Viet Nam's Submission on Reference Levels for REDD+ Results Based Payments under the UNFCCC

Ministry of Agriculture and Rural Development, Vietnam

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1 FOREST DEFINITION

The definition of forests used for the construction of FREL/FRL for Vietnam, applies the definitions provided under Circular No. 34/2009/TT-BNNPTNT on criteria for forest identification and classification, defining forests as: minimum 10% tree cover, at a minimum height of 5 meters, over a minimum area of 0.5 ha (see Box1 below).

Newly planted or regenerated forests do not always reach the thresholds of the forest definition in situ. To avoid over-estimation of forest land while at the same time assessing newly established forest plantations as early as possible, Circular 34 sets a separate minimum height for forest plantations. (When this height is exceeded, establishment of the forest plantation is a fact and the likelihood of the forest plantation reaching the 5 meter height threshold in situ is optimal.) These thresholds are 1.5 meter height for slow growing plantations and 3 meter height for fast growing plantations and the density of at least 1,000 trees per ha.

Box 1: Forest definition under the Circular 34:

An area is identified as a forest when it meets the following 3 criteria:

1. An ecosystem of which the major component is perennial timber trees, bamboos and palms of all kinds of a minimum height of 5 meters (except new forest plantations and some species of coastal submerged forest species), and capable of providing timber and non-timber forest products and other direct and indirect values such as biodiversity conservation, environmental and landscape protection.

New forest plantations of timber trees and newly regenerated forests of forest plantations are identified as forests if they reach the average height of over 1.5 meters for slow-growing species, and over 3.0 meters for fast-growing species and a density of at least 1,000 trees per hectare.

Agricultural and aqua-cultural ecosystems with scattered perennial trees, bamboos or palms etc. will not be regarded as forests.

2. Having a minimum tree cover of 10% for trees which constitute the major component of the forest.

3. Having a minimum plot area of 0.5 hectares or forest tree strips of at least 20 meters in width and of at least 3 tree lines.

This definition is consistent with the forestry definition used for the GHG inventory of the Viet Nam National Communication 2010.[1]

Prior to the issuance of the Circular 34 (which reflects changes made pertaining to tree cover first in the Law on Forest Protection and Development 2004), the forest definition applied in Viet Nam (Decision 682B, 1984) set a minimum of 30% tree cover. This former definition was applied to the Clean Development Mechanism under the Kyoto Protocol. The main rationale behind Viet Nam's choice to change its forest definition was to standardize with internationally applied definitions (i.e., FAO FRA definition of forests).

Box 2: Plantations

According to "Decision 2855 (2008) on Identification of Rubber as Multi-purpose Trees", rubber is defined as a multi-purpose tree and is accounted as forest.

The planting of *Acacia* when occurring as nursing tree for improving native species growth is considered natural forest, and forest plantation otherwise.

For the purpose of FREL/FRL development, data for the historical reference period have consistently been re-interpreted applying the new definition (i.e., 10% tree cover).

2 CLASSIFICATION AND STRATIFICATION SYSTEMS

For the purpose of estimating historical emissions and removals with increased accuracy, Viet Nam has stratified its land use into 17 land use types including 12 forest types (Table 1). Emission Factors/Removal Factors (EFs/RFs) are calculated based on the average carbon stock in these forest and land use types.

Table 1: The 17 forest and land use types used to estimate EFs/RFs

ID	Forest type	Forest / Non-forest	Remarks
1	Evergreen broadleaf - rich forest	Forest	Average timber stock > 200 m^3/ha
2	Evergreen broadleaf - medium forest	Forest	Average timber stock 100-200 m^3/ha
3	Evergreen broadleaf - poor forest	Forest	Average timber stock < 100 m^3/ha
4	Evergreen broadleaf - regrowth forest	Forest	

[1]It is also consistent with the forest definition described in the Emission Reduction Program Idea Note submitted in May 2014 to the Forest Carbon Partnership Facility.

5	Deciduous forest	Forest	
6	Bamboo forest	Forest	
7	Mixed timber and bamboo forest	Forest	
8	Coniferous forest	Forest	
9	Mixed broadleaf and coniferous forest	Forest	
10	Mangrove forest	Forest	
11	Limestone forest	Forest	
12	Plantation	Forest	
13	Limestone without trees	Non forest	
14	Other bare land (grass land, shrub land, land with scattered trees)	Non forest	
15	Water body	Non forest	
16	Residential area	Non forest	
17	Other land	Non forest	

In addition, to reduce the uncertainty of emissions and removals estimates as far as possible, Viet Nam further stratifies its EFs/RFs into ecological regions. Table 2 shows the eight agro-ecological regions of Viet Nam.

