and the related carbon curves discussed above. Default parameters and algorithms within CBM-CFS3 model and track all stand dynamics, including natural tree mortality, harvesting scenario felling/ removals, blowdown, and any other biomass loss including decay. Generally, mortality related live biomass is shifted into dead biomass pools by CBM-CFS3 (Aboveground Standing Dead (snags), Aboveground Downed and Dead Wood (DOM), Belowground DOM), which are reported in the Delta Ecosystem Reports. Additional details about related model default values, functionality, and parameters are found in Kull *et al.* (2019) & Kurz *et. al.* (2009).

7.2.4 Calculating Baseline Scenario Dead Organic Matter Dynamics

Dead organic matter dynamics ($\Delta C_{BSLDOM,t}$, Eqn 10, 11a-b, 12, 13, 14a-b, 15, 16, 17a-d) are calculated by CBM-CFS3 based on the project area stratifications, regionally specific forest dynamics and the related carbon curves discussed above. Default parameters and algorithms within CBM-CFS3 model and track all stand dead wood dynamics, including standing dead, downed dead, and below ground dead organic matter. CBM-CFS3 uses the regionally specific variant data and related parameters to model and track dead organic matter between carbon pools (Aboveground Dead (i.e. Stem Snags), Belowground Dead, Aboveground Slow DOM (VM0012 calls this Lying Dead Wood)), and decay temperate related decay within each pool.

Additionally, CBM-CFS3 tracks dead organic matter dynamics related to harvesting (slash) or other events when applied. The project uses the default decay factors and dead matter dynamics that are set within the CBM-CFS3 model and specific to the variant dataset. The results of dead organic matter dynamics are reported in the Delta Ecosystem Reports. Additional details about related model default values, functionality, and parameters are found in Kull *et al.* (2019) & Kurz *et. al.* (2009). Generally, carbon stocks are transitioned between dead biomass pools, and emitted as they decay.

7.2.5 Calculating Baseline Scenario Harvested Wood Products

Harvested Wood Product dynamics ($\Delta C_{BSLHWP,t,}$ Eqn. 18, 19, 20 (not used), 21, 22a-c, 23) are calculated with a derivative pivot table based on forecast harvest volumes from CBM (i.e. merchantable volume generated during the harvest period (m^3) converted using species-specific wood densities along with a Carbon Fraction (CF = 0.5)).

For the purposes of Step 2 (carbon contained in harvested timber after milling) Forest Product Conversion Factors for the UNECE Region published by the United Nations Economic Commission for Europe (ECE/TIM/DP/49) was used to determine the total carbon in harvested timber that will enter the wood products pool by product type accounting for mill efficiencies and estimated product disposition percentages ($C_{BSL,MILL,h}$; t C). The gross quantity of carbon contained in harvested timber for each of the four product types (k) described in Step 1 must be decremented to account for losses during processing. This loss is calculated within *VM0012 BSL HWP70ST-30PLP (*excel spread sheet specifically tab 'Step 2 (Mill)'. Refer to the Appendices for additional information.

Step 3 calculates (carbon storage in medium-term and long-term wood products) the total carbon lost in short-lived products and stored in medium-term and long-term products using reference tables and factors from Smith, et al (2006). The result is a fraction of the Wood Products pool being emitted or stored annually for each In-Use category based on product, decay, and storage factors.

Constants from Smith, et al (2006) Table 6 – the Northwest Softwoods, Saw Logs and Pulpwood; along with the Northwest Hardwood tables were applied. The respective volumes were calculated by species and product type. Constants were used from the relevant "In Use" column to finalize calculations for the following HWP categories:

1. Short-lived HWP – multiplied (Year 1 – 3 look-up factor) for each of the tables against the respective remaining In-Use carbon volumes. This calculates the fraction of net Merch Carbon Removed that is In-Use as Short-lived HWP. Following VM0012, the sum of all Short-lived HWP is assumed to be emitted immediately.
2. Long-lived HWP – applied the look-up factor for Year 100 for each of the tables against the respective remaining In-Use carbon volumes. This calculates the fraction of net Merch Carbon Removed that is In-Use as Short-lived HWP. Following VM0012, the sum of all Long-lived HWP is assumed to be permanently stored.
3. Medium-Lived HWP – the difference between the carbon remaining In-Use at Year 3 and at Year 100 is then calculated using each table look-up factors and carbon volumes, respectively to calculate the Medium-Lived HWP. The sum of all Medium-Lived HWP is then modelled to emit on a straight line 20-year decay curve, starting in year 0 and being fully emitted in year 20.

Note that the remaining Merch Carbon Removed after accounting for Short-, Medium-, and Long-lived HWP is emitted immediately as a combination of emissions due to waste carbon being used for Energy and Emitted w/o Energy.

7.2.6 Fossil Fuel Emissions Associated With Logging, Transport, and Manufacture

Silvador has chosen to include the 'optional' pool of fossil fuel emissions (VM0012 Table 2). The annual change in fossil fuel emissions ($\Delta C_{BSL,\ EMITFOSSIL,t}$, Eqn. 24,25,26,27) from harvesting and processing of the various wood products applies to fuel emissions associated with harvesting of raw material (i.e., clear felling), transport of raw material (trucking and haul distance) and manufacturing of raw material (into product groups).

Default values in VM0012 Table 4 have been used. All calculations in support of this are within: *Emissions_BSL_Estimate* (spreadsheet - see Appendix 3)

Silvador's output reports that forecast species, product groups (e.g., roundwood sawlog) and related harvest volumes (m^3) for each planning period were used for the following calculations. Results are then converted to Merchantable Carbon pool using species specific wood densities along with a Carbon Fraction (CF = 0.5) providing Tonnes of Carbon (tC) harvested for each planning period. This is equivalent to $C_{BSL,TIMBER,h}$ as represented by Eq. 20 being the carbon contained in timber harvested in period h.

The annual change in fossil fuel emissions from harvesting and processing of the various wood products ($\Delta C_{BSL,EMITFOSSIL,t}$) are calculated as:

$$C_{BSL,EMITFOSSIL,t} = C_{BSL,EMITHARVEST,t} + C_{BSL,EMITMANUFACTURE,t} + C_{BSL,EMITTRANSPORT,t} \quad \text{(Eq. 24)}$$

Each of the carbon components are calculated as noted below:

Equation 25:

$C_{BSL,EMITHARVEST,t}$ is the annual fossil fuel emissions associated with harvesting of raw material (t C yr-1).

$$C_{BSL,EMITHARVEST,t} = \Sigma[C_{BSL,TIMBER,h}] \bullet c_{HARVEST}$$

All timber in the SCA is harvested via thinning and fellings, and the default value from Table 4 of VM0012 for $c_{HARVEST}$ is used.

Equation 26:

$C_{BSL,EMITTRANSPORT,t}$ is the annual fossil fuel emissions associated with the transport of raw material (t C yr-1). It should be noted that fuelwood was not transported as the material was used locally.

$$C_{BSL,EMITTRANSPORT,t} = \Sigma[C_{BSL,TIMBER,h}] \bullet \Sigma(f_{BSL,TRANSPORTk} \bullet d_{TRANSPORTk} \bullet c_{TRANSPORTk})$$

$f_{BSL,TRANSPORTk}$ = the fraction of raw material transported by transportation type, k. (unitless; 0 < 1). All timber in The SCA is transported by truck.

$d_{TRANSPORTk}$ = the distance transported by transportation type, k. (km); The reports contain information on the Haul distance from the harvest area (FMP) to the direct delivery customers. The boundaries of this emission calculation are from harvest operation areas to direct delivery customers in Romania and do not include any other type of log transportation (trans-national log export). This is conservative in nature.

$c_{TRANSPORTk}$ is the carbon emission intensity factor (kg C emitted/t C raw material) associated with transportation type, k. VM0012 Table 4 default values are used.

Equation 27

$C_{BSL,EMITMANUFACTURE,t}$ is the annual fossil fuel emissions associated with the manufacturing of raw material (t C yr-1).

$$C_{BSL,EMITMANUFACTURE,t} = \Sigma[C_{BSL,TIMBER,h}] \bullet \Sigma(f_{BSL,PRODUCTk} \bullet c_{MANUFACTUREk})$$

$c_{MANUFACTUREk}$ is the carbon emission intensity factor (t C emitted/t C raw material) associated with manufacture of product type, *k*;

The following product groups from the FMP areas are assigned to the following product type (k) categories:

1. Sawlogs
2. Fuelwood
3. Pulpwood

For each product type (k) VM0012 Table 4 for default values are used.

7.2.7 Baseline Scenario GHG Emissions Calculation Summary

The CBM-CFS3 model and the supporting spreadsheets were used based on spatial forest inventory data to calculate and track all annual changes in both the live biomass ($\Delta C_{BSL,LB,t}$) and dead organic matter pools (($\Delta C_{BSL,DOM,t}$) for the baseline scenario in a method consistent with the formulas in VM0012. Carbon storage changes in harvested wood products ($\Delta C_{BSl,HWP,t}$) and fossil fuel emissions ($\Delta C_{BSL,EMITFOSSIL,t}$) summarized net carbon balances, and other deductions and buffer discounts were determined in the supporting spreadsheets.

The total annual carbon balance in year, t, for the baseline scenario (ΔCBSL,t, in t C yr-1) was calculated as:

$$\Delta C_{BSL,t} = \Delta C_{BSL,P,t} \qquad (1)$$

where:

$\Delta C_{BSL,P,t}$ is the annual change in carbon stocks in all pools in the baseline across the project activity area (including all project instances); t C yr-1.

The annual change in carbon stocks in all pools in the baseline across the project activity area ($\Delta C_{BSL,P,t}$; t C yr^{-1}) was calculated as:

$$\Delta C_{BSL,P,t} = \Delta C_{BSL,LB,t} + \Delta C_{BSL,DOM,t} + \Delta C_{BSl,HWP,t} \qquad (2)$$

where:

$\Delta C_{BSL,LB,t}$ = annual change in carbon stocks in living tree biomass (above- and belowground); t C yr^{-1}

$\Delta C_{BSL,DOM,t}$ = annual change in carbon stocks in dead organic matter; t C yr^{-1}

$\Delta C_{BSl,HWP,t}$ is the annual change in carbon stocks associated with harvested wood products, t C yr^{-1}.

The annual change in carbon stocks in living tree biomass (above- and belowground) in the baseline scenario ($\Delta C_{BSL,LB,t}$; t C yr^{-1}) was calculated as:

$$\Delta C_{BSL,LB,t} = \Delta C_{BSL,G,t} - \Delta C_{BSL,i,t} \qquad (3)$$

where:

$\Delta C_{BSL,G,t}$ = annual increase in tree carbon stock from growth; t C yr^{-1}

$\Delta C_{BSL,L,t}$ = annual decrease in tree carbon stock from a reduction in live biomass; t C yr^{-1}.

The annual change in carbon stocks in dead organic matter (DOM) ($\Delta C_{BSL,DOM}$; t C yr^{-1}) in the baseline scenario was calculated as:

$$\Delta C_{BSL,DOM,t} = \Delta C_{BSL,LDW,t} + \Delta C_{BSL,SNAG,t} + \Delta C_{BSL,DBG,t} \qquad (10)$$

where:

$\Delta C_{BSL,LDW,t}$ = change in lying dead wood (LDW) carbon stocks in year, t; t C yr^{-1}

$\Delta C_{BSL,SNAG,t}$ = change in snag carbon stock in year, t; t C yr^{-1}

$\Delta C_{BSL,DBG,t}$ = change in dead below-ground biomass carbon stock in year, t; t C yr^{-1}.

The annual change in emissions associated with the production of harvested wood products (HWP), $\Delta C_{BSl,HWP,t}$, is calculated as:

$$\Delta C_{BSl,HWP,t} = \Delta C_{BSL,STORHWP,t} - \Delta C_{BSL,EMITFOSSIL,t}, \quad (18)$$

$\Delta C_{BSL,STORHWP,t}$ = the annual change in harvested carbon that remains in storage after conversion to wood products (t C yr^{-1})

$\Delta C_{BSL,EMITFOSSIL,t}$ = the annual change in fossil fuel emissions from harvesting (logging and log transport) and processing of the various wood products.

7.3 Project Emissions

Project emissions and carbon flows are calculated in the same manner as the baseline emissions discussed in the Section 7.2 Baseline Emissions. Calculations use the same forest inventory data, analysis units and polygons, and modeling tools under the Project Scenario activities. Project and Baseline Scenarios and polygon versions of each are tracked and calculated simultaneously in the supporting spreadsheets using the same parameters, outputs, and analysis under each scenario. In the project scenario, carbon flows are modeled using project activities which includes the focus on maintaining forest health throughout the term of the project.

Project activities affecting GHG emissions were carried out during the initial project period (2020-2022) however, no project scenario activities were projected on an *ex-ante* basis. Future years may include various project forest management activities that affect *ex-post* carbon stocks which will be monitored and reported on in future verifications (e.g. salvage due to significant fire or forest health loss). Project activities will be based on actual monitoring results (see Section 6) and any resulting emissions netted against emission reductions.

The methods described are equivalent to the equations and processes outlined in VM0012.

7.3.1 Calculating Project Scenario Live Biomass Gain

Live biomass gain ($\Delta C_{PRJ,G,t}$, Eqn 32, 33a-b) is calculated the same as in the Baseline Scenario (CBM-CFS3), Section 7.2.2 using project area (instances), and analysis unit information.

7.3.2 Calculating Project Scenario Live Biomass Loss

Live biomass loss (Δ CPRJ,L,t, Eqn 34, 35, 36, 37) is calculated the same as in the Baseline Scenario (CBM-CFS3), Section 0 using project area stratifications, regionally specific forest dynamics and the related carbon curves data.

7.3.3 Calculating Project Scenario Dead Organic Matter Dynamics

Dead organic matter dynamics (Δ CPRJ,DOM,t, Eqn 38, 39a-b, 40, 41, 42a-b, 43, 44, 45a-d) are calculated the same as in the Baseline Scenario, Section 7.2.4 using project scenario polygons and data.

7.3.4 Calculating Project Scenario Harvested Wood Products (HWP)

Harvested Wood Product dynamics (Δ CPRJ,HWP,t, Eqn 46, 47, 48, 49, 50a-c, 51, 52, 53, 54, 55) are calculated the same as in the Baseline Scenario, Section 7.2.5 with respect to any timber harvesting in the project scenario. Currently there is incidental harvesting in the project scenario and may occur in the future for forest health reasons (forest fire, health salvage operations).

7.3.5 Fossil Fuel Emissions Associated with Logging, Transport, and Manufacturing

Silvador has chosen to include the 'optional' pool of fossil fuel emissions (VM0012 Table 2). The annual change in fossil fuel emissions ($\Delta C_{PRJ,\ EMITFOSSIL,t}$, Eqn. 52,53,54,55) from harvesting and processing of the various wood products applies to fuel emissions associated with harvesting of raw material (i.e., clear felling), transport of raw material (trucking and haul distance) and manufacturing of raw material (into product groups). Emissions are calculated the same as in the Baseline Scenario, Section 7.2.6 with respect to any timber harvesting in the project scenario. Currently there is no timber harvesting in the project scenario, although it may occur in the future (forest fire, health salvage operations).

7.3.6 Project Scenario GHG Emissions Calculation Summary

The CBM-CFS3 and supporting spreadsheets were used in combination with the spatial forest inventory data to calculate and track annual changes in both the biomass ($\Delta C_{PRJ,LB,t}$) and dead organic matter pools ($\Delta C_{PRJ,DOM,t}$) for the project scenario. Changes in carbon storage in harvested wood products ($\Delta C_{PRJ,HWP,t}$) and fossil fuel emissions ($\Delta_{PRJ,EMITFOSSIL,t}$) and summarized net carbon balances and buffer discounts were determined within the applicable spreadsheets.

The total annual carbon balance in year, t, for the project scenario ($\Delta C_{PRJ,t}$, in t C yr^{-1}) was calculated as:

$$\Delta C_{PRJ,t} = \Delta C_{PRJ,P,t} \quad (29)$$

where:

$\Delta C_{PRJ,P,t}$ is the annual change in carbon stocks in all pools in the baseline across the project activity area; t C yr^{-1}.

The annual change in carbon stocks in all pools in the project scenario across the project activity area ($\Delta C_{PRJ,P,t}$; t C yr^{-1}) was calculated as:

$$\Delta C_{PRJ,P,t} = \Delta C_{PRJ,LB,t} + \Delta C_{PRJ,DOM,t} + \Delta C_{PRJ,HWP,t} \quad (30)$$

where:

$\Delta C_{PRJ,LB,t}$ = annual change in carbon stocks in living tree biomass (above- and belowground); t C yr^{1}

$\Delta C_{PRJ,DOM,t}$ = annual change in carbon stocks in dead organic matter; t C yr^{-1}

$\Delta C_{PRJ,HWP,t}$ is the annual change in carbon stocks associated with harvested wood products, t C yr^{1}.

The annual change in carbon stocks in living tree biomass (above- and belowground) in the project scenario ($\Delta C_{PRJ,LB,t}$; t C yr^{-1}) was calculated as:

$$\Delta C_{PRJ,LB,t} = \Delta C_{PRJ,G,t} - \Delta C_{PRJ,L,t} \qquad (31)$$

where:

$\Delta C_{PRJ,G,t}$ = annual increase in tree carbon stock from growth; t C yr^{-1}

$\Delta C_{PRJ,L,t}$ = annual decrease in tree carbon stock from a reduction in live biomass; t C yr^{-1}.

The annual change in carbon stocks in dead organic matter (DOM) ($\Delta C_{PRJ,DOM}$; t C yr^{-1}) in the project scenario was calculated as:

$$\Delta C_{PRJ,DOM,t} = \Delta C_{PRJ,LDW,t} + \Delta C_{PRJ,SNAG,t} + \Delta C_{PRJ,DBG,t} \qquad (38)$$

where:

$\Delta C_{PRJ,LDW,t}$ = change in lying dead wood (LDW) carbon stocks in year, t; t C yr^{-1}

$\Delta C_{PRJ,SNAG,t}$ = change in snag carbon stock in year, t; t C yr^{-1}

$\Delta C_{PRJ,DBG,t}$ = change in below-ground carbon stock in year, t; t C yr^{-1}.

The annual change in the carbon stored in harvested wood products (HWP), ($\Delta C_{PRJ,HWP,t}$; t C yr^{-1}) in the project scenario was calculated as:

$$\Delta C_{PRJ,HWP,t} = \Delta C_{PRJ,STORHWP,t} - \Delta C_{PRJ,EMITFOSSIL,t}, \ (46)$$

$\Delta C_{PRJ,STORHWP,t}$ = the annual change in harvested carbon that remains in storage after conversion to wood products (t C yr^{-1})

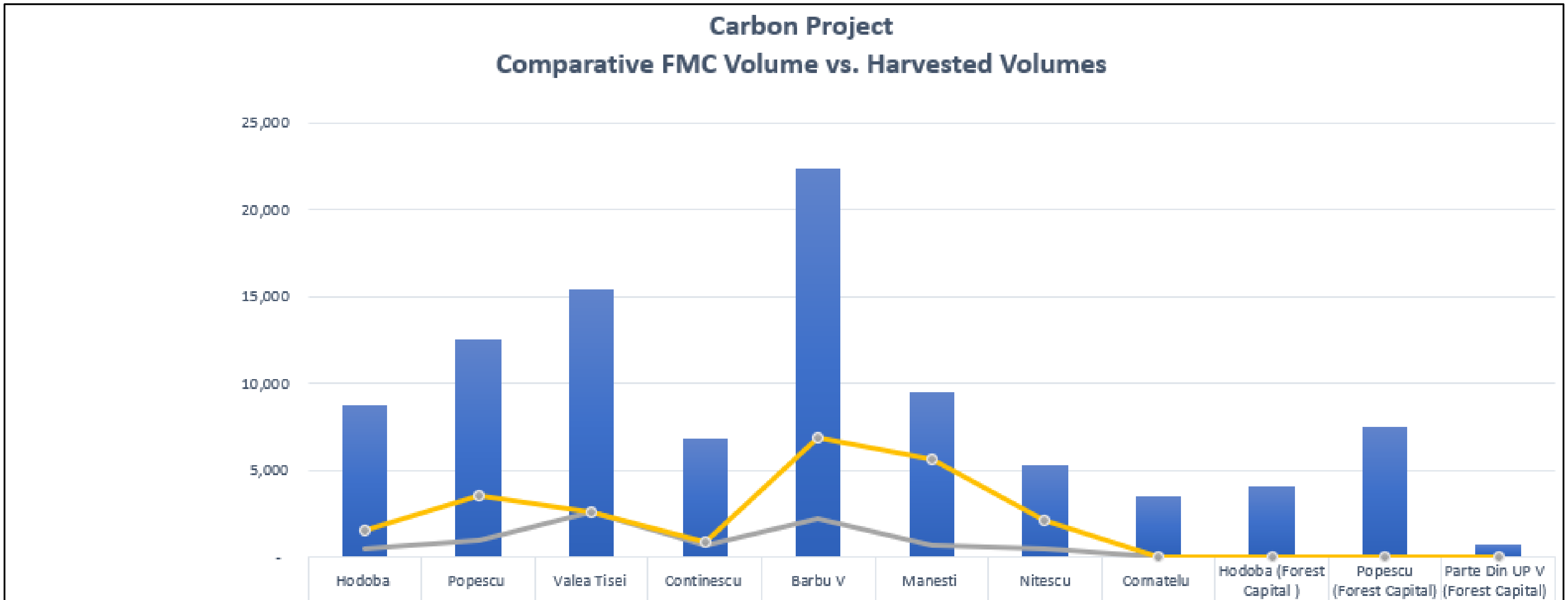
$\Delta C_{PRJ,EMITFOSSIL,t}$ = the annual change in fossil fuel emissions from harvesting (logging and log transport) and processing of the various wood products.

7.4 Leakage

7.4.1 Activity Shifting Leakage

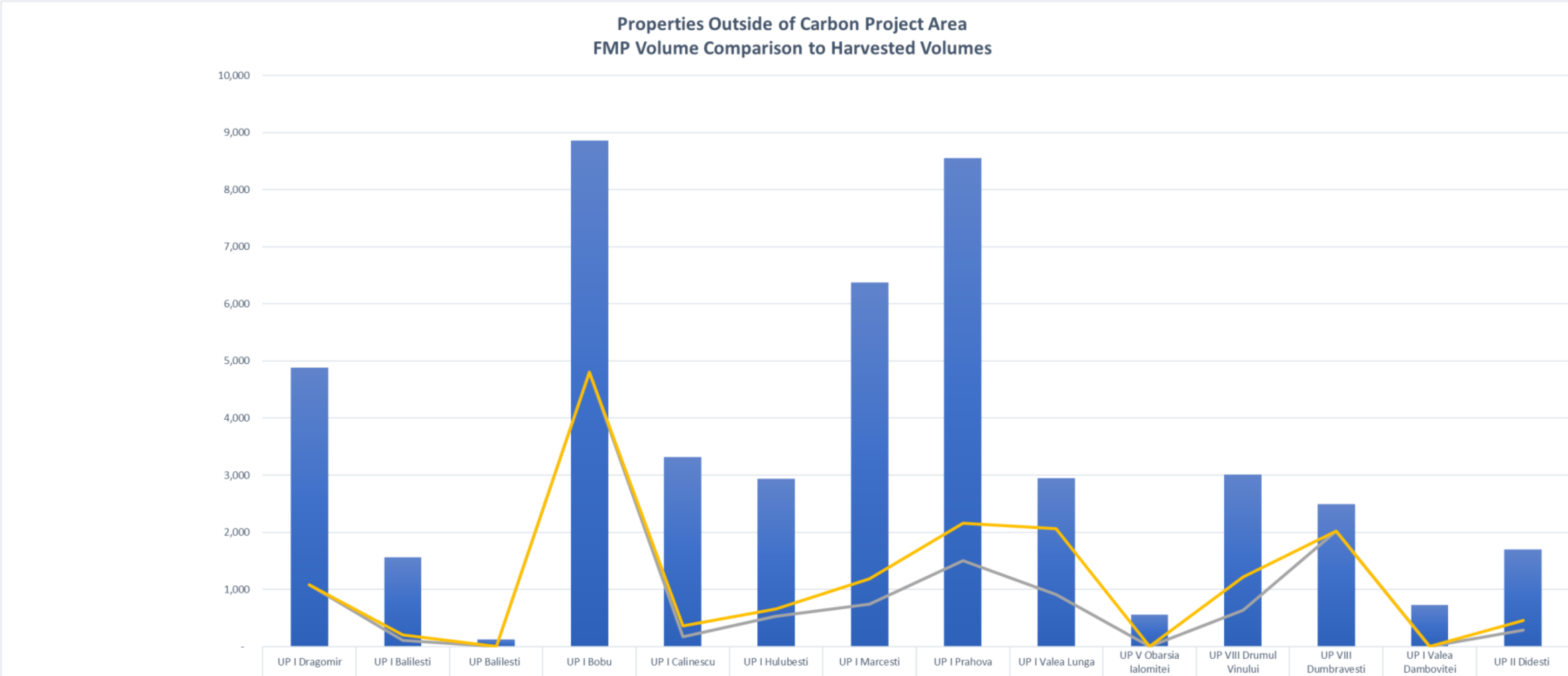
As mentioned in 5.3.1, Activity Shifting Leakage, the analysis of activity shifting leakage for the monitoring period was completed by comparing the cumulative harvested volumes of each forest fund property and FMP volumes. This was completed for all properties within the carbon area, as well as for other properties owned by Silvador.

Previous harvest amounts compared to FMP allocated volume amounts all remained below the acceptable benchmark (as determined from each forest fund forest management plan allocated 10-year harvest objectives). Figures below displays the analysis completed.



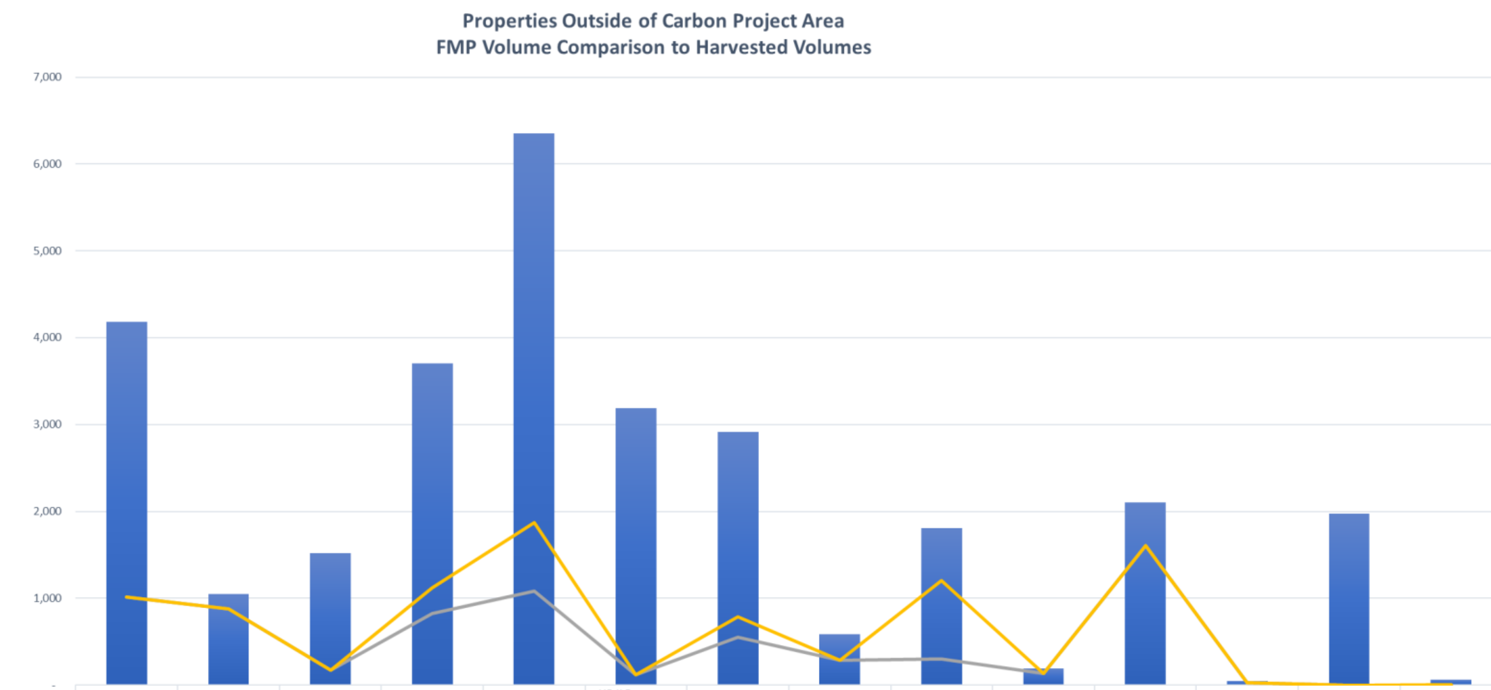
	Hodoba	Popescu	Valea Tisei	Continescu	Barbu V	Manesti	Nitescu	Comatelu	Hodoba (Forest Capital)	Popescu (Forest Capital)	Parte Din UP V (Forest Capital)
10 Year FMP Plan Vol m3	8,709	12,514	15,418	6,831	22,394	9,522	5,255	3,436	4,071	7,504	675
Vol Harvested Between 2020-2022	521	957	2,599	685	2,234	646	472	41	0	0	0
Total Cumulative Harvest to Date	1497	3,565	2,599	837	6,900	5,637	2,136	41	0	0	0

Figure 10: Comparison of Project Harvest Volumes During Monitoring Period (values in m3)



	UP I Dragomir	UP I Balilesti	UP Balilesti	UP I Bobu	UP I Calinescu	UP I Hulubesti	UP I Marcesti	UP I Prahova	UP I Valea Lunga	UP V Obarsia Ialomitei	UP VIII Drumul Vinului	UP VIII Dumbravesti	UP I Valea Dambovitei	UP II Didesti
10 Year FMP Plan Vol m3	4,886	1,557	120	8,859	3,319	2,932	6,376	8,556	2,943	559	3,007	2,488	727	1,699
Volume Harvested Between 2020-2022	1,083	112	0	4,805	171	527	747	1,502	910	0	641	2,024	0	285
Total Harvested Volume Between 2019-2022	1083	202	0	4805	361	652	1187	2161	2067	0	1222	2024	0	456

Figure 11: Comparison of Other Silvador/Forest Capital Properties During Monitoring Period (values in m3) – Part 1



	UP I Cosoba	UP VII Adanca	UP I Racari	UP I Cernata	UP X Ghergani	UP II Persoane Fizice si Juridice (Racotta)	UP I Vaile Unite (V.Caselor)	V Caselor	UP I Baleni	UP I Vaile Unite (III Bolovani)	III Bolovani	Padure mija	UP I Forest Capital (Arismendi)	Grajdanescu Manesti
10 Year FMP Plan Vol m3	4,178	1,047	1,515	3,703	6,348	3,191	2,913	583	1,808	188	2,103	45	1,977	60
Volume Harvested Between 2020-2022	1,013	880	173	824	1,083	117	552	282	303	131	1,608	30	0	0
Total Harvested Volume Between 2019-2022	1013	880	173	1117	1868	117	788	282	1201	131	1608	30	0	3

Figure 12: Comparison of Silvador/Forest Capital Other Properties During Monitoring Period (values in m3) – Part II

For the verification period, volumes of actual harvest for areas outside the carbon project were analyzed and compared to the pre-determined benchmark (FMP volumes). The harvest volumes were below the benchmark level, therefore representing no activity shifting leakage within the monitoring period.

7.4.2 Market Shifting Leakage

As noted in Section 5.3.2, for the calculation of Market Leakage a methodology deviation as noted in section 3.6 has been utilized. In this regard, the MARketz tool has been populated for the Silvador Project. Full details supporting the development and use of the MARketz tool are provided in the appendices. The intent is to rank each assessment as a low (1), moderate (5) or high risk (9) of market leakage.

