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## Report of the technical assessment of the proposed forest reference emission level of Viet Nam submitted in 2016


### *Summary*

This report covers the technical assessment of the submission of Viet Nam, on a voluntary basis, on its proposed forest reference emission level (FREL) and forest reference level (FRL), in accordance with decision 13/CP.19 and in the context of results-based payments. The FREL/FRL proposed by Viet Nam cover the activities “reducing emissions from deforestation”, “reducing emissions from forest degradation” and “enhancement of forest carbon stocks”, which are among the activities included in decision 1/CP.16, paragraph 70. In its submission, Viet Nam has developed a national FREL/FRL. The assessment team notes that the data and information used by Viet Nam in constructing its FREL/FRL, provided in its submission as well as during the assessment session, are in overall accordance with the guidelines contained in the annex to decision 12/CP.17. This report contains the assessed FREL/FRL and a few areas identified by the assessment team for future technical improvement, according to the scope of the technical assessment in the annex to decision 13/CP.19.

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## I. Introduction and summary

### A. Overview

1. This report covers the technical assessment (TA) of the submission of Viet Nam on its proposed forest reference emission level (FREL) and forest reference level (FRL),<sup>1</sup> submitted on 15 January 2016 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 14 to 18 March 2016 in Bonn, Germany, and was coordinated by the UNFCCC secretariat.<sup>2</sup> The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts<sup>3</sup> (hereinafter referred to as the assessment team (AT)): Ms. Elizabeth Philip (Malaysia) and Mr. James Penman (United Kingdom of Great Britain and Northern Ireland). In addition, Mr. Kamal Djemouai, an expert from the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, participated as an observer<sup>4</sup> during the centralized activity in Bonn.

2. In response to the invitation by the Conference of the Parties (COP) and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15, and its annex, Viet Nam submitted, on a voluntary basis, its proposed FREL/FRL. Viet Nam provided its submission in English. This proposed FREL/FRL is one of the elements<sup>5</sup> to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. The COP decided that each submission of a proposed FREL/FRL, as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments, pursuant to decisions 13/CP.19, paragraphs 1 and 2, and 14/CP.19, paragraphs 7 and 8.

3. The objective of this TA was to assess the degree to which information provided by Viet Nam was in accordance with the guidelines for submissions of information on FRELs/FRLs<sup>6</sup> and to offer a facilitative, non-intrusive, technical exchange of information on the construction of the FREL/FRL, with a view to supporting the capacity of Viet Nam for the construction and future improvement of its FRELs/FRLs, as appropriate.<sup>7</sup>

4. The TA of the FREL/FRL submitted by Viet Nam was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs as contained in the annex to decision 13/CP.19. This report on the TA was prepared by the AT following the guidelines and procedures in the same decision.

5. Facilitative exchanges during the TA allowed Viet Nam to provide clarifications and information that were considered by the AT in the preparation of this report.<sup>8</sup> As a result of the facilitative interactions with the AT during the TA session, Viet Nam submitted a modified version on 20 July 2016, which took into consideration the technical input of the AT and resulted in the modification of the originally proposed FREL/FRL. Following some additional technical input and suggestions for improving the transparency of the modified version by the AT, Viet Nam provided an updated modified submission on 22 December 2016. The latter submission provides in-depth information on the generation of activity data and emission/removal factors and the Intergovernmental Panel on Climate Change (IPCC)

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<sup>1</sup> The submission of Viet Nam is available at <<http://redd.unfccc.int/submissions.html?country=vnm>>.

<sup>2</sup> Decision 13/CP.19, annex, paragraph 7.

<sup>3</sup> Decision 13/CP.19, annex, paragraphs 7 and 9.

<sup>4</sup> Decision 13/CP.19, annex, paragraph 9.

<sup>5</sup> Decision 1/CP.16, paragraph 71(b).

<sup>6</sup> Annex to decision 12/CP.17.

<sup>7</sup> Decision 13/CP.19, annex, paragraph 1(a) and (b).

<sup>8</sup> Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.

guidelines used in the estimation of changes in forest carbon stocks and the associated emissions and removals. This TA report was prepared in the context of the latter modified submission. Following the process contained in the guidelines and procedures annexed to decision 13/CP.19, a draft version of this report was communicated to the Government of Viet Nam. The modified submission that contains the assessed FREL/FRL and the original submission are available on the UNFCCC website.

## **B. Proposed forest reference emission level and forest reference level**

6. In decision 1/CP.16, paragraph 70, the COP encourages developing country Parties to contribute to mitigation actions in the forest sector by undertaking a number of activities, as deemed appropriate by each Party and in accordance with their respective capabilities and national circumstances, in the context of the provision of adequate and predictable support. In its original submission, Viet Nam proposed an FREL for the activities reducing emissions from deforestation and reducing emissions from forest degradation and an FRL for the activities conservation and enhancement of forest carbon stocks (restoration and reforestation). It indicated that the activity sustainable management of forests, owing to the unavailability of data on exact boundaries of areas, was included as part of the activities conservation of forest carbon stocks and restoration.