Table 2: Eight agro-ecological regions in Vietnam

ID	Agro-eco regions (MARD)	Provinces/Cities included
1	North West	Lai Chau, Dien Bien, Son La, Hoa Binh
2	North East	Cao Bang, Lang Son, Bac Kan, Thai Nguyen, Quang Ninh, Bac Giang, Lao Cai, Yen Bai, Ha Giang, Tuyen Quang, Phu Tho
3	Red River Delta	Hai Phong, Hai Duong, Bac Ninh, Hung Yen, Ha Noi, Thai Binh, Nam Dinh, Ha Nam, Ninh Binh, Vinh Phuc
4	North Central Coast	Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien – Hue
5	South Central Coast	Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan
6	Central Highlands	Gia Lai, Kon Tum, Dak Lak, Dak Nong, Lam Dong

7	South East	Dong Nai, Binh Duong, Binh Phuoc, Tay Ninh, Ho Chi Minh City, Ba Ria - Vung Tau
8	Mekong River Delta	Long An, Ben Tre, Dong Thap, Soc Trang, Vinh Long, Can Tho, Hau Giang, Tien Giang, Bac Lieu, Ca Mau, Kien Giang, An Giang, Tra Vinh

However, since the National Forest Inventory (NFI) cycle 4 did not apply sufficient numbers of sample plots for the Red River Delta and Mekong River Delta regions, the Red River Delta region is combined with the North East region while the Mekong River Delta region is combined with the South East region when estimating historical average carbon stocks of forest types.

3 SCOPE OF ACTIVITIES, POOLS AND GASES INCLUDED IN THE FREL/FRL

3.1 Activities

The following definitions are applied for the five REDD+ activities, which are all accounted for under FREL/FRL of Viet Nam;

Reducing emissions from deforestation ("Deforestation"):

Activity of conversion of forests to non-forest land, as identified per NFI[2] results with modifications based on updates[3].

Where a series of activities including deforestation may have occurred within a single cycle of NFI, the deforestation activity occurring as a transitional activity will not necessarily be captured by the NFI, thus will be reported as degradation.

Reducing emissions from forest degradation ("Degradation"):

Activity resulting in a downward shift in terms of carbon stock between forest types, including evergreen broadleaf forest volume-based sub-types of "rich, medium, and poor" (based on the average standing volume per ha) and other forest types (deciduous, bamboos, etc.) (See Table 3below).

Enhancement of forest carbon stocks from reforestation ("Reforestation"):

Activity of land use change from non-forest land to forest land.

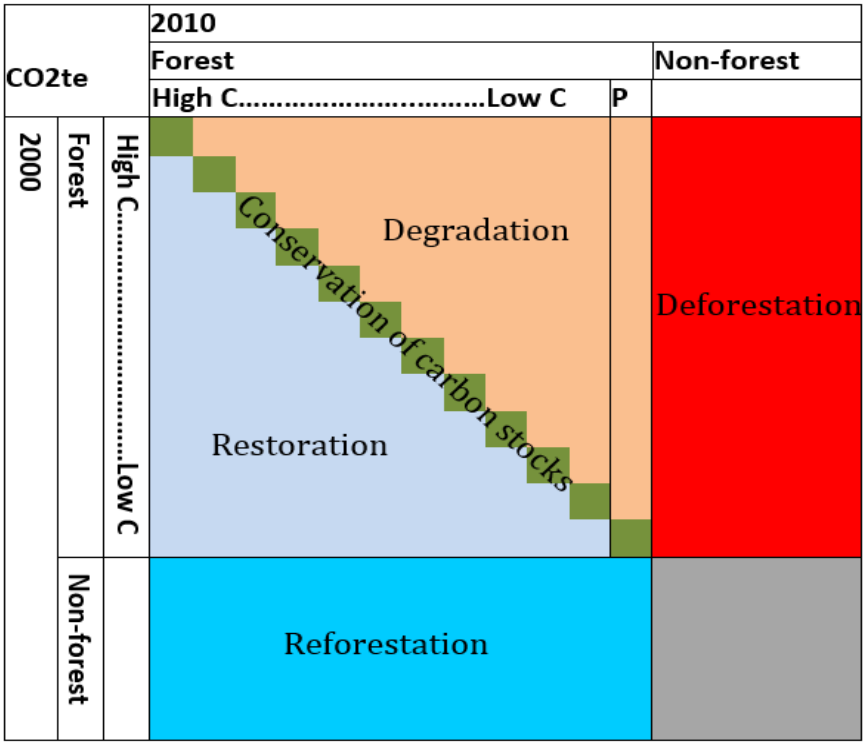
Enhancement of forest carbon stocks from forest restoration ("Restoration"):

Activity resulting in upward shift of carbon stock between forest types, including evergreen broadleaf forest volume-based sub-types of "rich, medium, and poor" (based on the average standing volume per ha) and other forest types (deciduous, bamboos, etc.) (See Table 3).

