Public Disclosure Authorized

Public Disclosure Authorized

World Bank GHG Accounting Guidance Note #3: Forest Sector Investment Projects (v1.1)

July 2013

Agriculture and Environmental Services Department (AES)

Disclaimer: this document is still work in progress and constantly updated; some supporting material in annexes and weblinks are still incomplete.

All comments are welcome, please send them to Tuukka Castren (AES, tcastren@worldbank.org), cc: Maria de Rijk (AES, mderijk@worldbank.org) or TGW-Forest members (see page 10).

Changes to ver. 1.0: annexes (incl. decision tree) modified and small textual changes; weblinks updated; discussion on GlobAllomeTree added.

CPF maintains a website for GHG accounting at http://ghgaccounting. The site contains the latest information and templates to be followed and should be checked when conducting GHG accounting for projects.

1. INTRODUCTION

As part of the new World Bank Group Environment Strategy (2012), all World Bank (WB) investment projects must undertake greenhouse gas (GHG) emissions accounting ('carbon footprinting') starting in fiscal year FY14 (July 2013). The phasing-in of carbon footprint analysis will be done gradually. The first sectors to be included are energy and forestry[1]. In the first phase, only projects and components for which there is an existing methodology will be included. Based on an assessment of past approvals, roughly half of forest projects incorporated such components. The methodologies currently available cover mainly re/afforestation (A/R), sustainable forest management, and REDD+; i.e. projects that deal with specific forest areas rather than policy reforms and capacity building (see section 3 below).

While this exercise is not intended to guide project selection as such, it will assist the World Bank understand its portfolio's GHG footprint or effect on the GHG emissions or reductions, and learn from such analysis. This will not only include REDD+ and other climate focused projects, but all Bank projects. After this initial phase-in period, preparing these *ex ante* GHG assessment is envisioned to become a standard practice in all WB project preparation.

[1] The requirement applies only to projects which have a PCN approved FY14 or later, ie. project with a PCN approved FY13 or earlier do not have to go through GHG accounting.

Assessing GHG emissions from investment operations is becoming common practice for most multilateral and bilateral institutions, and international financial institutions (IFI) in general. The IFI community is actively pursuing GHG analysis with a number of institutions already measuring and reporting their GHG impacts. However, there are some differences in the approaches followed and concepts used across these institutions. There is an ongoing effort to harmonize approaches to the extent this is possible.

This note provides approaches for World Bank staff to conduct GHG emission assessment calculations for forest-related investment projects. More detailed guidance will be provided during FY14 based on experiences from pilot assessments and practice once the new system is in place.

2. KEY CONSIDERATIONS

Projects to be included are all operations which are classified with sector code AT ('forestry'). However, during the transition phase, only projects and programs for which there is an existing methodology (see section 3 below), will be included. During FY14–FY15, new methodologies will be developed and from FY16 onwards, more project types will be included.

Some projects are regulated by formal, internationally recognized mandatory or voluntary standards. In these cases, the procedures described in this document are to be superseded by any formally endorsed external GHG calculation qualified in generating certified and/or verified carbon credits by an internationally recognized third party, such as the UNFCCC's Clean Development Mechanism (CDM) Executive Board or validation/verification body approved under the Verified Carbon Standard (VCS). If approved as generating carbon credits, the measurement and data e.g. in the Project Design Document (PDD, in the case of CDM), or equivalent, can be used as such.

This is *ex ante*- assessment and it is conducted only once, during project preparation. GHG accounting is not used in monitoring during implementation unless it forms part of the results framework.

3. TYPES OF PROJECTS INCLUDED

The requirement to prepare GHG assessments only applies to investment operations; Development Policy Operations (DPO/DPLs) are not included. Additionally, SILs which finance 'intangible' activities, such as capacity building and strengthening of forest institutions, policy development, and forest governance are excluded as well. However, if it can be assumed that the investments have an impact on clearly defined forest areas, an assessment needs to be made. The assessment will be carried out by the project team.

A selection tool (decision tree) for assessing if a particular project requires incorporating GHG footprinting and, if so, which tool to use, is presented in Annex I.

The decision on whether or not restructuring or additional financing triggers a revised GHG assessment will be done on a case-by-case basis. In essence, if additional new resources are allocated, a GHG assessment should be conducted.

ver 1.1

4. RESOURCES AND TECHNICAL APPROACHES

In selecting tools for GHG accounting, the WB is guided by the principles of *simplicity, transparency, harmonization, and credibility*[2] recognizing that there will be trade-offs between accuracy and time and resources required. Based on these criteria, the following approaches are being explored for inclusion in sector-specific and project-type-specific guidance under development.

Guidelines and Standards

The 2003 **Good Practice Guidance** (IPCC 2003) and the 2006 **IPCC Guidelines for National Greenhouse Gas Emissions** (IPCC, 2006) provide general guidance and a framework to estimate, measure, monitor and report carbon stock changes and greenhouse gas emissions from land use, land-use change and forestry (LULUCF) activities. They include definitions and classifications, detailed calculation steps with underpinning equations, default emission factors and other parameters, and reporting templates.[3]

There are three primary standards for forest carbon assessment. These include the **Clean Development Mechanism** (CDM), the **Climate Action Reserve**, and the **Verified Carbon Standard** (VCS). These standards accredit and supervise a number of methodologies or protocols to estimate, measure, monitor and possibly credit net GHG removals by sinks resulting from the implementation of LULUCF activities. They do so by providing a number of rules and principles for GHG accounting such as definition of the baseline scenario, modalities for considering carbon pools and sources of emissions, and ways to account for leakage.