7. Viet Nam provided information on the scope of activities, pools and gases covered and its classification and stratification system used in the construction of the FREL/FRL. It also provided information on restoration and reforestation programmes undertaken. Pursuant to paragraph 71(b) of decision 1/CP.16, Viet Nam has developed an FREL/FRL for the entire national territory of the country, including all forest areas. As identified in its submission, Viet Nam is applying a stepwise approach to its development of the FREL/FRL, in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve the FREL/FRL by incorporating better data, improved methodologies and, where appropriate, additional pools.

8. In response to the technical input of the AT, Viet Nam submitted a modified national FREL of 59,960,827 tonnes of carbon dioxide equivalent (t CO<sub>2</sub> eq)/year and FRL of -39,602,735 t CO<sub>2</sub> eq/year, in the context of accessing results-based payments for the activities referred to in decision 1/CP.16, paragraph 70.<sup>9</sup> The proposed FRL includes an adjustment of 8,183,337 t CO<sub>2</sub> eq/year, which is based on analysis of the annualized effect of a programme (Programme 661) to encourage reforestation, forest restoration and forest protection over a 12-year period between 1998 and 2010.

9. The modified national FREL/FRL proposed by Viet Nam for the historical reference period 1995–2010 (split into three five-year periods, which is in accordance with the country's national forest inventory (NFI) cycles) cover average annual CO<sub>2</sub> emissions and removals from three of the activities listed in decision 1/CP.16, paragraph 70, namely: reducing emissions from deforestation; reducing emissions from forest degradation; and enhancement of forest carbon stocks.

10. The proposed modified FREL/FRL includes the above- and below-ground biomass pools. The soil organic carbon and dead organic matter pools are not included. The proposed FREL/FRL includes only CO<sub>2</sub> emissions and removals. Although it was noted in

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<sup>9</sup> In its original submission, Viet Nam proposed a national FREL of 88, 211,131 t CO<sub>2</sub> eq/year and FRL of -70,886,660 t CO<sub>2</sub> eq/year (with adjustment) for the period 1995–2010. The difference in values between the original and modified submissions is due mostly to the exclusion of the activity conservation of forest carbon stocks in the modified submission (for details, see paras. 8 and 9 above).

the modified submission that non-CO<sub>2</sub> gases are emitted during forest fires, those emissions were estimated to account for less than 0.1 per cent of the total national emissions.

11. During the TA, Viet Nam provided a number of technical reports and a matrix with data on carbon stocks per region, emission/removal factors per region and land-cover changes and a graphical presentation of emissions and removals by activity, to increase the transparency of the data and information presented in the submission and to assist the AT in its TA of the FREL/FRL. Those reports and data were subsequently incorporated as part of the modified submission.

## **II. Data, methodologies and procedures used in the construction of the proposed forest reference emission level and forest reference level**

### **How each element in the annex to decision 12/CP.17 was taken into account in the construction of the forest reference emission level and forest reference level**

#### **1. Information that was used by the Party in the construction of the forest reference emission level and forest reference level**

12. Viet Nam used the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* for estimating emissions and removals for the proposed FREL/FRL, while the estimates of root-to-shoot ratio and carbon fraction were based on values provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Viet Nam informed the AT during the technical exchange that it used the gain–loss method for estimating the gains and losses of carbon stocks due to forest transition. The AT encourages Viet Nam to provide more detailed and relevant information on the methodological approach used for estimating emissions and removals in its future FREL/FRL submissions to increase the transparency of the methodologies used.

13. Deforestation estimates were calculated by multiplying area activity data and biomass carbon stock densities. Subsequent biomass carbon stock density (for non-forest land following deforestation) is assumed to be zero. The AT notes that this assumption is reasonable when forest is converted to settlements or annual crops, but may not be the case when forest is converted to perennial tree crops. The AT considers that it may be useful to conduct an assessment of post-conversion removals as an area for future technical improvement.

14. In the case of the activities reducing emissions from forest degradation and restoration (enhancement of forest carbon stocks), the emission factor is the difference in biomass carbon stock density between the two forest types involved in the transition (the second forest type having a lower carbon stock density than the first in the case of forest degradation, and vice versa in the case of restoration). In the case of reforestation, newly established forest is assumed to have the carbon stock density of the corresponding forest type, as derived from the NFI. Viet Nam noted that it presented the number of hectares for each type of forest transition in each of the ecoregions and for each of the five-year inventory cycles in its modified submission. This information was presented in forest and land-use change matrices (see tables 16–19 in the modified submission). The AT suggests that Viet Nam considers providing time-series information on forest and land-use transitions (such as natural forests to plantations, or vice versa, or forest transitions to other forest types such as evergreen broadleaf or mixed timber, including bamboo or mangrove

forest) in order to improve the accuracy of the corresponding estimates of emissions and/or removals in future FREL/FRL submissions.