[2] Including both plot measurements and remotely sensed information.

[3] Updates were made to the original results of the NFI cycles 1-4 by the same implementing body Forest Inventory and Planning Institute (FIPI) under MARD with technical and financial assistance from (in sequential order) Finland, Japan, MARD and UN-REDD Vietnam Programme throughout 2011-2015.

Table 3: Matrix of land type changes.



C: carbon; P: plantation

Activities resulting in shifts upwards between the above mentioned volume-based sub-categories may occur as results of both current and past human interventions. Notwithstanding, all such shifts will be accounted for under the FRL, and applying the principle of symmetrical reporting, all symmetrical downward shifts will be reported under degradation.

Conservation of forest carbon stock:

Forest types remaining the same, are regarded as "Conservation of forest carbon stock". These areas are accounted for, by applying growth factor for the removals, and assuming as emissions, the equal absolute amount of removals, as only one set of carbon stocks estimates is applied. With future forest inventories, changes of carbon stock in forests remaining the same forest type may be monitored more robustly and the corresponding emissions/removals accounted for.

Sustainable management of forests: Since Viet Nam does not have exact boundaries on areas for sustainable management of forests, this activity is included as part of the restoration or conservation of forest carbon stocks.

Symmetrical reporting

Given the complex character of forest land dynamics, there is a risk of some overlap between the above mentioned activities. E.g. deforestation may be preceded by forest degradation; forest degradation may be followed by restoration etc. Some of these dynamic processes only result in temporal emissions, the effect of which may be annulled if followed by an equal amount of removals in a short time-span. To avoid incomplete or partial reporting of these dynamics processes, Viet Nam proposes symmetrical reporting in the form of the land conversion matrix as displayed in Table 3. Thus, if a forest area (e.g. rich evergreen) is firstly degraded (to e.g. poor evergreen) and subsequently deforested (to e.g. cropland) the accumulated carbon

stock change would be the same as a direct deforestation from rich evergreen to cropland and therefore emissions from forest degradation and deforestation are not double-counted. Furthermore, given the dynamic character of forest degradation where extraction and regrowth are happening alternately, the approximation of the magnitude of degradation can be simplified by considering net change over a larger area over time. The land change matrix provides both aspects of this dynamic process though forest degradation and restoration and since the assessment represents a wall-to-wall comparison with full country coverage, short-term temporary dynamics will not result in a biased or incomplete assessment. The full inclusion of REDD+ activities in the FRL minimizes the risk of leakage or displacement of emission reductions from one activity to another.

Box 3: Conversion of natural forests to plantations

Conversions of natural forests to plantations remain a part of the national forest development activities, but only targets degraded forests. In the context of REDD+, if and when this conversion takes place, this will be regarded either as "forest degradation" or as "enhancement of forest carbon stocks", depending on whether the carbon contents of the plantation is lower or higher than the degraded natural forest it replaces. To avoid accounting for results-based payments under REDD+ any area of conversion of natural forests into plantations, these conversions were given an emission factor corresponding to the total loss of carbon of the original forest type (i.e. to the effect of a "deforestation" event).

The forest stratification applied to the past data collected on forests and planned for the Monitoring, Reporting and Verification (MRV) system clearly separate plantations from natural forest.

3.2 Carbon pools included in FREL/FRL

The carbon pools included in the construction of FREL/FRL for Viet Nam are summarized in Table 4 below.

Table 4: Pools included in the FREL/FRL for Viet Nam

Carbon pools	Included
AGB	Yes
BGB	Yes
Soil organic carbon	No
Dead wood	No
Litter	No

Vegetation components included in the aboveground biomass pool

The carbon stocks of the forests are calculated as the sum of the aboveground part of the living trees equal or bigger than 6 cm in diameter as measured in the national

forest inventory. The lianas, shrubs and understorey are not included due to lack of information and as they are not considered a significant contributor to forest aboveground biomass (less than 5 to 10%[4]). If future national forest inventory collect more information on these components, they will be included in the future FREL/FRL submission.

Justification for inclusion of BGB pool

Researches indicate that this pool constitutes from 0.2 to 1.0 times of AGB pool, depending on the forest type, and therefore is a significant pool. This pool is often estimated indirectly via a root-to-shoot (R/S) ratio. Viet Nam does not have a country-specific R/S ratio, and therefore will apply the IPCC default value. This will cause a high uncertainty estimate for this pool. However, considering the high costs of developing country-specific R/S ratio, there are no foreseen plans for conducting future research in Viet Nam. Taking into account the above, this pool has been included in the FREL/FRL for Viet Nam applying the IPCC default value.

