United Nations

Framework Convention on Climate Change

FCCC/TAR/2018/LAO

Distr.: General
22 January 2019

English only

Report of the technical assessment of the proposed forest reference emission level/forest reference level of the Lao People's Democratic Republic submitted in 2018

Summary

This report covers the technical assessment of the voluntary submission of the Lao People's Democratic Republic on its proposed forest reference emission level (FREL)/forest reference level (FRL), in accordance with decision 13/CP.19 and in the context of results-based payments. The FREL/FRL proposed by the Lao People's Democratic Republic covers 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, the Lao People's Democratic Republic developed a national FREL/FRL. The FREL/FRL presented in the original submission for the reference period 2005–2014 corresponds to emissions of 34,106,431 tonnes of carbon dioxide equivalent (t CO_2 eq) per year and removals of 7,530,536 t CO_2 eq/year. As a result of the facilitative process during the technical assessment, the FREL/FRL was modified to emissions of 41,013,316 t CO_2 eq/year and removals of 7,533,558 t CO_2/year. The assessment team notes that the data and information used by the Lao People's Democratic Republic in constructing its FREL/FRL are transparent and complete and 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 contained in the annex to decision 13/CP.19.

Please recycle

Contents

I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of the Lao People's Democratic Republic on its proposed forest reference emission level (FREL)/forest reference level (FRL),[1] submitted on 5 January 2018 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 19 to 23 March 2018 in Bonn, Germany, and was coordinated by the UNFCCC secretariat.[2] The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts[3] (hereinafter referred to as the assessment team (AT)): Mr. Emil Cienciala (Czechia) and Mr. Javier Fernandez (Costa Rica). In addition, Mr. Thiago de Araújo Mendes (Brazil), 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[4] during the centralized activity in Bonn. The TA was coordinated by Mr. Nalin Srivastava (UNFCCC secretariat).

2. In response to the invitation of the Conference of the Parties (COP) and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15, and its annex, the Lao People's Democratic Republic submitted its proposed FREL/FRL on a voluntary basis. The proposed FREL/FRL is one of the elements[5] 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 decision 13/CP.19, paragraphs 1 and 2, and decision 14/CP.19, paragraphs 7 and 8.

3. The objective of the TA was to assess the degree to which the information provided by the Lao People's Democratic Republic was in accordance with the guidelines for submissions of information on FRELs/FRLs[6] 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 the Lao People's Democratic Republic for the construction and future improvement of its FREL/FRL, as appropriate.[7]

4. The TA of the FREL/FRL submitted by the Lao People's Democratic Republic 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. Following the process contained in those guidelines and procedures, a draft version of this report was communicated to the Government of the Lao People's Democratic Republic. The facilitative exchange during the TA allowed the Lao People's Democratic Republic to provide clarifications and additional information, which were considered by the AT in the preparation of this report.[8] As a result of the facilitative interactions with the AT during the TA, the Lao People's Democratic Republic provided a modified version of its FREL/FRL submission on 28 May 2018, which took into consideration the technical inputs of the AT. The modifications improved the clarity and transparency of the submitted FREL/FRL, altering the approach used to construct the proposed FREL/FRL. This TA report was prepared in the context of the modified FREL/FRL submission. The modified submission, containing the assessed FREL/FRL, and the original submission are available on the UNFCCC website.[9]

---

[1] The submission of Lao People's Democratic Republic is available at http://unfccc.int/8414.
[2] Decision 13/CP.19, annex, paragraph 7.
[3] Decision 13/CP.19, annex, paragraphs 7 and 9.
[4] Decision 13/CP.19, annex, paragraph 9.
[5] Decision 1/CP.16, paragraph 71(b).
[6] Decision 12/CP.17, annex.
[7] Decision 13/CP.19, annex, paragraph 1(a) and (b).
[8] Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.
[9] http://unfccc.int/8414.

B.   Proposed forest reference emission level/forest reference level

6.   The national FREL/FRL proposed by the Lao People's Democratic Republic for the historical reference period 2005–2014 is the annual average of the carbon dioxide (CO_2) emissions and removals associated with deforestation, degradation and enhancement of forest carbon stocks. The Lao People's Democratic Republic proposed separate FREL/FRL values for emissions and removals. The values are the historical average of emissions and removals, respectively. The Lao People's Democratic Republic has defined deforestation as "a change of a forest land stratum to a non-forest land stratum" and degradation as "a change within forest land strata from a higher biomass stratum to lower biomass stratum". Enhancement of forest carbon stocks covers forest restoration and reforestation. The Lao People's Democratic Republic has defined forest restoration as "a change within forest land stratum from a lower biomass stratum to a higher biomass stratum" and reforestation as "a change of non-forest stratum to forest land strata". The activity data (AD) used in constructing the FREL/FRL were derived from three "forest type maps" (which are a combination of land-use and land-cover maps) for the years 2005, 2010 and 2015 and information derived from the second national forest inventory (NFI) of the Lao People's Democratic Republic conducted during the period 2015–2017. The emission factors were derived using data from the Lao People's Democratic Republic's second NFI together with the default parameters from the Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). The FREL/FRL presented in the modified submission, with the aim of accessing results-based payments for REDD-plus[10] activities for the period 2015–2025, corresponds to emissions of 41,013,316 t CO_2 eq/year and removals of 7,533,558 t CO_2 eq/year.