15. Viet Nam included conservation of forest carbon stocks in the FRL in its original submission. After technical exchanges with the AT during the TA, Viet Nam decided not to include the activity in the modified submission. A notable aspect of the modified submission is that Viet Nam made greater use of available historical data and avoided making an assumption, previously made without supporting data, on splitting forest carbon stock removals and emissions under the activity conservation.

16. The AT notes that the consideration of the dynamics of land-use change is based on changes in carbon stock densities, grouped into relevant activities and on allowing the emissions and removals to be estimated accordingly. Viet Nam used ecoregional activity data and emission factors and summed these in the construction of its national FREL/FRL. During the technical exchange, Viet Nam indicated that forests with emission /removal factors that are equal to zero were also included in the construction of its FREL and FRL. The AT suggests that Viet Nam considers specifying clearly the total forest area considered under each activity in the construction of its FREL and FRL in order to enhance completeness and transparency in future submissions.

17. The carbon densities used for emission factors were taken from NFI cycles I to IV.<sup>10</sup> The numbers of primary sample plots inventoried were 1,706, 2,500, 2,750 and 2,049 for NFI cycles I to IV, respectively, selected from an 8 km by 8 km grid, with 40 secondary sampling plots at each primary sample plot, disposed in two strips, one northerly and one easterly from the primary sample plot. Each plot is allocated to one of the forest ecoregions used for the activity data. In general, above-ground carbon densities are derived using country-specific allometric information produced from the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries<sup>11</sup> in Viet Nam. In some cases, a simplified method based on merchantable volume estimates and biomass expansion factors is used. The allometric equations use both diameter at breast height and height information. The modified submission notes that an IPCC default value for root-to-shoot ratio was applied to estimate below-ground biomass. As a result of the facilitative exchange, Viet Nam included the activity data and emission factors used in the construction of the FREL/FRL in the modified submission, which enhanced transparency.

18. Activity data are derived from: Landsat MSS and Landsat TM for the period 1991–1995; Landsat ETM+ and SPOT 4 for the period 1996–2000; Landsat ETM+ for the period 2001–2005; and SPOT 5 for 2005 and 2010. The SPOT map for 2010, which is consistent with the agreed forest classification system set out in the Vietnamese Government's Circular No. 34/2009/TT-BNNPTNT on criteria for forest identification and classification, was used as a basis for upgrading and harmonizing earlier maps. Relative to the 2010 base map, corrections were applied to earlier maps to remove the illogical changes in excess of a 3 per cent threshold. In order to assess the illogical changes, a set of 329,114 points was distributed systematically and obtained by applying a 1 km by 1 km grid to the entire country.<sup>12</sup> Removal and correction of illogical changes were by visual inspection and

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<sup>10</sup> The approach is described in more detail in part 3 of the modified submission on calculation of forest carbon stocks and emission/removal factors from NFI cycles I to IV plot measurement data.

<sup>11</sup> Phuong VT, Inoguchi A, Birigazzi L, Henry M and Sola G. 2012. Part A - Introduction and Background of the study. In: A Inoguchi, M Henry, L Birigazzi and G Sola (eds.). *Tree allometric equation development for estimation of forest above-ground biomass in Viet Nam*. Hanoi: United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. Available at <[http://vietnam-redd.org/Upload/Download/File/PartA-final\\_3823.pdf](http://vietnam-redd.org/Upload/Download/File/PartA-final_3823.pdf)>.

<sup>12</sup> See part 2 of the modified submission on historical processes of forest cover map generation and the

applied to all 17 land-use classes. Only one province had an excess of 3 per cent illogical change, which was corrected. Land-use change matrices were constructed on the basis of these maps, with 17 forest and land-use types (12 forest and 5 non-forest).

19. During the TA, Viet Nam provided information on the generation of historical forest maps using Landsat and SPOT 5. The images were interpreted either visually or digitally. Viet Nam indicated that different international technical assistance was obtained to improve the maps. The AT acknowledged the effort that went into building the time series of land-cover maps, but noted that maintaining consistency in the interpretation of the images is necessary. The AT is of the view that the use of a consistent approach to geospatial image interpretation across the time series, such as automated or digital interpretation, could ensure coherent interpretation while improving accuracy and identifies this as an area for future technical improvement.