Justification for exclusion of deadwood, litter and soil organic carbon pools

Changes in deadwood, litter and soil organic carbon stocks from deforestation will not be reported due to lack of a reliable time series of data for the whole country, and also since these are not considered significant pools. For soil organic carbon related to peat soil burning, potential emissions may be significant on a per hectare basis, but peat soils represent a marginal area of the forest land of the country (i.e. 0.04%[5]) and therefore their overall contribution to country-wide emissions is considered not significant. Furthermore, burning of peat soils is reducing in occurrence (i.e. the area of peat land burned in 2009 represented 46 % of the area burned in 1976[6]).

3.3 Gases included in FREL/FRL

Non-CO_2gases are emitted only through incidents of forest fires. The national statistics of Viet Nam report on average 2,339 ha of forest burning per year during the period 2005-2013 (0.01% of the country area).

Data on forest types impacted by fire is missing to accurately estimate the corresponding emissions, but a rough estimate based on the national statistics and Tier one combustion factors resulted in forest fire being responsible for less than 0.1% of Viet Nam non-CO_2 emissions for the period 2000-2010.

Therefore non-CO_2 gases are not included in the FREL/FRL for Viet Nam. CO_2 is the only gas included in Viet Nam's FREL/FRL.

4 SCALE OF THE FREL/FRL

The scale of Viet Nam's FREL/FRL is national.

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[4] See international studies: Schnitzer, S. A. and Bongers, F. (2011). "Increasing liana abundance and biomass in tropical forests: emerging patterns and putative mechanisms." Ecology Letters 14(4): 397-406 or Chave, J. et al. (2008). "Above-ground biomass and productivity in a rain forest of eastern South America." Journal of Tropical Ecology 24(04): 355-366.

[5] 12,983 ha of peat land were reported under the study from Phuong, V.T., Anh, T.T.T., Minang, P.A., forthcoming. Properties and carbon stock distribution of peat in U Minh Ha and U Minh Thuong National Parks, Viet Nam.

[6] Phuong, V.T., Sam, D.D., Anh, T.T.T. (2011). Report on potential emission reduction through peat land management in Viet Nam, Vietnamese Academy of Forest Science.

Viet Nam has a history of implementing NFIs since 1991, providing nation-wide data of its forest resources. Therefore, Viet Nam has sufficient data to develop a FREL/FRL at the national scale. The scale of Viet Nam's FREL/FRL is in agreement with the UNFCCC Decision 1/CP 16 paragraph 71, requesting countries to develop national FREL/FRL.

5 TRANSPARENT, COMPLETE, CONSISTENT AND ACCURATE INFORMATION USED IN THE CONSTRUCTION OF THE FREL/FRL

5.1 National circumstances and adjustments

Much of Viet Nam's forest cover was removed between 1943 and 1993 declining from at least 43% to 28%. Since then Viet Nam has made considerable efforts to increase its overall forest cover. Based on the forest cover maps generated by NFI, the actual forest area in Viet Nam has increased to 13.7 million ha in 2010 from 11.3 million ha in 1995. Much of the increase has been due to establishment of new plantations, which account for 2.1 million hectares, and the re-designation and inclusion of previously omitted limestone forests. It is generally acknowledged that the quality of natural forests continues to be more fragmented and degraded. As of 2010, over two-thirds of Viet Nam's natural forests are considered poor or regenerating, while rich and closed-canopy forest constitutes only 5 percent of the total. Between 1995 and 2010, the area of natural forest classified as rich decreased by 35,000 ha/year and medium forest reduced by 66,000 ha/year. These figures indicate that deforestation and forest degradation are still serious issues for Viet Nam. The key drivers of deforestation and forest degradation include: (i) Conversion of forest lands for agriculture and other purposes; (ii) Infrastructure development such as roads and hydropower plants; (iii) Unsustainable logging; and (iv) Forest fires.

Understanding the importance of forests and their environmental protection function, and recognizing the needs of effective policies to curb loss of forest cover from the end of 1980s to the early 1990s, since around the mid-1990s, the Government of Viet Nam has invested in a number of nation-wide reforestation, restoration and forest protection programmes; most notably the Programme No. 661 "Five million hectare reforestation programme" (1998-2010) has made considerable contributions to the recent national forest cover trends. The Final Report 243/BC-CP of the Programme 661 (dated 26/10/2011) refers to the main achievements from this national Programme including reforestation (conversion from non-forest to plantations and to natural forests) and restoration of approximately 5 million ha and concluded that the Programme has met its targets. Viet Nam should not be "penalized" with FREL/FRL which set Viet Nam for positive performance only if it surpasses such past efforts, a performance difficult to be achieved in the future, for the reasons of reduced area for planting, and termination of funding for the said Programme (financed partly by Official Development Assistance).