Below is a summary of results for each of the market assessments within the tool:

1. Market Determination: The database used to for this section contains details of the following topics: Industrial roundwood removals coniferous and non-coniferous wood, Sawlogs, Veneer logs, and Pulpwood round, production. Date range 2016-2022 and includes Export, Import and Production in m^3[31]. The international Leakage Factor applied is 13%.
2. Market Equilibrium: The Global Forest Products Model (GFPM, v2020[32]) developed by Buongiorno et al. is utilized. For the project run of the model, 1500 ha was removed from the total timber harvesting landbase. The first year the market equilibrium is disturbed in either total production or consumption was 2070. As this is greater than 40 years from the project's start date, the assessment results in a low risk of market leakage (Score = 1)
3. Barriers - A. Distribution Barrier – Cost of Transportation: No barriers to distribution were identified at the local or regional level but was identified at the national level. This is adequately reflected in historical market sales records prior to project implementation. The assessment resulted in a moderate risk of market leakage[33] (Score = 5).
4. Barriers - B. Regulatory Barrier – Jurisdiction: Information regarding laws and regulations impacting cut control were sourced from the FSC CW Risk Assessment for Romania[34]. Land Ownership was referenced from the National Forestry Accounting plan of Romania [35]. Given that all ownership types in Romania have quota-based legislation the project has a low risk of market leakage for this aspect (Score = 1).
5. Product Substitutability: Substitutability Factors are sourced from BC FCOP 2.0. currently under consultation and notes the substitutability of wood products has a significant effect on the

[31] https://www.fao.org/faostat/en/#data/FO

[32] https://buongiorno.russell.wisc.edu/gfpm/

[33] https://www.cnr.fr/en/romanian-road-freight-transport-2020

[34] https://connect.fsc.org/document-centre/documents/resource/291

[35] https://www.bmel-statistik.de/forst-holz/tabellen-zu-forst-und-holzwirtschaft

ultimate leakage estimate[36]. Given the high proportion of the project being made up of moderately substitutable products (i.e. European beech (*Fagus sylvatica L.*)) the project has a moderate risk of market leakage for this assessment (Score = 5).

6. Land/Carbon Impact - A. Percent of National Inventory: The database used to for this section contains details of the following topics: Industrial roundwood removals coniferous and non-coniferous wood, Sawlogs, Veneer logs, and Pulpwood round, production. Date range 2016-2022 and includes Export, Import and Production in m^3.[37]. Given the small size of the project in relation to the national inventory there is a low risk of market leakage (Score = 1).
7. Land/Carbon Impact - B. Biomass Ratio of Project: Data is sourced from the National Forest Inventory (NFI) is the main instrument to assess country's forest resources along with results of the CFS-CBM baseline run[38]. For the Leakage area, inventory volumes were converted into biomass. Given the biomass ratio of project stand types in relation to the potential leakage area the project may be subject to a low risk of market leakage (Score = 1).

Market Leakage Determination

Within the MARketz tool a score of each assessment is gathered on the Market Score Card within the excel workbook and has been provided during validation and verification. The market score card calculates the overall weighted score of all the assessments, produces the resulting assessment score as a percentage, and the corresponding Market Leakage Factor.

In conclusion, the detailed analysis of SCA conducted utilizing the MARketz tool calculates a Market Leakage Factor (MLF_Y) of 10%.

7.5 Net GHG Emission Reductions and Removals

7.5.1 Calculation of the Uncertainty Factor

As per the methodology monitoring section specification, the project has installed field plots in each analysis unit as per statistical requirements (UNFCCC[39]). The project has installed 110 permanent carbon plots in 2022 and 2024.

The project-level uncertainty factor is calculated by a function within the *Silvador_VM0012_Uncertainty Calculator* excel spreadsheet, following the formulas below:

Step 1 – the project calculated the average percent model error (E_M) for the project based on the average area-weighted difference between measured values in monitored plot observations and model-predicted values using Equations 60a, b.

[36] https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/offset-projects/consultation

[37] https://www.fao.org/faostat/en/#data/FO

[38] https://roifn.ro/site/rezultate-ifn-2/

[39] https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf

$E_M = 100 \cdot (\sum y_{d,h,i} / \sum(A_{PRJ,h} \cdot y_{m,h,i}))$ (60a)

where:

The summation is across all plot observations, i, and across all analysis units, h;

$y_{d,h,i} = A_{PRJ,h} \cdot (y_{p,h,I} - y_{m,h,i})$ (60b)

E_M = Mean model error for the project (%)

$y_{d,h,i}$ = the area-weighted difference between measured and predicted carbon storage in analysis unit, h, plot observation, i (t C)

$y_{m,h,i}$ = carbon storage measured in analysis unit, h, plot observation, i (t C ac^{-1})

$y_{p,h,i}$ = carbon storage predicted by model for analysis unit , h, plot observation, i (t C ac^{-1}) $A_{PRJ,h}$ = area of project analysis unit, h (ac)

Step 2 – The project calculated the inventory error (E_I) at a 90 percent confidence interval expressed as a percentage of the mean area-weighted inventory estimate from the measured plots. Inventory error is estimated based upon the difference between modeled and measured values for monitoring plots established in polygons grouped within analysis units.

Inventory error, E_I, is estimated by first calculating the standard error of the area-weighted differences between the plot observation measurement and the associated model-predicted carbon storage (both on a per acre basis) for analysis units. The standard error is then multiplied by the *t*- value for the 90 percent confidence interval. Finally, E_I is expressed in relative terms (in Equation 60c) by dividing the 90% confidence interval of the area-weighted differences between predicted and measured values in all plots by the area-weighted average of the measured values in all monitoring plots.

$E_I = 100 \cdot [SE * 1.654 / ((1/N) \cdot \sum(A_{PRJ,h} \cdot y_{m,h,i}))]$ (60c)

where:

E_I = Inventory error for the project (%)

SE = the project level standard error of the area weighted differences between measured plot observation and predicted values of carbon storage.

N = total number of plot observations in all analysis units

1.654 = the 90% confidence interval t-value

All other terms as defined in equation 60a.

$SE = S / \sqrt{N}$ (60d)

where:

N = total number of plot observations in all analysis units

S = the standard deviation of the area weighted differences between measured and predicted values of carbon storage across all analysis units.

$$S = \sqrt{[(1/ N - 1) \bullet \sum(y_{d,h,i} - \bar{y}bar_d)^2]} \qquad (60e)$$

where:

$ybar_d$ = the project-level mean of the area weighted differences between measured plot observation and predicted values of carbon storage. See equation 60b for the calculation of $y_{d,h,i}$

All other terms as defined in equation 60b and 60c.

Step 3 - The total error for the project (E_P; %) is calculated by adding the model and inventory error terms, as calculated in Steps 1 and 2.

$$E_P = E_M + E_I \qquad (60f)$$

Step 4 – Compare the result of Step 3 against the table below to determine the uncertainty factor.

Table 21: Uncertainty Factor Calculation

Estimated Project Error, E_P (%)	Uncertainty Factor (= $ER_{Y,ERR}$)
0 – 10%	= 1.5%
>10%	= 1.5% + E_P – 10%

7.5.2 Initial Estimate of Uncertainty

Carbon plot volumes were compiled using CBM-CFS3 EU AIDB. The inventory error term (E_I) was calculated to be 15.74% while the model error term (E_M) was -5.83%. As shown in Equation 60f, the project error term (E_P) was calculated as the sum of E_M and E_I 9.92%). Thus, the uncertainty factor ($ER_{Y,ERR}$) was calculated (based upon Table: Uncertainty Factor Calculation) to be 1.5%.

This uncertainty factor will be re-assessed at verification and adjusted annually to reflect improved field data from the project monitoring plot network.

7.5.3 Calculation Net Emissions Reductions

Net carbon emissions reductions (ER_y) created by The SCA were calculated annually utilizing equation 58:

$$ER_y = ER_{y,GROSS} - LE_y \qquad (58)$$

where:

ER_y = the net GHG emissions reductions and/or removals in year y (the overall annual carbon change between the baseline and project scenarios, net all discount factors except the permanence buffer) (t CO_2e yr^{-1}).

$ER_{y,GROSS}$ =the difference in the overall annual carbon change between the baseline and project scenarios (t CO_2e yr^{-1}), as calculated within Section 4.4

LE_y = Leakage in year y (t CO_2e yr^{-1}), as described in Section 5.3 and 7.4 (Leakage).

7.5.4 Calculation of Voluntary Credit Units (VCUs)

The number of VCU's The SCA generates as available for issuance and sale in year, *y* (VCU_y; t CO_2e yr^{-1}), is calculated as:

$$VCU_y = ER_y \bullet (1 - ER_{y,ERR}) - BR_y \quad (59)$$

where:

ER_y = the net GHG emissions reductions and/or removals in year (t CO_2e yr^{-1}), as calculated in equation 58.

$ER_{y,ERR}$ = the uncertainty factor for year, y, (calculated in Section 7.5.1), expressed as a proportion.

BR_y = estimated VCU-equivalent tCO_2e issued to the VCS Buffer Pool in year, *y*, calculated using the latest version of the VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer (Voluntary Carbon Standard, 2008).

BRy is calculated by multiplying the most current verified permanence risk Buffer Withholding Percentage for the project by the change in carbon stocks (difference between baseline and project scenario) for the project area.

The project VCS Buffer Discount Factor (BR_Y) was calculated as 11%, as per the non-permanence risk assessment. The BR factor will be re-assessed at each verification, as necessary.

The uncertainty factor was determined to be 1.5%, as calculated above. The uncertainty factor will be re-calculated from field plot data at each verification.

The annual VCUs projected for The SCA for the verification period of 2020 – 2022 are calculated in the table titled Net GHG Emissions Reductions and Removals.

Table 22: Net GHG Emissions Reductions and Removals

Year	Baseline emissions or removals (tCO2e)	Project emissions or removals (tCO2e)	Leakage emissions (tCO2e)	Net GHG emission reductions or removals (tCO2e)	Buffer pool allocation	VCUs eligible for Issuance
01-August-2020 - 31-December-2020	-10,990	4,438	1,543	13,885	1,527	12,150
01-January-2021 - 31-December-2021	7,805	-4,012	-1,182	-10,635	-1,170	0
01-January-2022 - 31-December-2022	-49,978	15,343	6,532	58,789	6,467	42,135
Total	**-53,164**	**15,770**	**6,893**	**62,040**	**6,824**	**54,285**

Table 23: Monitoring Period Estimated and Achieved Emission Reductions and Removals

Year	Ex-ante emissions reductions /removals	Achieved emissions reductions/ removals	Percent difference	Justification for the difference
01-August-2020 - 31-December-2020	13,885	13,885	0	As this is a validation and verification there is no difference in the Ex-Ante and Ex-Post estimates.
01-January-2021 - 31-December-2021	-10,635	-10,635	0	As this is a validation and verification there is no difference in the Ex-Ante and Ex-Post estimates.
01-January-2022 - 31-December-2022	58,789	58,789	0	As this is a validation and verification there is no difference in the Ex-Ante and Ex-Post estimates.

8 REFERENCES

Romania Law No. 46/2008, Forestry Code No.46 of 19 March 2008 (republished) http://legislatie.just.ro/Public/DetaliiDocument/90768

Natura 2000. Web Accessed: https://ec.europa.eu/environment/nature/natura2000/index_en.htm

Pilli, Roberto; Kull, Stephen; Blujdea, Viorel; Grassi, Giacomo (2017): The EU Archive Index Database customized for the Carbon Budget Model (CBM-CFS3). European Commission, Joint Research Centre (JRC) [Dataset] PID: http://data.europa.eu/89h/jrc-cbm-eu-aidb

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World Map of the Köppen-Geiger climate classification updated. Meteorol, 15, 259-263.

Scope 3 Emissions, Web Accessed: https://persefoni.com/learn/scope-3-emissions

Carbon Trust. (2013), Green House Gas Protocol, Technical Guidance for Calculating Scope 3 Emissions. Web Accessed https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

APPENDIX 1 - NON-PERMANENCE RISK REPORT

SILVADOR CLIMATE ACTION
NON-PERMANENCE RISK REPORT

Document Prepared by GreenRaise Consulting GmbH

Project Title	Silvador Climate Action
Version	1.2
Date of Issue	02-July-2024
Project ID	4511
Monitoring Period	01-August-2020 to 31-December-2022
Prepared By	GreenRaise Consulting GmbH
Contact	1010 Vienna, Rudolfsplatz 9/8, Austria Tel: +1 604 619 1585 Email: admin@green-raise.com Website: www.green-raise.com

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1 INTERNAL RISK

1.1 Project Management

a) Silvador utilizes 100% native species in reforestation using seed stock sourced locally and following typical forest regeneration practices in Romania. Multiple species may be planted in a manner consistent with local forest types.

b) The project area is within privately owned forest lands. Illegal timber harvest on these properties is minimal.

c) The project implementation and management team have experience in forest management including certification systems, audits and inspections, due diligence and legality, and project management. The team is comprised of Registered Professional Foresters (RPFs), Registered Professional Biologists (RPBio), and other resource professionals. Silvador project lands are locally managed by experienced Romanian foresters (Forest Management Companies).

d) The management team resides within the country. The most widespread project instances are within a day's travel from the corporate office.

e) The management team does not specifically include members with experience in AFOLU project design and implementation, however, is working directly with Implementation Partner and Project Developer, GreenRaise Consulting GmbH. who have successfully managed projects through validation, verification, and issuance of GHG credits.

f) Forest management plans created for Silvador by the forest management companies are detailed and dynamic and are updated regularly to incorporate monitoring and other current information as it is collected. These plans are created on a 10-year basis but offer flexibility in harvest implementation over this period. Monitoring requirements ensure that Silvador foresters are aware of stand-level changes and can adapt to changing conditions accordingly.

1.2 Financial Viability

d) The project cashflow breakeven point is less than 4 years from the current risk assessment.

h) The project has secured 80% of the funding needed to cover the total cash out before the project reaches is breakeven point.

i) The project has available as callable financial resources at least 50% of the total cash out before the project reaches breakeven.

1.3 Opportunity Cost

e) The NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity. The outcome of the Additionality test resulted in the selection of the "Historical Practice" as the most profitable alternative land use activity.

During project development, significant work was done at the project instance level (i.e., stand-level polygons) to assess the internal rate of return (IRR). An initial assessment of the project scenario under similar carbon pricing scenarios found on similar VCS Registry was used to determine a price of approximately $80.00 EUR (±20%) through the European markets.

The Silvador Climate Action is not protected by a legally binding commitment to continue management practices that protect the credited carbon stocks over the length of the project crediting period or 100 years.

1.4 Project Longevity

a) Silvador is without legal agreement or requirement via conservation easement or protected area to continue the management practice (i.e., avoid emissions for the entire project longevity). The project period is for a 30-year duration.

2 EXTERNAL RISKS

2.1 Land Tenure and Resource Access Impacts

a) The entire project area and the resources encompassed within are owned by Silvador Company SRL and Forest Capital SLR. Refer to the Project Description Document for an example of land ownership evidence.

c) There are no title disputes or other ownership disputes on the Silvador property.

d) There is no access or use right disputes.

e) The project is not defined as a Wetlands Restoration and Conservation (WRC) project category.

2.2 Community Engagement

a) There are no communities living directly within the project area instances (private land) that are reliant on the project lands for essential food, fuel, fodder, medicines or building materials.

b) There are no communities living within 20 km of the project area that are reliant on the project lands for essential food, fuel, fodder, medicines or building materials.

As the local populations are not reliant on the project area the risk is not relevant to the project and the risk rating for community engagement (CE) shall be zero. Community engagement was conducted both prior to and during project validation (refer to Local Stakeholder Consultation, Section 2.2 of the joint Project Description and Monitoring Report). No comments were received relating to project design.

2.3 Political Risk

d) The 5-year average governance score for Romania is 0.24

Table 1: World Bank Governance Indicators for Romania 2017-2021 (Source: http://info.worldbank.org/governance/wgi/Home/Reports)

World Bank Governance Indicators - Romania 2017-2021				
Indicator	Country	Year	Governance (-2.5 to +2.5)	5-Year Average
Voice and Accountability	Romania	2017	0.6	
		2018	0.52	
		2019	0.52	
		2020	0.59	
		2021	0.6	0.566
Political Stability and Absence of Violence/Terrorism	Romania	2017	0.06	
		2018	0.05	
		2019	0.56	
		2020	0.53	
		2021	0.53	0.346
Government Effectiveness	Romania	2017	-0.06	
		2018	-0.15	
		2019	-0.19	
		2020	-0.26	
		2021	-0.13	-0.158
Regulatory Quality	Romania	2017	0.45	
		2018	0.42	
		2019	0.46	
		2020	0.36	
		2021	0.31	0.4
Rule of Law	Romania	2017	0.46	
		2018	0.39	
		2019	0.44	
		2020	0.39	
		2021	0.41	0.418
Control of Corruption	Romania	2017	-0.12	
		2018	-0.2	
		2019	-0.21	
		2020	-0.07	
		2021	-0.04	-0.128

f) Romania has an established national FSC[1] and PEFC[2] standards body.

3 NATURAL RISKS

Forests in Romania are impacted natural, stand replacing disturbances however the severity of these disturbance impacts varies (Knorn, et al., 2012). Common forest disturbances include wildfire, pest and disease outbreaks, severe weather, and geological risks. Stand replacing disturbances are either rare or only affect small areas (Knorn, et al., 2012).

3.1 Significance and Likelihood

a) Fire

Forest fires are not widespread throughout Romania and cause a negligible number of disturbances annually (Anfodillo, et al., 2008). The National Inventory Report of Romania (NIRR) indicates that wildfires do not affect more than 1,000 ha annually (https://unfccc.int/documents/194916). The NIRR indicates that only 0.042% of the total forested area are impacted by wildfires, therefore making an insignificant impact on forest carbon stocks.

Rating: Insignificant (less than 5% loss of carbon stocks)

Data from the NIRR indicate that the significant fire return interval for Romania is 200-300 years. To be conservative, the 50–100-year likelihood was applied

Rating: Every 50 to less than 100 years

b) Pest and Disease Outbreaks

Insects are a common forest disturbance in Romania. Damaging insect species include defoliating caterpillars, bark and wood attacking beetles, defoliating beetles, xylophage insects, and insects which target the root, shoot, and stem of seedlings (Anfodillo, et al., 2008). Several large-scale insect outbreaks have occurred in Romania, targeting both deciduous and coniferous dominated stands. Coniferous forests in Romania are prone to bark beetle infestations. Specifically, monocultures of Norway spruce stands are highly susceptible to the impacts caused by *Ips typographus* (Anfodillo, et al., 2008; Turbe, et al., 2012). These impacts are heightened following abiotic stand stressing events, such as heavy snowfall, frost damage, and windthrow (Turbe, et al., 2012).

Lands which are included in the project area are dominated by deciduous species which are susceptible to infestations of *Anoplophora chinensis, Lumantria dispar* and *Tortix viridana* (Anfodillo, et al., 2008; Turbe, et al., 2012). Impacts of these insect pests on deciduous stands are lessened when early eradication efforts are utilized (Turbe, et al., 2012). Disturbance impacts of species targeting

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[1] https://connect.fsc.org/document-centre/documents/resource/275

[2] https://www.pefc.org/discover-pefc/our-pefc-members/national-members/pefc-romania

deciduous stands is far lesser than those which target coniferous dominated forests (Anfodillo, et al., 2008; Turbe, et al., 2012). Stands within the project area are dominated by deciduous species, therefore reducing the risk of significant stand disturbances by insect damage.

Forest diseases impact stands to a lesser extent compared to insects. Beech stands are susceptible to secondary attacks by bark fungus (*Nectria ditissima*) following damage caused by frost, hail, or heavy rains (Anfodillo, et al., 2008).

Rating: Minor (5% to less than 25% loss of carbon stocks)

No significant damaging events caused by insects or diseases have been reported in the last 10-years. Forest management practices such as sanitation harvests are utilized to remove dead, dying and downed timber.

Rating: Every 10 to less than 25-years

c) Extreme Weather

As noted above, abiotic disturbances from extreme or severe weather are common in Romania (Anfodillo, et al., 2008; Turbe, et al., 2012). A meta-analysis of natural disturbances in the Carpathian Mountains region indicates that extreme weather disturbances are either rare or impact a small area of the landscape (Knorn, et al., 2012). Windthrow disturbances are the most common weather-related disturbance and can cause severe damages to forests (Anfodillo, et al., 2008). Forests most susceptible are those with altered stand structures (Mihai, Savulescu, & Sandric, 2007). A supplementary study indicates that climate conditions causing severe weather disturbances are becoming rarer in Romania (Popa, 2008).

Rating: Insignificant (less than 5% loss of carbon stocks)

Significant weather impacts such as wind events have been shown to impact Romanian forests in 3–4-year cycles (Anfodillo, et al., 2008). This same study indicates that significant wind events are more common in the northwestern regions of the Carpathian mountains. The project instances are located in the southeastern region of Romania. Additionally, wind disturbances in Romania have greater impacts on forests with altered stand structures from their primary structure (Knorn, et al., 2012), meaning secondary forests with altered species composition are more susceptible to windthrow events. The project specifically targets primary forest stands, further reducing the likelihood of significant impact from wind throw, therefore the return interval of every 10 to less than 25 years was utilized.

Rating: Every 10 to less than 25 years

d) Geological Risk

Geological risks exist in Romania due to mountainous terrain and the convergence of tectonic plates. The Vrancea Seismic zone on the southeastern portion of the Carpathian mountains is active as the seismic fault generates 2-3 large magnitude seismic events each century (Pavel, Vacareanu, Arion, Aldea, & Scupin, 2021). The most recent seismic event occurred in 1977 when a 7.4 magnitude earthquake occurred east of the Carpathian Mountain range (Pavel, Vacareanu, Arion, Aldea, & Scupin, 2021).

Timber harvest operations can lead to the destabilization of sensitive slopes, contributing to landslides. The carbon project area lies within the Buzau Subcarpathian region, a landslide prone region in Romania (Malek, Boerboom, & Glad, 2015). The risk of landslides increases where deforestation is occurring and is considered less likely in areas where forest cover is being retained (Malek, Boerboom, & Glad, 2015), like in the carbon project area.

The potential impact of significant geological events impacting the project area is low. The project area is composed of non-contiguous parcels which reduces the risk of significant loss of carbon stocks from a geological event, such as a landslide or earthquake. Additionally, the conservation focused nature of the project scenario reduces slope instability risks by maintaining forest cover.

Risk: Insignificant (less than 5% loss of carbon stocks)

There have been no recorded surface erosion events within the Silvador properties within the last 10 years.

Rating: Every 10 to less than 25 years

e) Other Natural Risk

Silvador's properties are subject to animal browsing, especially in younger forest stands. This disturbance is considered a nuisance but does not have a significant impact on carbon stocks.

Risk: No loss

Frequency: Less than every 10 years

3.2 Score (LS)

The Score is assigned through a matrix based on significance and likelihood:

a) Fire = 1

b) Pest and Disease Outbreaks = 2

c) Extreme Weather = 1

d) Geological Risk = 0

e) Other Natural Risk = 0

3.3 Mitigation

a) Fire

Silvador employs forestry staff who are responsible for monitoring their privately owned forest lands. Forestry staff are able to action fires utilizing protection plans and appropriate equipment. Additional passive monitoring by adjacent communities and property owners allows Silvador employees to quickly respond to forest fires and mitigate risks.

Rating Multiplier: 0.25

*Total Rating: 1*0.25=0.25*

b) Pests and Disease Outbreaks

Silvador's forestry staff conduct field monitoring where instances of forest pests and disease can be identified. Remote sensing technologies and tools, such as drones are used to monitor stand conditions and identify forest health concerns early on. Preventative measures may be utilized on a case by case basis. Examples of preventative measures include maintaining natural stand conditions, reforestation using native tree species, sanitary timber harvests, and timely removal of timber harvests.

Rating Multiplier: 0.25

*Total Rating: 2*0.25=0.5*

c) Extreme Weather

Forest management practices implemented by Silvador to mitigate extreme weather risks include managing forest stand density, opening sizes, and maintaining diverse species stands (avoidance of monoculture forests)

Rating Multiplier: 0.25

*Total Rating: 1*0.25=0.25*

d) Geological Risk

There are no mitigation practices appliable to geological risks.

Rating Multiplier: 1

*Total Rating: 0*1=0*

e) Other Natural Risk

Silvador is not subject to any other significant natural risks.

Total Rating = N/A

4 REFERENCES

Anfodillo, T., Carrer, M., Dalla Valle, E., Giacoma, E., Lamedica, S., & Pettenella, D. (2008). *Current State of Forest Resources in the Carpathians.* Legnaro: UNIVERSITÀ DEGLI STUDI DI PADOVA DIPARTIMENTO TERRITORIO E SISTEMI AGRO-FORESTALI.

Knorn, J., Kuemmerle, T., Volker, R., Keeton, W., Gancz, V., Biris, I.-A., . . . Hostert, P. (2012). Continued loss of temperate old-growth forests in the Romanian Carpathians despite an increasing protected area network. *Environmental Conservation*.

Malek, Z., Boerboom, L., & Glad, T. (2015). Future Forest Cover Change Scenarios with Implication for Landslide Risk: an Example from Buzau Subcarpathians, Romania. *Environmental Management*, 1228-1243.

Mihai, B., Savulescu, I., & Sandric, I. (2007). Change Detection Analysis (1986-2002) of Vegetation Cover in Romania. *BioOne Complete*.

Pavel, F., Vacareanu, R., Arion, C., Aldea, A., & Scupin, A. (2021). Seismic risk assessment of lifelines in Bucharest. *International Journal of Disaster Risk Reduction*.

Popa, I. (2008). Windthrow risk management: results from Romanian forests. *Disturbi in foresta ed effetti sullo stock di carbonio: il problema della non permanenzai, Pubblicazione del Corso di Cultura in Ecologia, Atti del 44 corso*, 77-88.

Turbe, A., Jana, U., Arianna, d., Woodward, S., Schopf, A., Netherer, S., . . . Sonigo, P. (2012). *Disturbances of EU forests caused by biotic agents.* bio Intelligence Service.

STEP 1: RISK ANALYSIS

1 INTERNAL RISK

Project Management		
a)	Species planted (where applicable) associated with more than 25% of the stocks on which GHG credits have previously been issued are not native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located.	0
b)	Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks on which GHG credits have previously been issued.	0
c)	Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (ie, any area of required experience is not covered by at least one individual with at least 5 years experience in the area).	0
d)	Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area.	0
e)	**Mitigation:** Management team includes individuals with significant experience Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting (eg, individuals who have successfully managed projects through validation, verification and issuance of GHG credits) under the VCS Program or other approved GHG programs.	-2
f)	**Mitigation:** Adaptive management plan in place	-2
Total Project Management [a + b + c + d + e + f]		-4
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		

Financial Viability		
Q	How many years does it take for the cumulative cashflow to break even?	d)
Q	What percentage of funding is needed to cover the total cash out before the project breaks even has been secured?	h)
a)	Project cash flow breakeven point is greater than 10 years from the current risk assessment	0
b)	Project cash flow breakeven point is between 7 and up to less than 10 years from the current risk assessment	0
c)	Project cash flow breakeven point between 4 and up to less than 7 years from the current risk assessment	0
d)	Project cash flow breakeven point is less than 4 years from the current risk assessment	0
e)	Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven	0
f)	Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven	0
g)	Project has secured 40% to less than 80% of funding needed to cover the total cash out required before the project reaches breakeven	0
h)	Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven	0
i)	**Mitigation:** Project has available as callable financial resources at least 50% of total cash out before project reaches breakeven	-2
Total Financial Viability [(a, b, c or d) + (e, f, g or h) + i]		0
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		

Opportunity Cost		
Q	What is the NPV from the most profitable alternative land use activity compared to NPV of project activity?	f)
a)	NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated	0
b)	NPV from the most profitable alternative land use activity is expected to be between 50% and up to100% more than from project activities	0
c)	NPV from the most profitable alternative land use activity is expected to be between 20% and up to 50% more than from project activities	0
d)	NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated	0
e)	NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity	0
f)	NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity	-4
g)	**Mitigation:** Project proponent is a non-profit organization	0
h)	**Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over the length of the project crediting period (see project longevity)	0
i)	**Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over at least 100 years (see project longevity)	0
Total Opportunity Cost [(a, b, c, d, e or f) + (g + h or i)]		-4
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may be less than zero		

Project Longevity		
Q	Does the project have a legally binding agreement that covers at least a 100 year period from the project start date?	No
Q	What is the project Longevity in years?	30
Q	Legal Agreement or requirement to continue management practice?	No
a)	Without legal agreement or requirement to continue the management practice	18
b)	With legal agreement or requirement to continue the management practice	0
Total Project Longevity		18

Note: Total may not be less than zero.
Any project with a legally binding agreement that covers at least a 100 year period from the project start date will be assigned a score of zero.
Any project with a project longevity of less than 30 years fails the risk assessment

Total Internal Risk (PM + FV + OC + PL)	**10**

Note: Total may not be less than zero

2 EXTERNAL RISK

Q	Are the ownership and resource access/use rights held by the same of different entities?	Same
a)	Ownership and resource access/use rights are held by same entity(s)	0
b)	Ownership and resource access/use rights are held by different entity(s) (eg, land is government owned and the project proponent holds a lease or concession)	
c)	In more than 5% of the project area, there exist disputes over land tenure or ownership	0
d)	There exist disputes over access/use rights (or overlapping rights)	0
e)	WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts	0
f)	**Mitigation:** Project area is protected by legally binding commitment (eg, a conservation easement or protected area) to continue management practices that protect carbon stocks over the length of the project crediting period	0
g)	**Mitigation:** Where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims	0
Total Land Tenure [(a or b) + c + d + e + f +g)]		**0**
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may not be less than zero		

a)	Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted	0
b)	Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted	0
c)	**Mitigation:** The project generates net positive impacts on the social and economic well- being of the local communities who derive livelihoods from the project area	0
Total Community Engagement [a + b + c]		**0**
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may be less than zero		

Q	What is the country's calculated Governance score?	0.24
a)	Governance score of less than -0.79	0
b)	Governance score of -0.79 to less than -0.32	0
c)	Governance score of -0.32 to less than 0.19	0
d)	Governance score of 0.19 to less than 0.82	1
e)	Governance score of 0.82 or higher	
f)	**Mitigation:** Country implementing REDD+ Readiness or other activities such as: a) The country is receiving REDD+ Readiness funding from the FCPF, UN-REDD or other bilateral or multilateral donors b) The country is participating in the CCBA/CARE REDD+ Social and Environmental Standards Initiative c) The jurisdiction in which the project is located is participating in the Governors' Climate and Forest Taskforce d) The country has an established national FSC or PEFC standards body e) The country has an established DNA under the CDM and has at least one registered CDM A/R project	-2
Total Political [(a, b, c, d or e) + f)]		**0**
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may not be less than zero		

Total External Risk (LT + CE +PC)	**0**
Note: Total may not be less than zero	

3 NATURAL RISK

Risk Category Factors				Risk Rating
a)	Fire (F)	1	0.25	0.25
b)	Pest and Disease Outbreaks (PD)	2	0.25	0.50
c)	Extreme Weather (W)	1	0.25	0.25
d)	Geological Risk (G)	0	1.00	0.00
e)	Other natural risk (ON1)	0	1.00	0.00
f)	Other natural risk (ON2)	0	1.00	0.00

g)	Other natural risk (ON3)	0	0.25	0.00
Total Natural Risk [F + PD + W + G + ON]				1.00
Note: When a risk factor does not apply to the project, the score shall be zero for such factor Risk rating is determined by [LS x M]				

Total Natural Risk (F + PD + W + G + ON)	**1.00**
Note: Total may not be less than zero	
If the Total Natural Risk is above 35 then the project fails the entire risk analysis	

STEP 2: OVERALL NON-PERMANENCE RISK RATING AND BUFFER DETERMINATION

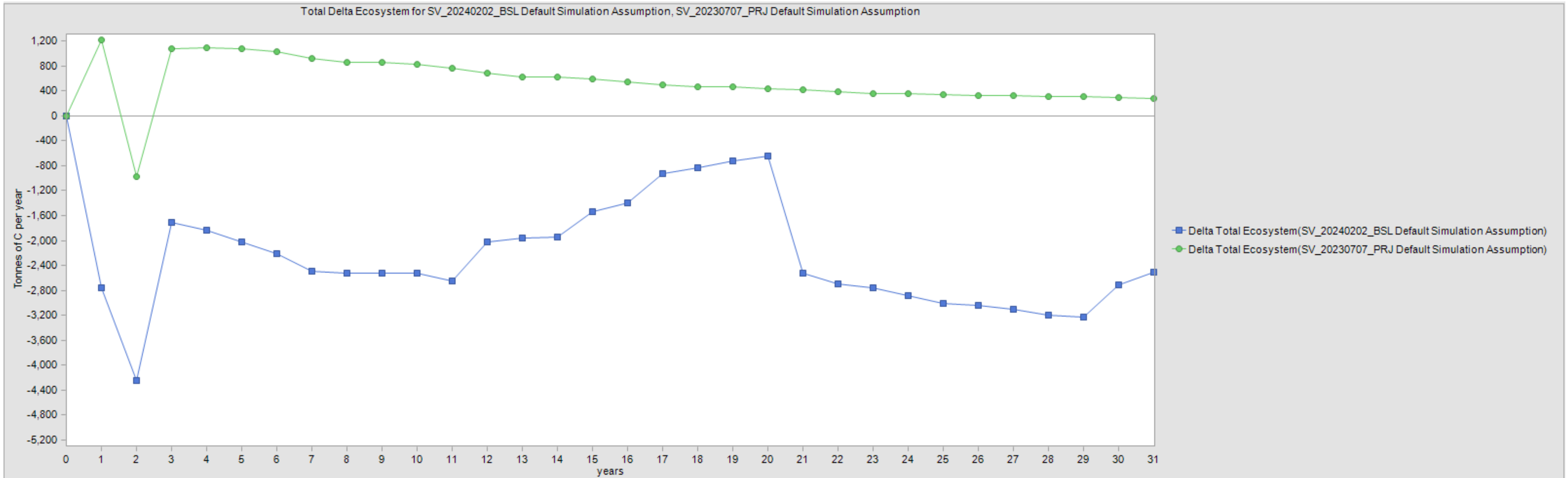
Risk Category		**Rating**
a)	Internal risk	10.00
b)	External risk	0.00
c)	Natural Risk	1.00
Overall risk rating (a + b + c)		**11**
Note: Overall risk rating shall be rounded up to the nearest whole percentage		
The minimum risk rating shall be 10, regardless of the risk rating calculated		
If the overall risk rating is over 60 then the project fails the entire risk analysis		
Total Risk Assessment		**11%**
Net change in the project's carbon stocks		62040
TOTAL NUMBER OF CREDITS TO BE DEPOSITED IN THE AFOLU POOLED BUFFER ACCOUNT		**6824**

APPENDIX 2 - OUTPUTS FROM CBM CFS3 MODEL RUNS

Time Step	Delta Total Ecosystem* (BSL)	Delta Total Ecosystem (PRJ)
01-August-2020 - 31-December-2020	-2,766	1,229
01-January-2021 - 31-December-2021	-4,247	-976
01-January-2022 - 31-December-2022	-1,711	1,074
01-January-2023 - 31-December-2023	-1,835	1,101
01-January-2024 - 31-December-2024	-2,017	1,077
01-January-2025 - 31-December-2025	-2,206	1,030
01-January-2026 - 31-December-2026	-2,499	930
01-January-2027 - 31-December-2027	-2,523	865
01-January-2028 - 31-December-2028	-2,524	865
01-January-2029 - 31-December-2029	-2,532	825
01-January-2030 - 31-December-2030	-2,651	772
01-January-2031 - 31-December-2031	-2,029	689
01-January-2032 - 31-December-2032	-1,960	622
01-January-2033 - 31-December-2033	-1,938	618
01-January-2034 - 31-December-2034	-1,542	593
01-January-2035 - 31-December-2035	-1,403	549
01-January-2036 - 31-December-2036	-930	494
01-January-2037 - 31-December-2037	-832	468
01-January-2038 - 31-December-2038	-724	463
01-January-2039 - 31-December-2039	-643	445
01-January-2040 - 31-December-2040	-2,527	428
01-January-2041 - 31-December-2041	-2,702	385

Time Step	Delta Total Ecosystem* (BSL)	Delta Total Ecosystem (PRJ)
01-January-2042 - 31-December-2042	-2,753	366
01-January-2043 - 31-December-2043	-2,884	363
01-January-2044 - 31-December-2044	-3,014	348
01-January-2045 - 31-December-2045	-3,040	334
01-January-2046 - 31-December-2046	-3,107	324
01-January-2047 - 31-December-2047	-3,207	312
01-January-2048 - 31-December-2048	-3,225	309
01-January-2049 - 31-December-2049	-2,709	297
01-January-2050 - 31-July-2050	-2,515	288

* For analyses of Total Delta Ecosystem, annual values greater than zero indicate that the ecosystem is functioning as a carbon sink, annual values below zero indicate that it is functioning as a carbon source, and an annual value of exactly zero indicates that the ecosystem is carbon-neutral (i.e., neither a source nor a sink).