20. For Viet Nam's original submission of its proposed FREL/FRL, average carbon stock estimates were obtained from NFI cycle IV (2010) because the assessment of uncertainty on the quality of data from past NFI cycles had not been completed. The AT commends Viet Nam for reviewing again its NFI data sets after the technical exchanges and for applying updated emission factors derived from all NFI cycles in the modified submission. The AT notes that Viet Nam could provide information on how consistency of data has been ensured, such as correction or treatment of missing data within NFI cycles and factors contributing to the decline in carbon stocks between the inventory cycles, in its future FREL/FRL submissions.

21. Estimates of uncertainties were made separately for activity data and emission factors. For the former, they were made by comparison with ground-based data and with high-resolution images and assessed to be 5 per cent for change between forest and non-forest, 20 per cent for between forest types and 26 per cent for between volume-based subcategories of evergreen broadleaf forest.<sup>13</sup> For the latter, variances obtained from the NFI samples were used to estimate 95 per cent confidence intervals, which are shown in table 6 of the modified submission.

22. Viet Nam applied an adjustment to its FRL. No adjustment was applied to its FREL. The adjustment changed the FRL from  $-47,786,072$  t CO<sub>2</sub> eq/year to  $-39,602,735$  t CO<sub>2</sub> eq/year. This is intended to reflect the estimated effect that Programme 661 had in increasing removals by converting non-forest land to forest land. Partly funded by official development assistance, Programme 661 aimed to establish 5 million ha forest over the 12-year period 1998–2010. The AT understands that two studies have been conducted to determine the effectiveness of Programme 661 covering different geographical areas. The AT notes that Viet Nam has now made available the reports on the assessment of Programme 661 to increase the transparency of the removal effects resulting from the programme.<sup>14</sup>

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description of the latest map review and activity data generation process. The full report on this is available at

<[http://vietnam-redd.org/Upload/Download/File/Report\\_AD\\_En\\_13102015\\_\(ai\)\\_P\\_4911.pdf](http://vietnam-redd.org/Upload/Download/File/Report_AD_En_13102015_(ai)_P_4911.pdf)>.

<sup>13</sup> The uncertainty analysis for activity data is described in Japan International Cooperation Agency and Vietnam Administration of Forestry, Ministry of Agriculture and Rural Development, the Socialist Republic of Vietnam. 2012. *Final Report. The Study on Potential Forests and Land Related to "Climate Change and Forests" in the Socialist Republic of Vietnam*. Parts 1 and 2 of this study are available at <<http://vietnam-redd.org/Web/Default.aspx?tab=download&zoneid=152&subzone=156&child=210&lang=en-US>>.

<sup>14</sup> All reports are available at <<http://vietnam-redd.org>>.

Japan International Cooperation Agency. 2014. *Dien Bien REDD+ Pilot Project Final Report*. Available at <[http://vietnam-redd.org/Upload/CMS/Content/REDD%20projects/JICA-DienBienREDDpilot/SUSFORM-NOW/FinalReport\\_EN.pdf](http://vietnam-redd.org/Upload/CMS/Content/REDD%20projects/JICA-DienBienREDDpilot/SUSFORM-NOW/FinalReport_EN.pdf)>.

23. The first assessment was conducted for Dien Bien Province (north-west region) only and indicated a planting success rate of 41 per cent for Programme 661. The first survey was considered relevant to the neighbouring provinces of Son La and Lai Chau as these provinces are considered similar to Dien Bien in terms of accessibility and pressure from competing land-uses. The second was conducted for five other provinces, considered representative of the rest of the country. The second survey found the planting success rate to be 87 per cent. The adjustment was calculated by assuming a 41 per cent planted area in the three provinces of Dien Bien, Son La and Lai Chau and 87 per cent in the other provinces compared with the target area of planting. According to the modified submission, the adjustment applied was –123 Mt CO<sub>2</sub> cumulatively over the programme period 1998–2010, which lies within the 15-year period (1995–2010) of the data used to establish the FRL.

24. Viet Nam considers the adjustment that takes into account the efforts taken under Programme 661 to be justified because the success of past efforts should not be penalized, particularly if the efforts were dependent upon official development assistance and would be difficult to achieve again in the future. Viet Nam has undertaken other domestic efforts aimed at encouraging forest planting and restoration and has therefore made no corresponding adjustment. The AT commends Viet Nam for its domestic efforts.

**2. Transparency, completeness, consistency and accuracy of the information used in the construction of the forest reference emission level and forest reference level**

Methodological information, including description of data sets, approaches and method

25. The AT recognizes the ongoing and challenging harmonization process that Viet Nam is undertaking to produce a consistent data set based on Landsat and SPOT data and an update of past forest maps to be consistent with the most recent forest definition. The additional information provided by Viet Nam to the AT during the technical exchange is considered to have improved transparency and completeness concerning the harmonization. The AT notes that reports on activity data and emission factor estimation have now been included as part of the modified submission.<sup>15</sup>

26. The activity data used in the construction of the FREL/FRL came from interpretation of images from Landsat TM (1995 with mapping back to 1990) and SPOT 4 and 5 (for 2000, 2005 and 2010). Information on emission factors was derived from NFI cycles I to IV.