The exact areas of successful reforestation as well as information on the species planted, tree density, rotation and survival rates have not been fully and accurately compiled yet. Until the data compilation is completed, as an alternative measure Viet Nam will apply an assumed success rate of 75% for the 661 Programme implementation in order to apply an adjustment for its national circumstances.

Plans are being developed to improve data of Programme 661 impact, so that the method of adjustment may be duly reviewed towards a future resubmission of Viet Nam's FREL/FRL.

Box 4: Other national initiatives promoting enhancement in forest carbon stocks

In addition to Programme 661 Viet Nam has implemented several other initiatives, such as Programme 327 encouraging forest planting and restoration. However, since some of these initiatives started as far back as 1992 and the resulting carbon stock increases of these initiatives were not adequately monitored, Viet Nam will consider these as its own effort and not include results from these initiatives either for results-based payments or as an adjustment to discount past performance from its FREL/FRL.

5.2 Historical data: activity data and emission factors

5.2.1 Activity data

Viet Nam will apply IPCC Approach 3 for representing activity data when developing its FREL/FRL.[7]

To date, forest cover maps have been developed every five years since 1991, at national scale, through the NFI. Remote sensing imageries used for the development of these maps have varied, as well as the applied forest definition and forest type classifications. In order to develop national FREL/FRL, Viet Nam has made efforts to harmonize these forest cover maps, making them compatible and consistent over time by applying the same forest definition and a harmonization method for classification.

The maps for the historical reference period have been reviewed for correction, applying the 2010 forest cover map as a baseline map, and applying the most recent forest definition cited above, and a harmonized forest classification system (i.e. the forest and land use types presented in Table 1). Forest changes for the three NFI results relevant to the three historical time periods 1995-2000, 2000-2005 and 2005-2010 were checked against logic of possible changes, and where illogical changes were detected, corrections were made including with reference to satellite imageries taken near the time of map creation. A grid of 1 km by 1 km was used nationwide to control the illogical changes and a threshold of 3 % of the control points was set as acceptable number of illogical changes for each province.

Area statistics of forest and land use dynamics during 1995-2010, which were derived from the upgraded NFI forest cover maps, are provided in Table 5. Details on how these results were derived are provided in the "Report on Historical processes of forest cover map generation and review and the description of the latest map review and Activity Data generation process".

[7] This will allow for nesting of the FREL/FRL of regional REDD+ projects, namely the FCPF Carbon Fund's ER Program for Viet Nam under the national FREL/FRL.

Table 5: Areas of national forest and land use 1995 – 2010 (unit: 1,000 ha)

No	Forest and land use types	1995	2000	2005	2010
	Total area	**33,015**	**33,015**	**33,017**	**33,017**
I	***Forest***	***11,357***	***11,938***	***12,741***	***13,661***
1	Evergreen broadleaf – rich	856	804	693	681
2	Evergreen broadleaf – medium	2,004	1,889	1,783	1,674
3	Evergreen broadleaf – poor	1,918	1,785	1,621	1,581
4	Evergreen broadleaf – regrowth	2,399	2,699	3,283	3,654
5	Deciduous	751	722	665	646
6	Bamboos	526	547	490	441
7	Mixed timber – bamboos	734	751	751	748
8	Coniferous	172	177	164	162
9	Mixed broadleaf - coniferous	64	56	54	53
10	Mangrove	199	178	134	142
11	Limestone forest	740	749	759	757
12	Plantation	994	1,582	2,343	3,122
II	***Bare land***	***7,979***	***7,264***	***6,249***	***4,893***
13	Limestone without trees	232	224	207	205
14	Other bare land	7,748	7,039	6,042	4,688
III	***Agriculture and other land***	***13,678***	***13,814***	***14,027***	***14,463***
15	Water body	824	846	851	870
16	Residential area	1,498	1,569	1,669	1,798
17	Agriculture and other land	11,356	11,399	11,507	11,796

5.2.2 Emission and Removal Factors (EFs/RFs)

Following the forest activity data, NFI plot measurement data are available for Viet Nam for each of the five-year NFI cycles since 1995.

