Ministry of Environment and Natural Resources

Dominican Republic

Technical and Methodological Proposal Responding to the Conditions Pointed out in Resolution CFM/20/2019/5: Selection of Emission Reductions Program Document of Dominican Republic into the Portfolio of the Carbon Fund

September 11, 2019

Response to the comments of the Chair summary report:

A stepwise approach will be used to improve the reference level for the period 2006-2015. All improvements are in line with paragraph 2 of the "Guideline on the application of the methodological framework Number 2: Technical corrections to GHG emissions and removals reported in the reference period" and will be presented three months before the end of the first reporting period, in order to allow the assessment of the improved methodology by a recognized international independent expert (three months prior to the end of 2021). Technical corrections will not compromise the consistency of GHG emissions and removals estimates between the Reference Period and monitoring periods, as the improvements will be applied for both estimates. Responses to comment 1 refer to improvements on historical activity data, while the responses to comments 2 and 3 refer to improvements of emission and removal factors to be used in the construction of the reference level. **None** of the improvements relate to a change in policy and design decisions affecting the Reference Level, including, selected carbon pools and gases, selected GHG sources, selected reference period, forest definition, selected REDD+ activities, selected Accounting Areas, identified forest types and definitions, definitions of REDD+ activities (deforestation, degradation).

1. Biennial data on deforestation of primary and secondary forest, degradation, restoration, deforestation, all data on a pixel basis wall-to-wall.

The improvements of historical data on deforestation are twofold: 1) increase in sampling intensity, 2) the use of biennial satellite-derived LC maps. Corrections to historical activity data will result from the use of reference data that is of higher spatial and temporal resolution than the one used at the time of submission of the final ER-PD. The methods that will be used to estimate LC transitions are all in line with IPCC and GFOI guidance and guidelines.

Biennial data on deforestation of primary and secondary forest, degradation, restoration, deforestation will be obtained on a pixel basis wall-to wall, once the Terrapulse products are validated. In case the products do not improve the estimations of the reference level, an intensive, systematic sample based approach with 7,697 points will be used to estimate the reference level with biennial data on all activities. The following steps are being developed:

Step 1. Validation of the Terrapulse cover and cover change products.

TerraPulse developed and applied data extraction and automatic learning algorithms to large volumes of satellite images in order to monitor deforestation, reforestation, degradation, and forest recovery, based on 4 categories of canopy cover: intact forest (>85 of cover), degraded forest (between 60-85% of cover), severely degraded forest (between 30-60% of cover) and non-forest (<30% of cover). These algorithms were used to provide the Dominican Republic with annual wall-to-wall raster maps from 2001 to 2018, each based on 30*30 m pixels, each set with a probability estimate for each pixel of the result map. The following maps were delivered to the Dominican Republic:

1. Pixels that were deforested between 2001 and 2018 and their probability
2. Pixels that were reforested between 2001 and 2018 and their probability.
3. Average cover of each class for the periods 2001-2005, 2006-2010, 2011-2015, and 2016-2018 using the values taken from all of the pixels over the period.

4. Pixels with >30% canopy cover and their probability
5. Pixels with >60% canopy cover and their probability
6. Pixels with >85 % canopy cover and their probability

The deforestation, reforestation, degradation, and forest recover (taking into account the two degradation and two recovery classes) are estimated annually from 2001 to 2018, based on the canopy cover and probability of change in cover from one year to another (considering only those pixels with> 90% probability of having a forest cover greater than 30%). Biennial change matrices for 2006-2015 between the 4 categories can be generated and subsequently these changes can be converted into the different forest and non-forest types, overlaying the pixel maps with other data sources (see below). It is expected that the process will offer long-term and consistent mapping and monitoring of forest cover and will allow the retrieval of historical reference scenarios from the satellite records, as well as the detection of deforestation, degradation and growth over time. As a first step the products require the validation of the results.

To validate the Land cover change map produced with Terrapulse data, a systematic grid of 7,697 sampling points (grid of 2.5*2.5 km) has been established (see Figure 1). Each point represents a pixel with data from 2001 to 2015 that can be classified as follows (using Terrapulse data of 2001 to 2015 as input), depending on the state of the pixel in the years 2001, 2003, 2005, 2007, 2009, 2011, 2013, and 2015:

1. Intact forest (1,429 points): pixel that is classified as forest in all years between 2001 and 2015.
2. Secondary forest (925 points): this class refers to a pixel that is classified **as forest in 2015** and **non-forest in 2001 or later** (age of secondary forest will then be determined from the time series).
3. Deforestation of Intact Forest (86 points): pixel that is classified as forest in 2001 and 2006 and non-forest in 2015. Year of deforestation to be determined from the time series.
4. Deforestation of Secondary forest (513 points): pixel that is classified as non-forest in 2001, forest between 2002 and 2014 and non-forest in 2015. Start and end-year of the forest to be determined from the time series.
5. Temporarily (un) covered by forest (708 points): pixel that is classified as Forest in 2006 and 2015, but non-forest in (some) years in between or pixel that is classified as non-forest in 2006 and 2015 and forest in (some) years in between. The years of change will be annotated. These pixels will be masked in order to account for emissions or removals according to the state of the pixel at the end of the reference period and the start and end of the ERPA.
6. Non forest (3,919 points): pixel that is classified as non-forest between 2006 and 2015.
7. Water (117 points): pixel that is classified as water between 2006 and 2015.