7.   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. The FREL/FRL proposed by the Lao People's Democratic Republic, on a voluntary basis, for a TA in the context of results-based payments, covers the activities "reducing emissions from deforestation", "reducing emissions from degradation" and "enhancement of forest carbon stocks", which are listed as part of the five activities included in decision 1/CP.16, paragraph 70. Pursuant to paragraph 71(b) of the same decision, the Lao People's Democratic Republic has developed a national FREL/FRL that covers its entire territory. For its submission, the Lao People's Democratic Republic applied 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 their FREL/FRL by incorporating better data, improved methodologies and, where appropriate, additional pools.

8.   The proposed FREL/FRL includes above-ground and below-ground biomass, and excludes the dead organic matter (litter and deadwood) and soil organic carbon pools. Regarding greenhouse gases (GHGs), the submission includes CO_2 only.

9.   As part of the TA, the Lao People's Democratic Republic made two adjustments to the FREL/FRL in the modified submission. The first adjustment involved using a revised assumption of annual regrowth rates over different transition periods and addressing emissions from reversal events in lands subject to enhancement of forest carbon stocks. The second adjustment involved revising the assumption of immediate restocking of regenerated forest lands prior to deforestation and forest degradation by estimating and using the actual biomass stocks prior to deforestation and forest degradation by tracking such lands through time.

10.   The Lao People's Democratic Republic estimated the overall uncertainty of the historical emissions and removals (2005–2014) as 16.0 and 19.3 per cent, respectively.

---

[10]   In decision 1/CP.16, paragraph 70, the COP encourages developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

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

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

11. For the construction of the FREL/FRL, the Lao People's Democratic Republic used the methodologies and equations provided in the 2006 IPCC Guidelines. The Lao People's Democratic Republic used equations 2.15 and 2.16 from the 2006 IPCC Guidelines for the estimation of carbon stock changes in land converted to other land-use categories. For lands remaining in the same land-use category, the Lao People's Democratic Republic partially used the gain and loss method, by considering only the losses in carbon stocks from selective logging.

12. In its modified submission, the Lao People's Democratic Republic presented a FREL/FRL for the activities reducing emissions from deforestation, reducing emissions from forest degradation and enhancement of forest carbon stocks (restoration and reforestation), while excluding the activities conservation of forest carbon stocks and sustainable management of forests. The Lao People's Democratic Republic stated in the submission that in future it may include emissions from degradation occurring in forests remaining in the same category owing to activities such as firewood collection and disturbance, which, except for emissions from selective logging (estimated using measurement of tree stumps as a proxy indicator), are currently not included owing to a lack of robust country-specific data sets.

13. For the representation and classification of land, the Lao People's Democratic Republic developed forest type maps for the years 2000, 2005, 2010 and 2015 applying two levels of classification based on land-cover and land-use classes (in some cases). The first level is divided into seven classes: current forest, potential forest, other vegetated areas, cropland, settlement, other land and above-ground water source. The second level of stratification comprises 20 classes, including 8 forest types (including potential forests) and 12 non-forest types. The Lao People's Democratic Republic grouped these 20 classes into five strata. The AD used for the estimation of emissions and removals were derived using maps constructed for the years 2005, 2010 and 2015 using satellite imagery (SPOT4/5 for 2005 and RapidEye for 2010 and 2015). The forest type map for 2010 was used as the benchmark map, while those for 2000, 2005 and 2015 were developed using the change detection method. The Lao People's Democratic Republic applied the design-based area estimation method proposed by Olofsson et al. (2014)[11] for generating statistical estimates of AD. Owing to a significant difference in the resolution of satellite imagery used for 2000 (Landsat 5) in comparison with the other years, which could potentially lead to a relatively high uncertainty in change detection, the year 2000 was excluded from the reference period used for constructing the FREL/FRL.

14. The Lao People's Democratic Republic estimated the emission and removal factors corresponding to transitions between the various strata by calculating the difference in the carbon stocks of the two strata. The forest carbon stocks were derived using the data from the second NFI conducted during the period 2015–2017 together with the default parameters provided in the 2006 IPCC Guidelines. To calculate the above-ground biomass stocks of the five strata of land classes, the Lao People's Democratic Republic used country-specific allometric equations, while using the root-to-shoot ratios provided in the 2006 IPCC Guidelines (vol. 4, chapter 4, table 4.4) for calculating the below-ground biomass stocks. Biomass stocks were converted into carbon stocks using the carbon fraction values (0.46 or 0.47 depending on the land class) provided in the 2006 IPCC Guidelines (vol. 4, chapter 4, table 4.3).