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Delta Total Ecosystem(SV_20240202_BSL Default Simulation Assumption)	0	-2,766	-4,247	-1,711	-1,835	-2,017	-2,206	-2,499	-2,523	-2,524	-2,532	-2,651	-2,029	-1,960	-1,938	-1,542
Delta Total Ecosystem(SV_20230707_PRJ Default Simulation Assumption)	0	1,229	-976	1,074	1,101	1,077	1,030	930	865	865	825	772	689	622	618	593

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Delta Total Ecosystem(SV_20240202_BSL Default Simulation Assumption)	-1,403	-930	-832	-724	-643	-2,527	-2,702	-2,753	-2,884	-3,014	-3,040	-3,107	-3,207	-3,225	-2,709	-2,515
Delta Total Ecosystem(SV_20230707_PRJ Default Simulation Assumption)	549	494	468	463	445	428	385	366	363	348	334	324	312	309	297	288

Figure 13: CBM-CFS graphical output of Delta Total Ecosystem between Baseline (blue) and Project (green) scenario (tC).

APPENDIX 3 - SUPPORTING DATA FILES

The following table identifies the key data files used for calculating all aspects of the Project Development Document. All additional files not submitted here will be provided to the Auditors upon request.

Table 24: List of reporting document files used in the formation of The SCA Development Document

Description	Filename	Format	Date
Spatial Inventory data for The SCA Instances	Silvador_Project_Instance	kml	2023-02-15
Spatial Monitor Plot data for The SCA	SilvadorMonitoringPlots	kml	2024-10-23
Tabular Ownership data for The SCA	Silvador_ForestCapital_Ownership	Excel	2023-12-12
Spatial Ownership data for The SCA	Silvador_Ownership	kml	2023-12-12
Extract of Land Deed for Information	Extras CF (Property UP)	PDF	2022-09-30
Notarized Property Sale Contracts	Translated Property Sales Contracts	PDF	202402-06
Project inventory dataset	Silvador_Forest_Inv_GC's	Excel	2024-10-22

CBM-CFS Stores result and run assumptions along with all carbon pools and fluxes related to the BSL model run	SV_[DATE]_BSL	Access Datafile (large)	2024-02-02
CBM-CFS Stores result and run assumptions along with all carbon pools and fluxes related to the PRJ model run	SV_[DATE]_PRJ	Access Datafile (large)	2023-07-07
CBM-CFS Delta Ecosystem Results (BSL and PRJ)	delta_eco	Excel	2024-02-09
Annual Change in carbon storage for wood products in the baseline	Emissions_BSL_Estimate	Excel	2024-02-02
Fossil Fuel emissions related to logging, transport, and manufacturing (optional pool)	Emissions_PRJ_Estimate	Excel	2023-12-06
VCU determination worksheet	GHG Estimate	Excel	2024-02-02

Calculation of Uncertainty Factor	Silvador_VM0012_Uncertainty Calculator	Excel	2024-10-23-
Monitoring plots – compiled merch volume	NFI_Biomass_Calc_Silvador(Oct'24)Plot110ee	Excel	2024-10-23
Monitoring plots – compiled CWD volume	tree_data_carbon_final	Excel	2024-01-02
Market Leakage	Silvador_MARketLeakage	Excel	2024-01-12
Non-Permanence-Risk-Report	Silvador-Non-Permanence-Risk-Report	PDF	2024-02-09
NPV Analysis	Silvador - NPV for Non-Perm Risk Report	Excel	2024-02-09
VCS-Risk-Report Tool	Silvador VCS-Risk-Report-Calculation-Tool-v4.0	Excel	2024-02-09

APPENDIX 4 – SPATIAL NDVI ANALYSIS

Monitoring – Project Area

The spatial monitoring program was implemented to identify natural disturbance events >4ha, planned project activities such as harvests, road construction and reforestation, and unplanned anthropogenic ("human-caused") disturbances such as illegal or unplanned harvests, as well as any loss events[40].

Changes in vegetation cover were monitored by comparing temporally distinct satellite images and their respective derived Normalized Difference Vegetation Indices (NDVI). The resulting analysis calculates either an increases or decreases in vegetation cover which can be classified and symbolized according to the magnitude of change. Changes are measured at the pixel scale of the imagery (20m x 20m for *Sentinel-2 2LA* imagery).

Losses of at least 0.5ha in area (12 continuous pixels) where assigned a unique Polygon ID, then further examined to categorize the change/ or loss as cloud cover-water reflection, natural disturbance, planned project activities or unplanned harvests.

Data Acquisition

To account for seasonality of vegetation cover, satellite imagery from 2020 and 2022 within a close seasonal range were selected for comparison analysis. Cloud cover was limited to between 0 and 3%, but not entirely avoidable due to the large project area coverage, the variability of timing for satellite flight paths, and days of data availability.

Data Classification

Representative ranges were established for the change in NDVI over the designated time period.

Table 25: Classification Ranges for Changes in NDVI

NDVI change	Qualitative Classification
> 0.2	Significant vegetation gain
0.1 to 0.2	Vegetation gain
0.05 to 0.1	Minor vegetation gain
0 to 0.05	Minimal positive vegetation change
0 to -0.05	Minimal negative vegetation change
-0.05 to -0.1	Minor vegetation loss
-0.1 to -0.2	Vegetation loss
< -0.2	Significant vegetation loss

[40] Any event that results in a loss of more than 5 percent of previously verified emission reductions and removals due to losses in carbon stocks. See VCS Program Definitions v4.2.

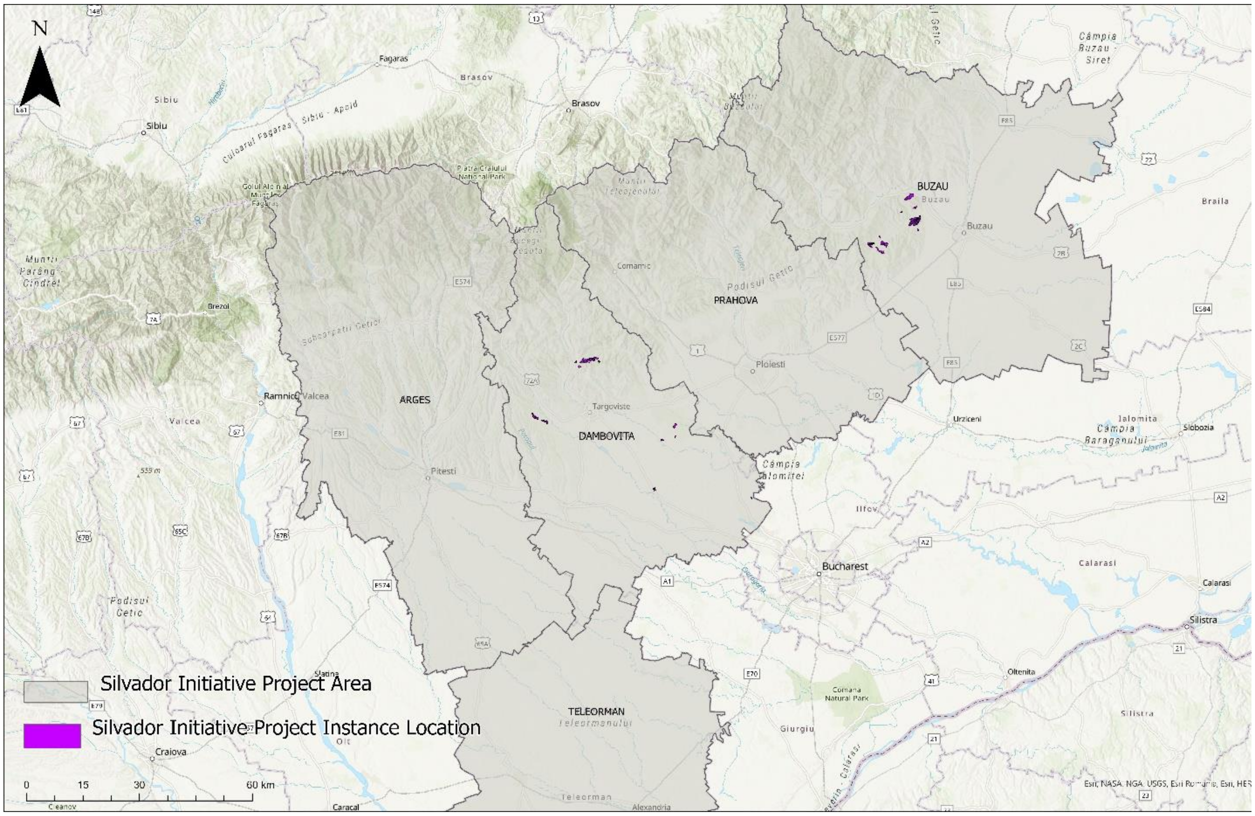


Figure 14: SCA PAI Location

Results/Conclusion

The PAI is non-contiguous and is located throughout Romanian counties of Buzău and Dâmbovița. The total area monitored was 1,538 hectares.

No natural, planned, unplanned or loss disturbance events resulting in vegetation losses >0.5 ha were observed in the project for years 2020-2022. The completion of the NDVI spatial assessment indicates that no additional changes/ updates are required for analysis units utilized in calculating carbon stocks.

APPENDIX 5 – TEMPERATE ZONE MAP

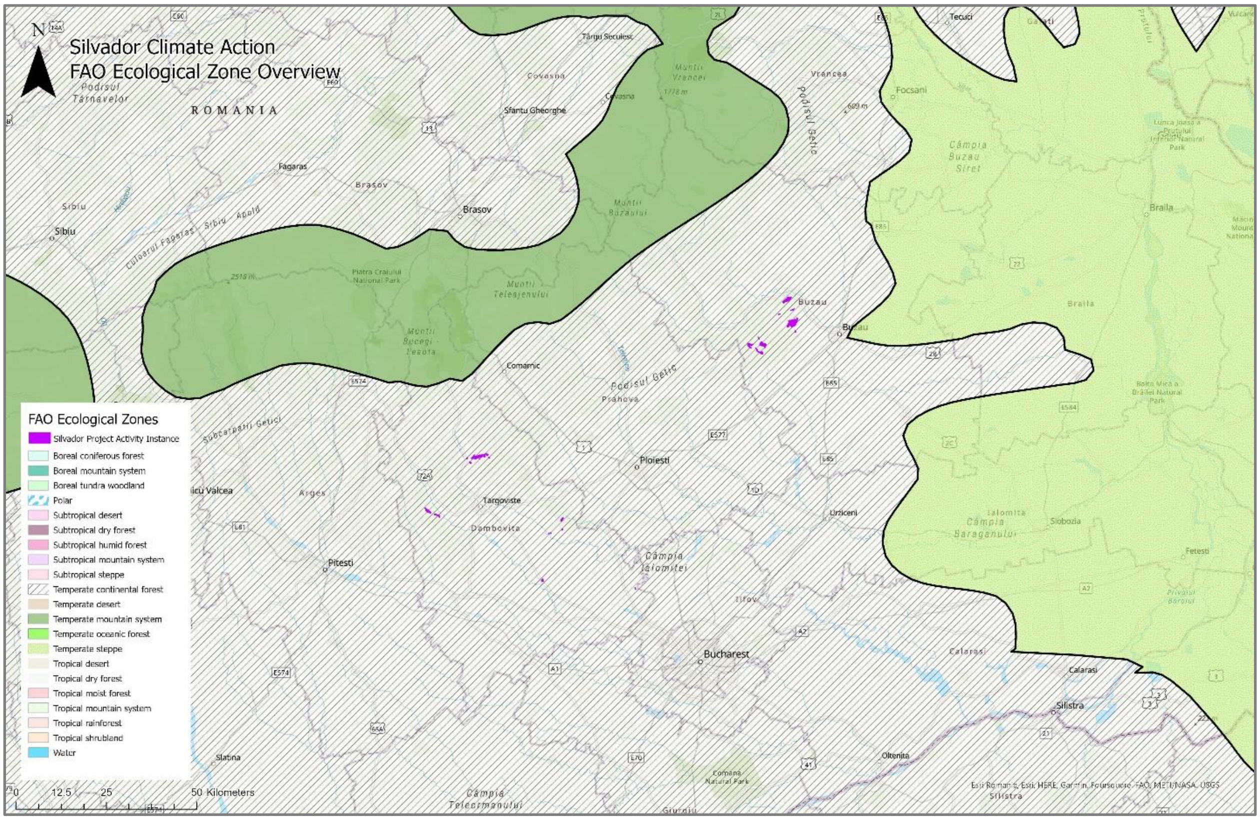


Figure 15: FAO Ecological Zone Overlain with Silvador PAI

APPENDIX 6 – PEATLANDS MAP

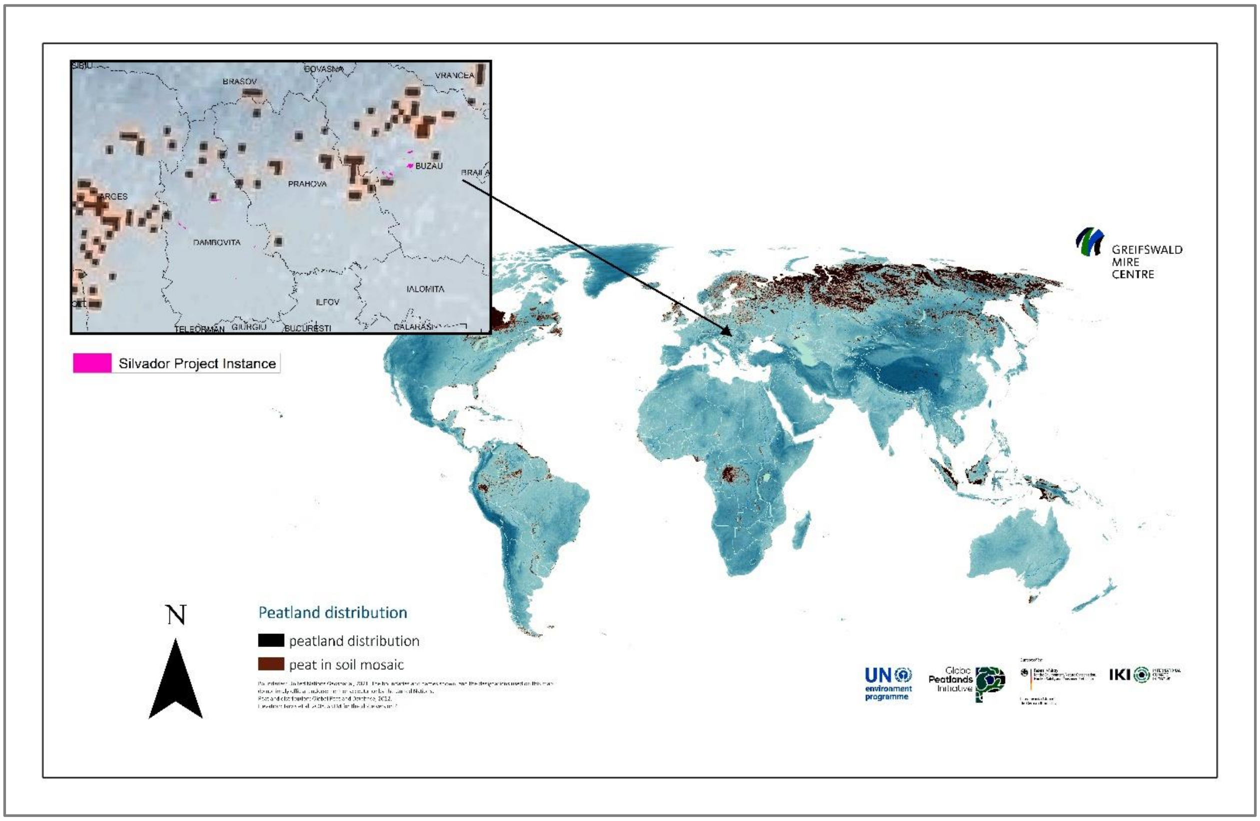


Figure 16: 2021 United Nations Peatlands Map overlain with Silvador PAI[41]

[41] For further information see: https://wedocs.unep.org/handle/20.500.11822/37571, United Nations Environment Programme (2021). The Global Peatland Map 2.0. https://wedocs.unep.org/20.500.11822/37571.

APPENDIX 7 – VM0012 EQUATIONS

Methodology Section #	Equation #	Screenshot
8.1.2	1	The total annual carbon balance in year, t, for the baseline scenario is calculated as ($\Delta C_{BSL,t}$, in t C yr^{-1}): $\Delta \mathbf{C_{BSL,t}} = \Delta \mathbf{C_{BSL,P,t}}$ **(1)** where: $\Delta C_{BSL,P,t}$ = annual change in carbon stocks in all pools in the baseline across the project activity area; t C yr^{-1} .
8.1.2	2	$\Delta \mathbf{C_{BSL,P,t}} = \Delta \mathbf{C_{BSL,LB,t}} + \Delta \mathbf{C_{BSL,DOM,t}} + \Delta \mathbf{C_{BSI,HWP,t}}$ **(2)** where: $\Delta C_{BSL,LB,t}$ = annual change in carbon stocks in living tree biomass (above- and belowground); t C yr^{-1} $\Delta C_{BSL,DOM,t}$ = annual change in carbon stocks in dead organic matter; t C yr^{-1} $\Delta C_{BSI,HWP,t}$ = annual change in carbon stocks associated with harvested wood products, t C yr^{-1}.
8.1.2	3	$\Delta \mathbf{C_{BSL,LB,t}} = \Delta \mathbf{C_{BSL,G,t}} - \Delta \mathbf{C_{BSL,i,t}}$ **(3)** where: $\Delta C_{BSL,G,t}$ = annual increase in tree carbon stock from growth; t C yr^{-1} $\Delta C_{BSL,L,t}$ = annual decrease in tree carbon stock from a reduction in live biomass; t C yr^{-1}. *If the project area has been stratified, carbon pools are calculated for each polygon, i, and then summed during a given year, t.*

Methodology Section #	Equation #	Screenshot
8.1.3	4	Live biomass gain in year, *t*, polygon, *i* ($\Delta C_{BSL,G,i,t}$) is calculated as: $\Delta C_{BSL,G,t} = \Sigma(A_{BSL,i} \bullet G_{BSL,i,t}) \bullet CF$ **(4)** where: $A_{BSL,i,}$ = area (ha) of forest land in polygon, *i*; $G_{BSL,i,t}$ = annual increment rate in tree biomass (t d.m. ha^{-1} yr^{-1}), in polygon, *i*, and; CF = carbon fraction of dry matter t C t^{-1} d.m. (IPCC default value = 0.5).
8.1.3	5a	$G_{BSL,i,t} = G_{BSL,AG,i,t} + G_{BSL,BG,i,t}$ **(5a)** where: $G_{BSL,AG,i,t}$ and $G_{BSL,BG,i,t}$ = annual above- and belowground biomass increment rates (t d.m. ha^{-1} yr^{-1});

Methodology Section #	Equation #	Screenshot
8.1.3	5b	$G_{BSL,AG,i,t}$ and $G_{BSL,BG,i,t}$ = annual above- and belowground biomass increment rates (t d.m. ha^{-1} yr^{-1}); $$G_{BSL,BG,i,t} = G_{BSL,AG,i,t} \bullet R_i \quad \textbf{(5b)}$$ where R_i is the root:shoot ratio in polygon, *i*. R_i should ideally be estimated for each polygon, but these data are difficult to derive empirically. Hence, general relationships are acceptable as long as they are appropriate for the species and region associated with the project (Cairns, 1997). Equations 4 and 5 can be used directly to calculate $\Delta C_{BSL,G,t}$ when all tree cover within a polygon is removed by harvesting (i.e., clearfelling) and no residual structure is retained. In cases of partial harvesting and/or multiple entries into a polygon, these equations must be applied separately to each of the resulting sub-polygons (the different age classes that are created). This ensures that growth rates reflect the difference in forest age between the sub-polygons. The ex ante calculation of $G_{BSL,i,t}$ (either directly, or from its component parts) will be derived from models that require inputs derived, in part, from forest inventory data. Criteria for model suitability are provided in 8.1.1.1. The exact form of the input data depends on the nature of the model but may include site index, species composition, and volume.
8.1.4	6	$$\Delta C_{BSL,L,t} = \Sigma(LBL_{BSL,NATURALi,t} + LBL_{BSL,FELLINGS,i,t} + LBL_{BSL,OTHER,i,t}) \bullet CF \quad \textbf{(6)}$$ where: $LBL_{BSL,NATURALi,t}$ = annual loss of live tree biomass due to natural mortality in polygon, *i*; t d.m. yr^{-1} $LBL_{BSL,FELLINGS,i,t}$ = annual loss of live tree biomass due to commercial felling in polygon, *i*; t d.m. yr^{-1} $LBL_{BSL,OTHER,i,t}$ = annual loss of live tree biomass from incidental sources in polygon, *i*; t d.m. yr^{-1} CF = carbon fraction of dry matter; t C t^{-1} d.m. (IPCC default value = 0.5).

Methodology Section #	Equation #	Screenshot
8.1.4	7[18]	**$LBL_{BSL,NATURALi,t} = A_{BSL,i} \bullet LB_{BSL,i,t} \bullet f_{BSL,NATURAL,i,t}$ (7)[18]** where $A_{BSL,i}$ = area (ha) of forest land in polygon, *i*; $LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i,* for year, *t* $LB_{BSL,i,t}$ is calculated for year, *t*, beginning with biomass estimates in year *t*=1 (the project start year) and with annual biomass increments ($G_{BSL,i,t}$) added as per calculations in equation 5a. $f_{BSL,NATURAL,i,t}$ = the annual proportion of biomass that dies from natural mortality in polygon , *i* (unitless; $0 \leq f_{BSL,NATURALi} \leq 1$), year, *t*. Tree mortality is an ongoing process during stand development. Trees die as a consequence of insect attack, disease, competition, or some combination thereof. Hence, mortality can be highly variable between years. This parameter can be applied uniformly across an analysis unit, or individually to a given polygon. Sources for mortality estimates include permanent sample plots in similar stand types, literature reports, and inventory data.
8.1.4	8	**$LBL_{FELLINGS,i,t} = A_{BSL,i} \bullet LB_{BSL,i,t} \bullet f_{BSL,HARVEST,i,t}$ (8)** where: $A_{BSL,i}$ = area (ha) of forest land in polygon, *i* $LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i,* for year, *t* (see equation 7 for its calculation). $f_{BSL,HARVEST,i,t}$ = the proportion of biomass removed by harvesting from polygon, *i,* (unitless; $0 \leq f_{BSL,HARVESTi} \leq 1$), in year, *t*. Data for this variable should be obtained from harvest schedule information. Values may be constrained by (a) the value of $f_{BSL,NATURAL,i,t}$ (i.e., $f_{BSL,HARVEST,i,t} < 1 - f_{BSL,NATURAL,i,t}$), and/or (b) the area of timber available for commercial harvest. Incidental loss ($LBL_{BSL,OTHER,i,t}$; t d.m. yr^{-1}) is the additional live tree biomass removed for road and landing construction in the polygon, *i*, and is calculated as a proportion of biomass removed by harvesting:

Methodology Section #	Equation #	Screenshot
8.1.4	9	$LBL_{BSL,OTHER,i,t} = A_{BSL,i} \bullet LB_{BSL,i,t} \bullet f_{BSL,DAMAGE,i,t}$ **(9)** where: $A_{BSL,i}$ = area (ha) of forest land in polygon, *i*; $LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i*, for year, *t* $f_{BSL,DAMAGE,i,t}$ = the proportion of additional biomass removed for road and landing construction in polygon, *i*, year, *t* (unitless; $0 \leq f_{BSL,DAMAGE,i,t} \leq 1$)[19]. Data for this variable should be based on regional and local comparative studies and experiential information derived from the local forest industry[20].
8.1.5	10	The annual change in carbon stocks in DOM ($\Delta C_{BSL,DOM}$; t C yr^{-1}) is calculated as: $\Delta C_{BSL,DOM,t} = \Delta C_{BSL,LDW,t} + \Delta C_{BSL,SNAG,t} + \Delta C_{BSL,DBG,t}$ **(10)** where: $\Delta C_{BSL,LDW,t}$ = change in lying dead wood (LDW) carbon stocks in year, t; t C yr^{-1} $\Delta C_{BSL,SNAG,t}$ = change in snag carbon stock in year, t; t C yr^{-1} $\Delta C_{BSL,DBG,t}$ = change in dead belowground biomass carbon stock in year, t; t C yr^{-1}.
8.1.5	11a	$\Delta C_{BSL,LDW,t} = \Sigma(LDW_{BSL,IN,i,t} - LDW_{BSL,OUT,i,t}) \bullet CF$ **(11a)**

Methodology Section #	Equation #	Screenshot
8.1.5	11b	$$\mathbf{LDW_{BSL,i,t+1} = LDW_{BSL,i,t} + (LDW_{BSL,IN,i,t} - LDW_{BSL,OUT,i,t})} \quad \mathbf{(11b)}$$ where: $LDW_{BSL,,i,t}$ = The total mass of lying dead wood accumulated in polygon *i* , at time, *t* (t d.m.). $LDW_{BSL,IN,i,t}$ = annual increase in LDW biomass for polygon *i*, year, *t* (t d.m yr^{-1}). LDW increases occur as a result of natural mortality (typically, blowdown), and as a direct or indirect result of harvesting. $LDW_{BSL,OUT,i,t}$ = annual loss in LDW biomass through decay, for polygon *i*, year, *t*, (t d.m yr^{-1}) $LDW_{BSL,IN,i,t}$ and $LDW_{BSL,OUT,i,t}$ are summed across polygons. CF = carbon fraction of dry matter (IPCC default value = 0.5).

Methodology Section #	Equation #	Screenshot
8.1.5	12	$LDW_{BSL,IN,i,t} = (LBL_{BSL,NATURALi,t} - LBL_{BSL,NATURALi,t} \bullet R_i) \bullet f_{BSL,BLOWDOWN,i,t} +$ $((LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i) +$ $(LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet R_i)) \bullet f_{BSL,BRANCH,i,t} +$ $((LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i) +$ $(LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet R_i)) \bullet$ $(1 - f_{BSL,BRANCH,i,t}) \bullet f_{BSL,BUCKINGLOSS,i,t} + SNAG_{BSL,,i,t} \bullet f_{BSL,SNAGFALLDOWN,i,t}$ **(12)** where: $LBL_{BSL,NATURALi,t}$, $LBL_{BSL,FELLINGS,i,t}$, and $LBL_{BSL,OTHER,i,t}$ are as calculated in equations 7, 8, and 9, respectively. R_i is the root:shoot ratio in polygon, *i* (see equation 5b). $f_{BSL,BLOWDOWN,i,t}$ = the annual proportion of live aboveground tree biomass subject to blowdown in polygon, *i*, year, *t* (unitless; $0 \leq f_{BSL,BLOWDOWN,i,t} \leq 1$). Ex ante estimates must be derived preferably from regional reports in similar forest types. $f_{BSL,BRANCH,i,t}$ = the annual proportion of aboveground tree biomass comprised of branches $\geq$ 5 cm diameter in polygon, *i* (unitless; $0 \leq f_{BSL,BRANCH,i,t} \leq 1$). Ex ante data are available from allometric equations and models (for example, (Kurz & Apps, 2006) for Canada; (Smith, Miles, Vissage, & Pugh, 2004) for the U.S.). In the event slash burning was undertaken as part of regular management activities, this parameter should be reduced accordingly to reflect the proportion of biomass remaining. Estimates should be obtained from expert opinion; as a default, assume 100% consumption if slash burning occurs.