The 7,697 sampling points will also be classified according to land cover type and the transitions derived from the 7*7-point analysis will also be classified according to LC-change classes (Table 8.3.8 of the ERPD).

The Terrapulse time series related to pixels with >30%, >60% and >85% canopy cover and their probability will be used separately to determine uncertainties in the estimations of degradation and forest enhancement of forests remaining forests, using the 2,083 reference points already established for this purpose (see Table 8.3.8 of the final ERPD).

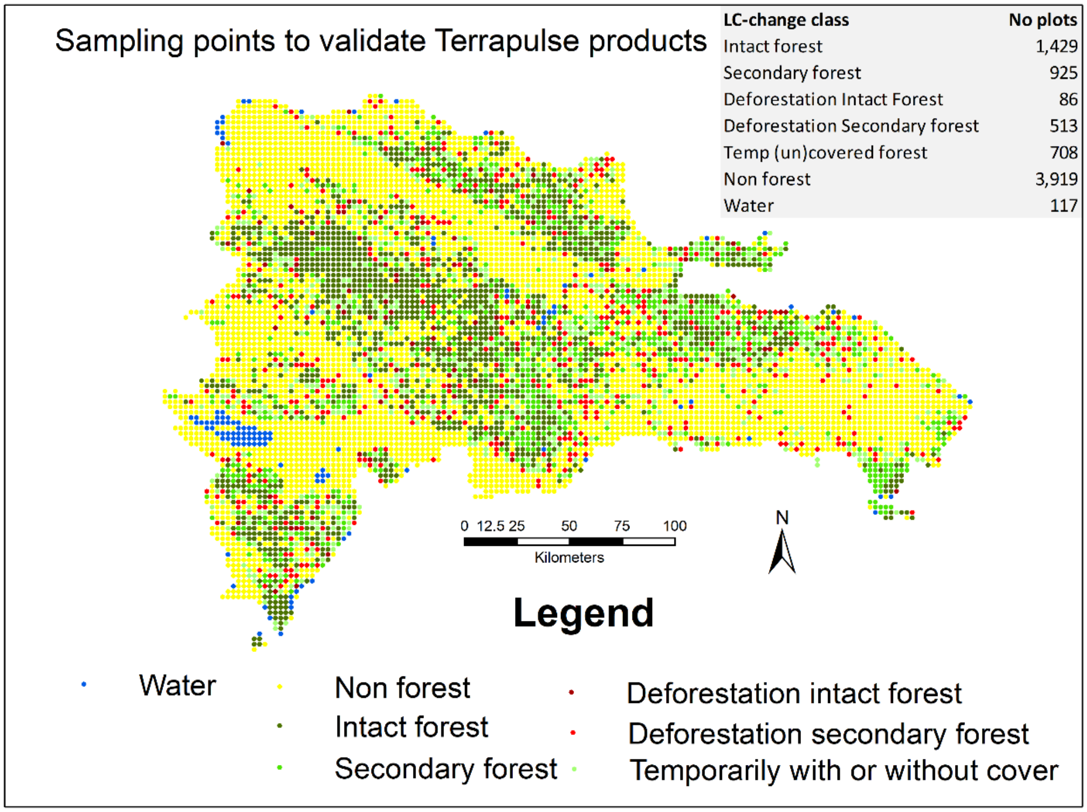


Figure 1. Map showing the distribution of the sampling points and their LC-change class distribution, to be used to validate the Terrapulse change maps 2006-2015.

Each pixel will be visually validated with high resolution imagery available in Google earth within the Earth Collect platform, using a standardized protocol (see for details https://www.dropbox.com/sh/432ed5r8daoticd/AABVBrA_DqS9jsRsNSkLKYg9a?dl=0). All seven technicians that will carry out the validation have been properly trained and comparison of their results did not present any statistical differences in their interpretation of 50 test points.

Step 2. Uncertainty analysis of activity data.

All pixels that show a change during 2006-2015 (deforestation, pixels temporarily with or without forest cover and secondary forest) will be revisited to determine the area of change. Within a one hectare plot a 7 * 7 point grid will be overlaid, to determine the % of change, taking into consideration that each point represents approximately 2% of the area. The type of transition and the number of points that transit from one class to another will be registered, including the year of transition.

The uncertainty estimation procedure, described by Olofsson (2014), will be used to determine the levels of uncertainty of the transitions. The data that will be used to estimate the transitions and their uncertainties to be used to estimate the improved reference level will depend on the validation of the Terrapulse products:

Option 1. The Terrapulse data show a low level of uncertainty in the estimations of the stable areas (class 1, 6 and 7) and transitions (class 2, 3, 4, and 5; the Terrapulse estimates of all seven stable and transition classes fall within the 90% confidence interval of the estimated ranges derived from the sampling pixels). Biennial data of land cover and land cover change will then be derived directly from Terrapulse land cover maps and biennial transition matrices will be used to estimate the improved reference level. Emissions and removals due to degradation and canopy recovery in forest remaining forest will be determined separately from the three canopy cover series developed by Terrapulse and their uncertainty will be estimated, using the 2,083 data points established already for this purpose (see Table 8.3.8 of the ERPD).. Uncertainties of stable classes will be determined from the pixel validation procedure and the 7*7 point analysis will be used to estimate the uncertainty of the transition classes.