27. During the facilitative technical exchanges, Viet Nam provided additional clarification on how the activity and carbon stock density data were used to construct the proposed FREL/FRL. With the additional information, the AT was able to use the land-use change matrices provided in the activity data report plus the carbon stock densities provided in the modified submission to cross-check deforestation, reforestation and restoration estimates for some cases presented in figure 1 of the modified submission. The AT notes that Viet Nam included the activity data and emission factors used in the construction of its proposed FREL/FRL in the annexes to its modified submission. In

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Vietnamese Academy of Forest Sciences. 2016. *Assessment Report on Success Rate of 5 Million Hectare Reforestation Program*. Available at <[http://vietnam-redd.org/Upload/Download/File/661SuccessRateReport-240716\\_2206.pdf](http://vietnam-redd.org/Upload/Download/File/661SuccessRateReport-240716_2206.pdf)>.

<sup>15</sup> 2015 Report on Historical Processes of Forest Cover Map Generation and the Description of the Latest Map Review and Activity Data Generation Process; and 2016 Report on Calculation of Forest Carbon Stocks and Emission/Removal Factors from NFIMAP Cycles I to IV Plot Measurement Data. The information contained in these two reports can be found in parts 2 and 3 of the modified submission.



addition, Viet Nam shared the calculations made in the construction of its FREL/FRL with the AT separately during the technical exchanges.

28. The AT compared the total forest area provided for the FREL/FRL with the area reported in the Food and Agriculture Organization of the United Nations (FAO) Forest Resources Assessment (FRA) 2015 Country Report for Viet Nam.<sup>16</sup> The AT notes that the total forest area provided in the FRA Country Report is 2 per cent lower for 2000 and 3 per cent higher for 2005 and 2010 compared with the total forest area provided in the modified submission.

29. Viet Nam submitted its first biennial update report (BUR) in 2014.<sup>17</sup> The greenhouse gas (GHG) inventory provided in its BUR showed a net sink for 2010, while the sum of the FREL/FRL shows a net source. The FREL/FRL is therefore, at present, not consistent with the GHG inventory data. The AT acknowledges that Viet Nam collected, improved and reviewed the existing data for its FREL/FRL through its modified submission. Viet Nam indicated to the AT that the differences between the FREL/FRL estimates and the estimates for the land use, land-use change and forest sector in the GHG inventory are due to the fact that for the latter statistical data as well as IPCC default values are used, while the FREL/FRL calculations are based on country-specific data (including the use of country-specific allometric equations). The AT notes that this is a priority area for future technical improvement, taking note of decision 12/CP.17, paragraph 8, and decision 13/CP.19, annex, paragraph 2(a), in order to maintain consistency with corresponding anthropogenic forest-related GHG emissions by sources and removals by sinks as contained in the national GHG inventory.

30. In addition, the AT notes that FAOSTAT<sup>18</sup> shows that forest land remaining forest land was a net sink in Viet Nam over the period 1998–2010. Viet Nam clarified that, for its reporting to FAOSTAT, it used default IPCC emission factors and data that were reported to the global FRA and that these estimates were based on different assumptions regarding forest growth and conversion from volume to biomass compared with the values used in constructing its FREL/FRL. The AT notes that Viet Nam could consider ensuring the consistency of its data and information being reported across various platforms such as in its GHG inventory and to FAOSTAT and the FRA.

31. It was noted that different emission factors were used between the periods 1995–2000, 2001–2005 and 2005–2010 and carbon density was on a declining trend for most forest types (see table 6 in the modified submission). The AT notes that the decline in forest carbon stocks could potentially be due to the number of plots assessed or sampling different plots within the forest types between the NFI cycles. However, Viet Nam informed the AT that the sampling design remained consistent between all the NFI mapping cycles and that the differences are potentially due to changing the number of plots assessed. The AT encourages Viet Nam to ensure the time-series consistency of its carbon density estimates and identifies this as an area for future technical improvement.

32. In the light of the decline in carbon stocks over time for 7 of the 12 forest types, the AT encourages Viet Nam to improve the definition of forest degradation by including variables such as time frame and carbon loss or canopy cover thresholds as suggested by the IPCC<sup>19</sup> and FAO.<sup>20</sup>

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<sup>16</sup> FAO. 2015. *Global Forest Resources Assessment 2015. Country Report. Viet Nam*. Available at <<http://www.fao.org/documents/card/en/c/e9d76fe8-9fdc-4b10-aa9a-3fd4af9112d1/>>.

<sup>17</sup> Available at <<http://unfccc.int/resource/docs/natc/vnmbur1.pdf>>.