Methodology Section #	Equation #	Screenshot
		$f_{BSL,BUCKINGLOSS,i,t}$ = the annual proportion of the log bole biomass left on site after assessing and/or merchandizing the log bole for quality, in polygon, *i* (unitless; $0 \leq f_{BSL,BUCKINGLOSS,i,t} \leq 1$). Preferably, data for this variable must be based on regional and local comparative studies and experiential information derived from the local forest industry. Otherwise, an average default value of 21% can be used, based on US national summary statistics (Smith, Miles, Vissage, & Pugh, 2004). $SNAG_{BSL,,i,t}$ = the total mass of the snag pool in polygon, *i*, year, *t* (see equation 14b). $f_{BSL,SNAGFALLDOWN,i,t}$ = the annual proportion of snag biomass in polygon, *i*, year, *t*, that falls over and thus is transferred to the LDW pool (unitless; $0 \leq f_{SNAGFALLDOWN,i,t} \leq 1$). Ex ante estimates for this parameter can be derived from peer reviewed literature (for example, (Parish, Antos, Ott, & Di Lucca, 2010) and forest carbon accounting models that track the rates of input and losses from dead organic matter pools (for example, (Kurz & et al, 2009).
8.1.5	13	$$LDW_{BSL,OUT,i,t} = LDW_{BSL,,i,t} \bullet f_{BSL,lwDECAY,i,t} \qquad (13)$$ where: $LDW_{BSL,,i,t}$ = the total amount of lying deadwood mass in polygon *i*, year, *t (see equation 11b)*. $f_{BSL,lwDECAY,i,t}$ = the annual proportional loss of lying dead biomass due to decay, in polygon *i*, year, *t* (unitless; ; $0 \leq f_{BSL,lwDECAY,i,t} \leq 1$). A common approach to ex ante estimation of $f_{BSL,lwDECAY,i,t}$ is to assume mass loss occurs in proportion to the amount of mass remaining in accordance with a single exponential model, of the general form: $Y_t = Y_o\ e^{-kt}$ where Y_o is the initial quantity of material, Y_t the amount left at time t, and k is a decay constant (Harmon, et al., 1986). Other types of exponential models are available (reviewed in (Harmon, et al., 1986)) and may be more appropriate to particular forest types (to be described and justified by the project proponent, if used). Ex ante estimates for the decay parameter appropriate for the project should be derived from peer-reviewed literature (for example, (Harmon, et al., 1986); (Laiho & and Prescott, 2004); (Harmon et al, 2008)).
8.1.5	14a	The change in standing dead wood (snag) carbon stock in year, t (t C yr^{-1}) is calculated as: $$\Delta C_{BSL,SNAG,t} = \Sigma(SNAG_{BSL,IN,i,t} - SNAG_{BSL,OUT,i,t}) \bullet CF \qquad (14a)$$

Methodology Section #	Equation #	Screenshot
8.1.5	14b	$$SNAG_{BSL,i,t+1} = SNAG_{BSL,i,t} + (SNAG_{BSL,IN,i,t} - SNAG_{BSL,OUT,i,t}) \quad (14b)$$ where: $SNAG_{BSL,i,t}$ = The total mass of snags accumulated in polygon *i, at time t (t d.m.).* $SNAG_{BSL,IN,i,t}$ = annual gain in snag biomass for polygon *i*, year, *t* (t d.m yr^{-1}). Snag biomass develops as a result of natural mortality. In cases where snags are created through management activities, these should be accounted for here. $SNAG_{BSL,OUT,i,t}$ = annual loss in snag biomass through decay, or falldown (i.e, transfer to the LDW pool)(t d.m yr^{-1}) CF = carbon fraction of dry matter (IPCC default value = 0.5). Note that $SNAG_{BSL,IN,i,t}$ and $SNAG_{BSL,OUT,i,t}$ are summed across polygons.
8.1.5	15	$$SNAG_{BSL,IN,i,t} = (LBL_{BSL,NATURALi,t} - LBL_{BSL,NATURALi,t} \bullet R_i) \bullet (1 - f_{BSL,BLOWDOWN,i,t}) \quad (15)$$ where: $LBL_{BSL,NATURALi,t}$ is as calculated in equation 7, and $1 - f_{BSL,BLOWDOWN,i,t}$ is the proportion of live tree aboveground biomass that dies in polygon, *i*, year, *t*, but remains as standing dead organic matter (i.e., snags) (unitless; $0 \leq f_{BSL,BLOWDOWN,i,t} \leq 1$). Ex ante default estimates for this calculation can be derived from literature values (for example (Harmon, et al., 1986); (Runkle, 2000); (Harmon et al, 2008)) and should be matched to the ecosystems that most closely characterize the project area.

Methodology Section #	Equation #	Screenshot
8.1.5	16	$$SNAG_{BSL,OUT,i,t} = SNAG_{BSL,i,t} \bullet f_{BSL,SWDECAY,i,t} + SNAG_{BSL,i,t} \bullet f_{BSL,SNAGFALLDOWN,i,t} \quad (16)$$ where: $SNAG_{BSL,i,t}$ = the total amount of snag mass in polygon *i*, year, *t* (see equation 14b). $f_{BSL,SWDECAY,i,t}$ = the annual proportional loss of snag biomass due to decay, in polygon, *i*, year, *t* (unitless; $0 \leq f_{BSL,SWDECAY,i,t} \leq 1$). As with lying dead wood, a common approach to estimating $f_{BSL,SWDECAY,i,t}$ is to assume mass loss occurs in proportion to the amount of mass remaining in accordance with a single exponential model (see equation 13). Ex ante estimates for this parameter should be derived from peer reviewed literature appropriate for the project site (for example, Vanderwel et al. 2006a) and forest carbon accounting models that track the rates of input and losses from dead organic matter pools for each forest type, productivity, and age-class (see, for example, Vanderwel et al., 2006b; (Kurz & et al, 2009)). $f_{BSL,SNAGFALLDOWN,i,t}$ = the annual proportion of snag biomass in polygon, *i*, that falls over and thus is transferred to the LDW pool (unitless; $0 \leq f_{BSL,SNAGFALLDOWN,i,t} \leq 1$). See equation 12 for parameter estimates. The annual change in DOM derived from dead belowground biomass ($\Delta C_{BSL,DBG,,t}$; t C yr^{-1}) is calculated for each polygon as per equation 17a. Calculation of $\Delta C_{BSL,DBG,t}$ is specific to a given polygon; each polygon must therefore be summed in order to calculate total annual loss across the project activity area.
8.1.5	17a	$$\Delta C_{BSL,DBG,t} = \Sigma(DBG_{BSL,IN,i,t} - DBG_{BSL,OUT,i,t}) \bullet CF \quad (17a)$$
8.1.5	17b	$$DBG_{BSL,i,t+1} = DBG_{BSL,i,t} + (DBG_{BSL,IN,i,t} - DBG_{BSL,OUT,i,t}) \quad (17b)$$ where: $DGB_{BSL,i,t}$ = The total quantity of dead belowground biomass accumulated in polygon *i*, at time, *t* (t d.m.). $DBG_{BSL,IN,i,t}$ = annual gain in dead belowground biomass for polygon *i*, year, *t* (t d.m yr^{-1}). Dead belowground biomass develops as a result of mortality through natural causes or through harvesting activities. $DBG_{BSL,OUT,i,t}$ = annual loss in dead belowground biomass through decay, (t d.m yr^{-1}) CF = carbon fraction of dry matter (IPCC default value = 0.5).

Methodology Section #	Equation #	Screenshot
8.1.5	17c	$$DBG_{BSL,IN,i,t} = [(A_{BSL,i} \bullet LB_{BSL,i,t} \bullet R_i) \bullet (f_{BSL,NATURAL,i,t} + f_{BSL,HARVEST,i,t} + f_{BSL,DAMAGE,i,t})] \quad (17c)$$ where: $A_{BSL,i}$ = area (ha) of forest land in polygon, *i*; $LB_{BSL,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i*, for year, *t*. $LB_{BSL,i,t}$ is calculated for year, *t*, beginning with biomass estimates in year *t*=1 (the project start year) and with annual biomass increments ($G_{BSL,i,t}$) added as per calculations in equation 5 a, b. This value is then multiplied by $A_{BSL,i,}$ the area (ha) of forest land in polygon, *i*. R_i is the root:shoot ratio in polygon, *i* (see equation 5b). $f_{BSL,NATURAL,i,t}$ = the annual proportion of biomass that dies from natural mortality in polygon, *i* (unitless; $0 \leq f_{NATURALi} \leq 1$), year, *t* (see equation 7), $f_{BSL,HARVEST,i,t}$ = the proportion of biomass removed by harvesting from polygon, *i*, (unitless; $0 \leq f_{HARVESTi} \leq 1$), year, *t* (see equation 8), $f_{BSL,DAMAGE,i,t}$ = the proportion of additional biomass removed or road and landing construction in polygon, *i* (unitless; $0 \leq f_{DAMAGE,i,t} \leq 1$), year, *t* (see equation 9)
8.1.5	17d	$$DBG_{BSL,OUT,i,t} = DBG_{BSL,i,t} \bullet f_{BSL,dgbDECAY,i,t} \quad (17d)$$ where: $DBG_{BSL,i,t}$ = the total quantity of dead belowground in polygon *i*, year, *t* (see equation 17b). $f_{BSL,dgbDECAY,i,t}$ = the annual proportional loss of dead belowground biomass due to decay, in polygon *i*, year, *t* (unitless; ; $0 \leq f_{BSL,lwDECAY,i,t} \leq 1$). The ex ante estimation of the decay of dead belowground biomass should be done using a similar single exponent decay function as that described above for lying deadwood biomass. Estimates for the decay parameter appropriate for specific project should be derived from peer-reviewed literature (see for example: (Moore, Trofymow, Siltanen, Prescott, & CIDET, 2005)); Melin et al. (2009); (Melin, Petersson, & Nordfjell, 2009)).

Methodology Section #	Equation #	Screenshot
8.1.6	18	The annual change emissions associated with the production of harvested wood products (HWP), $\Delta C_{BSl,HWP,t}$, is calculated as: $\Delta C_{BSl,HWP,t} = \Delta C_{BSL,STORHWP,t} - \Delta C_{BSL,EMITFOSSIL,t,}$ **(18)** $\Delta C_{BSL,STORHWP,t}$ = the annual change in harvested carbon that remains in storage after conversion to wood products (t C yr^{-1}) $\Delta C_{BSL,EMITFOSSIL,t}$ = the annual change in fossil fuel emissions from harvesting (logging and log transport) and processing of the various wood products.
8.1.7	19	The annual change in carbon storage in harvested wood products in year *t* ($\Delta C_{BSL,STORHWP,t}$; t C yr^{-1}) is determined based upon the following equation: $\Delta C_{BSL,STORHWP,t} = (C_{BSL,STORHWP,t2} - C_{BSL,STORHWP,t1}) / T$ **(19)** where: $C_{BSL,STORHWP,t2}$ = carbon storage in harvested wood products at t=2; t C $C_{BSL,STORHWP,t1}$ = carbon storage in harvested wood products at t=1; t C T = number of years between monitoring t1 and t2 t : 1,2,3…t years elapsed since the project start date

Methodology Section #	Equation #	Screenshot
8.1.7	20	$$C_{BSL,TIMBER,h} = \Sigma[(LBL_{BSL,FELLINGS,i,h} - LBL_{BSL,FELLINGS,i,h} \bullet R_i + LBL_{BSL,OTHER,i,h} - LBL_{BSL,OTHER,i,h} \bullet R_i) \bullet (1 - f_{BSL,BRANCH,i,h}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,h})] \bullet \bullet CF \quad (20)$$ where: $C_{BSL,TIMBER,h}$= carbon contained in timber harvested in period *h* (summed for all harvested polygons, *i*); t C $LBL_{BSL,FELLINGS,i,h}$ = annual removal of live tree biomass due to commercial felling in polygon, *i*; t d.m. (equation 8) $LBL_{BSL,OTHER,i,h}$ = annual removal of live tree biomass from incidental sources in polygon, *i*; t d.m. (equation 9) R_i is the root:shoot ratio in polygon, *i* (see equation 5b). $1 - f_{BSL,BRANCH,i,h}$ the proportion of live tree biomass remaining after netting out branch biomass, in polygon *i* (unitless; $0 \leq f_{BRANCH,i,t} \leq 1$)(see equation 12) $1 - f_{BSL,BUCKINGLOSS,i,h}$ = the proportion of the log bole remaining after in-woods log processing/bucking for quality, length, etc., in polygon, *i* (unitless; $0 \leq f_{BUCKINGLOSS,i,t} \leq 1$) (equation 12) h = harvest period ; yr
8.1.7	21	$$C_{BSL,MILL,h,k} = (C_{BSL,TIMBER,h,k} \bullet f_{RND,k} \bullet r_{RND,k}) \quad (21)$$

Methodology Section #	Equation #	Screenshot
		where: $C_{BSL,MILL,h,k}$ = carbon contained in harvested timber after milling in period h, for product type *k*; t C $C_{BSL,TIMBER,h,k}$ = carbon contained in timber harvested in period h, for product type *k*; t C k = wood product type – (softwood saw log, softwood pulpwood, hardwood saw log, or hardwood pulpwood; proportions determined from Table 1.4 of 1605(b) document) $f_{RND,k}$ = fraction of growing stock volume removed as roundwood for product type *k* (default values by region in Table 1.5 of the 1605(b) document); dimensionless $r_{RND,k}$ = ratio of industrial roundwood to growing stock volume removed as roundwood for product type *k* (default values by region in Table 1.5 of the 1605(b) document); dimensionless
8.1.7	22a	Three values are then calculated from these data selected from Table 1.6 in the 1605(b) document, for each product type, *k* : the short-lived fraction ($P_{BSL,SLF,k}$), medium-lived fraction ($P_{BSL,MLF,k}$), and long-lived fraction ($P_{BSL,LLF,k}$): $P_{BSL,SLF,k} = 1 - P_{3\text{-}year}$ **(22a)**
8.1.7	22b	$P_{BSL,LLF,k} = P_{100\text{-}year}$ **(22b)**
8.1.7	22c	$P_{BSL,MLF,k} = P_{3\text{-}year} - P_{100\text{-}year}$, **(22c)**

Methodology Section #	Equation #	Screenshot
8.1.7	23	$C_{BSL,STORHWP,t,} = \Sigma\Sigma((C_{BSL,MILL,h,k} \bullet P_{LLF,k}) + [(C_{BSL,MILL,h,k} \bullet P_{MLF,k}) \bullet ((20\text{-}h) / 20)])$ **(23)** where: $C_{BSL,STORHWP,t,}$ = carbon stored in harvested wood products in year *t* summed for all product types *k* and then over all harvest periods *h*; t C k = wood product type – (softwood saw log, softwood pulpwood, hardwood saw log, or hardwood pulpwood; proportions determined from Table 1.4 of 1605(b) document) h = year of harvest (the term (20-h) should not be allowed to drop below 0)
8.1.8	24	The annual change in fossil fuel emissions from harvesting and processing of the various wood products ($\Delta C_{BSL,EMITFOSSIL,t}$) are calculated as: $C_{BSL,EMITFOSSIL,t} = C_{BSL,EMITHARVEST,t} + C_{BSL,EMITMANUFACTURE,t} + C_{BSL,EMITTRANSPORT,t}$ **(24)** where: $C_{BSL,EMITHARVEST,t}$ is the annual fossil fuel emissions associated with harvesting of raw material (t C yr^{-1}) $C_{BSL,EMITMANUFACTURE,t}$ is the annual fossil fuel emissions associated with the manufacturing of raw material (t C yr^{-1}) $C_{BSL,EMITTRANSPORT,t}$ is the annual fossil fuel emissions associated with the transport of raw material (t C yr^{-1})

Methodology Section #	Equation #	Screenshot
8.1.8	25	The simplest approach to calculating $C_{BSL,EMITFOSSIL,t}$ is to use published or derived carbon emission intensity factors. In the case of harvesting, $_{BSL,}C_{EMITHARVEST,t}$; t C yr^{-1}), can be calculated (summed across harvested polygons)as: $C_{BSL,EMITHARVEST,t} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i + LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet R_i) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet CF \bullet c_{HARVEST}$ **(25)** where: $c_{HARVEST}$ is the carbon emission intensity factor (t C emitted/t C raw material) associated with harvesting (see Table 4 for default values); all other terms are as defined in equation 20.
8.1.8	26	$C_{BSL,EMITTRANSPORT,t}$ must be calculated after consideration of the transport distance from harvest to processing facility, and the means of transportation. This term can be calculated as follows (after (Heath, et al., 2010)): $C_{BSL,EMITTRANSPORT,t} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i + LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet R_i) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet CF \bullet \Sigma(f_{BSL,TRANSPORTk} \bullet d_{TRANSPORTk} \bullet c_{TRANSPORTk})$ **(26)** where: $f_{BSL,TRANSPORTk}$ = the fraction of raw material transported by transportation type, *k*. (unitless; $0 \leq f_{BSL,TRANSPORTk} < 1$). $d_{TRANSPORTk}$ = the distance transported by transportation type, *k*. (km); $c_{TRANSPORTk}$ is the carbon emission intensity factor (kg C emitted/t C raw material) associated with transportation type, k (see Table 4 for default values); all other terms are as defined in equation 20.

Methodology Section #	Equation #	Screenshot
8.1.8	27	$C_{BSL,EMITMANUFACTURE,t} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i + LBL_{BSL,OTHER,i,t} - LBL_{BSL,OTHER,i,t} \bullet R_i) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet \Sigma(f_{BSL,PRODUCTk} \bullet c_{MANUFACTUREk}) \bullet CF$ (27) $c_{MANUFACTUREk}$ is the carbon emission intensity factor (t C emitted/t C raw material) associated with manufacture of product type, *k*; all other terms are as defined in equation 19.
8.2.3	28a	Actual (ex post) annual net carbon stocks are calculated using the equations in this section. $C_{ACTUAL,i,t} = C_{LB,i,t} + C_{DOM,i,t}$ (28a) where: $C_{ACTUAL,i,t}$ = carbon stocks in all selected carbon pools in polygon, *i*, year, *t*; t C $C_{LB,i,t}$ = carbon stocks in living tree biomass in polygon, *i*, year, *t*; t C $C_{DOM,i,t}$ = carbon stocks in dead organic matter in year, *t*; t C
8.2.3	28b	$B_{TOTAL,i,t} = (B_{AG,i,t} + B_{BG,i,t})$ (28b)
8.2.3	28c	$C_{LB,i,t} = (B_{TOTAL,i,t}) \bullet CF$ (28c) where: $B_{AG,i,t}$ = aboveground tree biomass (t d.m. ha^{-1}) measured in polygon, *i*, year, *t* $B_{BG,i,t}$ = belowground tree biomass (t d.m. ha^{-1}) measured in polygon, *i*, year, *t*. $B_{TOTAL,i,t}$ = total tree biomass (t d.m. ha^{-1}) measured in polygon, *i*, year, *t*

Methodology Section #	Equation #	Screenshot
8.2.3	28e	$C_{DOM,i,t} = (DOM_{LDW,i,t} + DOM_{SNAG,i,t}) \bullet CF$ **(28e)** where: $DOM_{LDW,i,t}$ = average mass of dead organic matter contained in lying dead wood (t d.m. ha^{-1}) in measured in polygon, *i,* year, *t* $DOM_{SNAG,i,t}$ = average mass of dead organic matter contained in standing snags (t d.m. ha^{-1}) in measured in polygon, *i,* year, *t* The average quantity of dead organic matter contained in lying dead wood for measured polygon, *i,* in year, *t* ($DOM_{LDW,i,t}$) is calculated according to equations 60a-c in Section 9.3.2. The value of $DOM_{LDW,i,t}$ must be compared to the equivalent calculation of lying dead wood mass ($LDW_{PRJ,i,t}$) in the project scenario (Section 8.2.8) (see comparison method and steps below).
8.2.5	29	The total annual carbon balance in year, t, for the project scenario is calculated as ($\Delta C_{PRJ,t}$, in t C yr^{-1}): $\Delta C_{PRJ,t} = \Delta C_{PRJ,P,t}$ **(29)** where: $\Delta C_{PRJ,P,t}$ is the annual change in carbon stocks in all pools in the project across the project activity area; t C yr^{-1} .
8.2.5	30	$\Delta C_{PRJ,P,t} = \Delta C_{PRJ,LB,t} + \Delta C_{PRJ,DOM,t} + \Delta C_{PRJ,HWP,t}$ **(30)** $\Delta C_{PRJ,LB,t}$ = annual change in carbon stocks in living tree biomass (above- and belowground); t C yr^{-1} $\Delta C_{PRJ,DOM,t}$ = annual change in carbon stocks in dead organic matter; t C yr^{-1} $\Delta C_{PRJ,HWP,t}$ is the annual change in carbon stocks associated with harvested wood products, t C yr^{-1}.

Methodology Section #	Equation #	Screenshot
8.2.5	31	$\Delta C_{PRJ,LB,t} = \Delta C_{PRJ,G,t} - \Delta C_{PRJ,L,t}$ **(31)** where: $\Delta C_{PRJ,G,t}$ = annual increase in tree carbon stock from growth; t C yr^{-1} $\Delta C_{PRJ,L,t}$ = annual decrease in tree carbon stock from a reduction in live biomass; t C yr^{-1}.
8.2.6	32	Live biomass gain in year, *t*, polygon, *i* ($\Delta C_{PRJ,G,i,t}$) is calculated as: $\Delta C_{PRJ,G,t} = \Sigma(A_{PRJ,i} \bullet G_{PRJ,i,t}) \bullet CF$ **(32)** where: $A_{PRJ,i,}$ = area (ha) of forest land in polygon, *i*; $G_{PRJ,i,t}$ = annual increment rate in tree biomass (t d.m. ha^{-1} yr^{-1}), in polygon, *i*, and; CF = carbon fraction of dry matter t C t^{-1} d.m. (IPCC default value = 0.5).
8.2.6	33a	$G_{PRJ,i,t} = G_{PRJ,AG,i,t} + G_{PRJ,BG,i,t}$ **(33a)** where $G_{PRJ,AG,i,t}$ and $G_{PRJ,BG,i,t}$ are the annual above- and belowground biomass increment rates (t d.m. ha^{-1} yr^{-1});
8.2.6	33b	$G_{PRJ,BG,i,t} = G_{PRJ,AG,i,t} \bullet R_i$ **(33b)** where R_i is the root:shoot ratio in polygon, *i*. R_i should ideally be estimated for each polygon, but these data are difficult to derive empirically. Hence, general relationships are acceptable (Cairns, 1997).

Methodology Section #	Equation #	Screenshot
8.2.7	34	$\Delta C_{PRJ,L,t} = \Sigma(LBL_{PRJ,NATURALi,t} + LBL_{PRJ,FELLINGS,i,t} + LBL_{PRJ,OTHERi,t}) \bullet CF$ **(34)** where: $LBL_{PRJ,NATURALi,t}$ = annual loss of live tree biomass due to natural mortality in polygon, *i*; t d.m. yr^{-1} $LBL_{PRJ,FELLINGS,i,t}$ = annual loss of live tree biomass due to commercial felling in polygon, *i*; t d.m. yr^{-1} $LBL_{PRJ,OTHER,i,t}$ = annual loss of live tree biomass from incidental sources in polygon, *i*; t d.m. yr^{-1} CF = carbon fraction of dry matter; t C t^{-1} d.m. (IPCC default value = 0.5).
8.2.7	35[24]	$LBL_{PRJ,NATURALi,t} = A_{PRJ,i} \bullet LB_{PRJ,i,t} \bullet f_{PRJ,NATURAL,i,t}$ **(35)[24]** where $A_{PRJ,i}$ = area (ha) of forest land in polygon, *i*; $LB_{PRJ,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i,* for year, *t* $LB_{PRJ,i,t}$ is calculated for year, *t*, beginning with biomass estimates in year *t*=1 (the project start year) and with annual biomass increments ($G_{PRJ,i,t}$) added as per calculations in equation 33a. $f_{PRJ,NATURAL,i,t}$ = the annual proportion of biomass that dies from natural mortality in forest type , *i* (unitless; $0 \leq f_{PRJ,NATURALi} \leq 1$), year, *t*. Tree mortality is an ongoing process during stand development. Trees die as a consequence of insect attack, disease, competition, or some combination thereof. Hence, mortality can be highly variable between years. This parameter can be applied uniformly across an analysis unit, or individually to a given polygon. Ex post estimates from regional data sources in corresponding stand types are preferred. Sources for mortality estimates include permanent sample plots in similar stand types, literature reports, and inventory data. Some models (the FORECAST model, for example) simulate annual background mortality rates directly and can accommodate variable age structures following partial harvesting.

Methodology Section #	Equation #	Screenshot
8.2.7	36	$LBL_{PRJ,FELLINGS,i,t} = A_{PRJ,i} \bullet LB_{PRJ,i,t} \bullet f_{PRJ,HARVEST,i,t}$ **(36)** where: $A_{PRJ,i}$ = area (ha) of forest land in polygon, *i* $LB_{PRJ,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i*, for year, *t* (see equation 7 for its calculation). $f_{PRJ,HARVEST,i,t}$ = the proportion of biomass removed by harvesting from polygon, *i*, (unitless; $0 \leq f_{PRJ,HARVESTIi} \leq 1$), in year, *t*. Data for this variable should be obtained from harvest schedule information. Values may be constrained by (a) the value of $f_{PRJ,NATURAL,i,t}$ (i.e., $f_{PRJ,HARVEST,i,t} < 1 - f_{PRJ,NATURAL,i,t}$), and/or (b) the area of timber available for commercial harvest.
8.2.7	37	Incidental loss ($LBL_{PRJ,OTHER,i,t}$; t d.m. yr^{-1}) is the additional live tree biomass removed for road and landing construction in the polygon, *i*, and is calculated as a proportion of biomass removed by harvesting: $LBL_{PRJ,OTHER,i,t} = A_{PRJ,i} \bullet LB_{PRJ,i,t} \bullet f_{PRJ,HARVEST,i,t} \bullet f_{PRJ,DAMAGE,i,t}$ **(37)** where: $A_{PRJ,i}$ = area (ha) of forest land in polygon, *i*; $LB_{PRJ,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i*, for year, *t* $f_{PRJ,HARVEST,i,t}$ = the proportion of biomass removed by harvesting from polygon, *i*, in year, *t* (unitless; $0 \leq f_{PRJ,HARVEST,i,t} \leq 1$). $f_{PRJ,DAMAGE,i,t}$ = the proportion of additional biomass removed for road and landing construction in polygon, *i*, year, *t* (unitless; $0 \leq f_{PRJ,DAMAGE,i,t} \leq 1$)[25]. Data for this variable should be based on regional and local comparative studies and experiential information derived from the local forest industry[26].

Methodology Section #	Equation #	Screenshot
8.2.8	38	The annual change in carbon stocks in DOM ($\Delta C_{PRJ,DOM}$; t C yr^{-1}) is calculated as: $$\Delta C_{PRJ,DOM,t} = \Delta C_{PRJ,LDW,t} + \Delta C_{PRJ,SNAG,t} + \Delta C_{PRJ,DBG,t} \quad (38)$$ where: $\Delta C_{PRJ,LDW,t}$ = change in lying dead wood (LDW) carbon stocks in year, *t*; t C yr^{-1} $\Delta C_{PRJ,SNAG,t}$ = change in snag carbon stock in year, *t*; t C yr^{-1} $\Delta C_{BSL,DBG,t}$ = change in belowground carbon stock in year, *t*; t C yr^{-1}.
8.2.8	39a	$$\Delta C_{PRJ,LDW,t} = \Sigma(LDW_{PRJ,IN,i,t} - LDW_{PRJ,OUT,i,t}) \bullet CF \quad (39a)$$
8.2.8	39b	$$LDW_{PRJ,i,t+1} = LDW_{PRJ,i,t} + (LDW_{PRJ,IN,i,t} - LDW_{PRJ,OUT,i,t}) \quad (39b)$$ where: $LDW_{PRJ,i,t}$= The total mass of lying dead wood accumulated in polygon *i* at time t (t d.m.). $LDW_{PRJ,IN,i,t}$ = annual increase in LDW biomass for polygon *i*, year, *t* (t d.m ha^{-1} yr^{-1}). LDW increases occur as a result of natural mortality (typically, blowdown), and as a direct or indirect result of harvesting. $LDW_{PRJ,OUT,i,t}$ = annual loss in LDW biomass through decay, for polygon *i*, year, *t*, (t d.m ha^{-1} yr^{-1}) $LDW_{PRJ,IN,i,t}$ and $LDW_{PRJ,OUT,i,t}$ are summed across polygons. CF = carbon fraction of dry matter (IPCC default value = 0.5).

Methodology Section #	Equation #	Screenshot
8.2.8	40	$LDW_{PRJ,IN,i,t} = (LBL_{PRJ,NATURALi,t} - LBL_{PRJ,NATURALi,t} \bullet R_i) \bullet f_{PRJ,BLOWDOWN,i,t} +$ $((LBL_{PRJ,FELLINGS,i,t} - LBL_{PRJ,FELLINGS,i,t} \bullet R_i) +$ $(LBL_{PRJ,OTHER,i,t} - LBL_{PRJ,OTHER,i,t} \bullet R_i)) \bullet f_{PRJ,BRANCH,i,t} +$

		$$((LBL_{PRJ,FELLINGS,i,t} - LBL_{PRJ,FELLINGS,i,t} \bullet R_i) +$$ $$(LBL_{PRJ,OTHER,i,t} - LBL_{PRJ,OTHER,i,t} \bullet R_i)) \bullet$$ $$(1 - f_{PRJ,BRANCH,i,t}) \bullet f_{PRJ,BUCKINGLOSS,i,t} + SNAG_{PRJ,,i,t} \bullet f_{PRJ,SNAGFALLDOWN,i,t} \quad (40)$$ where: $LBL_{PRJ,NATURALi,t}$, $LBL_{PRJ,FELLINGS,i,t,}$ and $LBL_{PRJ,OTHER,i,t}$ are as calculated in equations 35, 36, and 37, respectively. R_i is the root:shoot ratio in polygon, *i* (see equation 33b). $f_{PRJ,BLOWDOWN,i,t}$ = the annual proportion of live aboveground tree biomass subject to blowdown in polygon, *i*, year, *t* (unitless; $0 \leq f_{PRJ,BLOWDOWN,i,t} \leq 1$). Ex ante estimates must be derived from regional reports in similar forest types. $f_{PRJ,BRANCH,i,t}$ = the annual proportion of aboveground tree biomass comprised of branches ≥ 5 cm diameter in polygon, *i* (unitless; $0 \leq f_{PRJ,BRANCH,i,t} \leq 1$). Ex ante data are available from allometric equations and models (for example, (Kurz & Apps, 2006) for Canada; (Smith, Miles, Vissage, & Pugh, 2004) for the U.S.). In the event slash burning is undertaken, this parameter should be reduced accordingly to reflect the proportion of biomass remaining. Estimates should be obtained from expert opinion; as a default, assume 100% consumption. $f_{PRJ,BUCKINGLOSS,i,t}$ = the annual proportion of the log bole biomass left on site after assessing and/or merchandizing the log bole for quality, in polygon, *i* (unitless; $0 \leq f_{PRJ,BUCKINGLOSS,i,t} \leq 1$). Preferably, data for this variable must be based on regional and local comparative studies and experiential information derived from the local forest industry Otherwise, an average default value of 21% can be used, based on US national summary statistics (Smith, Miles, Vissage, & Pugh, 2004). $SNAG_{PRJ,i,t}$ = the total mass of the snag pool in polygon, *i*, year, *t* (see equation 42b). $f_{PRJ,SNAGFALLDOWN,i,t}$ = the annual proportion of snag biomass in polygon, *i*, year, *t*, that falls over and thus is transferred to the LDW pool (unitless; $0 \leq f_{PRJ,SNAGFALLDOWN,i,t} \leq 1$). Ex ante estimates for this parameter can be derived from peer reviewed literature (for example, (Parish, Antos, Ott, & Di Lucca, 2010) and forest carbon accounting models that track the rates of input and losses from dead organic matter pools (for example, (Kurz & et al, 2009).