Option 2. The Terrapulse estimates of stable classes fall within the confidence interval of the sampling based estimates, but LC-transitions show high levels of uncertainty in the estimation of change (the Terrapulse estimates of changes fall outside the 90% confidence interval of changes estimated from the sampling pixels). Biennial stable classes will then be derived from Terrapulse data and all biennial LC-transitions will be estimated from the sampling pixels and the 7*7 point grid window analysis. Emissions and removals due to degradation and canopy recovery in forest remaining forest will be determined separately from the three canopy cover series developed by Terrapulse and their uncertainty will be estimated, using the 2,083 data points established already for this purpose (see Table 8.3.8 of the ERPD).

Option 3. All estimates of LC-transitions and stable classes based on Terrapulse data fall outside the confidence intervals of the sampling-based estimates. Only sampling-based estimates will be used to calculate the reference level and associated uncertainties and all Terrapulse data will be discarded. The area estimates of the ER-PD will be updated with the estimates from the 7,697 pixels and 7*7 point estimates of transitions and estimated confidence intervals. Biennial change matrices will be derived from the sampling procedure (7,697 pixels and 7*7 point grid windows), where years of transitions are registered for each pixel. In case the uncertainties are high, we will intensify the number of sampling points using the Terrapulse data or other change maps as the basis to stratify the additional sampling points. Emissions and removals due to degradation and canopy recovery in forest remaining forest will be determined separately from the three canopy cover series developed by Terrapulse and their uncertainty will be estimated, using the 2,083 data points established already for this purpose (see Table 8.3.8 of the ERPD).

In order to obtain the land-cover classes and LC-transitions as per table 9.1.1 of the ERPD, the following procedures will be applied:

> Option 1: To separate the forest based classes, broadleaf forest and dry forest will be separated, using the Holdridge Life-Zone map. Areas with pine forest and tree-shaded crops will be masked with maps available in Marena. The areas covered by woody and non-woody vegetation in non-forest classes will be estimated from the reference data (7,697 pixels and 7*7-point grid). The areas with degraded forest and forest enhancement within the forest-remaining forest classes will be derived from Terrapulse 30%, 60%, and 85% cover maps.
>
> Option 2: To estimate the changes within forest types, the proportion of the different forest types will be derived from the 7,697 pixels and 7*7-point grid analysis. Also, the area estimations of woody and non-woody vegetation within the non-forest class will be estimated from the reference points. The areas with degraded forest and forest enhancement within the forest-remaining forest classes will be derived from Terrapulse 30%, 60%, and 85% cover maps.
>
> Option 3: all stable land-cover classes and LC- transitions will be estimated from the 7,679 pixels and 7*7-point grid analysis. Only the areas with degraded forest and forest enhancement within the forest-remaining-forest class will be derived from Terrapulse 30%, 60%, and 85% cover maps, using the Holdridge Life-Zone map and Pine and tree-shaded crops maps will be used to separate the forest cover types.

The applied methodology will be converted to standard operating procedures with guidelines to QA/QC assessments of all steps. MARENA personnel will be trained in all aspects of the procedure, starting from applying the TERRAPULSE algorithms, post-processing and validation of all products.

2. Monitoring and emission factors of soil organic carbon using a considerably improved methodological approach, especially given the significance of soil carbon in mangroves;

The improvements to monitor and estimate emission factors from soil organic matter due to deforestation are twofold: 1) a stratification of the inventory plots, according to major soil types and 2) increase the number of inventory plots, particularly the number of plots in non-woody vegetation, such as annual crops and sugar cane plantations. These improvements are in accordance with the “Guideline on the application of the methodological framework Number 2: Technical corrections to GHG emissions and removals reported in the reference period"

The Dominican Republic is very keen to maintain soil organic carbon in the monitoring procedures, although changes in SOC as a carbon pool will only be used to estimate emissions and ERs from deforestation. In order to improve the estimations of emissions of soil organic carbon due to deforestation, all inventory plots will be stratified according to soil type and land cover. Additional plots will be inventoried using the same methodology as applied in the National Forest Inventory (NFI) and "Evaluating the Biomass and Carbon Content in Non-Forest Cover in the Dominican Republic" (ISNB).