Given the incomplete assessment of uncertainty on the data quality of the past NFI cycles 1-3, the average carbon stock estimates are obtained from plot measurements of NFI cycle 4 (reported in 2010) and applied over the historical reference period. This implies that the estimation of historical emissions and removals is based on the

assumption that the carbon stocks for each forest and land use types remain the same over cycles. The raw data from NFI cycle 4 was improved by internal and external reviews and when used in combination with country-specific allometric equations, the uncertainty of average carbon stocks were reduced. The most optimal allometric equations are selected after testing various allometric equations per forest type per agro-ecological region. The resulting national average carbon stocks per forest type together with errors at the 90% confidence interval are provided in Table 6. For convenience, Table 6 presents information on the trends at national level but the calculations of actual EFs/RFs used in the FREL/FRL were implemented at the agro-ecological region level. The detailed carbon stock estimates per land cover type and agro-ecological region are presented in the "Report on Calculation of forest carbon stocks and emission/removal factors from NFI Cycle IV plot measurement data".

Table 6: National level average carbon stocks for each forest types

Forest and land use types	# of PSP	# of SSP	Average C stock (tC/ha)	Error (90% CI)
1. Evergreen broadleaf – rich	403	5,970	137.12	2.44
2. Evergreen broadleaf – medium	708	8,819	73.95	1.11
3. Evergreen broadleaf – poor	689	6,860	31.70	2.41
4. Evergreen broadleaf –regrowth	863	11,749	26.05	5.23
5. Deciduous	165	4,401	30.95	6.65
6. Bamboos	293	3,417	14.49	8.97
7. Mixed timber – bamboos	429	5,585	41.24	5.84
8. Coniferous	36	645	92.71	9.73
9. Mixed broadleaf - coniferous	19	227	63.57	38.39
10. Mangrove			58 (*)	n.a.
11. Limestone forest	7	45	19.07	67.56
12. Plantation	269	3,216	16.26	10.46

PSP: Primary sample plot; SSP: Secondary sample plot; C: Carbon; CI: Confidence Interval. (*) Carbon stocks for mangroves are based on literature review.

For mangrove forests, since the number of sample plots is not statistically significant, the average carbon stocks for this forest type have been substituted by results of a research conducted by the Viet Nam Academy of Forest Sciences. According to this research, the average carbon stock of mangrove forest is 35.2 tC/ha in the North East, Red River Delta and North Central Coast regions and 64.4 tC/ha in the South Central Coast, South East and Mekong River Delta regions. As 22 % of the mangrove forests were located in the North and 78 % in the South, the national level weighted average carbon stock is 58.0 tC/ha.

Carbon stocks of non-forest land use types are assumed zero.

The EFs/RFs resulting from the conversion of land types were calculated as the difference of carbon stocks between the two land types, and converted to tonnes CO_2e. These EFs/RFs are calculated separately for each agro-ecological region and the results are provided in the "Report on Calculation of forest carbon stocks and emission/removal factors from NFI Cycle IV plot measurement data".

Carbon stock changes may also occur in forest types remaining the same forest type within one 5-year cycle (i.e. conservation of forest carbon stocks). However, because the current method, which corresponds to IPCC stock-difference method, applies one set of carbon stocks of NFI Cycle 4 for all past cycles, emissions and removals in forest types remaining the same are not recorded. Therefore, the gain-loss method was applied to estimate the emissions/removals in forest types remaining the same. The removals were estimated by applying the average annual wood increment rates compiled by Vietnam Academy of Forestry Sciences (Table 7). Due to lack of historical data for estimation of emissions, such as logging data, the emissions will be estimated based on the assumption that they equal the absolute amount of removals.

With future forest inventories, changes of carbon stock in forests remaining the same forest type may be monitored more robustly and the corresponding emissions/removals accounted for.

Table 7: Average annual wood increment rates by forest types in Vietnam

Forest types	Annual increment (%)
1. Evergreen broadleaf – rich	1.5
2. Evergreen broadleaf – medium	2.3
3. Evergreen broadleaf – poor	3.0
4. Evergreen broadleaf – regrowth	5.0
5. Deciduous	1.5
6. Bamboos	5.0
7. Mixed timber – bamboos	3.0
8. Coniferous	2.8
9. Mixed broadleaf - coniferous	3.7
10. Mangrove	2.7
11. Limestone forest	3.0
12. Plantation	12.0

5.3 The FREL/FRL

5.3.1 Method of construction

Viet Nam considers it transparent to present removals, emissions rather than presenting net emissions/removals. This separation allows a more adequate representation of the trends in both emissions and removals over time and it provides an improved way of monitoring the different policies and measures of enhancing forest carbon stocks and reducing emissions from deforestation and forest degradation. This also helps the REDD+ strategy/Action Programme to focus different actions on reducing emissions and on increasing removals.

5.3.2 The reference period

Since the NFI has provided both AD and EF/RF from 1995 to 2010, the period 1995 – 2010 was selected as the historical reference period for Viet Nam. This reference period is in accordance with NFI cycles.