4.1 Software and Tools

A number of tools of varying level of complexity are available that deal with projects' needs. Among these, CAT-AR, CAT-SFM, and EX-ACT are considered to be the most appropriate when analyzing GHG emissions in the majority of forestry projects in the World Bank investment portfolio.

Links to all tools can be found at http://go.worldbank.org/FAW2G7IOV0.

i. The **CAT AR** (*Carbon Assessment Tool for Afforestation and Reforestation,* World Bank, 2010a) was developed to provide a tool for A/R projects with intermediate complexity that is aligned with the methodological guidance of well-established carbon standards. It is based on the CDM and is a user-friendly Excel-based tool to assess the net climate impact of A/R activities requiring only a few simple steps.

ii. The **CAT SFM** (*Carbon Assessment Tool for Sustainable Forest Management, World Bank 2010b*) was also developed by the World Bank similar to CAT AR, but with the goal of calculating the benefits of SFM practices. It draws on the VCS.

[2] *Simple*, in terms of assessment time and/or resources and application by project task teams; *Transparent*, in terms of being objective and clear about methodological choices and assumptions; *Harmonized*, in terms of alignment with tried and tested approaches, including those used by other IFIs; *Credible*, in terms of the robustness of analytical underpinning, which is also linked to the other three principles.

[3] http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html

ver 1.1

iii. **EX-ACT** was developed by the United Nations' Food and Agriculture Organization (FAO) and launched in 2010. It provides ex-ante estimates of the net climate impact of agriculture (annual crops, agro-forestry/perennial crops, irrigated rice, and cattle) and forest activities (A/R, forest conservation/avoided conversion, forest degradation and deforestation) to inform the design and selection of projects. EX-ACT is based primarily on the IPCC Guidelines (IPCC, 2006), and is complemented by other existing methodologies and default coefficients where available. While not all forest activities can be covered by EX-ACT, it offers the advantage of broadening the scope of GHG analysis to the entire spectrum of agriculture, forestry and other land-use (AFOLU) activities. Also, its land-use conversion matrix, to track land-use changes and changes in practices, makes EX-ACT well-suited for the assessment of "mosaic" projects that combine forestry and agricultural activities on various land-use areas and scales.

   The tool and additional information can also be found at http://www.fao.org/tc/exact/en/.

A selection tool (decision tree) for assessing if a particular project requires GHG footprinting and, if so, which tool to use, is presented in Annex I.

Task Team Leaders (TTLs) should ensure that only the latest versions of the tools are used.

Other tools that could be used for GHG accounting in forest projects include: **TARAM**[4]**,** the **Forest Carbon Calculator** (USAID/Winrock)[5], **CO2FIX** (EFI/CASFOR)[6], IFC's **FICAT**[7], and the upcoming suite of tools under the GEF **Carbon Benefits Project**.[8] The recently developed **GlobAllomeTree** (FAO/CIRAD) [9] online platform allows global access to tree allometric equations, the basic tool for assessing forest biomass in most forest types. The tool enables users to assess stem volume, tree biomass and carbon stocks from such tree characteristics as trunk diameter, height and wood specific gravity for various types of trees and ecological zones.

For additional information on these tools, please refer to the respective websites or http://go.worldbank.org/FAW2G7IOV0.

4.2 Harmonization within the World Bank Group

The World Bank (i.e. IDA and IBRD) and IFC have different project preparation procedures and finance different types of projects. However, these guidelines will be aligned to the extent possible with the practices used by IFC. This alignment will be maintained in all future guidance and whenever feasible, similar systems will be applied across WBG.

[4] http://wbcarbonfinance.org/Router.cfm?Page=DocLib&CatalogID=31252&zrzs=1

[5] http://winrock.stage.datarg.net

[6] http://www.efi.int/projects/casfor/models.htm

[7] http://www.ficatmodel.org/landing/index.html

[8] http://www.unep.org/climatechange/carbon-benefits/

[9] http://www.globallometree.org/

ver 1.1

The Global Environment Facility (GEF) and various climate and carbon financing programs also have their requirements for GHG accounting. To promote harmonization of GHG accounting processes and requirements among different financing programs, a more rigorous assessment could be substituted for an ex ante assessment required at the project formulation or Project Concept Note (PCN) stage.[10]

See also Chapter 2 above.

5. IMPLEMENTATION

GHG gas accounting will become routine and part of the regular project preparation cycle and will be considered as one of the tasks conducted by the project preparation team. Resources for the assessment will come from project preparation budgets.

The anchor units from the Carbon Partnership Facility (CPF) and Agriculture and Environmental Services (AES) will provide support as needed. It is estimated, that particularly during the phase-in stage, Anchor units will provide notable support. The Anchor is also to develop tools for those project types, which are not covered by the CAT AR, CAT SFM or EX-ACT tools.