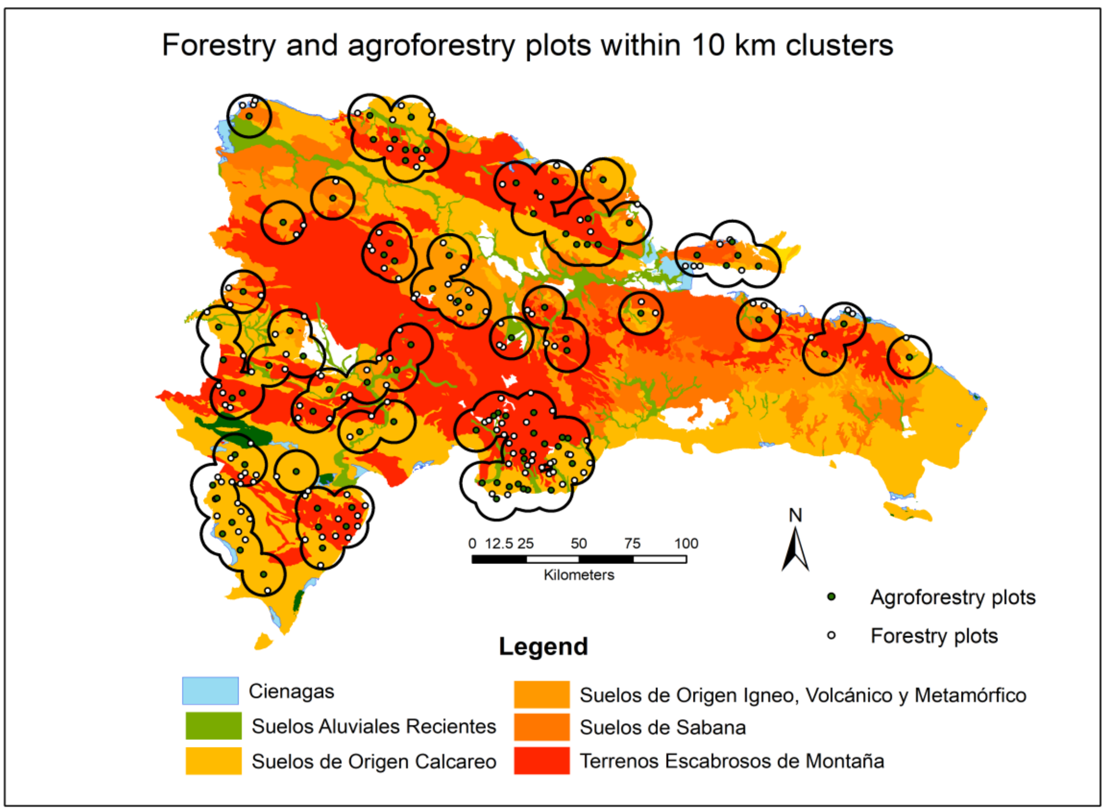


Figure 2. Clusters of NFI and ISBN plots less than 10 km apart from each other.

The new plots will be established in non-wood land uses, mainly annual crops and sugar cane. For each sampling plot, the land use history of the plot will be determined by interviewing the owner and where possible validated with satellite imagery. Soil organic carbon content of the agricultural plots will be compared with SOC of the nearby forest and agroforest plots, to estimate the change and where the history is known, the rate of change. Clusters of plots less than 10 km distance will be generated with plots of NFI, ISNB and non-wood land uses (see Figure 2). We expect similar soil types and environmental conditions within each cluster, leaving land use and cover as the main variable that explain differences in SOC. These plots will be further separated according to soil type, using the following plot distribution (Table 1):

Table 1. Number of forestry, agroforestry and agricultural plots (to be inventoried) in each major soil type

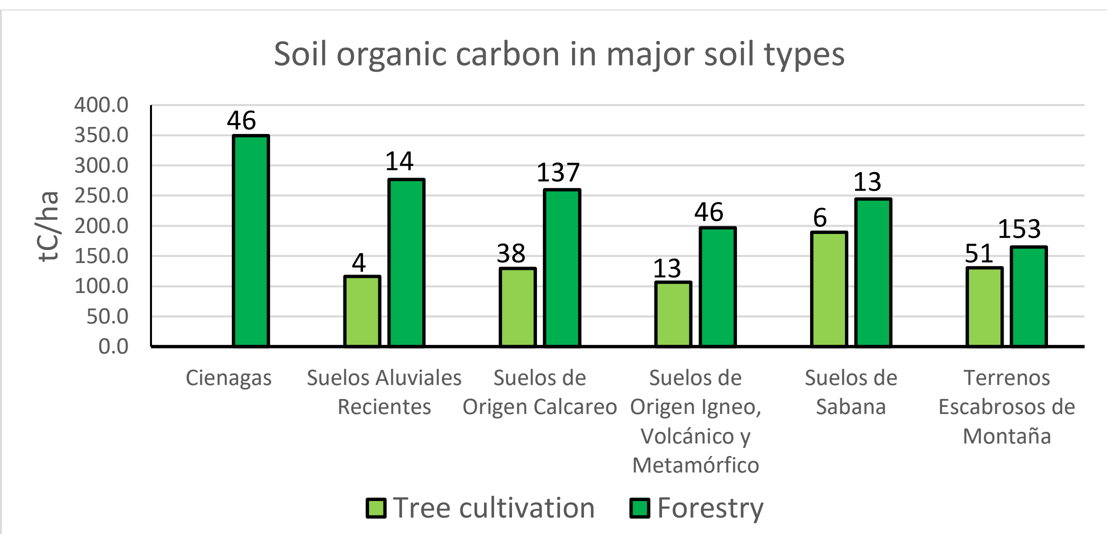
Major soil types of the RD		Number of inventory plots		
	HECTARES	NFI	Tree cultivation	Agricultural plots (to be inventoried)
Cienagas (manglar)	58,155	46		10
Suelos Aluviales Recientes	265,544	14	4	10
Suelos de Origen Calcáreo	1,553,330	137	38	36
Suelos de Origen Igneo, Volcánico y Metamórfico	574,518	46	13	13
Suelos de Sabana	449,091	13	6	11
Terrenos Escabrosos de Montaña	1,599,240	153	51	40
Total general	**4,499,878**	**409**	**112**	**120**

In 2024, SOC will be determined in 10% of all plots to determine changes over time and to validate the ERs derived from a reduction in the rate of deforestation.