5.3.3 The FREL/FRL of Viet Nam

Emissions and removals in one period are obtained by multiplying the activity data by the corresponding EFs/RFs and summing them up. Emissions/removals are in principle estimated by agro-ecological region for three periods 1995 – 2000, 2000 – 2005 and 2005 – 2010, and then aggregated to the national level. The historical emissions and removals are shown in Figure 1.

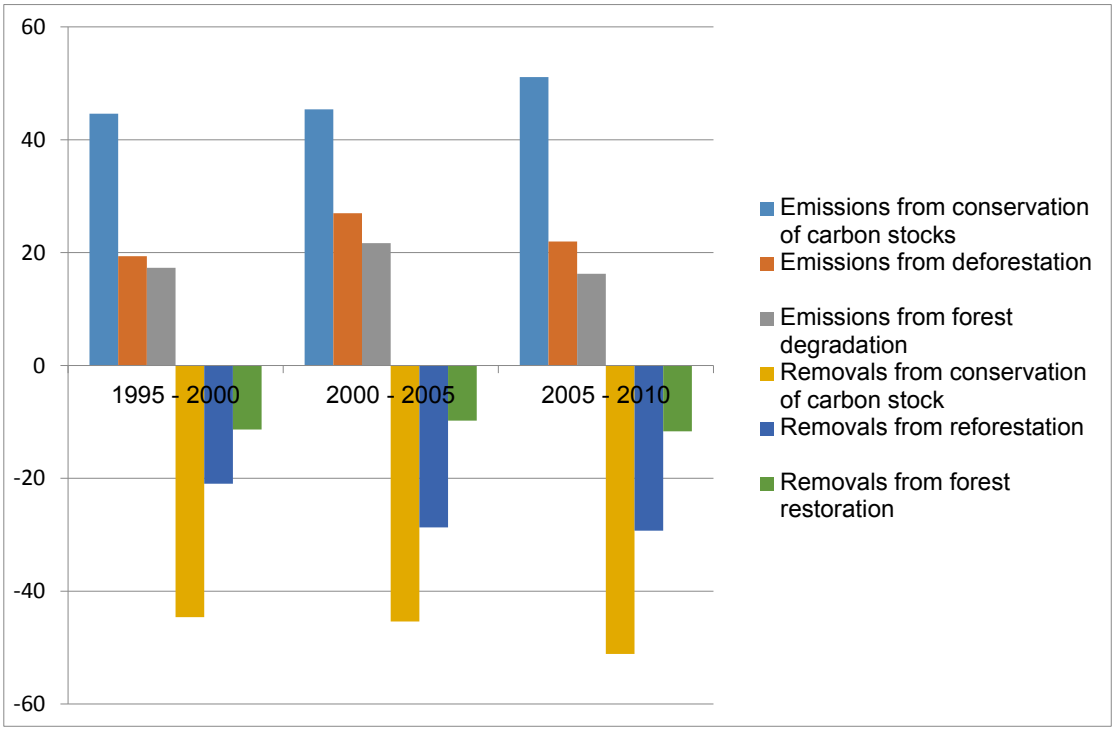

Figure 1: Historical emissions/removals in Viet Nam (in M tCO_2e per year)

Figure 1 shows that there is no clear trend on the historical emissions/removals. Therefore, the average of historical emissions/removals during the reference period will be used as FREL/FRL for Viet Nam.

The proposed FREL/FRL for Viet Nam is provided in Table 8 and illustrated in Figure 2. According to Table 8, the proposed FREL for Viet Nam is 88.2 million tCO_2e/year and the proposed FRL is -70.9 million tCO_2e/năm.

Table 8: The proposed FREL/FRL for Viet Nam

FREL/FRL	Emissions/Removals (tCO_2e/year)
Average emission (FREL)	+88,211,131
Average removal with adjustment (FRL)	-70,866,660
Average removal without adjustment	-84,273,607