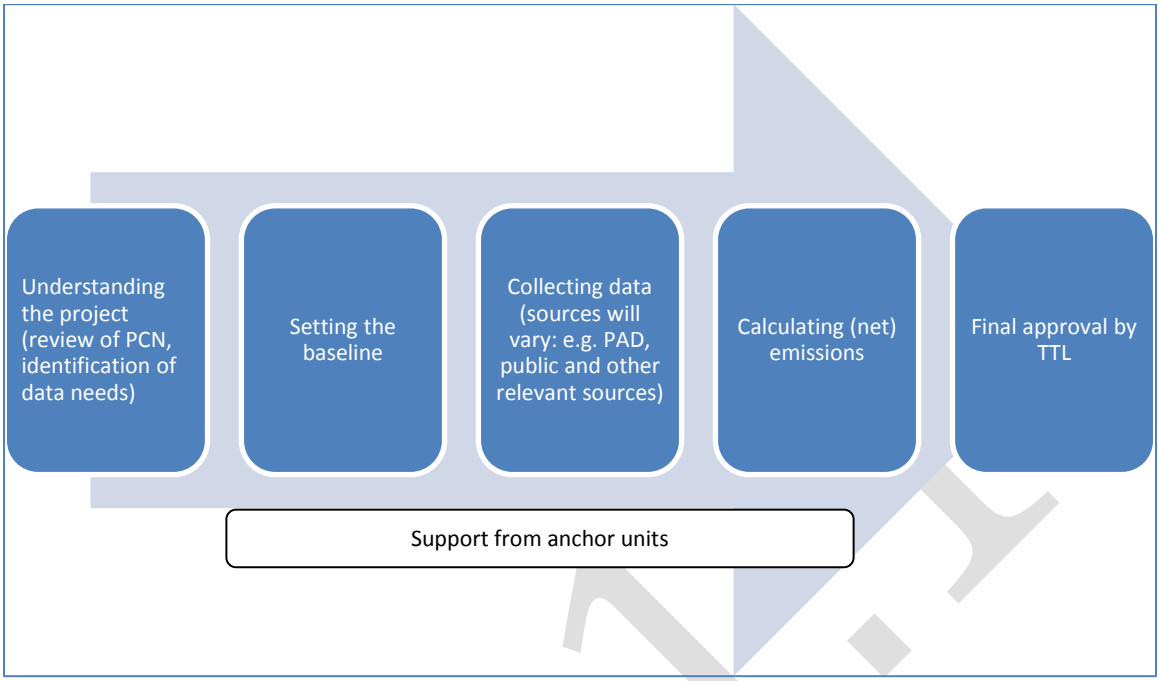
Vice President Units (VPUs) may develop their own internal support structures (e.g. helpdesks) to assist project teams in conducting GHG accounting.

Figure 1 depicts the typical steps of the net emissions calculation process.

ver 1.1

[10] GEF5 has a requirement to have an *ex ante* GHG assessment in Project Information Form (PIF) or in Project Concept Note (PCN). However, there is no formal requirement to use specific tools. It is understood that WB *ex ante* assessment meets the GEF criteria as such. Decision on applicability under future GEF6 will be done separately.

Figure 1 GHG accounting in project preparation



6. REPORTING

The measurement of GHG accounting will be conducted at project level[11]. However, it still needs to be decided if reporting and dissemination will be at corporate level (e.g. specific annual reports) or at project level (e.g. in PADs).[12]

Sample reporting is presented in Annex IV.[13]

[11] During the phase-in period when accounting methods have been developed only some, but not all forest projects, calculations are done for those activities and components, for which methodology does exist.

[12] There is no decision yet if GHG footprints would be disclosed at project level. It is not yet [April 2013] clear if some clients would oppose disclosing project specific carbon accounting results. Until final decisions have been made, project teams need to take this in to consideration.

[13] This is an interim, offline reporting. GHG reporting will become part of the Operations Portal at a later stage.

7. APPLICATION OF KEY CONCEPTS

GHG accounting is being introduced at several IFIs. These institutions have agreed on a joint approach and terminology in order to allow coherence across institutions[14]. However, their consistent application for accounting purposes requires sector-specific agreement and interpretation on the key concepts. Definitions of these concepts are provided in the *World Bank Group GHG Accounting Guidance Note* (WBG, June 2012).

In all GHG accounting, WB guidelines and definitions are applied. Their specific application to investment projects in the forest sector is mentioned below.

7.1 Net vs. Gross Emissions

In forest projects, both **gross and net emissions[15]** will be calculated. The approach of the WB will focus on net emissions. However, in forest sector in order to achieve net emission, gross calculations need to be identified. The reporting of these two types of emissions will be decided separately (see section 6 above).

7.2 Baseline

The baseline is the scenario that reasonably describes changes over time in carbon stocks and GHG emissions within the project boundary in the absence of the proposed project activity. It is among the most challenging components of the GHG analysis as it requires an understanding of land use options and management practices and their evolution, as well as, the multiple drivers of land-use changes and their extrapolation in a credible scenario.

While ideally a dynamic baseline would be preferred that cannot always be achieved. If data is lacking for credible projections, GHG analysis may opt for a simplified description of the baseline corresponding to a continuation of current land-use or a static scenario.