Methodology Section #	Equation #	Screenshot
8.2.8	41	$\mathbf{LDW_{PRJ,OUT,i,t} = LDW_{PRJ,i,t} \bullet f_{PRJ,lwDECAY,i,t}}$ **(41)** where: $LDW_{PRJ,i,t}$ = the total amount of lying deadwood mass in polygon *i*, year, *t (see equation 39b)*. $f_{PRJ,lwDECAY,i,t}$ = the annual proportional loss of lying dead biomass due to decay, in polygon *i*, year, *t* (unitless; ; $0 \leq f_{PRJ,lwDECAY,i,t} \leq 1$). A common approach to ex ante estimation of $f_{PRJ,lwDECAY,i,t}$ is to assume mass loss occurs in proportion to the amount of mass remaining in accordance with an a single exponential model, of the general form: $Y_t = Y_o e^{-kt}$ where Y_o is the initial quantity of material, Y_t the amount left at time *t*, and k is a decay constant (Harmon, et al., 1986). Other types of exponential models are available (reviewed in (Harmon, et al., 1986)) and may be more appropriate to particular forest types (to be described and justified by the project proponent, if used). Ex ante estimates for the decay parameter appropriate for the project should be derived from peer-reviewed literature (for example, (Harmon, et al., 1986); (Laiho & and Prescott, 2004); (Harmon et al, 2008)).
8.2.8	42a	The change in standing dead wood (snag) carbon stock in year, *t* (t C yr^{-1}) is calculated as: $\mathbf{\Delta C_{PRJ,SNAG,t} = \Sigma(SNAG_{PRJ,IN,i,t} - SNAG_{PRJ,OUT,i,t}) \bullet CF}$ **(42a)**

Methodology Section #	Equation #	Screenshot
8.2.8	42b	**$SNAG_{PRJ,i,t+1} = SNAG_{PRJ,i,t} + (SNAG_{PRJ,IN,i,t} – SNAG_{PRJ,OUT,i,t})$ (42b)** where: $SNAG_{PRJ,i,t}$ = The total mass of snags accumulated in polygon *i* at time *t* (t d.m.) $SNAG_{PRJ,IN,i,t}$ = annual gain in snag biomass for polygon *i*, year, *t* (t d.m ha^{-1} yr^{-1}). Snag biomass develops as a result of natural mortality. In cases where snags are created through management activities, these should be accounted for here. $SNAG_{PRJ,OUT,i,t}$ = annual loss in snag biomass through decay, or falldown (i.e, transfer to the LDW pool)(t d.m ha^{-1} yr^{-1}) CF = carbon fraction of dry matter (IPCC default value = 0.5). Note that $SNAG_{PRJ,IN,i,t}$ and $SNAG_{PRJ,OUT,i,t}$ are summed across polygons.
8.2.8	43	**$SNAG_{PRJ,IN,i,t} = (LBL_{PRJ,NATURALi,t} - LBL_{PRJ,NATURALi,t} \bullet R_i) \bullet (1 - f_{PRJ,BLOWDOWN,i,t})$ (43)** where: $LBL_{PRJ,NATURALi,t}$ is as calculated in equation 35, and $1 - f_{PRJ,BLOWDOWN,i,t}$ is the proportion of live tree aboveground biomass that dies in polygon, *i*, year, *t*, but remains as standing dead organic matter (i.e. snags) (unitless; $0 \leq f_{PRJ,BLOWDOWN,i,t} \leq 1$). Ex ante default estimates for this calculation can be derived from literature values (for example (Harmon, et al., 1986); (Runkle, 2000); (Harmon et al, 2008)) and should be matched to the ecosystems that most closely characterize the project area.

Methodology Section #	Equation #	Screenshot
8.2.8	44	$SNAG_{PRJ,OUT,i,t} = SNAG_{PRJ,i,t} \bullet f_{PRJ,SWDECAY,i,t} + SNAG_{PRJ,i,t} \bullet f_{PRJ,SNAGFALLDOWN,i,t}$ **(44)** where: $SNAG_{PRJ,i,t}$ = the total amount of snag mass in polygon *i*, year, *t (see equation 42b)*. $f_{PRJ,SWDECAY,i,t}$ = the annual proportional loss of snag biomass due to decay, in polygon, *i*, year, *t* (unitless; $0 \leq f_{PRJ,SWDECAY,i,t} \leq 1$). As with lying dead wood, a common approach to estimating $f_{PRJ,SWDECAY,i,t}$ is to assume mass loss occurs in proportion to the amount of mass remaining in accordance with an a single exponential model (see equation 41). Ex ante estimates for this parameter can be derived from peer reviewed literature appropriate for the project site (for example, Vanderwel et al. 2006a) and forest carbon accounting models that track the rates of input and losses from dead organic matter pools for each forest type, productivity, and age-class (see, for example, Vanderwel et al., 2006b; (Kurz & et al, 2009)). $f_{PRJ,SNAGFALLDOWN,i,t}$ = the annual proportion of snag biomass in polygon, *i*, that falls over and thus is transferred to the LDW pool (unitless; $0 \leq f_{PRJ,SNAGFALLDOWN,i,t} \leq 1$). See equation 40 for parameter estimates.
8.2.8	45a	$\Delta C_{PRJ,DBG,t} = \Sigma(DBG_{PRJ,IN,i,t} - DBG_{PRJ,OUT,i,t}) \bullet CF$ **(45a)**

Methodology Section #	Equation #	Screenshot
8.2.8	45b	**$DBG_{PRJ,i,t+1} = DBG_{PRJ,i,t} + (DBG_{PRJ,IN,i,t} – DBG_{PRJ,OUT,i,t})$ (45b)** where: $DGB_{PRJ,i,t}$ = The total quantity of dead belowground biomass accumulated in polygon *i* at time *t* (t d.m.). $DBG_{PRJ,IN,i,t}$ = annual gain in dead belowground biomass for polygon *i*, year, *t* (t d.m ha^{-1} yr^{-1}). Dead belowground biomass develops as a result of mortality through natural causes or through harvesting activities. $DBG_{PRJ,OUT,i,t}$ = annual loss in dead belowground biomass through decay, (t d.m ha^{-1} yr^{-1}) CF = carbon fraction of dry matter (IPCC default value = 0.5).
8.2.8	45c	**$DBG_{PRJ,IN,i,t} = [(A_{PRJ,i} \bullet LB_{PRJ,i,t} \bullet R_i) \bullet (f_{PRJ,NATURAL,i,t} + f_{PRJ,HARVEST,i,t} + f_{PRJ,DAMAGE,i,t})]$ (45c)** where: $A_{PRJ,i}$ = area (ha) of forest land in polygon, *i*; $LB_{PRJ,i,t}$ = average live tree biomass (t d.m. ha^{-1}) in polygon, *i*, for year, *t*. $LB_{PRJ,i,t}$ is calculated for year, *t*, beginning with biomass estimates in year *t*=1 (the project start year) and with annual biomass increments ($G_{PRJ,i,t}$) added as per calculations in equation 33 a, b. This value is then multiplied by $A_{PRJ,i,}$ the area (ha) of forest land in polygon, *i*. R_i is the root:shoot ratio in polygon, *i* (see equation 33b). $f_{PRJ,NATURAL,i,t}$ = the annual proportion of biomass that dies from natural mortality in polygon, *i* (unitless; $0 \leq f_{NATURALi} \leq 1$), year, *t* (see equation 35), $f_{PRJ,HARVEST,i,t}$ = the proportion of biomass removed by harvesting from polygon, *i*, (unitless; $0 \leq f_{PRJ,HARVESTi} \leq 1$), year, *t* (see equation 36), $f_{PRJ,DAMAGE,i,t}$ = the proportion of additional biomass removed by for road and landing construction in polygon, *i* (unitless; $0 \leq f_{PRJ,DAMAGE,i,t} \leq 1$), year, *t* (see equation 37),

Methodology Section #	Equation #	Screenshot
8.2.8	45d	$DBG_{PRJ,OUT,i,t} = DBG_{PRJ,i,t} \bullet f_{PRJ,dgbDECAY,i,t}$ **(45d)** where: $DBG_{PRJ,i,t}$ = the total quantity of dead belowground in polygon *i*, year, *t (equation 17b)*. $f_{PRJ,dgbDECAY,i,t}$ = the annual proportional loss of dead belowground biomass due to decay, in polygon *i*, year, *t* (unitless; $0 \leq f_{PRJ,lwDECAY,i,t} \leq 1$). The ex ante estimation of the decay of dead belowground biomass should be done using a similar single exponent decay function as that described above for lying deadwood biomass. Estimates for the decay parameter appropriate for specific project should be derived from peer-reviewed literature (see for example: (Moore, Trofymow, Siltanen, Prescott, & CIDET, 2005); (Melin, Petersson, & Nordfjell, 2009).
8.2.9	46	$\Delta C_{PRJ,HWP,t} = \Delta C_{PRJ,STORHWP,t} - \Delta C_{PRJ,EMITFOSSIL,t,}$ **(46)** $\Delta C_{PRJ,STORHWP,t}$ = the annual change in harvested carbon that remains in storage after conversion to wood products (t C yr^{-1}) $\Delta C_{PRJ,EMITFOSSIL,t}$ = the annual change in fossil fuel emissions from harvesting (logging and log transport) and processing of the various wood products.

Methodology Section #	Equation #	Screenshot
8.2.10	47	The annual change in carbon storage in harvested wood products in year *t* ($\Delta C_{PRJ,STORHWP,t}$; t C yr^{-1}) is determined based upon the following equation: $$\Delta C_{PRJ,STORHWP,t} = (C_{PRJ,STORHWP,t2} - C_{PRJ,STORHWP,t1}) / T \quad (47)$$ where: $C_{PRJ,STORHWP,t2}$ = carbon storage in harvested wood products at t=2; t C $C_{PRJ,STORHWP,t1}$ = carbon storage in harvested wood products at t=1; t C T = number of years between monitoring t1 and t2 t : 1,2,3…t years elapsed since the project start date
8.2.10	48	$$C_{PRJ,TIMBER,h} = \Sigma[(LBL_{PRJ,FELLINGS,i,h} - LBL_{PRJ,FELLINGS,i,h} \bullet R_i + LBL_{PRJ,OTHER,i,h} - LBL_{PRJ,OTHER,i,h} \bullet R_i) \bullet (1 - f_{PRJ,BRANCH,i,h}) \bullet (1 - f_{PRJ,BUCKINGLOSS,i,h})] \bullet \bullet CF \quad (48)$$ where:

Methodology Section #	Equation #	Screenshot
		$C_{PRJ,TIMBER,h}$= carbon contained in timber harvested in period *h* (summed for all harvested polygons, *i*); t C $LBL_{PRJ,FELLINGS,i,h}$ = annual removal of live tree biomass due to commercial felling in polygon, *i*; t d.m. (equation 36) $LBL_{PRJ,OTHER,i,h}$ = annual removal of live tree biomass from incidental sources in polygon, *i*; t d.m. (equation 37) R_i is the root:shoot ratio in polygon, *i* (see equation 33b). 1 - $f_{PRJ,BRANCH,i,h}$ the proportion of live tree biomass remaining after netting out branch biomass, in polygon *i* (unitless; $0 \leq f_{BRANCH,i,t} \leq 1$)(see equation 12) 1 - $f_{PRJ,BUCKINGLOSS,i,h}$ = the proportion of the log bole remaining after in-woods log processing/bucking for quality, length, etc., in polygon, *i* (unitless; $0 \leq f_{BUCKINGLOSS,i,t} \leq 1$) (equation 40) h = harvest period ; yr
8.2.10	49	$$C_{PRJ,MILL,h,k} = (C_{PRJ,TIMBER,h,k} \bullet f_{RND,k} \bullet r_{RND,k}) \quad (49)$$ where: $C_{PRJ,MILL,h,k}$ = carbon contained in harvested timber after milling in period h, for product type *k*; t C $C_{PRJ,TIMBER,h,k}$ = carbon contained in timber harvested in period h, for product type *k*; t C k = wood product type – (softwood saw log, softwood pulpwood, hardwood saw log, or hardwood pulpwood; proportions determined from Table 1.4 of 1605(b) document) $f_{RND,k}$ = fraction of growing stock volume removed as roundwood for product type *k* (default values by region in Table 1.5 of the 1605(b) document); dimensionless $r_{RND,k}$ = ratio of industrial roundwood to growing stock volume removed as roundwood for product type *k* (default values by region in Table 1.5 of the 1605(b) document); dimensionless

Methodology Section #	Equation #	Screenshot
8.2.10	50a	To determine the proportion of harvested wood products (by type) that fall into each category, refer to the "In Use" column for the selected forest region in Table 1.6 in the 1605(b) document. Table 3 provides recommendations for analogs for areas within North America but outside of the conterminous US; the project proponent must justify the appropriateness of the selected analog .Three values are then calculated from these data selected from Table 1.6 in the 1605(b) document, for each product type, *k* : the short-lived fraction ($P_{PRJ,SLF,k}$), medium-lived fraction ($P_{PRJ,MLF,k}$), and long-lived fraction ($P_{PRJ,LLF,k}$): $\mathbf{P_{PRJ,SLF,k} = 1\text{-}P_{3\text{-}year}}$ **(50a)**
8.2.10	50b	$\mathbf{P_{PRJ,LLF,k} = P_{100\text{-}year}}$ **(50b)**
8.2.10	50c	$\mathbf{P_{PRJ,MLF,k} = P_{3\text{-}year} - P_{100\text{-}year}}$ **,** **(50c)** Each category of wood products (*k*) stores carbon according to the following rules: iv. Short-lived wood products – immediate emission of all carbon upon harvest v. Medium-lived wood products – no emission of carbon upon harvest, but carbon stored will decrease by 1/20th for the next 20 years after harvest, such that after 20 years the term becomes zero vi. Long-lived wood products – no loss of carbon.

Methodology Section #	Equation #	Screenshot
8.2.10	51	$C_{PRJ,STORHWP,t,} = \Sigma\Sigma$ (($C_{PRJ,MILL,h,k} \bullet P_{LLF,k}$) + [($C_{PRJ,MILL,h,k} \bullet P_{MLF,k}$) • ((20-h) / 20)]) **(51)** where: $C_{PRJ,STORHWP,t,}$ = carbon stored in harvested wood products in year *t* summed for all product types *k* and then over all harvest periods *h*; t C k = wood product type – (softwood saw log, softwood pulpwood, hardwood saw log, or hardwood pulpwood; proportions determined from Table 1.4 of 1605(b) document) h = year of harvest (the term (20-h) should not be allowed to drop below 0)
8.2.11	52	The annual change in fossil fuel emissions from harvesting and processing of the various wood products ($\Delta C_{PRJ,EMITFOSSIL,t}$) are calculated as: $\Delta C_{PRJ,EMITFOSSIL,t} = C_{PRJ,EMITHARVEST,t} + C_{PRJ,EMITMANUFACTURE,t} + C_{PRJ,EMITTRANSPORT,t}$ **(52)** Where $C_{PRJ,EMITHARVEST,t}$ = the annual fossil fuel emissions associated with harvesting of raw material (t C yr^{-1}) $C_{PRJ,EMITMANUFACTURE,t}$ = the annual fossil fuel emissions associated with the manufacturing of raw material (t C yr^{-1}) $C_{PRJ,EMITTRANSPORT,t}$ = the annual fossil fuel emissions associated with the transport of raw material (t C yr^{-1})

Methodology Section #	Equation #	Screenshot
8.2.11	53	The simplest approach to calculating $C_{PRJ,EMITFOSSIL,t}$ is to use published or derived carbon emission intensity factors. In the case of harvesting, $_{PRJ,}C_{EMITHARVEST,t}$; t C yr^{-1}), can be calculated as: $$C_{PRJ,EMITHARVEST,t} = \Sigma[(LBL_{PRJ,FELLINGS,i,t} - LBL_{PRJ,FELLINGS,i,t} \bullet R_i + LBL_{PRJ,OTHER,i,t} - LBL_{PRJ,OTHER,i,t} \bullet R_i) \bullet (1 - f_{PRJ,BRANCH,i,t}) \bullet (1 - f_{PRJ,BUCKINGLOSS,i,t})] \bullet CF \bullet c_{HARVEST} \quad (53)$$ where: $c_{HARVEST}$ = carbon emission intensity factor (t C emitted/t C raw material) associated with harvesting (see Table 4 for default values); all other terms are as defined in equation 19.
8.2.11	54	$C_{PRJ,EMITTRANSPORT,t}$ must be calculated after consideration of the transport distance from harvest to processing facility, and the means of transportation. This term can be calculated as follows (after (Heath, et al., 2010)): $$C_{PRJ,EMITTRANSPORT,t} = \Sigma[(LBL_{PRJ,FELLINGS,i,t} - LBL_{PRJ,FELLINGS,i,t} \bullet R_i + LBL_{PRJ,OTHER,i,t} - LBL_{PRJ,OTHER,i,t} \bullet R_i) \bullet (1 - f_{PRJ,BRANCH,i,t}) \bullet (1 - f_{PRJ,BUCKINGLOSS,i,t})] \bullet CF \bullet \Sigma(f_{PRJ,TRANSPORTk} \bullet d_{TRANSPORTk} \bullet c_{TRANSPORTk}) \quad (54)$$ where: $f_{PRJ,TRANSPORTk}$ = the fraction of raw material transported by transportation type, *k*. (unitless; $0 \leq f_{PRJ,TRANSPORTk} < 1$). $d_{TRANSPORTk}$ = the distance transported by transportation type, *k*. (km); $c_{TRANSPORTk}$ = the carbon emission intensity factor (kg C emitted/t C raw material) associated with transportation type, *k* (see Table 4 for default values); all other terms are as defined in equation 48.

Methodology Section #	Equation #	Screenshot
8.2.11	55	$C_{PRJ,EMITMANUFACTURE,t} = \Sigma[(LBL_{PRJ,FELLINGS,i,t} - LBL_{PRJ,FELLINGS,i,t} \bullet R_i + LBL_{PRJ,OTHER,i,t} - LBL_{PRJ,OTHER,i,t} \bullet R_i) \bullet (1 - f_{PRJ,BRANCH,i,t}) \bullet (1 - f_{PRJ,BUCKINGLOSS,i,t})] \bullet \Sigma(f_{PRJ,PRODUCTk} \bullet c_{MANUFACTUREk}) \bullet CF$ (55) $c_{MANUFACTUREk}$ = the carbon emission intensity factor (t C emitted/t C raw material) associated with manufacture of product type, k; all other terms are as defined in equation 48.
8.3.3	56a	For project proponents using Market Leakage Option 1: **The outcome of the VCS Leakage Discount Factor determination = the value for MLF_y (56a)**
8.3.3	56b	To calculate the project market leakage (LE_Y, t CO2e yr^{-1}): $LE_Y = MLF_y \bullet ER_{y,GROSS}$ (56b) Where, MLF_y = Market leakage factor, as calculated above. $ER_{y,GROSS}$ = the gross difference in the overall annual carbon change between the baseline and project scenarios in year 'y' (in tonnes CO_2e yr^{-1}). This term is calculated in equation 57.

Methodology Section #	Equation #	Screenshot
8.3.4	56c.1	$$BC_{hv,n} = \Sigma[(LBL_{BSL,FELLINGS,i,t} - LBL_{BSL,FELLINGS,i,t} \bullet R_i + LBL_{BSL,OTHER,i,t} - LBL_{BSL,Other,i,t} \bullet R_i) \bullet (1 - f_{BSL,BRANCH,i,t}) \bullet (1 - f_{BSL,BUCKINGLOSS,i,t})] \bullet CF \bullet 44/12 \quad (56c.1)$$ As calculated using the *baseline scenario data*, and where: $LBL_{BSL,FELLINGS,i,t}$ = annual removal of live tree biomass due to commercial felling in polygon, *i*; t d.m. yr^{-1} (equation 6) $LBL_{BSL,OTHER,i,t}$ = annual removal of live tree biomass from incidental sources in polygon, *i*; t d.m. yr^{-1} (equation 6) $1 - f_{BSL,BRANCH,i,t}$ = the proportion of aboveground live tree biomass remaining after netting out branch biomass, in polygon *i* (unitless; $0 \leq f_{BRANCH,i,t} \leq 1$)(see equation 12) $1 - f_{BSL,BUCKINGLOSS,i,t}$ = the proportion of the log bole remaining after processing for quality, in polygon, *i* (unitless; $0 \leq f_{BUCKINGLOSS,i,t} \leq 1$) (equation 12) R_i = the root:shoot ratio in polygon, *i* CF = carbon fraction of dry matter (IPCC default value = 0.5).

Methodology Section #	Equation #	Screenshot
8.3.4	56c.2	$$AC_{hv,n} = \Sigma[(LBL_{PRJ,FELLINGS,i,t} - LBL_{PRJ,FELLINGS,i,t} \bullet R_i + LBL_{PRJ,OTHER,i,t} - LBL_{PRJ,Other,i,t} \bullet R_i) \bullet (1 - f_{PRJ,BRANCH,i,t}) \bullet (1 - f_{PRJ,BUCKINGLOSS,i,t})] \bullet CF \bullet 44/12 \quad (56c.2)$$ As calculated using the *project scenario data*, and where: $LBL_{PRJ,FELLINGS,i,t}$ = annual removal of live tree biomass due to restoration felling in polygon, *i*; t d.m. yr^{-1} (equation 6) $LBL_{PRJ,OTHER,i,t}$ = annual removal of live tree biomass from incidental sources in polygon, *i*; t d.m. yr^{-1} (equation 6) $1 - f_{PRJ,BRANCH,i,t}$ = the proportion of aboveground live tree biomass remaining after netting out branch biomass, in polygon *i* (unitless; $0 \leq f_{BRANCH,i,t} \leq 1$)(see equation 12) $1 - f_{PRJ,BUCKINGLOSS,i,t}$ = the proportion of the log bole remaining after processing for quality, in polygon, *i* (unitless; $0 \leq f_{BUCKINGLOSS,i,t} \leq 1$) (equation 12) CF = carbon fraction of dry matter (IPCC default value = 0.5).
8.3.4	56c.3	$$SE_y = LE_y \quad (56c.3)$$ where: SE_y = Secondary Effects in year 'y' (tCO_2e) calculated using equations in Figure 1 and equations 56c.1, 56c.2 and 56c.3. LE_Y = Leakage in year y (in tonnes CO_2e yr^{-1}) – used in equation 58.

Methodology Section #	Equation #	Screenshot
8.3.5	56d	For project proponents utilizing Leakage Option 3, project market leakage (LE_Y; t CO_2e yr^{-1}) is calculated as: $\mathbf{LE_Y = MLF_y \cdot ER_{y,GROSS}}$ **(56d)** Where, MLF_y = the market leakage factor in year, *y* (as calculate per section 8.3.5) $ER_{y,GROSS}$ = the gross difference in the overall carbon balance between the baseline and project scenarios in year *y* (t CO_2e yr^{-1}). See equation 57 for its calculation.
8.5	57	*Gross* carbon emissions reductions (ER_y,gross; t CO_2e yr^{-1}) created by the carbon project are calculated annually as the difference between the baseline and project scenario net emission reductions/emissions: $\mathbf{ER_{y,GROSS} = (\Delta C_{BSL,t} - \Delta C_{PRJ,t}) \bullet 44/12}$ **(57)** Where, $\Delta C_{BSL,t}$ = total net baseline scenario emissions calculated from equation 1 (t C yr^{-1}). $\Delta C_{PRJ,t}$ = total net project scenario emissions calculated from equation 29 (t C yr^{-1}). 44/12 = factor to convert C to CO_2e

Methodology Section #	Equation #	Screenshot
8.5.1	58	The annual *net* carbon emissions reductions is the actual net GHG removals by sinks from the project scenario minus the net GHG removals by sinks from the baseline scenario, were then calculated by applying the leakage and uncertainty discount factors (but not the VCS permanence buffer), on an annualized basis: $\mathbf{ER_y = ER_{y,GROSS} - LE_y}$ **(58)** where: ER_y = the net GHG emissions reductions and/or removals in year *y* (the overall annual carbon change between the baseline and project scenarios, net all discount factors except the permanence buffer) (t CO_2e yr^{-1}). $ER_{y,GROSS}$ = the difference in the overall annual carbon change between the baseline and project scenarios (t CO_2e yr^{-1}). LE_y = Leakage in year y (t CO_2e yr^{-1}), as calculated in equation 56b.
8.5.2	59	The number of VCU's the project available for issuance and sale in year, *y* (VCU_y; t CO_2e yr^{-1}), is calculated as: $\mathbf{VCU_y = ER_y \cdot (1 - ER_{y,ERR}) - BR_y}$ **(59)** where: ER_y = the net GHG emissions reductions and/or removals in year (t CO_2e yr^{-1}), as calculated in equation 58. $ER_{y,ERR}$ = the uncertainty factor for year, y, (calculated in Section 8.5.3), expressed as a proportion. BR_y = estimated VCU-equivalent tCO_2e issued to the VCS Buffer Pool in year, *y*, calculated using the latest version of the VCS AFOLU Non-Permanence Risk Tool. BRy is calculated by multiplying the most current verified permanence risk Buffer Withholding Percentage for the project by the change in carbon stocks (difference between baseline and project scenario) for the project area as per the latest approved VCS AFOLU Requirements (Voluntary Carbon Standard, 2008a).

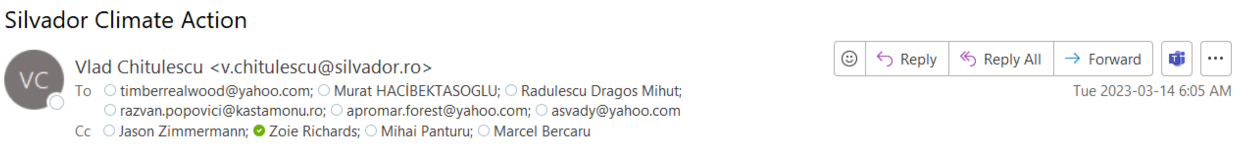
Methodology Section #	Equation #	Screenshot
8.5.3	60a	$E_M = 100 \cdot (\sum y_{d,h,i} / \sum(A_{PRJ,h} \cdot y_{m,h,i}))$ **(60a)** where: The summation is across all plot observations, *i*, and across all analysis units , *h*;
8.5.3	60b	$y_{d,h,i} = A_{PRJ,h} \cdot (y_{m,h,i} - y_{p,h,i})$ **(60b)** E_M = Mean model error for the project (%) $y_{d,h,i}$ = the area-weighted difference between measured and predicted carbon storage in analysis unit, *h*, plot observation, *i* (t C) $y_{m,h,i}$ = carbon storage measured in analysis unit, *h*, plot observation, *i* (t C ha^{-1}) $y_{p,h,i}$ = carbon storage predicted by model for analysis unit , *h*, plot observation, *i* (t C ha^{-1}) $A_{PRJ,h}$ = area of project analysis unit, *h* (ha)
8.5.3	60c	$E_I = 100 \cdot [SE * 1.654 / ((1/N) \cdot \sum(A_{PRJ,h} \cdot y_{m,h,i}))]$ **(60c)** Where, E_I = Inventory error for the project (%) SE = the project level standard error of the area weighted differences between measured plot observation and predicted values of carbon storage. N = total number of plot observations in all analysis units or polygons[37] 1.654 = the 90% confidence interval *t*-value

Methodology Section #	Equation #	Screenshot
		All other terms as defined in equation 60a.
8.5.3	60d	$SE = S/\sqrt{N}$ **(60d)** Where, N = total number of plot observations in all analysis units or polygons (see Footnote 37) S = the standard deviation of the area weighted differences between measured and predicted values of carbon storage across all analysis unit or polygons.
8.5.3	60e	$S = \sqrt{[(1/N-1) \cdot \sum(y_{d,h,i} - \bar{y}bar_d)^2]}$ **(60e)** Where, $\bar{y}bar_d$ = the project-level mean of the area weighted differences between measured plot observation and predicted values of carbon storage. See equation 60b for the calculation of $y_{d,h,i}$ All other terms as defined in equation 60b and 60c.
8.5.3	60f	$E_P = E_M + E_I$ **(60f)**

Methodology Section #	Equation #	Screenshot
9.3.5	61a	Each piece of dead wood will be assigned to one of three density classes, sound (1), intermediate (2), and rotten (3) (details below). The volume per unit area is calculated for each density class, *c*, as: $V_{LDW,c} = \pi^2 * [(d_1^2 + d_2^2 \ldots d_n^2)/8L]$ **(60a)** where: d_1, d_2, d_n = diameter (cm) of each of *n* pieces intersecting the line, and L = the length of the line (100 m default (Harmon, et al., 1986).
9.3.5	61b	The mass of LDW in density class, *c* (t ha^{-1}), is: $M_{LDW,c} = V_{LDW,c} * D_{LDW,c}$ **(60b)** where: $V_{LDW,c}$ = the volume per unit area calculated for each density class, *c*, as calculated in 60a. $D_{LDW,c}$ = the density of LDW in density class, *c* (t d.m. m^{-3})
9.3.5	61c	The total mass of LDW in each plot summed over all density classes (t ha^{-1}) is: $DOM_{LDW} = \sum M_{LDW,c}$ **(60c)** where: $M_{LDW,c}$ = the mass of LDW in density class, *c* (t ha^{-1}), is as calculated in 60b.

APPENDIX 8 – SCOPE 3 EMISSIONS NOTIFICATIONS

Supply Chain Scope 3 Emissions email sent to Silvador clients dated 2023-03-14:



Dear valued Customer/ Log buyer,

Recently Silvador Company SRL and Forest Capital SRL have partnered on a new business venture and are developing a forest carbon project to help achieve climate greenhouse gas emission reductions and removals through the globally recognized VERRA Verified Carbon Standard (VCS).

This will be accomplished through the reduction of regular timber cuttings on approximately 1,500 ha of our private lands in the Buzau and Dambovita counties. Low levels of forest operational activities will still take place for forest health and risk mitigation measures.

As a log supplier for various business supply chains, we would like to inform you that we are claiming the 'transportation emissions' for logs removed from our forest fund properties in the carbon project, to our customers mill and manufacturing sites. These are known as 'Scope 3 Emissions' and the purpose of this disclosure is to avoid the risk of double-counting emissions along the supply chain.