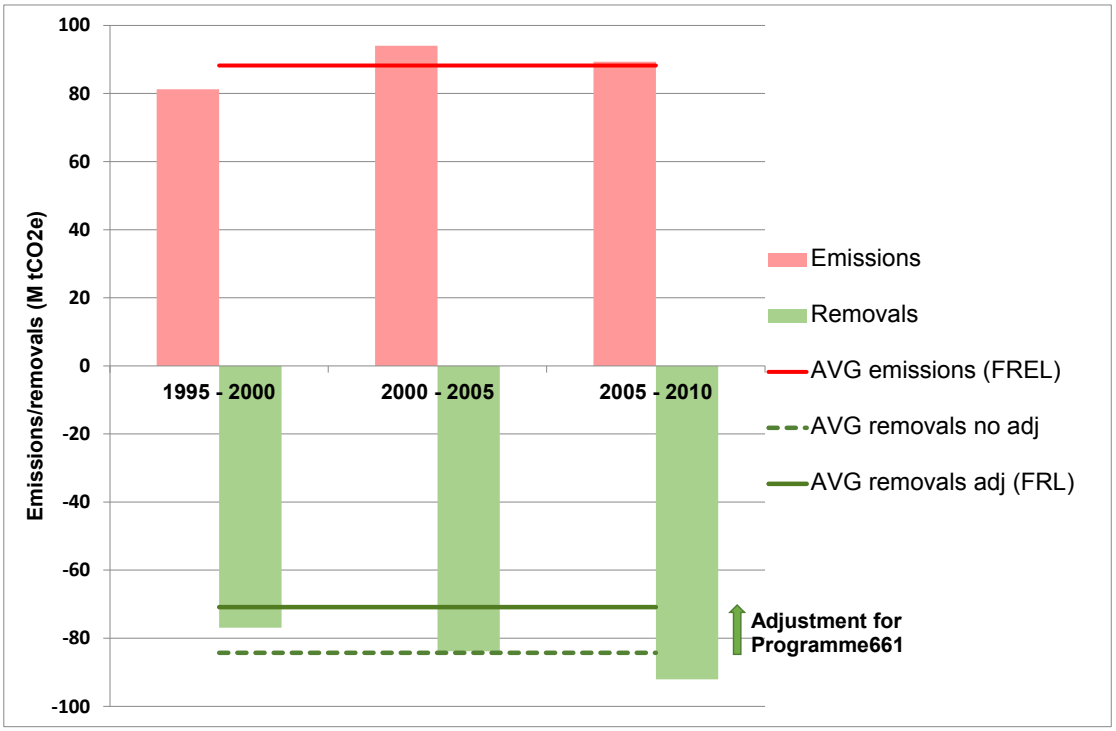

Figure 2: Proposed FREL/FRL for Viet Nam in M tCO_2e per year

5.3.4 Uncertainty of the Emissions/Removals

A study conducted by FIPI and JICA[8] estimated that the uncertainty of change between forest and non-forest, between forest types and between volume based sub-categories of evergreen broadleaf forests was respectively 5%, 20% and 26%. This analysis was mainly conducted on the NFIMAP cycle IV map which was based on high resolution images and therefore the provided numbers may underestimate the uncertainty of change between the past maps. Additional uncertainty assessment is under implementation.

The standard deviation and the error at 90% confidence interval of the carbon stocks estimates were calculated to take into consideration the sampling design used for collecting the data. No systematic errors are expected from the forest inventory as it was reviewed several times and included quality control procedures. However the uncertainty due to the models applied (biomass and volume equations) was not

[8]JICA & VNFOREST 2012. The Study on Potential Forests and Land Related to "Climate Change and Forests" in The Socialist Republic of Vietnam. Hanoi, Vietnam: Japan International Cooperation Agency and Vietnam Administration of Forestry.

included in the study. A more complete uncertainty analysis, including NFI cluster based sampling design, model and estimated variables (wood density, tree height) error is under implementation

5.3.5 Transparency

To ensure the transparency of the data used to calculate the FREL/FRL, Viet Nam will host the historical maps, tables of carbon stocks per eco-region and REDD+ initiatives on a web geoportal available on internet. Graphs representing the importance of the main activities from national to provincial level, the land use change matrix and the emissions and removals will be hosted on the portal.

6 IMPROVEMENTS FOR THE FUTURE FREL/FRL

Potential improvements in future FREL/FRL submissions include:

- The proposed FRL is based on the assumption that the successful rate of Programme 661 is 75%. A more robust method of adjustment should be based on the actual area of reforestation accounted for during the period of Programme 661 (2000-2010). In order to understand the actual area of reforestation during 2000-2010, data of Programme 661 actual implementation (i.e. not just the plans) need to be collected from the provincial level, and validated.
- With the development of EFs/RFs based on future forest inventories, changes of carbon stock in forest remaining the same forest type may be accounted for more robustly in future FREL/FRL submissions.
- Plantation species cannot be separated in the current data, but on-going efforts are anticipated to allow measuring separately the different forest plantation species for the past and present data. Plantation forest type could be separated per species with specific EFs/RFs and activity data in the future.
- If dead wood, litter and soil organic carbon should be measured in the future NFIs, they are proposed for inclusion in the carbon pools considered in future FREL/FRL submissions. The same applies to the lianas, shrubs and understorey components of aboveground and belowground biomass.