The **default baseline is the current use of the land**. For SFM projects where the starting point is a well-stocked forest, an estimate needs to be made on if and how the management would have changed without the project. In af/reforestation projects, if the land has been abandoned[16], the estimated natural regeneration should be used as a baseline.

7.3 Project Boundaries and Scope

The **project area** is the discrete site(s) where a forestry project is implemented (i.e., the area under the control of the project component). GHG assessment should include the project area as well as other site(s) where GHG emissions or removals increase/decrease due to the project activity ('leakage').

[14] See "International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting" (November 2012) and "GHG Accounting: Overview of IFI Harmonized Framework and The World Bank's Proposed Approach" (November 2012)

[15] **Gross emissions** – Actual project emissions; **Net emissions** – Change in emissions due to a World Bank investment project. Net emissions are calculated as the difference between emissions in the project scenario and those occurring in the corresponding baseline scenario.

[16] E.g. unutilized former pasture or farmland.

ver 1.1

A **carbon pool** is a reservoir with the capacity to accumulate (remove) or release (emit) carbon. Five carbon pools are usually considered in GHG analysis including: above ground living biomass, below ground living biomass, dead wood (standing, laying or on ground, or in the soil, e.g. dead root stocks), leaf litter, and soil organic matter. Ideally, all carbon pools should be included. However, this depends to a large extent on data availability and default values may be needed.[17]

7.4 Timeframe

The Economic and financial analysis of WB projects often considers **30 year** time horizon and a similar timeframe is used for the GHG assessment[18]. CAT-AR and CAT-SFM provide annual forecasts of carbon stocks and changes and GHG emissions/removals up to a maximum of 30 years. EX-ACT can handle projections for longer time horizons with user modifications to ensure the saturation of carbon sequestration into biomass as plantations progressively reach maturity is accurately captured.

For other sectors, 'a representative year' is often the first year of full capacity utilization. However, due to a different nature in forest projects – and af/reforestation projects in particular – this is not applicable. In its place, when annual figure is needed, **the average net/gross removals** (effectively increase in carbon stock) over the 30 project period should be used.

7.5 Emission Factors

A variety of parameters are critical to estimate carbon stocks and changes in carbon stock. They include factors relating to biomass growth (e.g., biomass growth rate, wood density, biomass expansion factor (BEF), root-to-shoot ratio and carbon fraction) and changes in land use (e.g., deforestation rate). IPCC provides Tier 1 data for many of these parameters while **Tier 2 (possibly 3)** can be obtained from companion documentation to carbon offset projects, or underlying database of tools. The highest available tier should be used.

Tiers 1, 2 and 3

"Different methods can be used to estimate emissions or removals from most source and sink categories. The selection of a particular method will depend on the desired degree of estimation detail, the availability of activity data and emission factors, and the financial and human resources available to complete the inventory. In IPCC terminology, the lowest ranking or simplest method is "Tier 1", while more elaborate methods are "Tier 2" and "Tier 3."

Tier 1 methods typically utilize IPCC default emission factors and require the most basic, and least disaggregated, activity data. Higher tiers usually utilize more elaborate methods and source-specific, technology-specific, region specific and/or country-specific emission factors, which are often based on measurements, and normally require more highly disaggregated activity data. Tier 2 and 3 methods require more detailed data and/or measurements for their application. In cases where a national methodology exists, which is consistent with the IPCC Guidelines, it is highly advisable to use the national methodology. This methodology should be

[17] Usually the default is that harvested wood products are considered emitted on the date of harvest. This is reasonable for fuelwood. However, fiber and not to mention saw logs/construction wood have much longer life cycles. Global methodologies are currently being developed e.g. by IPCC. Also IFC is developing an approach for dealing with wood products in GHG accounting. The approach used in World Bank assessments will be aligned with that of IFC to the extent possible.

[18] For plantation projects this may need to be adjusted based on rotation lengths to avoid misleading values.

fully documented in order to allow the reader to understand why this particular method is better than the default one proposed by the IPCC."

UNFCCC resource guide for preparing the national communications of non-annex I parties, module 3: National greenhouse gas inventories

(http://unfccc.int/resource/docs/publications/09_resource_guide3.pdf)

7.6 Gases Considered

GHG accounting generally considers **CO_2, CH_4, and N_2O** associated with the gain and loss of (living or dead) biomass in each carbon pools and for emissions from forestry activities. As CO_2, CH_4, and N_2O have a different global warming impact, their flows are converted into one metric for accounting purposes, Carbon Dioxide Equivalent (tCO_2e), based on their global warming potential (GWP). CO_2 has a 100 year GWP of 1, CH_4 of 25 and N_2O of 298.

7.7 Threshold

Usually, a quick ex-ante estimate is conducted to determine whether a project falls over a preset threshold for analysis. Across IFIs, this threshold is often set at **20 $ktCO^2eq$ per year (net)**, i.e. projects that generate net GHG emission reductions (carbon sequestration) greater than 20 $ktCO^2eq$ per average year are assessed. This translates to a wide margin of forest areas; using default IPCC growth rates as an example, in tropical moist deciduous forests on about 2300 hectares (global average 5 t d.m/ha/yr.) and in temperate mountain forests (global average 3 t d.m/ha/yr.) 3900 hectare forest areas with zero baseline.

The impact of this threshold should be assessed through during implementation to understand whether some project types would be systematically excluded.