For more information, please contact Vlad Chitulescu at v.chitulescu@silvador.ro or visit our website www.silvador.ro

If you would like more information regarding VERRA or on Scope 3 Emissions, please use the links below:

VERRA
https://verra.org/about/overview/

Greenhouse Gas Protocol Scope 3
https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf

Vlad Chitulescu
CEO Silvador Company SRL

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APPENDIX 9 – PROJECT AREA POLYGONS

Forest Plan	Ownership.	Latitude	Longitude	GIS_ID
Barbu39	Silvador	45.2375	26.6699	Barbu39119
Barbu39	Silvador	45.2381	26.6775	Barbu39122
Barbu39	Silvador	45.2343	26.6257	Barbu39184D
Barbu39	Silvador	45.2343	26.6220	Barbu39184A
Barbu39	Silvador	45.2344	26.6235	Barbu39184B
Barbu39	Silvador	45.1845	26.6672	Barbu39114A
Barbu39	Silvador	45.1829	26.6661	Barbu39114C
Barbu39	Silvador	45.1824	26.6681	Barbu39114B
BarbuV	Forest Capital	45.1991	26.6479	BarbuV19B
BarbuV	Forest Capital	45.2103	26.6739	BarbuV3D
BarbuV	Forest Capital	45.2002	26.6447	BarbuV19E
BarbuV	Forest Capital	45.2005	26.6453	BarbuV19A
BarbuV	Forest Capital	45.2004	26.6497	BarbuV19F
BarbuV	Forest Capital	45.2019	26.6481	BarbuV20B
BarbuV	Forest Capital	45.2132	26.6739	BarbuV25A
BarbuV	Forest Capital	45.2050	26.6580	BarbuV22G
BarbuV	Forest Capital	45.2037	26.6533	BarbuV22E
BarbuV	Forest Capital	45.2063	26.6616	BarbuV23A
BarbuV	Forest Capital	45.2079	26.6631	BarbuV23D
BarbuV	Forest Capital	45.1995	26.6733	BarbuV6D
BarbuV	Forest Capital	45.2003	26.6672	BarbuV6B
BarbuV	Forest Capital	45.2037	26.6588	BarbuV9E
BarbuV	Forest Capital	45.2034	26.6477	BarbuV20A
BarbuV	Forest Capital	45.2054	26.6641	BarbuV7C
BarbuV	Forest Capital	45.2091	26.6736	BarbuV3G
BarbuV	Forest Capital	45.2073	26.6791	BarbuV3B
BarbuV	Forest Capital	45.2093	26.6711	BarbuV4D
BarbuV	Forest Capital	45.2098	26.6835	BarbuV1B
BarbuV	Forest Capital	45.2115	26.6729	BarbuV24E
BarbuV	Forest Capital	45.2125	26.6845	BarbuV1F
BarbuV	Forest Capital	45.2123	26.6587	BarbuV26A
BarbuV	Forest Capital	45.2131	26.6515	BarbuV28
BarbuV	Forest Capital	45.2150	26.6843	BarbuV1G
BarbuV	Forest Capital	45.1998	26.6458	BarbuV19D
BarbuV	Forest Capital	45.2075	26.6667	BarbuV24H
BarbuV	Forest Capital	45.2137	26.6830	BarbuV1C

Forest Plan	Ownership.	Latitude	Longitude	GIS_ID
BarbuV	Forest	45.1985	26.6583	BarbuV10B
BarbuV	Capital	45.2008	26.6483	BarbuV19C
BarbuV	Forest	45.2040	26.6648	BarbuV7B
BarbuV	Capital	45.2096	26.6649	BarbuV24G
BarbuV	Forest	45.2111	26.6551	BarbuV27B
BarbuV	Capital	45.2108	26.6837	BarbuV1D
BarbuV	Forest	45.2093	26.6763	BarbuV3A
BarbuV	Capital	45.2077	26.6607	BarbuV23C
BarbuV	Forest	45.2121	26.6797	BarbuV1E
BarbuV	Capital	45.2124	26.6742	BarbuV24B
BarbuV	Forest	45.2011	26.6571	BarbuV10A
BarbuV	Capital	45.2067	26.6737	BarbuV4A
BarbuV	Forest	45.2098	26.6801	BarbuV2
BarbuV	Capital	45.2100	26.6681	BarbuV24D
BarbuV	Forest	45.2118	26.6648	BarbuV25B
BarbuV	Capital	45.2128	26.6549	BarbuV27C
BarbuV	Forest	45.2026	26.6684	BarbuV6A
BarbuV	Capital	45.2042	26.6489	BarbuV20C
BarbuV	Forest	45.2053	26.6533	BarbuV22A
BarbuV	Capital	45.2047	26.6509	BarbuV21
BarbuV	Forest	45.2041	26.6576	BarbuV22D
BarbuV	Capital	45.2036	26.6558	BarbuV22C
BarbuV	Forest	45.2061	26.6564	BarbuV22F
BarbuV	Capital	45.2093	26.6524	BarbuV27A
BarbuV	Forest	45.2098	26.6562	BarbuV26B
BarbuV	Capital	45.2098	26.6533	BarbuV27D
BarbuV	Forest	45.2108	26.6617	BarbuV25D
BarbuV	Capital	45.2104	26.6595	BarbuV25C
BarbuV	Forest	45.2066	26.6620	BarbuV23B
BarbuV	Capital	45.2055	26.6598	BarbuV22B
BarbuV	Forest	45.2043	26.6603	BarbuV8C
BarbuV	Capital	45.2026	26.6582	BarbuV9D
BarbuV	Forest	45.1989	26.6616	BarbuV9A
BarbuV	Capital	45.2070	26.6637	BarbuV24A
BarbuV	Forest	45.2013	26.6627	BarbuV8B
BarbuV	Capital	45.2013	26.6648	BarbuV7A
BarbuV	Forest	45.2034	26.6720	BarbuV5A
BarbuV	Capital	45.2000	26.6723	BarbuV6H
BarbuV	Forest	45.1989	26.6699	BarbuV6F
BarbuV	Capital	45.2003	26.6707	BarbuV6C
BarbuV	Forest Capital	45.1982	26.6677	BarbuV7D

Forest Plan	Ownership.	Latitude	Longitude	GIS_ID
BarbuV	Forest Capital	45.1973	26.6664	BarbuV8A
BarbuV	Forest Capital	45.2080	26.6662	BarbuV24C
BarbuV	Forest Capital	45.2065	26.6667	BarbuV6G
BarbuV	Forest Capital	45.2114	26.6749	BarbuV3E
BarbuV	Forest Capital	45.2094	26.6704	BarbuV4E
BarbuV	Forest Capital	45.2073	26.6681	BarbuV5B
BarbuV	Forest Capital	45.2129	26.6757	BarbuV24F
BarbuV	Forest Capital	45.2118	26.6821	BarbuV1A
BarbuV	Forest Capital	45.2062	26.6778	BarbuV3C
BarbuV	Forest Capital	45.2047	26.6764	BarbuV4B
BarbuV	Forest Capital	45.2045	26.6736	BarbuV4C
BarbuV	Forest Capital	45.2115	26.6754	BarbuV3F
Const	Forest Capital	45.1709	26.5349	Const110D
Const	Forest Capital	45.1641	26.5504	Const107C
Const	Forest Capital	45.1720	26.5428	Const108E
Const	Forest Capital	45.1719	26.5395	Const109A
Const	Forest Capital	45.1676	26.5455	Const108J
Const	Forest Capital	45.1751	26.5423	Const108K
Const	Forest Capital	45.1721	26.5439	Const108F
Const	Forest Capital	45.1700	26.5498	Const107E
Const	Forest Capital	45.1702	26.5468	Const108D
Const	Forest Capital	45.1676	26.5412	Const110C
Const	Forest Capital	45.1696	26.5357	Const110B
Const	Forest Capital	45.1684	26.5424	Const109B
Const	Forest Capital	45.1709	26.5376	Const110A
Const	Forest Capital	45.1725	26.5454	Const108M
Const	Forest Capital	45.1725	26.5471	Const108L
Const	Forest Capital	45.1730	26.5468	Const108B
Const	Forest Capital	45.1739	26.5463	Const108A
Const	Forest Capital	45.1710	26.5544	Const107A
Const	Forest Capital	45.1699	26.5542	Const107G
Const	Forest Capital	45.1678	26.5523	Const107B
Const	Forest Capital	45.1670	26.5557	Const107D
Const	Forest Capital	45.1685	26.5545	Const107F
Const	Forest Capital	45.1617	26.5513	Const106A
Const	Forest Capital	45.1762	26.5435	Const108C
Const	Forest Capital	45.1755	26.5409	Const108H
Const	Forest Capital	45.1759	26.5413	Const108G
Const	Forest Capital	45.1733	26.5450	Const108I
Corna	Forest Capital	44.8289	25.7229	Corna10
Corna	Forest Capital	44.8521	25.7268	Corna8A

Forest Plan	Ownership.	Latitude	Longitude	GIS_ID
Corna	Forest Capital	44.8273	25.6800	Corna7G
Corna	Forest Capital	44.8555	25.7317	Corna9A
Corna	Forest Capital	44.8494	25.7260	Corna8D
Corna	Forest Capital	44.8513	25.7227	Corna8B
Corna	Forest Capital	44.8264	25.6745	Corna7A
Corna	Forest Capital	44.8272	25.6788	Corna7E
Corna	Forest Capital	44.8264	25.6803	Corna7F
Corna	Forest Capital	44.8261	25.6772	Corna7C
Corna	Forest Capital	44.8255	25.6802	Corna7B
Corna	Forest Capital	44.8249	25.6813	Corna7D
Corna	Forest Capital	44.7167	25.6156	Corna2B
Corna	Forest Capital	44.7122	25.6179	Corna1B
Corna	Forest Capital	44.7131	25.6173	Corna1C
Corna	Forest Capital	44.7190	25.6210	Corna3B
Corna	Forest Capital	44.7174	25.6217	Corna3A
Corna	Forest Capital	44.7181	25.6190	Corna2F
Corna	Forest Capital	44.7139	25.6201	Corna1A
Corna	Forest Capital	44.7166	25.6197	Corna2D
Corna	Forest Capital	44.7168	25.6172	Corna2C
Corna	Forest Capital	44.7160	25.6180	Corna2E
Hodoba	Forest Capital	45.2608	26.6494	Hodoba136B
Hodoba	Forest Capital	45.2649	26.6657	Hodoba139
Hodoba	Forest Capital	45.2678	26.6717	Hodoba140A
Hodoba	Forest Capital	45.2643	26.6593	Hodoba138A
Hodoba	Forest Capital	45.2607	26.6622	Hodoba135B
Hodoba	Forest Capital	45.2631	26.6538	Hodoba137A
Hodoba	Forest Capital	45.2675	26.6753	Hodoba140C
Manesti	Forest Capital	44.6490	25.9317	Manesti65B
Manesti	Forest Capital	44.6462	25.9319	Manesti64
Manesti	Forest Capital	44.6492	25.9321	Manesti65C
Manesti	Forest Capital	44.9401	25.2812	Manesti38A
Manesti	Forest Capital	44.9480	25.2662	Manesti41D
Manesti	Forest Capital	44.9480	25.2675	Manesti41F
Manesti	Forest Capital	44.9454	25.2680	Manesti40D
Manesti	Forest Capital	44.9393	25.2795	Manesti38B
Manesti	Forest Capital	44.9411	25.2792	Manesti39D
Manesti	Forest Capital	44.9376	25.2774	Manesti38D
Manesti	Forest Capital	44.9405	25.2711	Manesti39G
Manesti	Forest Capital	44.9409	25.2743	Manesti39A
Manesti	Forest Capital	44.9376	25.2816	Manesti38C
Manesti	Forest Capital	44.9401	25.2749	Manesti39B

Forest Plan	Ownership.	Latitude	Longitude	GIS_ID
Manesti	Forest	44.9423	25.2757	Manesti39E
Manesti	Capital Forest	44.9426	25.2715	Manesti39F
Manesti	Capital	44.9439	25.2745	Manesti39C
Manesti	Forest	44.9466	25.2735	Manesti40A
Manesti	Capital	44.9504	25.2671	Manesti41B
Manesti	Forest Capital	44.9506	25.2686	Manesti41A
Manesti	Forest	44.9516	25.2646	Manesti41C
Manesti	Capital	44.9436	25.2699	Manesti40C
Manesti	Forest	44.9446	25.2720	Manesti40E
Manesti	Capital Forest	44.9529	25.2653	Manesti41E
Manesti	Capital	44.9385	25.2776	Manesti38E
Manesti	Forest	44.9461	25.2717	Manesti40B
Manesti	Capital	44.9231	25.3098	Manesti129A
Manesti	Forest Capital	44.9243	25.3075	Manesti129D
Manesti	Forest	44.9245	25.3088	Manesti129C
Manesti	Capital	44.9249	25.3098	Manesti129B
Manesti	Forest Capital	44.9289	25.3032	Manesti131
Manesti	Forest	44.9262	25.3105	Manesti128B
Manesti	Capital	44.9305	25.2983	Manesti130B
Manesti	Silvador	44.9317	25.2950	Manesti130C
Manesti	Silvador	44.9298	25.2953	Manesti127C
Manesti	Silvador	44.9314	25.2932	Manesti127D
Manesti	Silvador	44.9269	25.3069	Manesti128A
Manesti	Silvador	44.9287	25.2996	Manesti127A
Manesti	Silvador	44.9277	25.3007	Manesti127B
Manesti	Silvador	44.9298	25.2984	Manesti130A
Manesti	Silvador	44.6484	25.9313	Manesti65A
Popescu	Silvador	45.1880	26.5360	Popescu84A
Popescu	Silvador	45.1785	26.4998	Popescu40A
Popescu	Silvador	45.1597	26.5214	Popescu98
Popescu	Silvador	45.1494	26.5349	Popescu100B
Popescu	Silvador	45.1857	26.5371	Popescu84D
Popescu	Silvador	45.1892	26.5370	Popescu84C
Popescu	Silvador	45.1902	26.5355	Popescu84B
Popescu	Silvador	45.1758	26.5083	Popescu39C
Popescu	Silvador	45.1727	26.4975	Popescu36C
Popescu	Silvador	45.1758	26.4949	Popescu40E
Popescu	Silvador	45.1766	26.5009	Popescu40B
Popescu	Silvador	45.1759	26.5018	Popescu39B
Popescu	Silvador	45.1768	26.5087	Popescu39A
Popescu	Silvador	45.1749	26.5078	Popescu38C

Forest Plan	Ownership.	Latitude	Longitude	GIS_ID
Popescu	Silvador	45.1780	26.4960	Popescu40D
Popescu	Silvador	45.1685	26.5023	Popescu36A
Popescu	Silvador	45.1529	26.5310	Popescu99A
Popescu	Silvador	45.1531	26.5272	Popescu99B
Popescu	Silvador	45.1512	26.5371	Popescu100A
Popescu	Silvador	45.1706	26.5008	Popescu36B
Popescu	Silvador	45.1759	26.4981	Popescu40C
Popescu	Silvador	45.1743	26.5054	Popescu38B
Popescu	Silvador	45.1735	26.5054	Popescu38A
Valea Tisei	Silvador	45.0496	25.4831	ValeaTisei27B
Valea Tisei	Silvador	45.0519	25.4865	ValeaTisei27A
Valea Tisei	Silvador	45.0444	25.4890	ValeaTisei21
Valea Tisei	Silvador	45.0511	25.4672	ValeaTisei6C
Valea Tisei	Silvador	45.0488	25.4607	ValeaTisei5C
Valea Tisei	Silvador	45.0389	25.4528	ValeaTisei2C
Valea Tisei	Silvador	45.0487	25.5021	ValeaTisei17A
Valea Tisei	Silvador	45.0416	25.5205	ValeaTisei14A
Valea Tisei	Silvador	45.0507	25.5146	ValeaTisei16D
Valea Tisei	Silvador	45.0491	25.5182	ValeaTisei15B
Valea Tisei	Silvador	45.0469	25.5066	ValeaTisei17B
Valea Tisei	Silvador	45.0490	25.4963	ValeaTisei19A
Valea Tisei	Silvador	45.0491	25.4883	ValeaTisei26A
Valea Tisei	Silvador	45.0441	25.4865	ValeaTisei23
Valea Tisei	Silvador	45.0502	25.4722	ValeaTisei30
Valea Tisei	Silvador	45.0517	25.4456	ValeaTisei1C
Valea Tisei	Silvador	45.0518	25.5062	ValeaTisei18A
Valea Tisei	Silvador	45.0478	25.4678	ValeaTisei6A
Valea Tisei	Silvador	45.0511	25.4700	ValeaTisei6B
Valea Tisei	Silvador	45.0544	25.4702	ValeaTisei7B
Valea Tisei	Silvador	45.0485	25.4759	ValeaTisei29
Valea Tisei	Silvador	45.0491	25.4798	ValeaTisei28
Valea Tisei	Silvador	45.0510	25.4895	ValeaTisei26B
Valea Tisei	Silvador	45.0527	25.4906	ValeaTisei26C
Valea Tisei	Silvador	45.0478	25.4915	ValeaTisei20
Valea Tisei	Silvador	45.0508	25.4951	ValeaTisei19B
Valea Tisei	Silvador	45.0506	25.5039	ValeaTisei18B
Valea Tisei	Silvador	45.0479	25.5136	ValeaTisei16A
Valea Tisei	Silvador	45.0403	25.5220	ValeaTisei14B
Valea Tisei	Silvador	45.0414	25.5227	ValeaTisei13D
Valea Tisei	Silvador	45.0510	25.4424	ValeaTisea1B

APPENDIX 10 – MARKETZ TOOL

An independent assessment of the risks of market leakage from AFOLU-IFM projects

Introduction and Scope

As defined within the VSC Methodology VM0012, “market leakage risks occur when a project significantly reduces the production of a commodity causing a change in the supply and market demand equilibrium that results in a shift of production elsewhere to make up for the lost supply”. The Market Affects and Risks (MARketz) Tool sets out to accurately, quantitatively, and conservatively assess the risks that Agriculture, Forestry and Other Land Use (AFOLU) carbon projects have on the market equilibrium within the project country.

The MARketz Tool was developed to be applied to projects following the VCS VM0010 and VM00012 methodologies, however, has the potential to be applied to other Improved Forest Management (IFM) project methodologies. The tool itself has been independently developed by resource professionals (Registered Professional Biologists and Professional Foresters) within the province of British Columbia, Canada, and relies on sources and assessments that have been developed by academic/ subject matter experts and are peer reviewed. All references can be found within the *References* section, or as indicated within the footnotes throughout this document.

The intention of the MARketz Tool is to provide an accurate assessment of the potential risks that AFOLU IFM projects pose to the wood products markets where they exist compared to the options currently provided within the Verra VCS Standard. As a methodology deviation it strives to increase the accuracy and quantification of the assessment. It should be acknowledged that the complexities of market leakage, the wood products industry and market itself cannot be understated, however, the MARketz Tool has been developed to encompass the most significant factors leading to market leakage risks and has sought to analyze the effects as a whole.

MARketz Tool

The MARketz Tool utilizes seven different analyses to examine the potential affects project activities will have on the local, regional, and national markets of the host country. This document has been developed to describe the analyses utilized within the tool. Please note, the assessment is conducted within a corresponding Microsoft Excel Workbook with tabs related to each analysis.

Scoring

Five categories of analyses are utilized within the MARketz Tool as described below, with two of the categories having two sub assessments each. The results of each assessment are given a score of 1 (low risk of market leakage), 5 (moderate risk of market leakage), or 9[42] (high risk of market leakage). Scoring criteria is defined within the assessment descriptions below. The resulting scores, weighting of each analysis and determination of the market leakage factor are described later within the section *Market Leakage Factor Calculation*.

1. Market Determination

The market determination assessment and quantification of a Domestic Leakage Factor seeks to define the proportion of potential leakage that will occur in domestic markets versus international markets. As per VCS standard requirements, leakage occurring outside the host country (international leakage), is not quantified[43].

Reference

The analysis is derived from/ builds upon part 1 'International Leakage Proportion' of the VCS VM0012 Market Leakage Option 3[44] Assessment method.

Data Source

Each factor described below is determined via national roundwood production, import, export, and domestic use data. Country specific data is utilized.

Method

The International Leakage Factor (LF_{INT}) is calculated as follows: ($FP_{TO\_DOMESTIC}$) * ($DOM.DEMAND_{FROM\_INTL}$) + (FP_{TO_EXPORT}) * ($EXP.DEMAND_{FROM\_INTL}$), where:

- FP_{TO_EXPORT} = International Demand - is the total project country forest products delivered to export (international) markets (%)
- $FP_{TO\_DOMESTIC}$ = Domestic Demand - is the total project country forest products delivered to domestic markets (%)
- $DOM.DEMAND_{FROM\_INTL}$ = Proportion of total project country forest products to International Markets (%)
- $EXP.DEMAND_{FROM\_INTL}$ = Weighted sum of proportions of key markets which are supplied from non-project country sources (%)

Scoring Criteria

The resulting International Leakage Factor is the only factor that is not assigned a score within the tool. Instead, the inverse of this factor (1 - LF_{INT}), the Domestic Leakage Factor, is used to refine the scores

42 The value of 9 as a maximum rating is utilized to allow for a whole number midpoint (5) between the values of 1 and 9.

43 Verra - Verified Carbon Standard (VCS), Standard v4.5, 4-October-2023, Section 3.15.11

44 3GreenTree Ecosystem Services Ltd & ERA Ecosystem Restoration Associates Inc. 2012. VCS Methodology VM0012 – Improved Forest Management in Temperate and Boreal Forests (LtPF), Version 1.2, Sectoral Scope 14, Section 8.3.5 – Table 5.

of assessments within Categories 3 – 5 (refer to section *Market Leakage Factor Calculation* for more details). The Domestic Leakage Factor is applied to the assessments under Categories 3 – 5 since these assessments utilize project volumes that are attributable to both the domestic and international markets. The resulting score is discounted to accurately account for domestic market effects. The Domestic Leakage Factor is not applied to the assessment within Category 2 – Market Equilibrium, as the model is run on a global scale.

Potential score = 0% - 100%

2. Market Equilibrium

The market equilibrium assessment seeks to determine the effects the project will have on the production and consumption within the host country, while taking a comprehensive set of global economic factors into account.

Reference

To achieve this level of assessment, the Global Forest Products Model (GFPM, v2020[45]) developed by Buongiorno et al. is utilized. The GFPM is a dynamic spatial equilibrium model that simulates the global market for forest products and tracks at a country level, annual volumes of timber harvests and changes in forest stock and area. The model incorporates data and parameters of forest resources for 180 countries and 14 forest product categories.

Data Source

Total timber harvesting landbase (THLB, in thousands of ha) for the country is built into the model. The total project area (in thousands of ha – rounded to the nearest 1000 ha), is then subtracted from the national total to model the project run (i.e. logged to protected).

Method

To run the analysis relating to the project, two runs of the GFPM model are completed. The first run is conducted without adjusting any parameters from the default model inputs establishing the base case. For the second run, the size of the carbon project area (in thousands of hectares) is removed from the project country's starting THLB (edited within the "Forest" tab of the input "World.xls" file), the model is run again forecasting the project case.

The resulting production and consumption records (.xls files) from each run are then compared for the host country. The first year that a disturbance in the amount of total production (thousands of m^3) or consumption (thousands of m^3) is noted and considered the year of the market equilibrium disturbance/ change.

[45] https://buongiorno.russell.wisc.edu/gfpm/

Figure 1 below displays an example of the analysis completed. Within the example, 1000 hectares is removed from the forest landbase in the project case. When comparing the outputs from both the base and the project case, the first year of disturbance to the market equilibrium is identified as 2065.

	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
					Area (thousands of ha)						
base	11,419.00	11,419.00	11,421.00	11,424.10	11,427.90	11,432.10	11,436.40	11,440.60	11,444.60	11,448.30	11,451.70
project	11,418.00	11,418.00	11,420.00	11,423.10	11,426.90	11,431.10	11,435.40	11,439.60	11,443.60	11,447.30	11,450.70
Difference	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00
					Production (Total Roundwood) (thousands of m3)						
base	79,638.70	78,962.80	77,189.00	75,457.40	74,105.60	71,428.50	68,485.70	65,728.00	62,551.50	58,675.30	54,145.10
project	79,638.70	78,962.80	77,189.00	75,457.40	74,105.60	71,428.50	68,485.70	65,728.00	62,551.50	58,673.80	54,143.00
Difference	-	-	-	-	-	-	-	-	-	- 1.50	- 2.10
% difference	-	-	-	-	-	-	-	-	-	0.00	0.00
					Consumption (Total Roundwood) (thousands of m3)						
base	73,679.10	73,760.70	73,503.20	73,502.70	73,507.50	71,987.20	70,153.00	68,602.50	66,889.90	64,922.30	62,985.70
project	73,679.10	73,760.70	73,503.20	73,502.70	73,507.50	71,987.20	70,153.00	68,602.50	66,889.90	64,920.80	62,983.60
Difference	-	-	-	-	-	-	-	-	-	- 1.50	- 2.10
% difference	-	-	-	-	-	-	-	-	-	0.00	0.00

Figure 17 Example of Market Equilibrium Assessment

Scoring Criteria

The resulting year of the first disturbance is compared to the start year of the carbon project to determine how many years since the implementation of the carbon project will it take to affect the market equilibrium. Scoring is determined as follows and is based on the VCS Standard v4.5 requirement of a 40-year project longevity (possible score):

- First disturbance occurs less than 20 years after project implementation: 9
- First disturbance occurs within 20 – 40 years after project implementation: 5
- First disturbance occurs within 40 years or greater after project implementation: 1

3. Barriers - A. Distribution Barrier – Cost of Transportation

The distribution barrier assessment is conducted to determine the potential spatial extent of market leakage effects as determined by the cost of transporting wood products.

Reference

Under this assessment, the threshold to define a transportation barrier was set as a 15% increase in cost of transport. This value was chosen based on the barrier grade definitions as presented within the VCS Module VMD0033 – Estimation of emissions from market leakage[46].

Data Source

[46] 3The Earth Partners LLC. 2012. VCS Module VMD0033 –Estimation of Emissions from Market Leakage, Version 1.0, Sectoral Scope 14, Table 2 – Barrier Grades.

Peer reviewed sources, or local knowledge is used to determine the thresholds. Average costs for transportation at each scale are also determined for each host country through local knowledge and/or peer reviewed sources.

Method

The analysis is conducted on a local, regional, and national scale. The thresholds of each scale category are based on the specifics of the host country. For example, the distance of the "local" scale within Romania will not be considered the same within Canada. This assessment is conducted by determining the average cost of transporting wood products in the baseline scenario. It is then determined at what scale the cost of transportation increases by 15% or more and thus represents a barrier. This provides for a reasonable market leakage distance, i.e., the maximum distance a buyer (e.g. a sawmill) would be willing to go to purchase wood products to replace the products removed from the market via the implementation of the project scenario.

Scoring Criteria

Assessment values are assigned based on absence of a transportation barrier at each scale. The scores are compounded and determined in sequence (1 – 3) as the scale of the transportation barrier increases. This effectively sums the scores for the smaller scale markets where a barrier did not exist. Scores are determined as follows:

1. Is there a transportation barrier at the local scale?
    a. Yes = 0
        i. Scoring concludes
    b. No = 1
        i. Continue to next question
2. Is there a transportation barrier at the regional scale?
    a. Yes – overall score = 1
        i. Scoring concludes
    b. No = 5 + 1 = 6
        i. Continue to next question
3. Is there a transportation barrier at the national scale?
    a. Yes – overall score = 5 + 1 = 6
        i. Scoring concludes
    b. No – overall score = 1 + 5 + 9 = 15

Overall scores then receive an assessment score following the criteria below (possible score):

- 0 or 1 = 1
- 6 = 5
- 15 = 9

3. Barriers - B. Regulatory Barrier – Jurisdiction

The jurisdiction barrier assessment is conducted to determine the potential legal extent of market leakage effects as determined by ownership type within the project country. Laws and regulations impacting cut control will vary based on country, and therefore ownership-based restrictions will also vary.

Reference

The jurisdictional assessment analysis itself is not a peer reviewed assessment, however all data used in the assessment (i.e. ownership type) must be based on publicly available and verifiable data. Legal interpretations regarding harvest quotas, cutting periods, allowable annual cut and flexibility of harvest volumes must be from government or credible third-party sources.

Data Source

This assessment is conducted by gathering forest land ownership data and categorizing it by cut control laws and regulations within the project country.

Method

The intent of the jurisdiction barrier assessment is to determine the risk of market leakage based on the legal freedoms of landowners to increase cut allowances. The two ends of the spectrum are private land holdings with perfect free market conditions vs. public forest lands with strong cut restrictions (e.g., Crown Lands in Canada). If a project country has a high proportion of ownership that is regulated by quota-based cut regulations, there is a lower risk of market leakage. Inversely, if a country has a higher proportion of ownership that is unregulated, then there is a higher risk of market leakage.

Scoring Criteria

The proportion of land covered by cut control regulations compared to the national total is scored following the criteria below (possible score):

- Proportion of the national timber harvesting landbase (THLB) covered by quota-based legislation is less than 33%: 9
- Proportion of the national THLB covered by quota-based legislation is greater than 33% but less than 66%: 5
- Proportion of the national THLB covered by quota-based legislation is greater than 66%: 1

4. Product Substitutability

The purpose of assessing product substitutability is to determine if a different product can be used in place of one that would be generated in the baseline scenario. If there is high substitutability, there is a higher risk of market leakage due to the product being easily replaced with another product.

Reference

The assessment of product substitutability is conducted partially following the methods as described within the Government of British Columbia's Forest Carbon Offset Protocol (FCOP) v2.0 (Draft)

Data Source

Peer reviewed sources, or local knowledge is used for this assessment.

Method

To determine a value of overall project substitutability (ɣ) the project species are defined by their harvest contribution (T, as a %) in the baseline scenario. Each species is then given a substitutability score (S) of 100% (perfectly substitutable), 70% (moderately substitutable), or 40% (low substitutability). The substitutability of the project is calculated by summing the harvest contribution of each species (T_{Sp1}, $T_{Sp2,}$ $T_{Sp3,}$ etc.) multiplied by the substitutability score of each species, ($S_{Sp1,}$ $S_{Sp1,}$ $S_{Sp1,}$ etc.).

$$\gamma_{Project} = \sum_{Sp=1}^{Sp*} (T_{\mathrm{Sp}} * S_{\mathrm{Sp}})$$

Where *Sp** = number of species groups in the baseline scenario.

Scoring Criteria

The substitutability of the project is scored following the criteria below (possible score):

- Project Substitutability is less than or equal to 40%: 1
- Project Substitutability is 41% to 70%: 5
- Project Substitutability is greater than 70%: 9

5. Land/Carbon Impact - A. Percent of National Inventory

The percentage of national inventory assessment is conducted to determine the scale of the carbon project compared to the national inventory of the host country. The result of this assessment provides a scaled or proportional analysis of the implementation of the project scenario as it relates to national resources. The smaller the project volume is as a proportion of the national resources, the less risk of market leakage, and vice versa.

Reference

The assessment itself is not a peer reviewed assessment, however all data used within this assessment must be based on publicly available and verifiable data.

Data Source

Data utilized must be based on publicly available (or easily obtained) national forest inventory data (for national data). All project data must be derived from project inventories.

Method

The assessment is completed using a weighted proportion approach. The volume of trees within the baseline scenario inventory is broken down by species and region (where appropriate). Each species is calculated as a percent of the total project inventory. Each species' proportion is then compared to the total volume of that same species within the national forest inventory. These weighted results are then added together to obtain the total weighted volume of the project species as a proportion of the national inventory.

Scoring Criteria

The percentage of national inventory of the project is scored following the criteria below (possible score):

- Project proportion is less than 33% of the national inventory: 1
- Project proportion is between (inclusive) 33% and 66% of the national inventory: 5
- Project proportion is greater than 66% of the national inventory: 9

5. Land/Carbon Impact - B. Biomass Ratio of Project (compared to national inventory)

The assessment of the biomass ratio of the project compared to the national inventory follows the biomass ratio assessment commonly used within several AFOLU methodologies. The purpose of this assessment is to determine the proportion of leakage to other national forests based on the ratio of merchantable biomass to total biomass on the project sites versus the leakage sites. It can be assumed that where a project possesses a higher ratio of merchantable biomass to total biomass than the leakage sites, there is a higher risk of market leakage, and vice versa.

Reference

This assessment follows the methods as described within part 2 'Proportional Leakage by Biomass Ratio' of VCS VM0012 Market Leakage Option 3[47] Assessment method.

Data Source

Data utilized must be based on publicly available (or easily obtained) national forest inventory data (for national data). All project data must be derived from project inventories.

[47] 3GreenTree Ecosystem Services Ltd & ERA Ecosystem Restoration Associates Inc. 2012. VCS Methodology VM0012 – Improved Forest Management in Temperate and Boreal Forests (LtPF), Version 1.2, Sectoral Scope 14, Section 8.3.5 – Table 5.

Method

The assessment within VCS VM0012 is described below.

A weighted average calculation, with the objective of creating an average difference in biomass ratio between the project and the national leakage areas, weighted by the proportion of timber supply coming from each leakage forest type:

- Identify national forest type (or ecotype) data where merchantable log volume biomass and total forest biomass estimates are available (i.e. from published national inventory data sources, etc.)
- Determine the biomass ratio in each national forest type (ratio of merchantable volume in biomass to total biomass;
- Determine the proportion of the domestic national market that is supplied by each of the national forest types (%);
- Determine the difference between the forest type containing the project and each leakage area biomass ratio (Biomass Ratio Difference (%) = ((Project Biomass Ratio – Leakage Area Biomass Ratio) / Project Biomass Ratio) * 100);
- Select the leakage factor for each national forest type, based on the difference between the project biomass ratio and each national forest type biomass ratio (see biomass ratio categories below);
- Multiply the proportion (%) of market supplied by each leakage forest type by the Leakage Factor from each forest type to determine the weighted average as per the scoring criteria for biomass ratios.

Leakage Factors

- >15% Lower merchantable biomass to total biomass = 1
- +/- 15% merchantable biomass to total biomass = 5
- > 15 % Higher merchantable biomass to total biomass = 9

Each value is then given a weighted value based on the proportion of that forest type within the project inventory.

Scoring Criteria

The percentage of national inventory of the project is scored following the criteria below (possible score):

- Biomass ratio score is less 33%: 1
- Biomass ratio score is within (inclusive) 33% and 66%: 5
- Biomass ratio score is greater than 66%: 9

Market Leakage Factor Calculation

The score of each assessment (1 – 5B) is gathered on the Market Score Card within the excel workbook. The market score card calculates the overall weighted score of all the assessments, produces the resulting assessment score as a percentage, and the corresponding Market Leakage Factor.

Weighted Scores and International Leakage Discount

Assessments 2 – 5B are each multiplied by a value of 0.167 as they are weighted equally within the MARketz tool (i.e. each are 1/6th).

The scores generated from assessments 3 – 5B are also discounted by the percentage of international leakage ($LF_{International}$) as calculated within assessment 1 – Market Determination. The international leakage discount is not applied to assessment 2 – Market Equilibrium as the GFPM already accounts for global (international) market effects.