<sup>18</sup> See <<http://www.fao.org/faostat/en/#home>>.

<sup>19</sup> IPCC. 2003. *Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types*. Japan: Institute for Global Environmental Strategies. Available at <<http://www.ipcc->

Description of relevant policies and plans, as appropriate

33. Initiatives aimed at nationwide reforestation, restoration and forest protection are described in the modified submission. Some initiatives (e.g. Programme 327, known as “The Greening of Barren Hills Programme”) go back to 1992. They were established to reverse forest loss from the end of the 1980s to the early 1990s. Viet Nam has based its adjustment proposal on the estimated effects of Programme 661, as described in paragraphs 22–24 above. This is because a programme as large as Programme 661 is seen as difficult to reproduce in the future. Other policy initiatives are considered to be national efforts and not included in the adjustment. The AT acknowledges the national efforts made.

### 3. Pools, gases and activities included in the construction of the forest reference emission level and forest reference level

34. According to decision 12/CP.17, annex, subparagraph (c), justifications for omitting a pool and/or activity from the construction of the FREL/FRL should be provided, noting that significant pools and/or activities should not be excluded. The pools included in the FREL/FRL submitted by Viet Nam are above- and below-ground biomass. The dead organic matter and soil carbon pools were not included due to the lack of reliable time-series data for the whole country. In the view of the AT, those pools are likely to follow the trend of the biomass pools (which are likely to be the largest pools) and therefore their omission at this stage can be justified under a stepwise approach. This conclusion would not necessarily hold for drained organic soils, but the AT understands that the area of organic soils likely to be affected is small in Viet Nam (less than 0.04 per cent of the land area<sup>21</sup>). The AT was informed that future cycles of the NFI may include measurement of the dead organic matter and soil organic carbon pools and commends Viet Nam for considering including other carbon pools as part of its future improvements.

35. CO<sub>2</sub> is the only gas included in Viet Nam’s FREL/FRL. The AT understands that forests in Viet Nam are not fertilized and considers that, potentially, fires are the main source of forest-related non-CO<sub>2</sub> gases. The AT notes that methane and nitrous oxide emissions from forest land are reported in the BUR at about 0.2 per cent of net total emissions from forests. Viet Nam indicated that forest fires are one of the key drivers of deforestation and forest degradation, potentially contributing to carbon stock reduction in 7 out of 12 forest types, ranging from 6 to 21 per cent between the NFI cycles, as shown in table 6 of the modified submission. However, Viet Nam noted that data on forest types that have been impacted by fires that would allow for the accurate estimation of the corresponding emissions are not available. An approximate estimation was made using national statistics and IPCC tier one combustion factors, which indicated that forest fires were responsible for less than 0.1 per cent of Viet Nam’s non-CO<sub>2</sub> emissions in the period 2000–2010. The AT suggests that Viet Nam assess the effects of forest fires on the resulting non-CO<sub>2</sub> emissions from deforestation and forest degradation, and identifies this as an area for future technical improvement (see para. 10 above).

36. The AT notes that Viet Nam included in its FREL/FRL three of the five activities identified in decision 1/CP.16, paragraph 70, namely reducing emissions from deforestation, reducing emissions from forest degradation and enhancement of forest carbon stocks. Although the modified submission does not include conservation of forest

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[nggip.iges.or.jp/public/gpplulucf/degradation.html](http://nggip.iges.or.jp/public/gpplulucf/degradation.html).

<sup>20</sup> FAO. 2003. *Proceedings. Second Expert Meeting on Harmonizing Forest-Related Definitions for Use by Various Stakeholders*. 11–13 September 2002, Rome. Available at <http://www.fao.org/docrep/005/Y4171E/y4171e00.htm>.

<sup>21</sup> A figure of 12,983 ha peatland was reported in the study by Phuong VT, Anh TTT and Minang PA. *Properties and carbon stock distribution of peat in U Minh Ha and U Minh Thuong National Parks, Viet Nam*. (forthcoming publication) (see footnote 5 in the modified submission).

carbon stocks and sustainable management of forests, Viet Nam considers those two activities to be included as part of forest degradation or restoration (enhancement of carbon stocks). In its submission, Viet Nam noted that all forest and land changes were captured in its land-use conversion matrix (see paras. 9 and 15 above).