Justification:

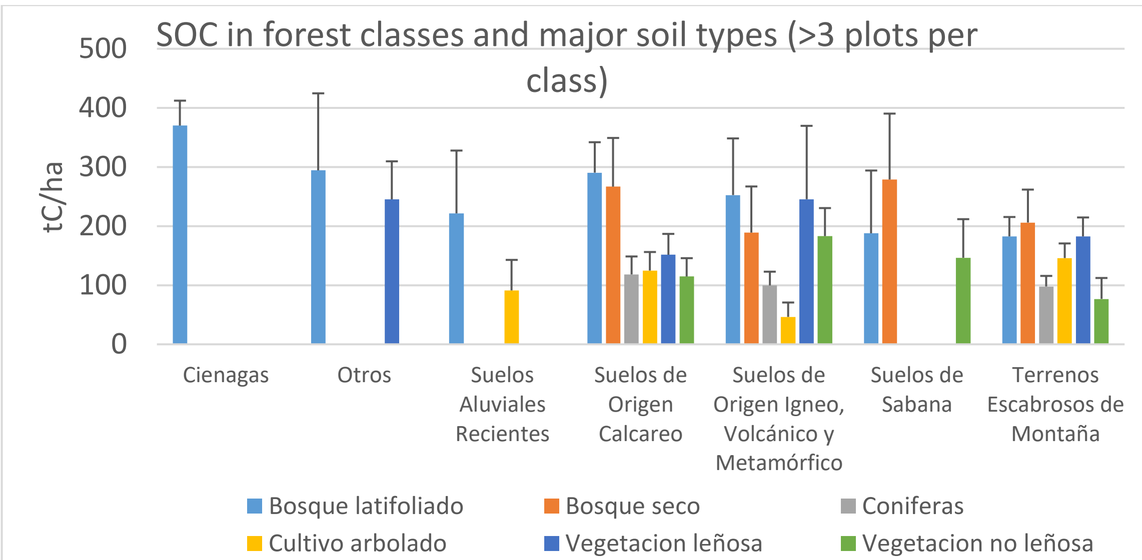
The results obtained from the forestry and agroforestry plots show a decrease in SOC between forest and Tree-shaded crops for all soil types where both land cover types occur (Figure 3)

Figure 3. Soil organic carbon in major soil types separated for forestry and Tree-shaded crops (coffee, silvopastoral systems and cacao).



We also observed differences in SOC for the major forest-soil combinations and other land uses, (Figure 4), with relatively high values of SOC in cienagas (dominated by mangrove forest) and lower values in “terrenos escabrosos de montaña”. SOC in plots with woody vegetation as the land cover was always higher than in plots with non-woody vegetation. All plots with non-woody vegetation were established in pasture land, which may explain the relatively high SOC-content in some soil types. SOC in tree cultivation plots were lower than broadleaved forests and dry forest for all soil types.

Figure 4. Soil organic carbon (COS) separated for the major soil and forest types.



Once all data are available, tests will be performed to separate EFs from LC-transitions of forest to non-forest according to soil type and for those cases where significant differences are detected, these will be applied accordingly to estimate the reference level and ERs during monitoring.

To respond to the comment raised by the CF members “It seems that for the EF for SOC, the ERPD assumes a 1/20 of the total carbon stock change, only one time during the Reference period. p203. Seems illogical”, the following:

To estimate the emission of soil organic carbon from deforestation, the IPCC suggest to use a default transition period of 20 years from SOC_{forest} to $SOC_{non\text{-}forest}$, when no data on SOC-loss in time are available. In the Dominican Republic these data are not yet available, as such the 20-year default legacy period was used to estimate emissions from SOC of each area deforested during the reference period, without taking into consideration emissions from SOC of deforested areas prior to the reference period. An alternative approach would be to assume an immediate release of all SOC in the year of deforestation, which in turn implies that deforestation is considered as constant over time, thus similar in area and type of deforestation before, during and after the reference period (thus, the legacy of areas deforested before 2006 are taking into account in the reference level estimation, and the legacy emissions after 2015 of areas deforested during 2006-2015 are also considered). This approach is only applicable when there is no tendency over time in the rate of deforestation. This assumption will be tested with Terrapulse data available between 2001 and 2018 and applied, once the Terrapulse data are validated, to estimate SOC-based emissions for the reference level and ERs. If there is a tendency in deforestation over time, this will need to be taken into account in the legacy analysis of emissions from SOC due to deforestation.

3. Estimation of separate emission factors for secondary and primary forest.

Based on the information made available by Terrapulse, each forest pixel will be subdivided into five categories:

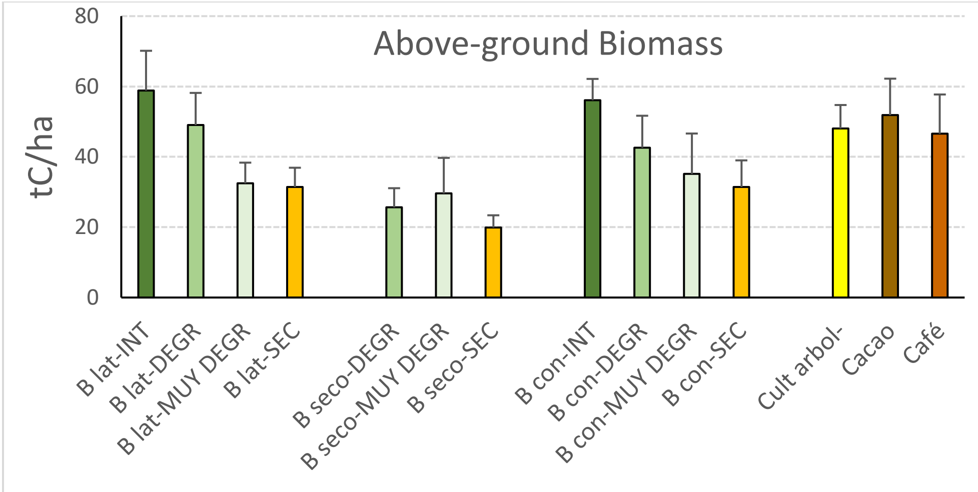
- Intact forest (>85% crown cover)
- Degraded forest (60-85% crown cover)
- Highly degraded forest (30-60% crown cover)
- Secondary forest (areas that are non-forest in 2001 and forest in 2015).
- Tree-shaded crops (derived from maps with permanent tree-cultivation, available in MARENA)