In the example provided within Figure 2 below, the project was determined as having a 15.3% international market leakage discount. This was applied to the resulting score of assessment 3A – Distribution Barrier – Cost of Transportation to account for effects due to international leakage, as follows:

$$\text{Market Score}_{3A} = \text{Score}_{3A} * \text{Weighting}_{3A} * (1 - LF_{International})$$

$$0.706 = 5 * 0.167 * (1 – 0.153)$$

1		**Market Determination**		**Weighting**
		What percentage of the log supply within the country is attributed to international markets?		
		15.3%	*International market leakage discount (value used to discount national level assessment scores)*	
2		**Market Equilibrium**		
		How long until the project effects the national market equilibrium? (refer to GFPM model)		
		47	*years (from tab 2)*	0.167
		1		**0.167**
		Score Criteria: <20 years = 9, 20-40 years = 5, >40 years = 1	**scoring based on effects during 40 yr project longevity (VCS Standard Requirements for AFOLU project longevity)*	
3		**Barriers**		
	A	**Distribution Barriers - cost of transportation**		
		No	*Barrier exists at local scale?*	
		1.00	*Score*	
		No	*Barrier exists at regional scale?*	
		5.00	*Score*	
		Yes	*Barrier exists at national scale?*	
		0.00	*Score*	
		6.00	*Sum of barrier scores*	0.167
		5		**0.706**
		Score Criteria: 15 = 9, 6 = 5, 1 = 1		

Figure 18. Example project scoring and application of $LF_{International}$ discount.

The international leakage discount is applied to the remainder of the assessments (3B – 5B) in the same manner.

Maximum Weighted Score and Assessment Score

To calculate the final market leakage factor, the maximum weighted score must be determined. The maximum weighted score is determined by multiplying the maximum potential score for each assessment by the assessment weighting (0.167). For assessments 3 – 5B this must be done by multiplying the maximum potential score for each assessment by the weighting and by the international leakage discount.

For the example project provided within Figure 2, the maximum weighted score would be calculated as follows:

Assessment 2: Maximum Score * Assessment Weighting

9 * 0.167 = 1.5

Assessments 3 – 5B: Maximum Score * Assessment Weighting * (1 - $LF_{International}$)

9 * 0.167 * (1 – 0.15) = 1.3

Total maximum weighted score (for example) =

Assessment 2 Maximum Weighted Score + Assessment 3 – 5B Maximum Weighted Score

1.5 + (1.3 * 5) = 8

The Assessment Score of the entire assessment is calculated by summing together the weighted scores, dividing by the sum of the maximum weighted scores, and multiplying by 100 to present the Assessment Score as a percent.

Market Leakage Factor

The market leakage factor scoring matrix (Table 1) was generated by completing an analysis of all possible scoring combination outcomes (excluding international leakage discounts). For the 6 assessments, weighted equally, that could receive a score of either 1, 5, or 9 produces 730 total possible outcomes. For each individual outcome, the scores were summed, and the results were filtered to present unique values only. Those unique values were then divided by the highest possible score (6 * 9 = 54) to present each unique possible outcome as a percentage. The possible outcome percentages were then divided evenly into 5 categories to correspond to the resulting market leakage factors.

To determine the market leakage factor, the Assessment Score is compared to the Market Leakage Factor Scoring Matrix.

Table 26 Market Leakage Factor Scoring Matrix

Market Leakage Factor	Assessment Score (maximum value)
5%	19%
10%	33%
20%	48%
40%	63%

70%	100%

Conclusion

MARketz Tool utilizes publicly available and verifiable data that results in increased accuracy and quantification of market leakage compared to the options currently made available within the applicable methodology and the VCS Standard. This tool is presented as a methodology deviation and has been utilized to assess the project presented within this PD/MR. This methodology deviation is not intended to be precedent setting.

References:

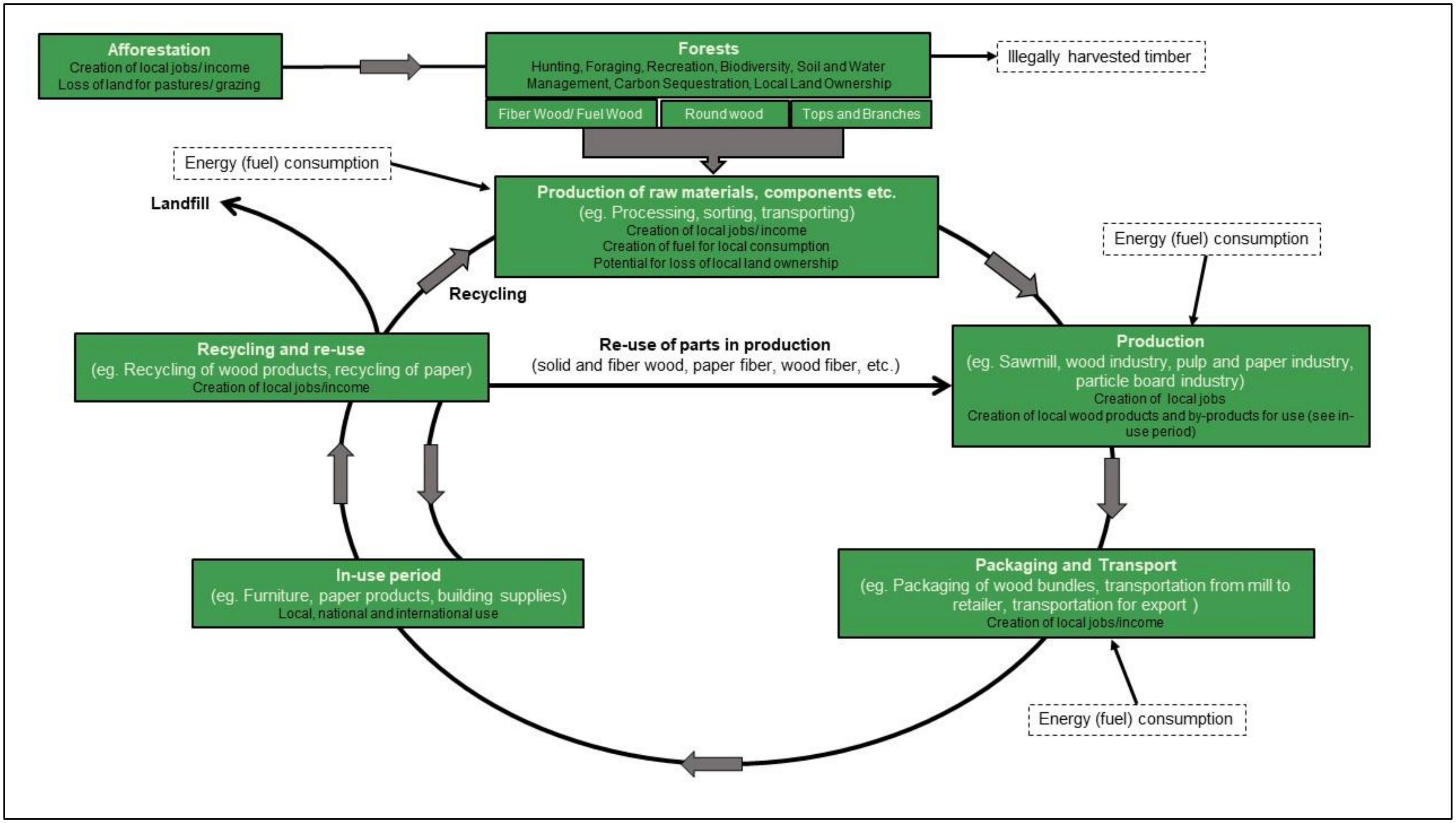
Buongiorno, J., S. Zhu, D. Zhang, J.A. Turner, and J. Tomberlin. 2003. The Global Forest Products Model: Structure, Estimation and Applications. Academic Press, San Diego. 301 pp.

Buongiorno, J., S. Zhu. 2020. Calibrating and updating the Global Forest Products Model GFPM version 2020 (with BPMPD and base year 2020).

Ministry of Environment and Climate Change Strategy. 2022. British Columbia Greenhouse Gas Offset Protocol: Forest Carbon – DRAFT. Appendix D: The Provincial Default Values for Addressing Leakage From Forest Carbon Projects.

3GreenTree, Ecosystem Restoration Associates. 2013. VM0012 Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2. Verra, Washington D.C.

APPENDIX 11 – LIFE CYCLE ANALYSIS FOR AFOLU IFM PROJECTS



APPENDIX 12 – RESULTING VALUES

Year	Time Step	Delta Total Ecosystem (BSL) tC	HWP (BSL) tC (Eq 19)	Emissions (BSL) tC (Eq 24)	Total BSL Emissions (tC)	Quantified net GHG emission reductions or removals tCO2e	Delta Total Ecosystem (PRJ) tC	HWP (PRJ) tC (Eq 19)	Emissions (PRJ) tC (Eq 24)	Total PRJ Emissions (tC)	Quantified project emissions or removals tCO2e	ERy,gross (Eq 57)	Ley (Eq 56b)	ERy (Eq 58) 'Net GHG emission reductions or removals (tCO2e)'	ERy -Uncert	Buffer Pool Allocation	VCUy (Eq 59)
January 1, 2020 - July 31, 2020	0	-	-	-	-	-	-	-	-	-	-						
August 1, 2020 - December 31, 2020	1	-2,766	-	231	-2,997	-10,990	1,229	-	19	1,210	4,438	15,428	1,543	13,885	13,677	1,527	12,150
January 1, 2021 - December 31, 2021	2	-4,247	6,643	267	2,129	7,805	-976	-	118	-1,094	-4,012	-11,816	-1,182	-10,635	-10,475	-1,170	-9,305
January 1, 2022 - December 31, 2022	3	-1,711	-11,808	112	-13,630	-49,978	1,074	3,110	-	4,184	15,343	65,321	6,532	58,789	57,907	6,467	51,440
January 1, 2023 - December 31, 2023	4	-1,835	698	111	-1,249	-4,579	1,101	-9,330	-	-8,229	-30,173	-25,594	-2,559	-23,034	-22,689	-2,534	-20,155
January 1, 2024 - December 31, 2024	5	-2,017	15	112	-2,114	-7,750	1,077	-	-	1,077	3,950	11,699	1,170	10,529	10,371	1,158	9,213
January 1, 2025 - December 31, 2025	6	-2,206	-17	111	-2,334	-8,560	1,030	-	-	1,030	3,777	12,336	1,234	11,102	10,936	1,221	9,715
January 1, 2026 - December 31, 2026	7	-2,499	145	114	-2,468	-9,048	930	-	-	930	3,411	12,459	1,246	11,213	11,045	1,233	9,812
January 1, 2027 - December 31, 2027	8	-2,523	-1,417	107	-4,047	-14,839	865	-	-	865	3,173	18,012	1,801	16,211	15,968	1,783	14,184
January 1, 2028 - December 31, 2028	9	-2,524	522	102	-2,104	-7,714	865	-	-	865	3,171	10,885	1,088	9,796	9,649	1,078	8,572
January 1, 2029 - December 31, 2029	10	-2,532	-430	96	-3,059	-11,215	825	-	-	825	3,026	14,241	1,424	12,817	12,625	1,410	11,215
January 1, 2030 - December 31, 2030	11	-2,651	10	96	-2,738	-10,038	772	-	-	772	2,832	12,869	1,287	11,583	11,409	1,274	10,135
January 1, 2031 - December 31, 2031	12	-2,029	-2,794	60	-4,883	-17,905	689	-	-	689	2,526	20,431	2,043	18,388	18,112	2,023	16,089
January 1, 2032 - December 31, 2032	13	-1,960	-446	55	-2,461	-9,023	622	-	-	622	2,279	11,302	1,130	10,171	10,019	1,119	8,900
January 1, 2033 - December 31, 2033	14	-1,938	-196	55	-2,189	-8,026	618	-	-	618	2,267	10,293	1,029	9,264	9,125	1,019	8,106
January 1, 2034 - December 31, 2034	15	-1,542	-1,240	37	-2,819	-10,336	593	-	-	593	2,174	12,511	1,251	11,260	11,091	1,239	9,852
January 1, 2035 - December 31, 2035	16	-1,403	-482	31	-1,916	-7,025	549	-	-	549	2,012	9,037	904	8,133	8,011	895	7,116
January 1, 2036 - December 31, 2036	17	-930	-1,651	11	-2,592	-9,505	494	-	-	494	1,811	11,316	1,132	10,184	10,031	1,120	8,911
January 1, 2037 - December 31, 2037	18	-832	0	11	-843	-3,091	468	-	-	468	1,716	4,808	481	4,327	4,262	476	3,786
January 1, 2038 - December 31, 2038	19	-724	1	11	-733	-2,688	463	-	-	463	1,699	4,387	439	3,949	3,889	434	3,455
January 1, 2039 - December 31, 2039	20	-643	-6	11	-660	-2,419	445	-	-	445	1,631	4,050	405	3,645	3,590	401	3,189
January 1, 2040 - December 31, 2040	21	-2,527	7,909	111	5,271	19,327	428	-	-	428	1,569	-17,757	-1,776	-15,982	-15,742	-	-15,742
January 1, 2041 - December 31, 2041	22	-2,702	-910	110	-3,723	-13,651	385	-	-	385	1,411	15,062	1,506	13,556	13,352	1,491	11,861
January 1, 2042 - December 31, 2042	23	-2,753	203	107	-2,656	-9,739	366	-	-	366	1,344	11,082	1,108	9,974	9,824	1,097	8,727
January 1, 2043 - December 31, 2043	24	-2,884	386	106	-2,604	-9,547	363	-	-	363	1,331	10,878	1,088	9,790	9,643	1,077	8,566
January 1, 2044 - December 31, 2044	25	-3,014	10	106	-3,110	-11,405	348	-	-	348	1,275	12,680	1,268	11,412	11,241	1,255	9,986
January 1, 2045 - December 31, 2045	26	-3,040	-955	101	-4,096	-15,020	334	-	-	334	1,225	16,245	1,624	14,620	14,401	1,608	12,793
January 1, 2046 - December 31, 2046	27	-3,107	9	100	-3,199	-11,728	324	-	-	324	1,189	12,917	1,292	11,625	11,451	1,279	10,172
January 1, 2047 - December 31, 2047	28	-3,207	211	100	-3,095	-11,348	312	-	-	312	1,143	12,491	1,249	11,242	11,073	1,237	9,836
January 1, 2048 - December 31, 2048	29	-3,225	-89	96	-3,410	-12,502	309	-	-	309	1,134	13,636	1,364	12,273	12,088	1,350	10,739
January 1, 2049 - December 31, 2049	30	-2,709	-2,261	66	-5,035	-18,463	297	-	-	297	1,087	19,551	1,955	17,596	17,332	1,936	15,396
January 1, 2050 - July 31, 2050	31	-2,515	-	802	-3,318	-12,165	288	-	-	288	1,055	13,219	1,322	11,897	11,719	1,309	10,410
						-303,163					40,815	**343,978**	**34,398**	**309,580**	**304,937**	**34,054**	**269,125**

APPENDIX 13 – CBM-CFS3 INVENTORY SUMMARY

Static Inventory Data

Static inventory data is information that is held constant for all simulations that exist in the project.

Classifier Name	Classifier Value Names
SpeciesGroup =	{?,S,B,O}
Administration Unit =	{?,Barbu,Barbu39_,Const,Corna,Hodoba,Manesti,Nitescu,Popescu,Valea Tisei}
UP =	{?,1,V}
UA1 =	{?,1,2,3,4,5,6,7,8,9,10,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,36,38,39,40,41,64,65,84,98,99,100,106,107,108,109,110,114,119,122,127,128,129,130,131,135,136,137,138,139,140,184}
UA2 =	{?,A,B,C,D,E,F,G,H,I,J,K,L,M}
AU Group =	{?,B2M,B2U,B3M,B3U,B4M,B4U,O2M,O2U,O3M,O3U,O4M,O4U,S3M,S3U}
Cutting Type =	{?,46,46A,46B,46C,46D,48,48A,48B,48C,48D,P0,TC}
Yield Curve AU =	{?,B3U,B3M,O3U,O3M,S3U,S3M}

Administrative boundaries, Ecological boundaries, Spatial units and Spatial unit groups

Administrative Boundary: Romania (mapped to default administrative boundary Romania)
Ecological Boundary: CLU35 (mapped to default ecological boundary CLU35)
Spatial Unit: 1 (Intersection of Romania, CLU35)
Spatial Unit Group: SPU Group 1, contains {1,}

Inventory Records

Inventory Description	Age	Area
B,Barbu,V,1,B,B3U,48,B3U	34	0.07
B,Barbu,V,1,B,B3U,48,B3U	54	0.14
B,Barbu,V,1,B,B3U,48,B3U	54	0.27
B,Barbu,V,1,B,B3U,48,B3U	54	0.14
B,Barbu,V,1,B,B3U,48,B3U	54	0.07
B,Barbu,V,1,F,B3U,48,B3U	29	0.13
B,Barbu,V,1,F,B3U,48,B3U	34	0.66
B,Barbu,V,1,F,B3U,48,B3U	19	0.53
B,Barbu,V,1,G,B3U,48,B3U	29	0.27
B,Barbu,V,1,G,B3U,48,B3U	34	1.33
B,Barbu,V,1,G,B3U,48,B3U	19	1.06
O,Barbu,V,1,D,O3M,48,O3M	54	1.27
O,Barbu,V,1,D,O3M,48,O3M	54	0.95
O,Barbu,V,1,D,O3M,48,O3M	54	0.63
O,Barbu,V,1,D,O3M,48,O3M	54	0.32
O,Barbu,V,1,E,O3M,48,O3M	24	0.25
O,Barbu,V,1,E,O3M,48,O3M	24	0.08
O,Barbu,V,1,E,O3M,48,O3M	24	0.08
S,Barbu,V,1,A,S3M,48,S3M	49	3.11
S,Barbu,V,1,A,S3M,48,S3M	54	0.62
S,Barbu,V,1,A,S3M,48,S3M	54	1.87

S,Barbu,V,1,A,S3M,48,S3M	44	0.62
B,Const,1,106,A,B3U,48,B3U	79	1.8
B,Const,1,106,A,B3U,48,B3U	79	1.08
B,Const,1,106,A,B3U,48,B3U	79	0.72
B,Manesti,1,64,A,B3U,48,B3U	81	1.74
B,Manesti,1,64,A,B3U,48,B3U	81	2.9
B,Manesti,1,64,A,B3U,48,B3U	81	1.16
B,Barbu,V,1,C,B4U,TC,B3U	29	5.23
S,Barbu,V,2,A,S3M,48,S3M	49	2.48
S,Barbu,V,2,A,S3M,48,S3M	54	4.96
S,Barbu,V,2,A,S3M,48,S3M	54	2.48
O,Const,1,108,C,O2U,48,O3U	54	0.63
O,Const,1,108,C,O2U,48,O3U	49	0.07
S,Barbu,V,2,A,S3M,48,S3M	54	2.48
B,Barbu,V,3,G,B3U,48,B3U	64	0.09
B,Barbu,V,3,G,B3U,48,B3U	64	0.03
B,Barbu,V,3,G,B3U,48,B3U	64	0.02
B,Barbu,V,3,G,B3U,48,B3U	64	0.02
O,Barbu,V,3,C,O3U,48,O3U	49	4.59
O,Barbu,V,3,C,O3U,48,O3U	39	0.66
O,Barbu,V,3,C,O3U,48,O3U	39	0.66
O,Barbu,V,3,C,O3U,48,O3U	49	0.66
O,Barbu,V,3,F,O4U,48,O3U	64	0.36
O,Barbu,V,3,A,O3M,48,O3M	64	4.17
O,Barbu,V,3,A,O3M,48,O3M	64	3.13
O,Barbu,V,3,A,O3M,48,O3M	64	3.13
O,Barbu,V,3,D,O4M,48,O3M	64	1.79
O,Barbu,V,3,D,O4M,48,O3M	84	0.77
B,Barbu,V,3,B,B3M,P0,B3M	64	8.83
B,Barbu,V,3,E,B4U,TC,B3U	69	1.55
B,Barbu,V,3,E,B4U,TC,B3U	69	0.39
O,Barbu,V,4,B,O3U,48,O3U	74	2.82
B,Barbu,V,4,D,B3M,48,B3M	64	1.08
B,Barbu,V,4,D,B3M,48,B3M	64	0.54
B,Barbu,V,4,D,B3M,48,B3M	64	1.08
O,Barbu,V,4,C,O3M,48,O3M	74	6.17
O,Barbu,V,4,C,O3M,48,O3M	74	3.09
O,Barbu,V,4,C,O3M,48,O3M	54	1.03
S,Barbu,V,4,A,S3M,48,S3M	49	7.5
S,Barbu,V,4,A,S3M,48,S3M	49	7.5
S,Barbu,V,4,A,S3M,48,S3M	49	1.88
S,Barbu,V,4,A,S3M,48,S3M	49	1.88
B,Barbu,V,4,E,B4U,TC,B3U	69	1.81
B,Barbu,V,4,E,B4U,TC,B3U	69	0.45
O,Barbu,V,5,A,O3U,48,O3U	74	6.68
O,Barbu,V,5,A,O3U,48,O3U	74	4.01
O,Barbu,V,5,A,O3U,48,O3U	74	2.67
B,Barbu,V,5,B,B4U,TC,B3U	74	0.59
B,Barbu,V,5,B,B4U,TC,B3U	74	0.25
B,Barbu,V,6,B,B3U,48,B3U	64	0.38

B,Barbu,V,6,B,B3U,48,B3U	64	0.23
B,Barbu,V,6,B,B3U,48,B3U	64	0.15
B,Barbu,V,6,D,B3U,48,B3U	39	0.87
B,Barbu,V,6,D,B3U,48,B3U	39	0.12
B,Barbu,V,6,D,B3U,48,B3U	39	0.25
O,Barbu,V,6,F,O3U,48,O3U	74	2.72
O,Barbu,V,6,F,O3U,48,O3U	74	0.78
O,Barbu,V,6,F,O3U,48,O3U	74	0.39
O,Barbu,V,6,A,O3M,48,O3M	74	8.91
O,Barbu,V,6,A,O3M,48,O3M	74	14.86
O,Barbu,V,6,A,O3M,48,O3M	74	5.94
O,Barbu,V,6,C,O3M,48,O3M	59	0.4
O,Barbu,V,6,C,O3M,48,O3M	59	0.05
O,Barbu,V,6,C,O3M,48,O3M	44	0.05
O,Barbu,V,6,H,O3M,48,O3M	74	2.08
O,Barbu,V,6,H,O3M,48,O3M	74	0.89
B,Barbu,V,6,G,B4U,TC,B3U	74	0.77
B,Barbu,V,6,G,B4U,TC,B3U	74	0.51
O,Barbu,V,7,D,O3U,48,O3U	154	0.37
O,Barbu,V,7,D,O3U,48,O3U	74	1.1
O,Barbu,V,7,D,O3U,48,O3U	84	0.74
O,Barbu,V,7,D,O3U,48,O3U	74	1.47
O,Const,1,107,C,O3U,48,O3U	74	9.27
O,Const,1,107,C,O3U,48,O3U	54	1.03
O,Const,1,108,A,O3U,48,O3U	59	0.9
O,Const,1,109,B,O3U,48,O3U	79	3.29
O,Const,1,109,B,O3U,48,O3U	54	1.41
O,Const,1,110,C,O3U,48,O3U	79	2.08
O,Const,1,110,C,O3U,48,O3U	59	0.52
O,Manesti,1,38,D,O3U,48,O3U	56	0.36
O,Manesti,1,38,D,O3U,48,O3U	36	0.12
O,Manesti,1,38,D,O3U,48,O3U	46	0.06
O,Manesti,1,38,D,O3U,48,O3U	56	0.06
O,Manesti,1,39,G,O3U,48,O3U	51	0.6
O,Manesti,1,39,G,O3U,48,O3U	51	0.48
O,Manesti,1,39,G,O3U,48,O3U	51	0.12
O,Manesti,1,127,C,O3U,48,O3U	76	0.8
O,Manesti,1,127,C,O3U,48,O3U	76	0.2
O,Manesti,1,130,C,O3U,48,O3U	81	4.69
O,Manesti,1,130,C,O3U,48,O3U	81	2.01
O,Barbu,V,7,B,O2M,48,O3M	74	2.06
O,Barbu,V,7,B,O2M,48,O3M	74	1.64
O,Barbu,V,7,B,O2M,48,O3M	74	0.41
O,Barbu,V,7,A,O3M,48,O3M	74	4.24
S,Const,1,107,A,S3U,48,S3U	44	0.2
S,Const,1,108,F,S3U,48,S3U	44	0.24
S,Const,1,108,F,S3U,48,S3U	34	0.16
S,Const,1,108,I,S3U,48,S3U	44	0.2
B,Valea Tisei,1,28,A,B2U,48,B3U	83	9.59
B,Valea Tisei,1,28,A,B2U,48,B3U	83	1.37

B,Valea Tisei,1,28,A,B2U,48,B3U	83	1.37
B,Valea Tisei,1,28,A,B2U,48,B3U	123	1.37
B,Valea Tisei,1,1,B,B3U,48,B3U	53	2.53
B,Valea Tisei,1,1,B,B3U,48,B3U	53	2.17
B,Valea Tisei,1,6,C,B3U,48,B3U	118	3.02
B,Valea Tisei,1,6,C,B3U,48,B3U	78	11.67
B,Valea Tisei,1,6,C,B3U,48,B3U	78	1.51
B,Valea Tisei,1,6,C,B3U,48,B3U	78	1.51
B,Valea Tisei,1,17,A,B3U,48,B3U	73	7.05
B,Valea Tisei,1,17,A,B3U,48,B3U	73	2.82
B,Valea Tisei,1,17,A,B3U,48,B3U	73	1.41
B,Valea Tisei,1,17,A,B3U,48,B3U	73	2.82
B,Valea Tisei,1,20,A,B3U,48,B3U	83	4.9
B,Valea Tisei,1,20,A,B3U,48,B3U	83	0.7
B,Valea Tisei,1,20,A,B3U,48,B3U	83	0.7
B,Valea Tisei,1,20,A,B3U,48,B3U	83	0.7
B,Valea Tisei,1,30,A,B3U,48,B3U	83	4.4
B,Valea Tisei,1,30,A,B3U,48,B3U	83	0.55
B,Valea Tisei,1,30,A,B3U,48,B3U	83	0.55
O,Valea Tisei,1,6,A,O3U,48,O3U	78	4.2
O,Valea Tisei,1,6,A,O3U,48,O3U	78	4.2
O,Valea Tisei,1,6,A,O3U,48,O3U	78	4.2
O,Valea Tisei,1,6,A,O3U,48,O3U	78	1.4
O,Valea Tisei,1,21,A,O3U,48,O3U	83	0.04
O,Valea Tisei,1,21,A,O3U,48,O3U	83	0.16
B,Manesti,1,129,C,B3U,48,B3U	16	0.52
B,Manesti,1,129,C,B3U,48,B3U	16	0.78
O,Barbu,V,7,A,O3M,48,O3M	74	2.12
O,Barbu,V,7,A,O3M,48,O3M	54	0.71
B,Barbu,V,7,C,B3U,TC,B3U	74	1.13
O,Const,1,108,E,O3U,48,O3U	19	1.68
O,Const,1,108,E,O3U,48,O3U	19	0.42
O,Const,1,108,L,O3U,48,O3U	19	0.24
O,Const,1,108,L,O3U,48,O3U	19	0.06
O,Manesti,1,129,B,O3U,48,O3U	21	0.84
O,Manesti,1,129,B,O3U,48,O3U	21	0.28
O,Manesti,1,129,B,O3U,48,O3U	21	0.14
O,Manesti,1,129,B,O3U,48,O3U	21	0.14
O,Valea Tisei,1,26,C,O3U,48,O3U	18	1.08
O,Valea Tisei,1,26,C,O3U,48,O3U	18	0.36
O,Valea Tisei,1,26,C,O3U,48,O3U	18	0.36
B,Barbu,V,7,C,B3U,TC,B3U	74	0.19
B,Barbu,V,7,C,B3U,TC,B3U	74	0.56
O,Barbu,V,8,B,O3M,48,O3M	74	7.07
O,Barbu,V,8,B,O3M,48,O3M	74	3.54
O,Barbu,V,8,B,O3M,48,O3M	74	5.3
O,Barbu,V,8,B,O3M,48,O3M	74	1.77
O,Barbu,V,8,A,O3M,48,O3M	74	1.67
O,Barbu,V,8,C,O3M,P0,O3M	74	1.25
O,Barbu,V,8,C,O3M,P0,O3M	74	1

O,Barbu,V,8,C,O3M,P0,O3M	74	0.25
O,Barbu,V,9,A,O3U,48,O3U	74	4
O,Barbu,V,9,A,O3U,48,O3U	74	4
O,Barbu,V,9,A,O3U,48,O3U	134	1
O,Barbu,V,9,A,O3U,48,O3U	54	1
O,Barbu,V,9,D,O3U,48,O3U	74	1.29
B,Const,1,107,F,B3M,48,B3M	19	1.3
B,Const,1,108,D,B3M,48,B3M	69	4.96
B,Const,1,108,D,B3M,48,B3M	69	4.96
B,Const,1,108,D,B3M,48,B3M	69	2.48
B,Manesti,1,38,A,B3M,48,B3M	51	1.04
B,Manesti,1,38,A,B3M,48,B3M	51	0.13
B,Manesti,1,38,A,B3M,48,B3M	51	0.13
B,Manesti,1,38,B,B3M,48,B3M	51	4.2
B,Manesti,1,38,B,B3M,48,B3M	51	3.36
B,Manesti,1,38,B,B3M,48,B3M	51	0.84
B,Manesti,1,39,A,B3M,48,B3M	66	3.48
B,Manesti,1,39,A,B3M,48,B3M	116	2.32
B,Manesti,1,39,C,B3M,48,B3M	46	1.36
B,Manesti,1,39,C,B3M,48,B3M	46	1.36
B,Manesti,1,39,C,B3M,48,B3M	46	0.68
B,Manesti,1,39,D,B3M,48,B3M	51	0.64
B,Manesti,1,39,D,B3M,48,B3M	51	0.16
B,Manesti,1,40,A,B3M,48,B3M	46	0.6
B,Manesti,1,40,A,B3M,48,B3M	46	0.2
B,Manesti,1,40,A,B3M,48,B3M	46	0.2
B,Manesti,1,40,B,B3M,48,B3M	46	4.84
B,Manesti,1,40,B,B3M,48,B3M	46	2.42
B,Manesti,1,40,B,B3M,48,B3M	46	4.84
B,Manesti,1,41,A,B3M,48,B3M	46	1.08
B,Manesti,1,41,A,B3M,48,B3M	46	0.54
B,Manesti,1,41,A,B3M,48,B3M	46	0.18
B,Manesti,1,41,B,B3M,48,B3M	46	4.28
B,Manesti,1,41,B,B3M,48,B3M	46	3.21
B,Manesti,1,41,B,B3M,48,B3M	46	3.21
B,Manesti,1,127,A,B3M,48,B3M	56	3.54
B,Manesti,1,127,A,B3M,48,B3M	76	1.18
B,Manesti,1,127,A,B3M,48,B3M	56	0.59
B,Manesti,1,127,A,B3M,48,B3M	56	0.59
B,Manesti,1,130,A,B3M,48,B3M	66	1.38
B,Manesti,1,130,A,B3M,48,B3M	66	0.46
B,Manesti,1,130,A,B3M,48,B3M	106	0.46
O,Barbu,V,9,D,O3U,48,O3U	74	0.97
O,Barbu,V,9,D,O3U,48,O3U	74	0.97
B,Barbu,V,9,E,B3M,48,B3M	19	0.65
B,Barbu,V,9,E,B3M,48,B3M	19	0.43
O,Barbu,V,10,B,O2M,48,O3M	44	6.96
O,Barbu,V,10,B,O2M,48,O3M	44	4.17
O,Barbu,V,10,B,O2M,48,O3M	44	2.78
S,Barbu,V,10,A,S3M,48,S3M	39	1.56