#### 4. Definition of forest

37. Viet Nam provided the definition of forest used in the construction of the FREL/FRL in its submission. This definition is contained in Circular No. 34/2009/TT-BNNPTNT, according to which an area is defined as forest when it meets the following three criteria:

(a) Being an ecosystem of which the major component is perennial timber trees, bamboos and palms of all kinds of a minimum height of 5 m (except new forest plantations and some species of coastal submerged forest species), capable of providing timber and non-timber forest products and other direct and indirect values such as biodiversity conservation and environmental and landscape protection. New forest plantations of timber trees and newly regenerated forests of forest plantations are identified as forests if they reach an average height of over 1.5 m for slow-growing species and over 3.0 m for fast-growing species and a density of at least 1,000 trees per ha. Agricultural and aquacultural ecosystems with scattered perennial trees, bamboos or palms, etc., will not be regarded as forests;

(b) Having a minimum tree cover of 10 per cent for trees which constitute the major component of the forest;

(c) Having a minimum plot area of 0.5 ha or forest tree strips of at least 20 m in width and of at least three tree lines.

38. Viet Nam also provided its definition of plantations or how it distinguishes between natural forest and plantation forest. According to Decision 2855 (2008) on identification of rubber as multipurpose trees, rubber is defined as a multipurpose tree and is accounted as forest. The planting of Acacia as nursing trees for improving native species growth is considered natural forest, and as forest plantation if otherwise.

39. The forest definition used for the FREL/FRL and that used for the most recent GHG inventory contained in Viet Nam's first BUR are consistent with each other. The minimum area, height and canopy cover thresholds are the same as those that Viet Nam uses in its reporting to FAO. However, the width threshold (20 m) and the requirement that there should be at least three tree lines are not mentioned in the FAO definition.<sup>22</sup> The FREL/FRL includes newly established plantations with tree heights of at least 1.5 m for slow-growing species or 3 m for fast-growing species. This is consistent with the FAO definition of including areas with the potential to reach 5 m in situ.

40. The AT understands that, in applying this definition, more subclasses of forest are to be included in future BUR submissions, and that there are plans to harmonize the forest definition between the BUR and the FREL/FRL by 2018. The AT encourages this step being considered by Viet Nam.

### III. Conclusions

41. The information used by Viet Nam in constructing its FREL for reducing emissions from deforestation and forest degradation, and its FRL for the enhancement of forest carbon stocks is in overall accordance with the guidelines for submission of information on

<sup>22</sup> As footnote 16 above.

FRELS/FRLs (as contained in the annex to decision 12/CP.17). The AT notes that, in general, the data and information used in the construction of the FREL/FRL can be considered complete. The AT identified several areas for future technical improvement that could increase transparency and completeness of data and information that will be used in future submission (see para.46 below).

42. The AT acknowledges that Viet Nam is undertaking three of the five activities referred to in decision 1/CP.16, paragraph 70 (see para. 9 above).

43. The AT agrees that, in constructing its FREL/FRL, Viet Nam included the most significant pools (the above- and below-ground biomass pools) and notes that Viet Nam has work in place to include other carbon pools. As a result of the facilitative interactions with the AT during the TA, Viet Nam submitted a modified submission that took into consideration the technical input of the AT. The AT notes that, for the modified submission, better use was made of the range of historical data available to Viet Nam and a previous assumption that was made about no net change of carbon stocks under forest conservation that was not supported by literature findings was no longer necessary. The AT is of the view that these constitute significant improvements in the accuracy of the data submitted and in the construction of the FREL/FRL.

44. The AT acknowledges Viet Nam's efforts to improve the transparency of the data used in the construction of its FREL/FRL. In its modified submission, Viet Nam stated that it plans to host historical maps, data tables on carbon stocks per ecoregion and other information relating to the activities listed in decision 1/CP.16, paragraph 70, at the national to provincial levels on a web geoportal,<sup>23</sup> which is now available to the public.

45. The AT notes that the FREL/FRL do not, at present, maintain consistency with the GHG inventory in Viet Nam's BUR, in particular in terms of activity data and emission factors used. The AT also notes that this is because the GHG inventory is based on statistical surveys and IPCC default emission factors, whereas, for the construction of the FREL/FRL, spatially explicit data and country-specific emission factors were used. Mindful of decision 12/CP.17, paragraph 8, and decision 13/CP.19, annex, paragraph 2(a), the AT considers that maintaining consistency with corresponding anthropogenic forest-related GHG emissions by sources and removals by sinks as contained in the national GHG inventory is an area for future technical improvement and should be taken into account in future FREL/FRL submissions (see para. 29 above).

46. Pursuant to decision 13/CP.19, annex, paragraph 3, the AT identified the following areas for future technical improvement:

(a) Use of a consistent approach to geospatial image interpretation across the time series to ensure coherent interpretation and to enhance accuracy (see para. 19 above);

(b) Harmonization of the activity data and emission factors used between the GHG inventory and the FREL/FRL submission (see paras. 25 and 29 above);

(c) Provision of time-series information on forest and land-use transitions (see para. 14 above);

(d) Use of time-series consistent data in the estimation of carbon stock densities (see para. 31 above);

(e) Improvement of the definition of forest degradation to include thresholds like canopy cover or carbon stock decline and to exclude short-term loss of carbon stocks (see para. 32 above);

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<sup>23</sup> <<http://temp-redd.vnforest.gov.vn/portal/index.html>>.