Emission factors for each category and forest type will be determined in two phases:

1. All forest inventory plots and plots with tree-shaded crops will be classified in one of the five categories, based on Terrapulse data, and carbon content of each plot will be directly derived from the NFI database (average and 90%CI, see Figure 6). Mean annual increment of secondary forest (tC/ha/yr) will be estimated dividing standing biomass by the age determined from the Terrapulse data.
2. A series of maximum 50 secondary plots will be inventoried in 2020 and age will be determined from different sources: interviews and satellite information and secondary information. Standing biomass of these plots will be divided by age to estimate mean annual increment rates (tC(ha/yr).

Applying phase 1 we separated the inventory plots in the five categories. 60% of the plots with tree-shaded crops were classified as degraded or very-degraded forest, 29% as intact forest and 11% as non-forest. The above-ground biomass show a steady decrease in biomass from intact forest to highly degraded and secondary forest for the three forest types and biomass in intact forest is also higher than biomass in tree-shaded crops (coffee, cacao and all together (Figure 6), particularly taking into account he biomass of intact broadleaf forest (B lat INT). The data show that tree-shaded crops have similar biomass densities as degraded broadleaf forest but lower than intact broadleaf forest, which is what was expected, considering that tree-shaded crops are mostly established in the areas with broad-leaf forest (this respond to a comment of one of the CF-country raised on the data presented in the ERPD, where biomass in agroforestry seem to be higher than in forest).

Figure 6, Aboveground biomass in each forest type, separated into intact (INT), degraded (DEGR), very degraded (MUY DEGR) and secondary forest (SEC). B lat = broadleaved fore st, including mangrove; B seco = dry forest; B con = coniferous forest; Cult arbol = Tree-shaded crops.



The methodological improvements that are proposed in the previous sections will substantially change the content of chapters 8, 9 and 12 of the ERPD and the estimations of the REs in chapter 13. Various LC-transitions will be added to the reference scenario and monitoring. In the next section the proposed changes to chapter 9 are presented, in blue the LC-transitions that will be new transitions and in yellow the changes in the text to be inserted in the ERPD, once the proposal for improvements are accepted:

*Table **Error! No text of specified style in document.**.1 **Summary of the procedures for generating activity data during the MMR (adjustments will also be reflected in the estimation of the reference level of chapter 8 and uncertainty analysis of chapter 12).***

Parameter:	Activity data

Description:	Activity data used to estimate the FREL reference level, determined for the monitoring period:
	
	Forest land converted to non-forest LC types (for those deforestation transitions where SOC-emissions are significantly different between soil types, these will be estimated separately):
	• 11 Broadleaf forest to Woody vegetation
	  ○ Broadleaf mature forest to Woody vegetation
	  ○ Broadleaf secondary forest to Woody vegetation
	• 12 Broadleaf forest to Non-Woody vegetation
	  ○ Broadleaf mature forest to Non-Woody vegetation
	  ○ Broadleaf secondary forest to Non-Woody vegetation
	• 13 Dry forest to Woody vegetation
	  ○ Dry mature forest to Woody vegetation
	  ○ Dry secondary forest to Woody vegetation
	• 14 Dry forest to Non-Woody vegetation
	  ○ Dry mature forest to Non-Woody vegetation
	  ○ Dry secondary forest to Non-Woody vegetation
	• 15 Pine to Woody vegetation
	  ○ Pine mature forest to Woody vegetation
	  ○ Pine secondary forest to Woody vegetation
	• 16 Pine to Non-Woody vegetation
	  ○ Pine mature forest to Non-Woody vegetation
	  ○ Pine secondary forest to Non-Woody vegetation

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30 Tree shaded crops to Woody vegetation
28 Tree shaded crops to Non-woody vegetation

Land converted to forest land:

17 Woody vegetation to Broadleaf secondary forest
18 Woody vegetation to Dry secondary forest
19 Woody vegetation to Pine secondary forest
29 Woody vegetation to Tree shaded crops
20 Non-Woody veg to Broadleaf secondary forest
21 Non-Woody veg to Dry secondary forest
22 Non-Woody veg to Pine secondary forest
23 Non-Woody veg to Tree shaded crops

Land remaining as forests

2 Area of Broadleaf forest with recovery of canopy cover

Broadleaf mature forest with recovery of canopy cover
Broadleaf mature forest with loss of canopy cover
Broadleaf secondary forest with recovery of canopy cover

5 Area of Dry forest with recovery of canopy cover

Dry mature forest with recovery of canopy cover
Dry mature forest with loss of canopy cover
Dry secondary forest with recovery of canopy cover

8 Area of Pine forest with recovery of canopy cover

Pine mature forest with recovery of canopy cover
Pine mature forest with loss of canopy cover
Pine secondary forest with recovery of canopy cover

3 Area of degraded Broadleaf forest

Degraded broadleaf forest with recovery of canopy cover
Degraded Broadleaf forest with loss of canopy cover
Highly degraded broadleaf forest with recovery of canopy

