

ESTIMATION OF CARBON STOCKS AND CHANGE IN CARBON STOCKS OF TREES  
AND SHRUBS IN ZERO2NATURE – PREFOR PROJECT ACTIVITIES

Version 1.1

“Developed from the UNFCCC CDM conception”.



April 2020

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### 1. INTRODUCTION

1. This tool provides step-by-step methods for estimation of carbon stock in living biomass of trees and shrubs. For *ex-ante* estimation of tree biomass it applies tree growth and stand development models. For *ex-post* estimation of tree biomass it uses data from measurements conducted in sample plots. Remote sensing data may also be used in conjunction with data from measurements conducted in sample plots. Biomass of shrubs is estimated from shrub crown cover.

### SCOPE, APPLICABILITY AND ENTRY INTO FORCE

#### Scope

2. This tool can be used for estimations of carbon stocks and change in carbon stocks in the living biomass in trees and shrubs related to ZERO2NATURE-PREFOR project activities. This tool is applicable in the following cases:

- (a) Estimations of carbon stocks and change in carbon stocks of living biomass in the baseline trees and shrubs;
- (b) *Ex ante* estimations of carbon stocks and change in carbon stocks in living biomass of trees and shrubs related to ZERO2NATURE-PREFOR project activities;
- (c) *Ex post* estimations of carbon stocks and change in carbon stocks in living biomass of trees and shrubs related to the monitoring system of the ZERO2NATURE-PREFOR project activity.

#### Applicability

3. This tool has no internal applicability conditions.

#### Entry into force

4. The date into force of this Tool's updated version is May 4, 2020.

### 3. DEFINITIONS AND NOTATIONS

5. The definitions contained in the Glossary of ZERO2NATURE terms shall apply.

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6. For the purpose of this tool, the following definitions apply:

- (a) Species - can also refer to a species group when a species-specific biometric parameter (e.g. biomass expansion factor-BEF), or a model (e.g. allometric equation), is demonstrated to be applicable to more than one species;
- (b) Tree biomass - refers to above-ground and below-ground living biomass of trees;
- (c) Shrub biomass - refers to above-ground and below-ground living biomass of shrubs;
- (d) Plot biomass - refers to tree biomass per hectare in a plot;
- (e) Measurement of a sample plot - refers to the measurement of one or more dimensions (e.g. diameter) of the trees in a sample plot, or measurement of a plot parameter (e.g. basal area per hectare), and conversion of the measured tree dimensions, or the measured plot parameter into plot biomass by using one of the methods provided in appendix I;
- (f) Conservative value of a parameter - refers to the value which, when used in calculations, is more likely to result in underestimation rather than overestimation of the net anthropic negative emission (dis-economy) removals by sinks;

7. This tool uses the following units in their abbreviated form:

- (a) Tonne dry matter is abbreviated as t d.m., and tonne dry matter per hectare is abbreviated as t d.m. ha<sup>-1</sup>;
- (b) Tonne carbon dioxide equivalent is abbreviated as t CO<sub>2</sub>e;
- (c) Environmental Impact Potential – EIP of each negative emitter will be measured in tonnes or briefly em tEIP.

### 4. PARAMETERS DETERMINED BY THE TOOL

8. This tool provides procedures to determine the parameters listed in table I.

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**Table I. Parameters determined by the tool**

Parameter	Unit	Description
$C_{TREE,y}$	tEIP	Carbon stock in tree biomass within the project boundary at a given point of time in year $y$
$\Delta C_{TREE,y}$	tEIP	Change in carbon stock in tree biomass within the project boundary in year $y$
$C_{SHRUB,y}$	tEIP	Carbon stock in shrub biomass within the project boundary at a given point of time in year $y$
$\Delta C_{SHRUB,y}$	tEIP	Change in carbon stock in shrub biomass within the project boundary in year $y$

9. While applying this tool in an approved ZERO2NATURE methodology, the following corresponding notations should be used:

(a) In the baseline scenario:

$C_{TREE\_BSL,y}$  for  $C_{TREE,y}$  and  $C_{SHRUB\_BSL,y}$  for  $C_{SHRUB,y}$

$\Delta C_{TREE\_BSL,y}$  for  $\Delta C_{TREE,y}$  and  $\Delta C_{SHRUB\_BSL,y}$  for  $\Delta C_{SHRUB,y}$

(b) in the project scenario:

$C_{TREE\_PROJ,y}$  for  $C_{TREE,y}$  and  $C_{SHRUB\_PROJ,y}$  for  $C_{SHRUB,y}$

$\Delta C_{TREE\_PROJ,y}$  for  $\Delta C_{TREE,y}$  and  $\Delta C_{SHRUB\_PROJ,y}$  for  $\Delta C_{SHRUB,y}$

### 5. CONDITIONS UNDER WHICH CARBON STOCK AND CHANGE IN CARBON STOCK MAY BE ESTIMATED AS ZERO

10. Carbon stock in trees in the baseline can be accounted as zero if all of the following conditions are met:

(a) The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;

(b) The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;

11. Related to ZERO2NATURE-PREFOR monitored preservation project activity, changes in carbon stocks in trees and shrubs in the baseline will be accounted as zero.

12. For the purpose of ex-ante estimation of carbon stock and change in carbon stock in the project

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scenario, change in carbon stock of shrubs may be estimated as zero.

### 6. ESTIMATING CHANGE IN CARBON STOCK IN TREES BETWEEN THE FIRST YEAR OF THE PROJECT AND THE SUBSEQUENT YEARS

13. Change in carbon stock in trees between the first year of the project and the subsequent years is estimated using one of the two methods:

- (a) By using direct estimation of change by re-measurement of sample plots. Under this method, the same sample plots are measured on two successive occasions and the plot-level change in biomass is obtained by subtracting the plot biomass on the first occasion from the plot biomass on the second occasion;
- (b) Taking in consideration the forest depletion rate which can be proved through objective evidences like official data, renowned entities studies or through criteria of proportionality, considering deforestation official data related to the project activity area and applying annual deforestation average arithmetic from 20% deforestation of the original forest until the beginning of the ZERO2NATURE-PREFOR; always adopting the most conservative possible scenario.

#### 6.1. Demonstration of “no-decrease”

14. This method is applicable only in ex-post estimation of change in carbon stock in trees for monitoring of project activities. Project participants may, at the time of a verification, demonstrate that tree biomass in one or more strata has not decreased relative to the tree biomass at the time of the previous verification, by proving that:

- (a) No harvest has occurred in the stratum since the previous verification;
- (b) The stratum was not affected by any disturbance (e.g. pest, fire) that would decrease the carbon stock in trees;
- (c) Remote sensing data or inventory data, including participatory inventory or participatory photo-mapping data, demonstrate that tree crown cover in the stratum has not decreased since the previous verification.

#### 6.2. Amazonian living biomass carbon quantity

According to studies published by the National Institute of Amazonian Research (INPA, in Portuguese) and adopted by the ZERO2NATURE standard, the average Amazonian living biomass (dry weight above and below the soil) is estimated in 247 tonnes per hectare and the carbon quantity represents 50%.

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History of the document Version	Date	Nature of revision(s)
I.1	EC 3, May 4, 2020	Updated
I.0	September 24, 2012	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Tool <b>Business Function:</b> Methodology		

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