(f) Inclusion in the FREL/FRL of non-biomass pools (dead organic matter and soil carbon) and non-CO<sub>2</sub> gases on the basis of the ongoing relevant work being undertaken (see paras. 34 and 35 above);

(g) Assessment of the effect of forest fires on the resulting non-CO<sub>2</sub> emissions from deforestation and forest degradation (see para. 35 above).

47. The AT acknowledges and welcomes the intention expressed by Viet Nam to continue its ongoing efforts to improve data collection and estimation in several areas, including:

(a) Efforts to separately measure the different forest plantation species for the past and present data in order to develop country-specific emission/removal factors per species and to improve the activity data for forest plantations;

(b) Consideration of other carbon pools such as dead wood, litter and soil organic carbon in future FREL/FRL submissions, if these pools were considered in future NFIs;

(c) Development of uncertainty estimates for error propagation from tree measurement to carbon stocks and for emission/removal factors and activity data in order to improve the accuracy of estimates for future proposed FRELs/FRLs.

48. The AT commends Viet Nam for identifying potential improvements that will be made for future FREL/FRL submissions when new, adequate data and information become available as part of the stepwise approach.

49. In conclusion, the AT commends Viet Nam for showing a strong commitment to the continuous improvement of its FREL/FRL estimates in line with the stepwise approach. Areas for future technical improvement of Vietnam's FREL/FRL have been identified in this report. The AT acknowledges that such improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.<sup>24</sup> The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Viet Nam.

50. The table contained in the annex summarizes the main characteristics of Viet Nam's proposed FREL/FRL.

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<sup>24</sup> Decision 13/CP.19, annex, paragraph 1(b), and decision 12/CP.17, paragraph 10.

## Annex

### Summary of main features of the proposed forest reference emission level and forest reference level based on information provided by the Party

<i>Main feature of the FREL/FRL</i>		<i>Remarks</i>
Proposed FREL (in t CO <sub>2</sub> eq/year)	59 960 827	The FREL/FRL include average historical annual CO <sub>2</sub> emissions and removals from reducing emissions from deforestation, reducing emissions from forest degradation and enhancement of forest carbon stocks (see paras. 8 and 9 of this document)
Proposed FRL (in t CO <sub>2</sub> eq/year)	-39 602 735	
Type and duration of FREL/FRL	FREL/FRL = historical emissions and removals 1995–2010	See paragraph 9 of this document
Adjustment for national circumstances	Yes	Adjustment was made to the FRL on the basis of the achievement of Programme 661 (see paras. 22–24 of this document)
National/subnational <sup>a</sup>	National	–
Activities included <sup>b</sup>	Reducing emissions from deforestation, reducing emissions from forest degradation, and enhancement of forest carbon stocks through reforestation and restoration	Refer to modified submission for full description of activities
Pools included <sup>b</sup>	Above-ground and below-ground biomass	For the reported pools, it is assumed that the carbon stocks immediately after deforestation are zero. Soil organic carbon and dead organic matter are not included due to a lack of reliable time-series data (see paras. 10 and 34 of this document)
Gases included	CO <sub>2</sub>	Preliminary estimates of non-CO <sub>2</sub> gases were included for information purposes (refer to modified submission) (see paras. 10 and 35 of this document)
Forest definition <sup>c</sup>	Included	Minimum tree crown cover of 10 per cent; minimum land area of 0.5 ha; minimum tree height of 5 m (see paras. 37 and 39 of this document)
Relationship with latest GHG inventory	Methods used for FREL differ from those for latest GHG inventory (in the 2014	Differences in activity data and emission factors used (see para. 29 of this document)

<i>Main feature of the FREL/FRL</i>		<i>Remarks</i>
	biennial update report)	
Description of relevant policies and plans <sup>d</sup>	Included	Brief summary information on relevant policies and plans is included in the modified submission (see para. 33 of this document)
Description of assumptions on future changes in policies <sup>d</sup>	Not applicable	–
Descriptions of changes to previous FREL	Not applicable	–
Future improvements identified	Yes	Several areas for future technical improvement were identified (see para. 46 of this document)

*Abbreviations:* FREL = forest reference emission level, FRL = forest reference level, GHG = greenhouse gas.

<sup>a</sup> If subnational, comments should include information on the treatment of displacement of emissions.

<sup>b</sup> In the case of omitted pools or activities, comments should include the justification provided by the country.

<sup>c</sup> The forest definition should be summarized and it should be stated if it differs from the definition used in the greenhouse gas inventory or in reporting to other international organizations.

<sup>d</sup> May be relevant to the description of national circumstances, which is required in the case of adjustment.