6 Area of degraded Dry forest

Degraded dry forest with recovery of canopy cover
Degraded dry forest with loss of canopy cover
Highly degraded dry forest with recovery of canopy

9 Area of degraded Pine forest

Degraded pine forest with recovery of canopy cover
Degraded pine forest with loss of canopy cover
Highly degraded pine forest with recovery of canopy

26 Tree shaded crops to Broadleaf secondary forest
31 Tree shaded crops to Dry secondary forest
32 Tree shaded crops to Pine secondary forest
27 Broadleaf forest to Tree shaded crops

Broadleaf mature forest to Tree shaded crops
Broadleaf secondary forest to Tree shaded crops

33 Dry forest to Tree shaded crops

Dry mature forest to Tree shaded crops
Dry secondary forest to Tree shaded crops on

34 Pine forest to Tree shaded crops

Pine mature forest to Tree shaded crops
Pine secondary forest to Tree shaded crops

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<tr><td>Data unit:</td><td>Hectares</td></tr>
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Parameter:	Carbon density and emission factors
Description:	Carbon densities used to estimate the FREL, including AGB, BGB, MM, H and SOC: • Broadleaf forest • Dry forest • Pine • Tree shaded crops • Woody vegetation • Non-Woody vegetation
Data unit:	t CO2*ha-1
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	The data from the National Forest Inventory (NFI) and from "Evaluating the Biomass and Carbon Content in Non-Forest Cover in the Dominican Republic" (ISNB) are used to estimate the carbon density in each of the land uses. Both inventories were carried out using the same primary and nested plots to determine the carbon density for each component recognized as a sink. the allometric equations of Chave et al. (2014) was used to convert the inventory data to above-ground biomass since there is no specific allometric equation for broadleaf woodlands in the Dominican Republic, only for pine trees, a local allometric equation is used. (Márquez, 2000). Allometric equations developed in Nicaragua and Costa Rica are used for coffee, cocoa, coconut, mango, avocado, and guava (see Table 8.3.11). The Cairns et al. (1997) equation is used to quantify below-ground biomass (1997). In both inventories, the carbon factor that is used is the IPCC's default value (0.47).
Frequency of monitoring/recording:	The Dominican Republic recently (October 2018) finalized the National Forest Inventory and the study "Evaluating the Biomass and Carbon Content in Non-Forest Cover in the Dominican Republic" (ISNB). The Forest Monitoring Unit has drawn up the re-measurement schedule and is planning to re-measure 10% of the plots in 2020 and these will be maintained as permanent plots, once a budget is allocated. The data will be used to generate stock-change estimates of the different forest and agroforest LC classes. An additional 120 plots will be inventoried in 2019 and 2020, to measure biomass and SOC in non-tree cover plots, particularly annual crops and sugar cane. SOC will be determined at the end of 2024 in 10% of all plots to validate the ERs from SOC due to a reduction in deforestation.
Monitoring equipment:	The Forest Monitoring Unit is responsible for updating the National Forest Inventory (NFI), and for carrying out specific inventories for assessing the condition of forests throughout the country.
Quality Assurance/Quality Control procedures to be applied:	The emission factors for the estimation of forest emissions and removals will be updated from those used in the construction of the reference level with the data that become available from the new plots and stratification of the plots according the forest cover class and soil type. The QA/QC procedures used in both inventories and established by the Forest Monitoring Unit, will be applied to all inventories.
Identification of sources of uncertainty for this parameter	There are three sources of uncertainty associated with the estimation of the EFs: • The country has allometric equations for the estimation of biomass in pine forests (Pinus occidentalis) only. The equations used to

	calculate AGB and BGB for the remaining forest and non-forest LC-cover classes are not calibrated specifically for the Dominican Republic. • Secondary forests were not separated from primary forest at the start of the reference period (2005), which may overestimate the emissions from deforestation and forest degradation or underestimate the removal of carbon during the process of biomass recovery in secondary forests. It was assumed that the forest present in 2005 were primary forests, which is not likely. The new procedure is separating secondary forest established after 2001. • The estimation of uncertainty in soil organic carbon (SOC) is very high in all LC classes, due to the variation of soil types and the low number of sampling points with SOC data. Once the new data are available, EFs of major LC-transitions will be separated into the dominant soils types and tested for significant differences between EFs. Where differences are significant, these will be applied separately for each LC transition and soil type to estimate the reference level and during monitoring of ERs.
Process for managing and reducing uncertainty associated with this parameter	• The Forest Monitoring Unit will validate the allometric equations used in the NFI. • Secondary forests, established after 2000 will be derived from a time series analysis (e.g. Terrapulse[1]) and the data available in the INF and ISNF. In a later stage, historical change from non-forest to forest and vice versa of all plots will be determined back to 1986 with BFAST[1]and any plot of the three inventories that changed in this period will be used to estimate the age of the forest plot and average increase in biomass. • Data on SOC will be improved by analyzing SOC of the remaining inventory plots and the new plots to be established in Non-woody vegetation (annual crops and sugar cane). Soil type of all plots will be determined by overlaying the location of the plots on soil maps and up to 120 additional plots will be established in those LC-soil type classes that are not well represented (particularly Non-woody vegetation). Changes in SO will be determined in 2024 in 10% of all plots.
Any comment:	

ANEXO

Brief overview how the Dominican Republic is responding to the conditions pointed out in Resolution CFM/20/2019/5