7.8 Attribution/cost sharing

In pooled funding, GHG accounting **will cover the whole project**, irrespective of WB's share of the overall project budget.

7.9 Estimate ranges

Often at the project appraisal stage, many issues of the project design and implementation are still unconfirmed and data available are range estimates. As a general rule, the **lower (more conservative) boundary value** is used in the GHG assessments. However, if some other value clearly has a higher probability, the team may use the most likely value.

8. UPDATING AND FURTHER INFORMATION

This approach is subject to refinement and expansion based on testing and feedback during implementation.

For additional information please visit http://ghgaccounting.

For contacts, please get in touch with:

- CPF (GHG accounting at corporate level, collaboration with other IFIs):
  - Jane Ebinger
  - Sameer Akbar
  - Philippe Ambrosi

ver 1.1

- AES (interpretation at project level)
  - Tuukka Castrén
  - Ademola Braimoh
  - Ijeoma Emenanjo
- Technical Working Group (TGW-Forests) members (VPU-level guidance)
  - AFR: Loic Braune
  - EAP: Stefanie Sieber and Johannes Heister
  - ECA: Nina Rinnerberger
  - LCR: Jeannette Ramirez
  - MENA: Taoufiq Bennouna
  - SAR: William B. Magrath
  - CPFCF: Rama Chandra Reddy; and
  - GEF: Junu Shrestha and Ian Gray.

9. ADDITIONAL INFORMATION AND REFERENCES:

FAO (2013). "Ex-Ante Carbon Balance Tool." Available at: http://www.fao.org/tc/exact/en/

FAO (2013). "GlobAllomeTree." Available at: http://www.globallometree.org/

IPCC (2003). "Good Practice Guidance for Land Use, Land-Use Change and Forestry". Edited by Jim Penman, et al. IPCC.

IPCC (2006). "2006 IPCC Guidelines for National Greenhouse Gas Inventories." Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T., and Tanabe K. (eds). Geneva: IPCC.

World Bank (1998). "Greenhouse Gas Assessment Handbook: A Practical Guidance Document for the Assessment of Project-Level Greenhouse Gas Emissions". Environment Department. Paper #064. Global Environment Division. Washington, DC: World Bank.

World Bank (2010a). "The Carbon Assessment Tool for Afforestation/Reforestation (CAT-AR): A User's Manual". World Bank.

World Bank (2010b). "The Carbon Assessment Tool for Sustainable Forest Management (CAT-SFM): A User's Manual". World Bank.

World Bank (2012a): Toward a Green, Clean, and Resilient World for All A World Bank Group Environment Strategy 2012–2022

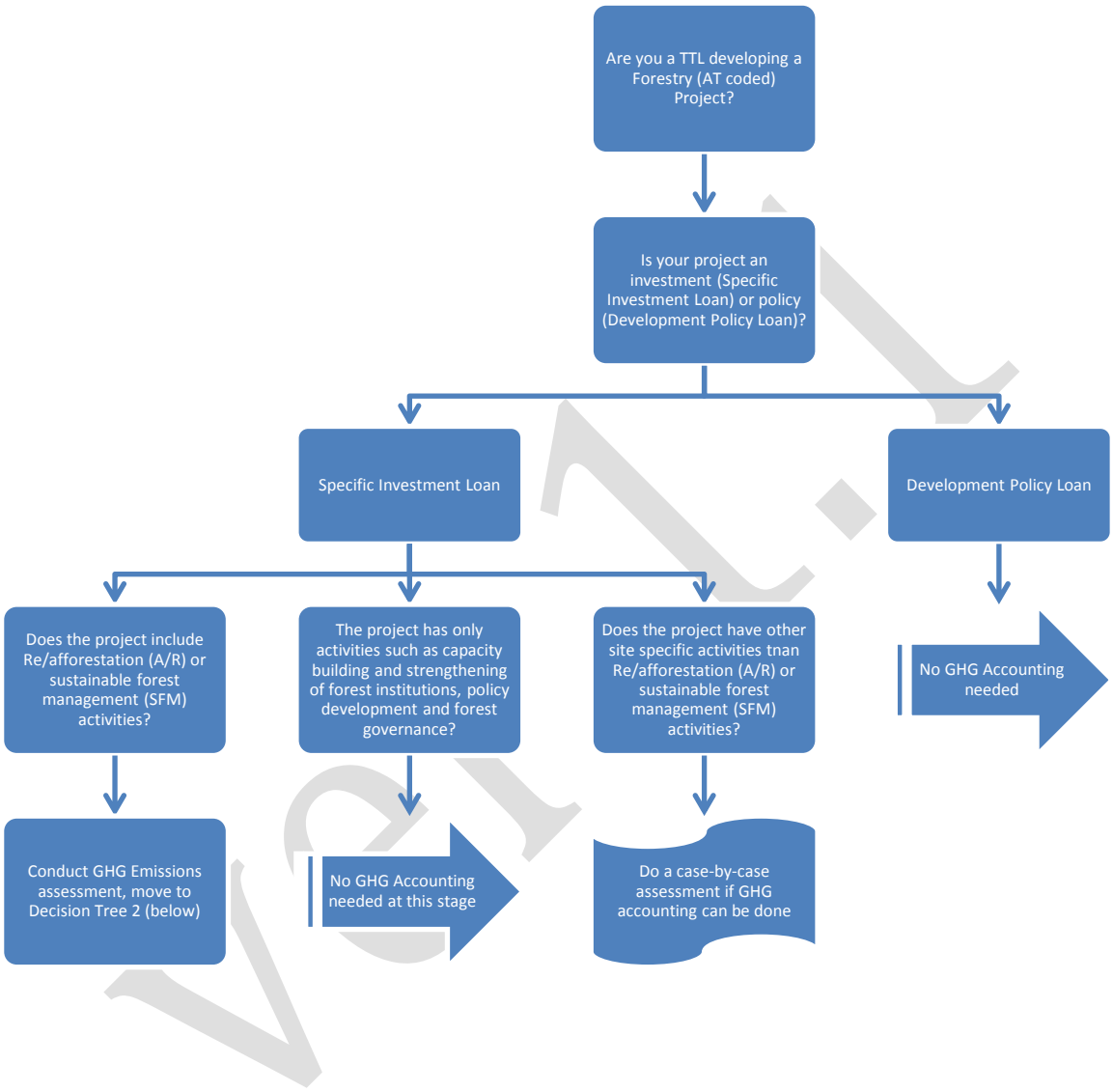
World Bank (2012b): Enhancing Carbon Stocks and Reducing CO_2 Emissions in Agriculture and Natural Resource Management Projects. World Bank – Agriculture and Rural Development (ARD)