---

[11] Olofsson P, Foody GM, Herold M, et al. 2014. Good practices for assessing accuracy and estimating area of land change. *Remote Sensing of Environment*. 148: pp.42–57.

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

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

15. The AT noted that the Lao People's Democratic Republic's latest GHG inventory estimates included in its second national communication submitted in 2013 are for the year 2000. Given that the selected historical reference period for the FREL/FRL is 2005–2014, the AT was unable to assess whether the FREL/FRL maintains consistency with the corresponding forest-related estimates of emissions and removals contained in its GHG inventory. The AT noted that, as reported in the modified FREL/FRL submission, the Lao People's Democratic Republic will submit a GHG inventory for the base year 2010 with its third national communication, which will be relevant for assessing the consistency with the current FREL/FRL. The AT further noted that, according to the Lao People's Democratic Republic, this inventory will be developed using a combination of the _Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories_ and the 2006 IPCC Guidelines (the former being used for areas where there remains a lack of data). The AT commends the Lao People's Democratic Republic for its efforts and notes the importance of maintaining consistency between the FREL/FRL and the national GHG inventory not only for the base year (2010) but for the complete time series of forest-related emissions and removals.

16. The Lao People's Democratic Republic used a simplified approach for land representation in which all non-forest land classes (cropland, grassland, wetlands, settlements, other land) were grouped into one non-forest class. The AT noted that this approach is not consistent with the approaches for land representation provided in the 2006 IPCC Guidelines (vol. 4, chapter 3) and thus does not enable a correct implementation of the methods provided therein, which are based on the six land-use categories and the transitions between them. The AT notes that, in particular, this simplification affects the estimation of emissions and removals from forest land converted to other land-use categories (deforestation). During the TA, in response to a question from the AT, the Lao People's Democratic Republic explained that it adopted this approach in order to reduce the uncertainty associated with the land representation. However, the Party confirmed the availability of national data to apply approach 3 for land representation provided in the 2006 IPCC Guidelines, which is characterized by spatially explicit tracking of the land-use categories and transitions between them. The AT considers that, given the availability of data to support it, the Party could consider implementing land representation according to the six land-use categories and their conversions and applying the land-use category-specific methods provided in the 2006 IPCC Guidelines, which would greatly increase the transparency, accuracy and the overall adherence to the IPCC guidelines of the FREL/FRL and facilitate achieving consistency with the national GHG inventory, and notes this as an area of future technical improvement.

17. The Lao People's Democratic Republic used an area-weighted average of the post-deforestation biomass carbon stocks of 4.91 t C/ha for all non-forest classes based on the areas in the year 2015. Although the AT could reproduce this value for 2015 using the additional information provided by the Party during the TA, it noted that the value would cease to be representative if the pattern of land use were to change significantly over time, particularly if this were due to the conversion of forest land. For example, using the areas of non-forest classes in 2005, the AT calculated the value of post-deforestation biomass carbon stocks as 5.00 t C/ha. The AT noted that this difference in carbon stock values, although small, does reduce the accuracy of the estimates of emissions from deforestation. The AT notes that in order to increase the accuracy of the FREL/FRL, the Lao People's Democratic Republic may wish to use the existing information on the areas of post-deforestation land-use categories and their carbon stocks to estimate the land-use category-specific emissions from forest land conversions to those land-use categories and considers this as an area of future technical improvement.

18. The Lao People's Democratic Republic used the relevant equations from the 2006 IPCC Guidelines (equations 2.15 and 2.16 from vol. 4, chapter 2) to estimate the carbon stock changes in biomass for land conversions. However, the AT noted that throughout the submission these equations (and their parameters) are only mentioned in section 4.1.2 of the FREL/FRL submission. In all other sections, when referring to data and methods, the Lao People's Democratic Republic uses different terminology. Further, the AT was unable to find specific references to these parameters and equations in other sections. The AT considers it an area of future technical improvement for the Lao People's Democratic Republic to use the

terminology and references to the equations and parameters from the 2006 IPCC Guidelines consistently throughout the submission, in order to enhance transparency.