S,Barbu,V,10,A,S3M,48,S3M	34	3.13
S,Barbu,V,10,A,S3M,48,S3M	34	1.56
S,Barbu,V,10,A,S3M,48,S3M	34	0.78
S,Barbu,V,10,A,S3M,48,S3M	34	0.78
B,Barbu,V,19,D,B4U,48,B3U	24	0.2
O,Barbu,V,19,F,O3U,48,O3U	74	0.38
O,Barbu,V,19,F,O3U,48,O3U	74	0.38
O,Barbu,V,19,F,O3U,48,O3U	74	0.38
O,Barbu,V,19,F,O3U,48,O3U	74	0.38
O,Barbu,V,19,F,O3U,48,O3U	74	0.19
O,Barbu,V,19,F,O3U,48,O3U	74	0.19
O,Barbu,V,19,C,O2M,48,O3M	59	2.76
O,Barbu,V,19,C,O2M,48,O3M	59	0.69
O,Barbu,V,19,A,O3M,48,O3M	74	9.98
O,Barbu,V,19,A,O3M,48,O3M	74	2.5
O,Barbu,V,19,E,O3M,48,O3M	74	1.68
O,Barbu,V,19,E,O3M,48,O3M	74	0.84
O,Barbu,V,19,E,O3M,48,O3M	74	0.28
O,Barbu,V,19,B,O3M,P0,O3M	74	0.48
O,Barbu,V,19,B,O3M,P0,O3M	74	0.07
O,Barbu,V,19,B,O3M,P0,O3M	74	0.07
O,Barbu,V,19,B,O3M,P0,O3M	74	0.07
O,Barbu,V,20,B,O3U,48,O3U	74	0.63
O,Barbu,V,20,B,O3U,48,O3U	54	0.07
O,Barbu,V,20,C,O3U,48,O3U	74	1.47
B,Barbu,V,20,A,B3M,48,B3M	74	6
B,Barbu,V,20,A,B3M,48,B3M	74	3
B,Barbu,V,20,A,B3M,48,B3M	74	1
O,Barbu,V,21,A,O3M,48,O3M	79	5.23
O,Barbu,V,21,A,O3M,48,O3M	79	5.23
O,Barbu,V,21,A,O3M,48,O3M	69	5.23
O,Barbu,V,21,A,O3M,48,O3M	69	1.74
O,Barbu,V,22,B,O3U,48,O3U	59	0.29
O,Barbu,V,22,C,O3U,48,O3U	29	0.32
O,Barbu,V,22,C,O3U,48,O3U	29	0.16
O,Barbu,V,22,C,O3U,48,O3U	24	0.16
O,Barbu,V,22,C,O3U,48,O3U	24	0.16
O,Barbu,V,22,C,O3U,48,O3U	29	0.32
O,Barbu,V,22,C,O3U,48,O3U	29	0.16
O,Barbu,V,22,C,O3U,48,O3U	24	0.16
O,Barbu,V,22,C,O3U,48,O3U	24	0.16
O,Barbu,V,22,E,O3U,48,O3U	69	0.17
O,Barbu,V,22,E,O3U,48,O3U	69	0.5
O,Barbu,V,22,E,O3U,48,O3U	69	0.17
B,Barbu,V,22,G,B2M,48,B3M	24	0.13
O,Barbu,V,22,A,O3M,48,O3M	74	6.03
O,Barbu,V,22,D,O3M,48,O3M	74	2.02
O,Barbu,V,22,D,O3M,48,O3M	64	3.04
O,Barbu,V,22,F,O3M,48,O3M	74	9.69
O,Barbu,V,22,F,O3M,48,O3M	54	3.23

O,Barbu,V,22,F,O3M,48,O3M	44	1.62
O,Barbu,V,22,F,O3M,48,O3M	24	1.62
O,Barbu,V,23,B,O3U,48,O3U	59	1.68
O,Barbu,V,23,B,O3U,48,O3U	59	0.19
O,Const,1,107,B,O3M,48,O3M	44	21.8
O,Const,1,107,B,O3M,48,O3M	44	8.72
O,Const,1,107,B,O3M,48,O3M	44	8.72
O,Const,1,107,B,O3M,48,O3M	44	4.36
O,Const,1,107,D,O3M,48,O3M	59	0.77
O,Const,1,107,D,O3M,48,O3M	59	0.11
O,Const,1,107,D,O3M,48,O3M	54	0.22
O,Const,1,107,E,O3M,48,O3M	59	0.88
O,Const,1,107,E,O3M,48,O3M	59	0.22
O,Const,1,108,G,O3M,48,O3M	59	0.3
O,Const,1,108,J,O3M,48,O3M	69	8.46
O,Const,1,108,J,O3M,48,O3M	54	0.94
O,Const,1,108,K,O3M,48,O3M	39	10.78
O,Const,1,108,K,O3M,48,O3M	39	3.08
O,Const,1,108,K,O3M,48,O3M	39	1.54
O,Const,1,109,A,O3M,48,O3M	34	8.22
O,Const,1,109,A,O3M,48,O3M	34	5.48
O,Const,1,110,A,O3M,48,O3M	44	9.73
O,Const,1,110,A,O3M,48,O3M	44	2.78
O,Const,1,110,A,O3M,48,O3M	44	1.39
O,Const,1,110,B,O3M,48,O3M	39	1.68
O,Const,1,110,B,O3M,48,O3M	39	1.12
O,Manesti,1,38,C,O3M,48,O3M	51	4.23
O,Manesti,1,38,C,O3M,48,O3M	51	0.47
O,Manesti,1,38,E,O3M,48,O3M	56	3.42
O,Manesti,1,38,E,O3M,48,O3M	101	0.57
O,Manesti,1,38,E,O3M,48,O3M	51	1.14
O,Manesti,1,38,E,O3M,48,O3M	56	0.57
O,Manesti,1,39,B,O3M,48,O3M	56	2.66
O,Manesti,1,39,B,O3M,48,O3M	56	0.38
O,Manesti,1,39,B,O3M,48,O3M	56	0.76
O,Manesti,1,39,E,O3M,48,O3M	36	2.67
O,Manesti,1,39,E,O3M,48,O3M	36	2.67
O,Manesti,1,39,E,O3M,48,O3M	36	3.56
O,Manesti,1,39,F,O3M,48,O3M	51	6.4
O,Manesti,1,39,F,O3M,48,O3M	51	0.8
O,Manesti,1,39,F,O3M,48,O3M	51	0.8
O,Manesti,1,40,C,O3M,48,O3M	46	1.76
O,Manesti,1,40,C,O3M,48,O3M	46	0.22
O,Manesti,1,40,C,O3M,48,O3M	46	0.22
O,Manesti,1,40,D,O3M,48,O3M	46	6
O,Manesti,1,40,D,O3M,48,O3M	46	3
O,Manesti,1,40,D,O3M,48,O3M	46	1
O,Manesti,1,40,E,O3M,48,O3M	46	0.32
O,Manesti,1,40,E,O3M,48,O3M	46	0.08
O,Manesti,1,41,C,O3M,48,O3M	41	2

O,Manesti,1,41,C,O3M,48,O3M	46	0.5
O,Manesti,1,41,D,O3M,48,O3M	46	1.1
O,Manesti,1,41,D,O3M,48,O3M	46	0.44
O,Manesti,1,41,D,O3M,48,O3M	46	0.66
O,Manesti,1,41,F,O3M,48,O3M	46	1.19
O,Manesti,1,41,F,O3M,48,O3M	46	0.34
O,Manesti,1,41,F,O3M,48,O3M	46	0.17
O,Manesti,1,127,B,O3M,48,O3M	61	0.9
O,Manesti,1,127,B,O3M,48,O3M	101	0.36
O,Manesti,1,127,B,O3M,48,O3M	61	0.36
O,Manesti,1,127,B,O3M,48,O3M	61	0.18
O,Manesti,1,127,D,O3M,48,O3M	76	0.8
O,Manesti,1,127,D,O3M,48,O3M	76	0.2
O,Manesti,1,128,A,O3M,48,O3M	56	9.81
O,Manesti,1,128,A,O3M,48,O3M	56	1.09
O,Manesti,1,129,D,O3M,48,O3M	56	4.32
O,Manesti,1,129,D,O3M,48,O3M	56	1.08
O,Manesti,1,130,B,O3M,48,O3M	61	2.1
O,Manesti,1,130,B,O3M,48,O3M	61	1.26
O,Manesti,1,130,B,O3M,48,O3M	61	0.84
O,Manesti,1,131,A,O3M,48,O3M	61	1.77
O,Manesti,1,131,A,O3M,48,O3M	86	0.59
O,Manesti,1,131,A,O3M,48,O3M	61	1.18
O,Manesti,1,131,A,O3M,48,O3M	61	1.77
O,Manesti,1,131,A,O3M,48,O3M	61	0.59
B,Barbu,V,23,A,B2M,48,B3M	24	0.45
O,Barbu,V,23,C,O3M,48,O3M	74	7.52
O,Barbu,V,23,C,O3M,48,O3M	74	1.25
O,Barbu,V,23,C,O3M,48,O3M	54	3.76
O,Barbu,V,23,D,O3M,P0,O3M	74	0.32
O,Barbu,V,23,D,O3M,P0,O3M	74	0.04
B,Barbu,V,24,E,B3U,48,B3U	64	0.34
B,Barbu,V,24,H,B4U,48,B3U	54	2.31
B,Barbu,V,24,H,B4U,48,B3U	74	0.77
B,Barbu,V,24,H,B4U,48,B3U	74	0.77
O,Barbu,V,24,A,O3U,48,O3U	59	1.47
O,Barbu,V,24,A,O3U,48,O3U	59	0.37
O,Barbu,V,24,B,O3U,48,O3U	44	1.97
O,Barbu,V,24,B,O3U,48,O3U	44	0.33
O,Barbu,V,24,B,O3U,48,O3U	44	0.33
O,Barbu,V,24,B,O3U,48,O3U	44	0.66
O,Barbu,V,24,F,O3U,48,O3U	19	0.38
O,Barbu,V,24,F,O3U,48,O3U	19	0.13
O,Barbu,V,24,F,O3U,48,O3U	19	0.13
O,Barbu,V,24,G,O2M,48,O3M	39	1.08
O,Barbu,V,24,G,O2M,48,O3M	39	0.72
S,Barbu,V,24,C,S3M,48,S3M	44	2.57
S,Barbu,V,24,C,S3M,48,S3M	44	1.1
S,Barbu,V,24,D,S3M,48,S3M	44	4.68
S,Barbu,V,24,D,S3M,48,S3M	44	3.51

S,Barbu,V,24,D,S3M,48,S3M	44	1.17
S,Barbu,V,24,D,S3M,48,S3M	44	1.17
S,Barbu,V,24,D,S3M,48,S3M	44	1.17
O,Barbu,V,25,C,O3U,48,O3U	74	1.79
O,Barbu,V,25,C,O3U,48,O3U	54	0.77
S,Barbu,V,25,A,S3U,48,S3U	39	0.64
S,Barbu,V,25,A,S3U,48,S3U	34	0.64
S,Barbu,V,25,A,S3U,48,S3U	34	0.32
S,Barbu,V,25,B,S3M,48,S3M	39	11.81
S,Barbu,V,25,B,S3M,48,S3M	34	11.81
S,Const,1,107,G,S3M,48,S3M	44	1.26
S,Const,1,107,G,S3M,48,S3M	39	0.63
S,Const,1,107,G,S3M,48,S3M	39	0.21
S,Manesti,1,128,B,S3M,48,S3M	51	1.7
S,Manesti,1,129,A,S3M,48,S3M	51	10.4
B,Valea Tisei,1,7,B,B2M,48,B3M	73	10.3
B,Valea Tisei,1,27,B,B2M,48,B3M	93	3.96
B,Valea Tisei,1,27,B,B2M,48,B3M	63	11.88
B,Valea Tisei,1,27,B,B2M,48,B3M	83	1.98
B,Valea Tisei,1,27,B,B2M,48,B3M	83	1.98
B,Valea Tisei,1,29,A,B2M,48,B3M	93	8.01
B,Valea Tisei,1,29,A,B2M,48,B3M	93	2.67
B,Valea Tisei,1,29,A,B2M,48,B3M	63	13.35
B,Valea Tisei,1,29,A,B2M,48,B3M	63	2.67
B,Valea Tisei,1,1,C,B3M,48,B3M	23	0.48
B,Valea Tisei,1,1,C,B3M,48,B3M	23	2.4
B,Valea Tisei,1,1,C,B3M,48,B3M	23	0.72
B,Valea Tisei,1,6,B,B3M,48,B3M	103	0.21
B,Valea Tisei,1,6,B,B3M,48,B3M	43	1.47
B,Valea Tisei,1,6,B,B3M,48,B3M	43	0.21
B,Valea Tisei,1,6,B,B3M,48,B3M	43	0.21
B,Valea Tisei,1,16,A,B3M,48,B3M	78	0.9
B,Valea Tisei,1,16,D,B3M,48,B3M	38	1.21
B,Valea Tisei,1,16,D,B3M,48,B3M	38	7.26
B,Valea Tisei,1,16,D,B3M,48,B3M	38	2.42
B,Valea Tisei,1,16,D,B3M,48,B3M	38	1.21
B,Valea Tisei,1,17,B,B3M,48,B3M	73	1.28
B,Valea Tisei,1,17,B,B3M,48,B3M	73	1.28
B,Valea Tisei,1,17,B,B3M,48,B3M	73	0.32
B,Valea Tisei,1,17,B,B3M,48,B3M	73	0.32
B,Valea Tisei,1,18,A,B3M,48,B3M	113	1.73
B,Valea Tisei,1,18,A,B3M,48,B3M	73	6.92
B,Valea Tisei,1,18,A,B3M,48,B3M	73	6.92
B,Valea Tisei,1,18,A,B3M,48,B3M	73	1.73
B,Valea Tisei,1,19,A,B3M,48,B3M	78	10.05
B,Valea Tisei,1,19,A,B3M,48,B3M	78	4.02
B,Valea Tisei,1,19,A,B3M,48,B3M	78	4.02
B,Valea Tisei,1,19,A,B3M,48,B3M	78	2.01
B,Valea Tisei,1,23,A,B3M,48,B3M	78	2.43
B,Valea Tisei,1,23,A,B3M,48,B3M	78	0.27

B,Valea Tisei,1,27,A,B3M,48,B3M	68	1.74
B,Valea Tisei,1,27,A,B3M,48,B3M	68	1.74
B,Valea Tisei,1,27,A,B3M,48,B3M	68	1.16
B,Valea Tisei,1,27,A,B3M,48,B3M	68	0.58
B,Valea Tisei,1,27,A,B3M,48,B3M	68	0.58
B,Valea Tisei,1,19,B,B4M,48,B3M	78	4.95
B,Valea Tisei,1,19,B,B4M,48,B3M	78	1.98
B,Valea Tisei,1,19,B,B4M,48,B3M	78	0.99
B,Valea Tisei,1,19,B,B4M,48,B3M	78	0.99
B,Valea Tisei,1,19,B,B4M,48,B3M	78	0.99
O,Valea Tisei,1,26,A,O3M,48,O3M	68	3.18
O,Valea Tisei,1,26,A,O3M,48,O3M	68	3.18
O,Valea Tisei,1,26,A,O3M,48,O3M	68	3.18
O,Valea Tisei,1,26,A,O3M,48,O3M	68	1.06
O,Valea Tisei,1,26,B,O3M,48,O3M	68	3.36
O,Valea Tisei,1,26,B,O3M,48,O3M	68	2.52
O,Valea Tisei,1,26,B,O3M,48,O3M	68	1.68
O,Valea Tisei,1,26,B,O3M,48,O3M	68	0.84
S,Valea Tisei,1,14,A,S3M,48,S3M	38	7.38
S,Valea Tisei,1,14,A,S3M,48,S3M	38	0.82
S,Valea Tisei,1,15,B,S3M,48,S3M	38	4.76
S,Valea Tisei,1,15,B,S3M,48,S3M	38	1.36
S,Valea Tisei,1,15,B,S3M,48,S3M	38	0.68
O,Valea Tisei,1,2,C,O3M,48,O3M	43	5.73
O,Valea Tisei,1,2,C,O3M,48,O3M	43	5.73
O,Valea Tisei,1,2,C,O3M,48,O3M	43	3.82
O,Valea Tisei,1,2,C,O3M,48,O3M	43	3.82
O,Valea Tisei,1,5,C,O3M,48,O3M	38	7.02
O,Valea Tisei,1,5,C,O3M,48,O3M	38	0.78
B,Barbu39_,1,184,D,B3U,48,B3U	75	2.04
B,Barbu39_,1,184,D,B3U,48,B3U	75	1.02
B,Barbu39_,1,184,D,B3U,48,B3U	75	1.02
B,Barbu39_,1,184,D,B3U,48,B3U	75	1.02
B,Popescu,1,39,A,B3U,48,B3U	100	0.71
B,Popescu,1,39,A,B3U,48,B3U	70	3.56
B,Popescu,1,39,A,B3U,48,B3U	70	1.42
B,Popescu,1,39,A,B3U,48,B3U	70	0.71
B,Popescu,1,39,A,B3U,48,B3U	70	0.71
B,Popescu,1,84,A,B3U,48,B3U	90	1.72
B,Popescu,1,84,A,B3U,48,B3U	50	1.3
B,Popescu,1,84,A,B3U,48,B3U	50	1.3
O,Hodoba,1,137,A,O2U,48,O3U	100	2.57
O,Hodoba,1,137,A,O2U,48,O3U	80	10.3
O,Hodoba,1,137,A,O2U,48,O3U	80	5.14
O,Hodoba,1,137,A,O2U,48,O3U	60	5.14
O,Hodoba,1,137,A,O2U,48,O3U	60	2.57
O,Popescu,1,38,C,O2U,48,O3U	75	1.74
O,Popescu,1,38,C,O2U,48,O3U	35	0.19
O,Popescu,1,84,D,O2U,48,O3U	90	1.27
O,Popescu,1,84,D,O2U,48,O3U	50	0.63

O,Popescu,1,84,D,O2U,48,O3U	50	0.21
O,Barbu39_,1,114,A,O3U,48,O3U	70	3.53
O,Barbu39_,1,114,A,O3U,48,O3U	70	1.77
O,Barbu39_,1,114,A,O3U,48,O3U	70	0.59
O,Barbu39_,1,184,A,O3U,48,O3U	125	0.87
O,Barbu39_,1,184,A,O3U,48,O3U	95	0.58
O,Barbu39_,1,184,A,O3U,48,O3U	70	0.58
O,Barbu39_,1,184,A,O3U,48,O3U	70	0.87
O,Hodoba,1,135,B,O3U,48,O3U	80	0.16
O,Hodoba,1,135,B,O3U,48,O3U	80	0.24
O,Popescu,1,38,A,O3U,48,O3U	75	0.1
O,Popescu,1,38,A,O3U,48,O3U	75	0.1
O,Popescu,1,38,A,O3U,48,O3U	70	0.31
O,Popescu,1,38,B,O3U,48,O3U	75	1.2
O,Popescu,1,40,C,O3U,48,O3U	100	0.13
O,Popescu,1,40,C,O3U,48,O3U	80	0.06
O,Popescu,1,40,C,O3U,48,O3U	50	0.44
O,Hodoba,1,140,C,O3U,48,O3U	80	0.16
O,Hodoba,1,140,C,O3U,48,O3U	60	0.64
O,Corna,1,2,B,O3U,48,O3U	60	0.23
O,Corna,1,2,B,O3U,48,O3U	60	0.35
O,Corna,1,2,C,O3U,48,O3U	85	3.16
O,Corna,1,2,C,O3U,48,O3U	50	0.35
O,Corna,1,2,E,O3U,48,O3U	70	0.94
O,Corna,1,2,E,O3U,48,O3U	50	0.23
B,Corna,1,7,B,B3U,48,B3U	10	1.52
B,Corna,1,7,B,B3U,48,B3U	5	0.65
B,Corna,1,7,E,B3U,48,B3U	15	0.17
B,Corna,1,7,E,B3U,48,B3U	10	0.7
B,Corna,1,7,F,B3U,48,B3U	15	0.89
B,Corna,1,7,F,B3U,48,B3U	10	1.33
O,Corna,1,8,A,O3U,48,O3U	75	14.65
O,Corna,1,8,A,O3U,48,O3U	75	7.33
O,Corna,1,8,A,O3U,48,O3U	75	2.44
O,Corna,1,8,D,O3U,48,O3U	75	0.15
O,Corna,1,8,D,O3U,48,O3U	75	0.14
O,Corna,1,8,D,O3U,48,O3U	75	0.05
O,Corna,1,8,D,O3U,48,O3U	75	0.14
O,Corna,1,9,A,O3U,48,O3U	75	9.69
O,Corna,1,9,A,O3U,48,O3U	75	7.75
O,Corna,1,9,A,O3U,48,O3U	75	1.94
B,Popescu,1,40,D,B3M,48,B3M	120	2.39
B,Popescu,1,40,D,B3M,48,B3M	100	4.79
B,Popescu,1,40,D,B3M,48,B3M	80	4.79
B,Popescu,1,40,D,B3M,48,B3M	60	7.17
B,Popescu,1,40,D,B3M,48,B3M	60	4.79
B,Popescu,1,99,B,B3M,48,B3M	45	0.41
B,Popescu,1,99,B,B3M,48,B3M	25	0.82
B,Popescu,1,99,B,B3M,48,B3M	15	2.89
O,Popescu,1,39,C,O2M,48,O3M	70	2.15

O,Popescu,1,39,C,O2M,48,O3M	60	5.38
O,Popescu,1,39,C,O2M,48,O3M	70	3.23
O,Popescu,1,98,A,O2M,48,O3M	60	21.52
O,Popescu,1,98,A,O2M,48,O3M	60	3.07
O,Popescu,1,98,A,O2M,48,O3M	30	6.15
O,Popescu,1,99,A,O2M,48,O3M	45	6.65
O,Popescu,1,99,A,O2M,48,O3M	45	1.67
O,Popescu,1,99,A,O2M,48,O3M	45	5
O,Popescu,1,99,A,O2M,48,O3M	45	3.33
O,Popescu,1,100,A,O2M,48,O3M	55	10.57
O,Popescu,1,100,A,O2M,48,O3M	55	1.18
O,Barbu39_,1,184,B,O3M,48,O3M	90	0.4
O,Barbu39_,1,184,B,O3M,48,O3M	70	0.6
O,Hodoba,1,136,B,O3M,48,O3M	100	2.02
O,Hodoba,1,136,B,O3M,48,O3M	80	4.04
O,Hodoba,1,136,B,O3M,48,O3M	80	2.02
O,Hodoba,1,136,B,O3M,48,O3M	60	6.06
O,Hodoba,1,136,B,O3M,48,O3M	60	6.06
O,Hodoba,1,138,A,O3M,48,O3M	100	3.29
O,Hodoba,1,138,A,O3M,48,O3M	80	9.86
O,Hodoba,1,138,A,O3M,48,O3M	65	13.15
O,Hodoba,1,138,A,O3M,48,O3M	65	3.29
O,Hodoba,1,138,A,O3M,48,O3M	65	3.29
O,Popescu,1,36,C,O3M,48,O3M	75	15.76
O,Popescu,1,36,C,O3M,48,O3M	75	3.94
O,Popescu,1,39,B,O3M,48,O3M	70	4.32
O,Popescu,1,39,B,O3M,48,O3M	50	1.23
O,Popescu,1,39,B,O3M,48,O3M	50	0.62
O,Popescu,1,40,B,O3M,48,O3M	70	1.28
O,Popescu,1,40,B,O3M,48,O3M	50	0.14
O,Popescu,1,40,E,O3M,48,O3M	90	1.21
O,Popescu,1,40,E,O3M,48,O3M	70	1.82
O,Popescu,1,84,B,O3M,48,O3M	90	0.78
O,Popescu,1,84,B,O3M,48,O3M	50	1.18
O,Popescu,1,84,C,O3M,48,O3M	30	0.31
O,Popescu,1,84,C,O3M,48,O3M	20	0.12
O,Popescu,1,84,C,O3M,48,O3M	20	0.12
O,Popescu,1,84,C,O3M,48,O3M	20	0.06
O,Popescu,1,100,B,O3M,48,O3M	75	6.64
O,Popescu,1,100,B,O3M,48,O3M	75	4.42
O,Popescu,1,100,B,O3M,48,O3M	55	4.42
O,Popescu,1,100,B,O3M,48,O3M	55	4.42
O,Popescu,1,100,B,O3M,48,O3M	55	2.21
O,Barbu39_,1,119,A,O4M,48,O3M	70	6
O,Barbu39_,1,119,A,O4M,48,O3M	70	3
O,Barbu39_,1,119,A,O4M,48,O3M	70	1
O,Hodoba,1,139,A,O4M,48,O3M	80	4.27
O,Hodoba,1,139,A,O4M,48,O3M	80	4.27
O,Hodoba,1,139,A,O4M,48,O3M	70	4.27
O,Hodoba,1,139,A,O4M,48,O3M	60	17.09

O,Hodoba,1,139,A,O4M,48,O3M	60	12.82
O,Hodoba,1,140,A,O4M,48,O3M	80	5.5
O,Hodoba,1,140,A,O4M,48,O3M	80	5.5
O,Hodoba,1,140,A,O4M,48,O3M	70	5.5
O,Hodoba,1,140,A,O4M,48,O3M	65	5.5
O,Hodoba,1,140,A,O4M,48,O3M	65	11
O,Hodoba,1,140,A,O4M,48,O3M	60	22
O,Corna,1,1,A,O3M,48,O3M	35	6.37
O,Corna,1,1,A,O3M,48,O3M	35	3.82
O,Corna,1,1,A,O3M,48,O3M	35	1.27
O,Corna,1,1,A,O3M,48,O3M	35	1.27
O,Corna,1,1,C,O3M,48,O3M	60	0.41
O,Corna,1,1,C,O3M,48,O3M	60	0.28
O,Corna,1,2,D,O3M,48,O3M	35	3.67
O,Corna,1,2,D,O3M,48,O3M	35	2.2
O,Corna,1,2,D,O3M,48,O3M	35	0.73
O,Corna,1,2,D,O3M,48,O3M	35	0.73
O,Corna,1,3,A,O3M,48,O3M	35	2.21
O,Corna,1,3,A,O3M,48,O3M	35	1.33
O,Corna,1,3,A,O3M,48,O3M	35	0.44
O,Corna,1,3,A,O3M,48,O3M	35	0.44
B,Corna,1,7,G,B3M,48,B3M	20	1.94
O,Corna,1,8,B,O3M,48,O3M	75	0.14
O,Corna,1,8,B,O3M,48,O3M	75	0.22
O,Corna,1,8,B,O3M,48,O3M	75	0.22
O,Corna,1,8,B,O3M,48,O3M	75	0.14
O,Corna,1,10,A,O2M,48,O3M	65	3.65
O,Corna,1,10,A,O2M,48,O3M	65	2.92
O,Corna,1,10,A,O2M,48,O3M	65	0.73
B,Const,1,108,B,B4U,P0,B3U	54	0.14
B,Const,1,108,B,B4U,P0,B3U	54	0.04
B,Const,1,108,B,B4U,P0,B3U	44	0.02
B,Const,1,108,H,B4U,P0,B3U	54	0.45
B,Const,1,108,H,B4U,P0,B3U	54	0.05
B,Corna,1,7,A,B3U,P0,B3U	45	2.2
B,Corna,1,7,A,B3U,P0,B3U	45	0.94
B,Corna,1,7,C,B2U,P0,B3U	45	1.94
B,Corna,1,7,C,B2U,P0,B3U	45	1.3
B,Corna,1,7,D,B3U,P0,B3U	40	0.88
B,Corna,1,7,D,B3U,P0,B3U	40	0.58
O,Popescu,1,36,B,O4M,P0,O3M	100	0.94
O,Popescu,1,36,B,O4M,P0,O3M	65	0.31
O,Popescu,1,36,B,O4M,P0,O3M	70	0.31
O,Corna,1,1,B,O4M,P0,O3M	100	0.27
O,Corna,1,1,B,O4M,P0,O3M	100	0.18
O,Corna,1,2,F,O3M,P0,O3M	85	0.46
O,Corna,1,2,F,O3M,P0,O3M	50	0.36
O,Corna,1,2,F,O3M,P0,O3M	50	0.09
B,Const,1,110,D,B3M,P0,B3M	139	2.43
B,Const,1,110,D,B3M,P0,B3M	144	0.17

B,Popescu,1,40,A,B3M,P0,B3M	120	7.16
B,Popescu,1,40,A,B3M,P0,B3M	100	4.3
B,Popescu,1,40,A,B3M,P0,B3M	60	2.87
O,Barbu39_,1,114,C,O3M,P0,O3M	110	0.93
O,Barbu39_,1,114,C,O3M,P0,O3M	70	0.26
O,Barbu39_,1,114,C,O3M,P0,O3M	70	0.13
O,Popescu,1,36,A,O3M,P0,O3M	120	1.82
O,Popescu,1,36,A,O3M,P0,O3M	100	0.91
O,Popescu,1,36,A,O3M,P0,O3M	70	0.91
O,Popescu,1,36,A,O3M,P0,O3M	70	3.66
O,Popescu,1,36,A,O3M,P0,O3M	55	1.82
B,Valea Tisei,1,14,B,B3M,P0,B3M	113	1.2
B,Valea Tisei,1,18,B,B3M,P0,B3M	113	2.52
B,Valea Tisei,1,18,B,B3M,P0,B3M	73	0.84
B,Valea Tisei,1,18,B,B3M,P0,B3M	73	4.2
B,Valea Tisei,1,18,B,B3M,P0,B3M	73	0.84
O,Corna,1,3,B,O3M,P0,O3M	90	0.33
O,Corna,1,3,B,O3M,P0,O3M	50	0.1
O,Corna,1,3,B,O3M,P0,O3M	50	0.05
S,Barbu,V,25,B,S3M,48,S3M	34	2.95
O,Barbu39_,1,114,B,O3M,P0,O3M	45	1.67
O,Barbu39_,1,114,B,O3M,P0,O3M	45	0.56
O,Barbu39_,1,114,B,O3M,P0,O3M	45	0.28
O,Barbu39_,1,114,B,O3M,P0,O3M	45	0.28
S,Barbu,V,25,B,S3M,48,S3M	34	2.95
O,Barbu,V,25,D,O3M,P0,O3M	39	0.88
O,Barbu,V,25,D,O3M,P0,O3M	39	0.25
O,Barbu,V,25,D,O3M,P0,O3M	39	0.13
O,Barbu,V,26,B,O3U,48,O3U	74	11.4
O,Barbu,V,26,B,O3U,48,O3U	39	2.85
B,Barbu,V,26,A,B3M,48,B3M	34	3.7
B,Barbu,V,26,A,B3M,48,B3M	34	0.46
B,Barbu,V,26,A,B3M,48,B3M	34	0.46
O,Barbu,V,27,A,O3U,48,O3U	74	4.67
O,Barbu,V,27,A,O3U,48,O3U	74	1.56
O,Barbu,V,27,A,O3U,48,O3U	74	0.78
O,Barbu,V,27,A,O3U,48,O3U	54	0.78
O,Barbu,V,27,B,O2M,48,O3M	59	0.7
O,Barbu,V,27,D,O3M,48,O3M	74	0.76
O,Manesti,1,41,E,O3M,P0,O3M	41	0.42
O,Manesti,1,41,E,O3M,P0,O3M	41	0.14
O,Manesti,1,41,E,O3M,P0,O3M	41	0.14
O,Const,1,108,M,O4M,P0,O3M	69	6.4
O,Barbu,V,27,D,O3M,48,O3M	74	0.3
O,Barbu,V,27,D,O3M,48,O3M	74	0.3
O,Barbu,V,27,D,O3M,48,O3M	74	0.15
S,Barbu,V,27,C,S3M,48,S3M	39	0.74
S,Barbu,V,27,C,S3M,48,S3M	29	1.48
S,Barbu,V,27,C,S3M,48,S3M	29	3.71
S,Barbu,V,27,C,S3M,48,S3M	29	0.74

S,Barbu,V,27,C,S3M,48,S3M	39	0.74
B,Barbu,V,28,A,B3M,48,B3M	39	0.49
B,Barbu,V,28,A,B3M,48,B3M	39	0.32
B,Barbu,V,28,A,B3M,48,B3M	39	0.49
B,Barbu,V,28,A,B3M,48,B3M	39	0.32
O,Barbu39_,1,122,A,O4U,TC,O3U	50	9
O,Barbu39_,1,122,A,O4U,TC,O3U	20	1
B,Valea Tisei,1,13,D,B3U,TC,B3U	108	0.24
B,Valea Tisei,1,13,D,B3U,TC,B3U	78	0.16
B,Manesti,1,65,B,B2U,48,B3U	46	0.9
B,Manesti,1,65,A,B3U,48,B3U	26	1.6
B,Manesti,1,65,C,B3U,48,B3U	26	1