World Bank (2013): [this set of guidance notes]

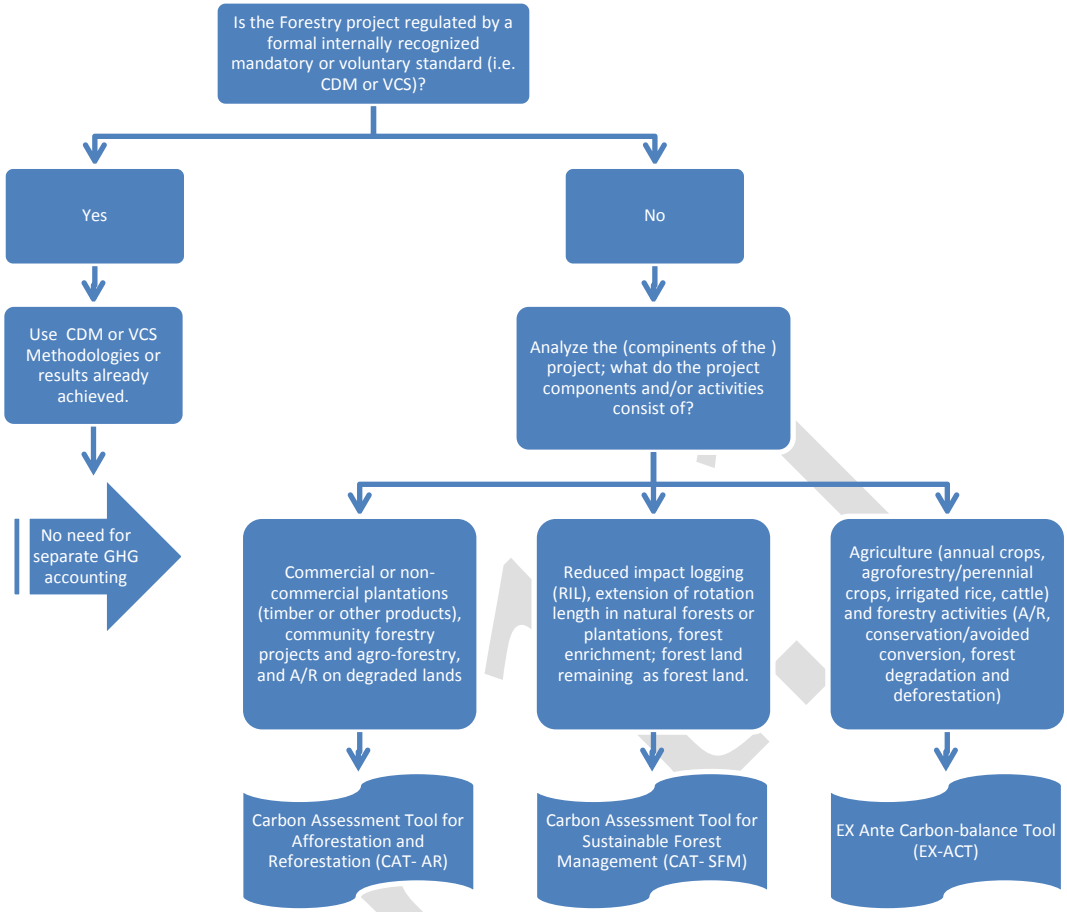
ver1.1

ANNEX I: PROJECT ELIGIBILITY AND DECISION-TREE FOR TOOL SELECTION

1. Eligibility for Forestry GHG Accounting projects



2. Decision Tree for Tool Selection



ver

TO BE DEVELOPED

Example I. A/R Project (watershed restoration project)

- Project Description
- Application of Key Concepts
- Main Inputs and Assumptions
- Findings