[1] BFAST, Breaks for Additive Season and Trend, integrates the decomposition of time series into trend, season, and remainder components with methods for detecting and characterizing change within time series. BFAST iteratively estimates the time and number of abrupt changes within time series and characterizes change by its magnitude and direction. BFAST can be used to analyze different types of time series (e.g. Landsat, MODIS) and can be applied to other disciplines dealing with seasonal or non-seasonal time series, such as hydrology, climatology, and econometrics. The algorithm can be extended to label detected changes with information on the parameters of the fitted piecewise linear models. https://sepal.io/

Herewith a brief overview how the Dominican Republic is responding to the conditions pointed out in **Resolution CFM/20/2019/5: Selection of Emission Reductions Program Document of Dominican Republic into the Portfolio of the Carbon Fund of the FCPF.**

In this document the fulfillment of the following conditions are required (1) preferably as soon as possible after this meeting but, in any case, by no later than September 15, unless otherwise agreed with the Carbon Fund Participants, and (2) in substance satisfactory to the Trustee, with the consent of the Carbon Fund Participants on a three (3) week no objection basis:

(a) Revision of the ER-PD that adjusts the estimation of residual uncertainty, consistent with the 2006 IPCC Guidelines, and adjusts the uncertainty buffer estimate under the ER Program Buffer, as appropriate, and submission of such revised ER-PD to the FMT;

Chapter 12 of the revised ER-PD includes an update of the uncertainty analysis in accordance with the 2006 IPCC guidelines and the uncertainty buffer has been adjusted accordingly in chapter 13. The estimated ERs are also adjusted in the abstract and chapter 2.

(b) Submission of a document to the FMT detailing any proposed additional technical corrections to be made to the Reference Level before the first verification (Technical Corrections Proposal), in line with the "Guideline on the application of the methodological framework Number 2: Technical corrections to GHG emissions and removals reported in the reference period" dated November 2018 and pursuant to the additional guidance provided in the Chair's Summary for this meeting.

A separate document is prepared that explains in detail how the country will improve the reference level, in line with the "Guideline on the application of the methodological framework Number 2: Technical corrections to GHG emissions and removals reported in the reference period", taking into account the considerations pointed out in the Chair's summary:

CFPs encouraged the Dominican Republic to further develop the following issues under the ER Program, informing the FMT, CFPs, and Observers prior to ERPA signature:

• Consider the following improvements when preparing the Technical Corrections Proposal as laid out in Resolution CFM/20/2019/5:

- Biennial data on deforestation of primary and secondary forest, degradation, restoration, deforestation, all data on a pixel basis wall-to-wall;

The Dominican Republic explains in detail how the activity data will be improved, including the validation process of wall-to-wall products delivered by Terrapulse and an intensive sampling process to estimate the uncertainty in activity data, according to GFOI guidelines. The separation of primary, secondary and degraded forests will generate a series of additional LC-transitions, for which a comprehensive sampling system has been designed to estimate all the uncertainties.

- Monitoring and emission factors of soil organic carbon using a considerably improved methodological approach, especially given the significance of soil carbon in mangroves;

The Dominican Republic explains in detail how the soil organic carbon (SOC) data will be improved, including additional inventory plots, repeated measurements and the separation of samples in major soil types, in order to monitor the emission factors of SOC. As stated before, ERs will only be estimated from avoided deforestation.

- Estimation of separate emission factors for secondary and primary forest.

The Dominican Republic explains in detail how the emission factors of secondary, degraded and primary or intact forests will be separated. Terrapulse time series will be used to determine the age of secondary inventory plots, using at first 2001 as the year which separate primary and secondary forest. In a later stage, 1986 will be used to determine the age of forest. A maximum of 50 permanent inventory plots will be established in secondary forests to determine mean and current annual increments and 10% of all inventory plots will be converted to permanent plots to measure changes in biomass and to validate ERs from soil organic carbon.

• Clarify how the downward trend of FREL data is taken into account in setting the Reference Level.

The Dominican Republic explains in chapter 8 of the ERPD how the removal of carbon has been treated in secondary forests, which in turn generated the downward trend in the FREL. Table 8.5.1 has been simplified, in order to avoid confusion.

• Continue to work on identifying potential sources of finance for private sector activities and begin implementation of a strategy to attract this financing.

The government finalized this year the Cost and Benefit Analysis of the ER-Program with support from a firm that gathered information on the administrative, transaction, implementation and opportunities costs. These were projected to a five- and 20-year term scenario. In addition, Terms of Reference were drafted and are under review by ER-Program stakeholders and Bank experts to hire a firm on an international process, that will look into designing a financing plan for the ER Program that strengthens the funding opportunities and sources of funds. The consultancy will look into blended finance schemes both targeting local sources, such as from the Agrarian Bank, and climate finance such as Green Climate Fund and impact investors among others. The firm will aid in the design of bankable projects for potential investors.

• Further develop the benefit-sharing arrangements, ensuring all relevant stakeholders, including those without formal land title, are represented and have access to benefits.

A preliminary version of an Advanced Draft of the Benefit Sharing Plan has been written and was consulted on September 10th, 2019 on a workshop with the Technical Advisory Committee and the Executing Entities of the ER -Program. The workshop validated the Benefit Sharing architecture, transfer of titles, and percentages and conditions of flow of funds to beneficiaries among others. The government will submit on the last week of September the final version of the Advanced Draft of the Benefit Sharing plan for World Bank review and to be ready for the Quality Enhancement Review to take place in October 2019.