Example II. SFM project

- Project Description
- Application of Key Concepts
- Main Inputs and Assumptions
- Findings

ver 1.1

ANNEX III: DATA NEEDS IN DIFFERENT TOOLS

This Annex summarizes the data needed in various tools. Detailed instructions can be found in the Manuals listed in section 4.1. Data inputs are interdependent and some issue may become redundant if a specific selection is made (e.g. if there is no logging, no wood product data needs to be included)

1) CAT-AR

General information on the baseline

- Number of baseline strata (number)
- Area of baseline stata (ha)
- Statum name (descriptive)
- Land-use category of stratum (descriptive): grassland or cropland
- Baseline land-use activities (descriptive)

Non woody biomass

- Peak biomass (tdm.ha^{-1})
- Root to shoot ratio (tdm/tdm)
- Carbon fraction (ton of carbon/tdm)

Woody biomass

- Is there a pre-existing woody vegetation on the BLSx? Yes/no
- Specify data unit for woody vegetation. Volume (m^3.ha^{-1}) or biomass (tdm.ha^{-1}) units.

Inputs required for volume units (m^3.ha^{-1} and m^3.ha^{-1}.year^{-1})

- Living stand volume at the project beginning (m^3.ha^{-1})
- Living stand volume at the end of the project (m^3.ha^{-1})
- Wood density of existing trees (tdm.m^{-3})
- Biomass expansion factor (dimensionless)

Inputs required for mass units (tdm.ha^{-1}and tdm.ha^{-1}.year^{-1})

- Living above-ground biomass at the project beginning (tdm.ha^{-1})
- Living above-ground biomass at the end of the project (tdm.ha^{-1})

Inputs required for both volume and mass units

- Root to shoot ratio (tdm/tdm)
- Carbon fraction (ton of carbon/tdm)

ver 1.1

2) CAT-SFM

Description: number of stands, measurement units, and project year

- Number of Stands
- Data unit: Mass units: tons of dry matter per hectare (tdm.ha^{-1}); or Volume units: cubic meters per hectare (m^3.ha^{-1})
- Type of growth data: between Mean Annual Increment (MAI) and Current Annual Increment (CAI)
- First project year (calendar year).

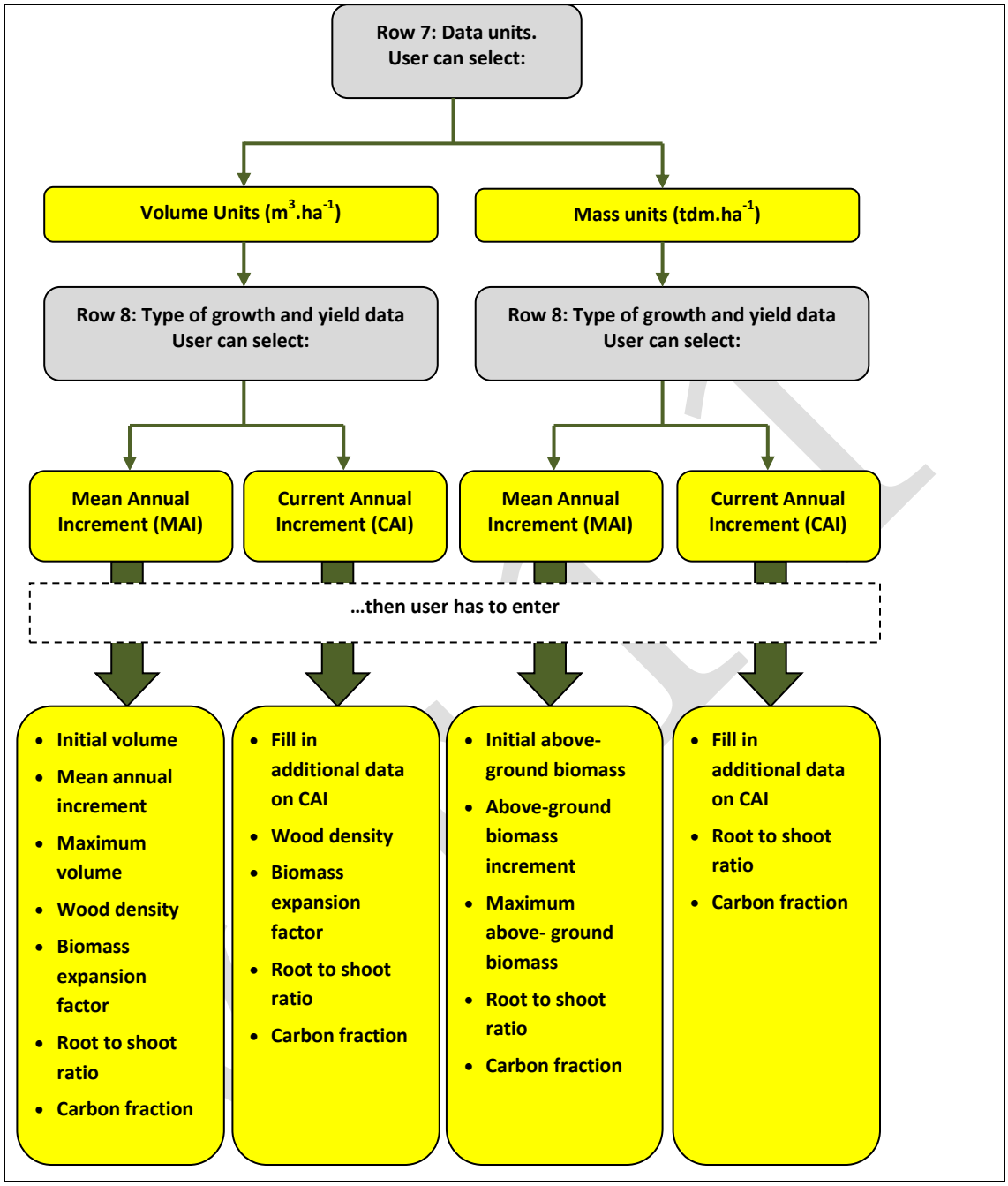
Description of Stands

- Area of the Stand (hectare)
- Stand name Baseline: name or code to identify the area
- Stand name Project: name or code to identify the area
- Type of forest: the user can choose between two options, "evenly aged forest" (forest plantation) or "forest" (natural forest)
- Woody vegetation

Figure 2 shows which information is entered by the user, depending on the selections done regarding the data unit and type of growth data to be used. In all cases, default values can be chosen (except if Current Annual Increment (CAI) used)

ver 1.1

Figure 2 User inputs for Section "Description of Stands: Woody Vegetation"



Inputs required for mass units (tdm.ha-1 and tdm.ha-1.year-1)

- Initial above-ground biomass (tdm.ha-1)
- Above-ground biomass increment (tdm.ha-1.year-1): If unknown, the tool will guide the user to a list of default values
- Maximum above-ground biomass (tdm.ha-1): If unknown, the tool will guide the user to a list of default values

Inputs required for volume units (m3.ha-1 and m3.ha-1.year-1)

- Wood density (tdm.m-3): If unknown, the tool will guide the user to a list of default values
- Biomass expansion factor (dimensionless):If unknown, the tool will guide the user to a list of default values
- Initial volume (m3.ha-1)
- Mean annual increment (m3.ha-1.year-1): If unknown, the tool will guide the user to a list of default values
- Maximum volume (m3.ha-1): If unknown, the tool will guide the user to a list of default values

Inputs required for both volume and mass units

- Root to Shoot ratio (dimensionless): If unknown, the tool will offer a list of default values for different vegetation
- Carbon fraction (ton of carbon/tdm): If unknown, the tool guides the user to choose a predefined value

Baseline: management activities

- Fertilization (nitrogen application):
  - Will there be fertilization?
  - Tons of synthetic nitrogen applied (ton.ha-1)
  - Tons of organic nitrogen applied (ton.ha-1)
- Liming
  - Will there be liming application? yes / no
  - Tons of CaCO3 applied (ton.ha-1)
  - Tons of CaMg(CO3)2 applied (ton.ha-1)
- Thinning and harvesting
  - Will there be thinning? yes / no
  - Will there be final harvesting? yes / no
  - Non-logged biomass dead due to logging (%)
  - Forest area impacted by transportation network (%)
  - Age when area cleared for transportation network in years.
  - First thinning age in years
  - First thinning: volume extracted in tdm.ha-1 or m3.ha
  - Second and subsequent thinnings ages in years
  - Second thinning: volume extracted in tdm.ha-1 or m3.ha
  - Final harvest age in years

ver 1.1

- Final harvest: volume extracted in tdm.ha-1 or m3.ha.

Solid wood products

- Wood to Solid Wood Products (SWP) (%)
- Losses from transformation of SWP (%)
- End use: SWP recycled (%)
- End use: SWP landfilled (%)
- End use: SWP burned (%)
- End use: SWP disposed of at unmanaged-shallow sites (%)

Paper wood products

- Wood to Paper Wood Products (PWP) (%)
- Losses from transformation of PWP (%)
- End use: PWP recycled (%)
- End use: PWP landfilled (%)
- End use: PWP burned (%)
- End use: PWP disposed of at unmanaged-shallow sites (%)

Wood fated to be burned

- Wood fated to be burned (%)

Fossil fuel consumption within the forest stand

- Liters of gasoline consumed for harvest (l.m-3 or l.tdm-1)
- Liters of diesel consumed for harvest (l.m-3 or l.tdm-1)

3) EXACT

The tool is aimed at providing estimations of the mitigation impact of agriculture and forestry development projects, estimating net carbon balance from Green House Gas (GHG) emissions and carbon sequestration. It is a land based accounting system associated with the adoption of alternative land management options.

EX-ACT consists of a set of linked Microsoft Excel sheets in which project designers insert basic data on land use and management practices foreseen under projects' activities. EX-ACT adopts a modular approach – each "module" describes a specific land use – and following a three-step logical framework:

1. A general description of the project (geographic area, climate and soil characteristics, duration of the project);
2. Identification of changes in land use and technologies foreseen by project components using specific "modules" (deforestation, forestation, forest degradation, annual/perennial crops, rice cultivation, grasslands, livestock, inputs, energy); and
3. Computation of C-balance with and without the project using IPCC default values and – when available – ad-hoc coefficients.

The main output of the tool consists of the C-balance resulting from project activities.

ver 1.1

ANNEX IV: REPORTING SAMPLE

to be added [template available at http://ghgaccounting]

ver 1.1