19. The AT noted that, with the exception of the emissions from selective logging, the Lao People's Democratic Republic assumed emissions and removals from forest land remaining forest land to be zero. The AT noted that this assumption is not consistent with the gain–loss method provided in the 2006 IPCC Guidelines for estimating biomass carbon stock changes in forest land remaining forest land (strata 1–4), which involves a complete accounting of gains and losses including biomass gains due to growth and losses due to harvest, fuelwood extraction and natural disturbances. During the TA, the Lao People's Democratic Republic explained that it has not applied the default biomass increment factors from the 2006 IPCC Guidelines because it does not consider those values to be representative of its national circumstances, as forests in the Lao People's Democratic Republic are subject to constant use and disturbance by the local communities; People's Democratic Republic therefore, believes that applying the default values of above-ground biomass growth from the 2006 IPCC Guidelines may overestimate the actual growth of forests in the Lao People's Democratic Republic. The AT notes that local or regional scientific research may provide more information on the growth of forests in the Lao People's Democratic Republic. The AT notes that the Lao People's Democratic Republic may wish to apply the default method provided in the 2006 IPCC Guidelines together with above-ground biomass increment factors from such research to increase the accuracy of the FREL/FRL, and considers this an area of future improvement.

20. The Lao People's Democratic Republic estimated emissions from selective logging in forest land remaining forest land based on a national methodology that uses tree stump data from the second NFI for estimating emissions from timber harvest. During the TA, the Lao People's Democratic Republic confirmed that it also has data on trees felled due to natural disturbance events that could be used to estimate carbon losses from natural disturbances, which, the AT noted, were not included in the FREL/FRL. The AT notes that to increase the accuracy of the FREL/FRL, consistent with the guidance provided in the 2006 IPCC Guidelines, the Party may wish to include the emissions from natural disturbances in managed lands, and considers this an area of future improvement.

21. The Lao People's Democratic Republic estimated AD for the periods 2005–2009 and 2010–2014 (land transition matrices are presented in tables 11 and 12 of the modified FREL/FRL submission). The final FREL/FRL values were estimated as the averages of emissions and removals for these two periods. The AT, however, notes that in order to apply the methods for estimating and reporting emissions and removals on an annual basis provided in the 2006 IPCC Guidelines it is necessary to have AD estimates on an annual basis. During the TA, in response to a question from the AT, the Lao People's Democratic Republic included in the modified submission annual estimates of AD (tables 19 and 21 of annex 1: AD report). The AT commends the Lao People's Democratic Republic for including the requested information, which increases the transparency of the information on the estimates of emissions and removals included in the FREL/FRL.

22. The Lao People's Democratic Republic grouped forest and non-forest classes into five strata: stratum 1: evergreen forest; stratum 2: mixed deciduous forest, conifer forest, and mixed coniferous and broadleaved forest; stratum 3: dry dipterocarp forest; stratum 4: plantation, bamboo and regenerating vegetation (RV); and stratum 5: 12 non-forest classes, including grasslands, rice paddies, urban areas, and barren land and rock. The AT noted that the land transition matrices for 2005–2009 and 2010–2014 contained a few transitions between strata belonging to different ecozones that could be theoretically impossible in such a short time, such as 3,066 ha of stratum 1 transitioning to stratum 2 as well as 3,685 ha of stratum 2 transitioning to stratum 1 in 2005–2009. During the TA, the Lao People's Democratic Republic explained that these transitions are considered possible based on expert judgment following a series of meetings among local experts. The AT commends the Lao People's Democratic Republic for implementing quality controls that improved the accuracy of the FREL/FRL estimates.

23. The Lao People's Democratic Republic collected extensive field data to determine the number of years required for forest fallow land, classified as RV, to regenerate to meet the national forest definition. The Lao People's Democratic Republic developed a regression model to predict the crown cover density based on the number of years after abandonment using survey plots and data collected by unmanned aerial vehicles, which was then used to

estimate the minimum number of years it would take the RV to reach the crown cover density of 20 per cent consistent with the national forest definition. The report on the RV survey was provided to the AT during the TA. Based on this regression model, the Lao People's Democratic Republic calculated the average number of years required for RV to regenerate to a crown cover density of 20 per cent as 7.4 years. While recognizing the Lao People's Democratic Republic's efforts, the AT noted a few issues with the methodology. For example, more than half of the eight-year-old sites surveyed did not meet the 20 per cent threshold used for the national forest definition. In addition, because the study only considered sites less than or equal to eight years after abandonment, the AT notes that it excluded those other sites that may not have reached 20 per cent crown cover density nine or more years after abandonment. The AT considers that this methodology may result in the classification forest being applied to RV areas that do not have the 20 per cent crown cover density consistent with the national forest definition, which may lead to an overestimation of removals in the historical reference period. The AT therefore notes that the Lao People's Democratic Republic may wish to include in its study, as an area of future technical improvement to enhance the accuracy of FREL/FRL, those other sites that have been abandoned for more than nine years in order to more accurately reflect the dynamics of conversion of abandoned upland crops to mixed deciduous forests for determining the years required for RV areas to regenerate to meet the national forest definition. While acknowledging the good quality of the data collected by the Lao People's Democratic Republic, the AT notes that assuming that RV areas convert to mixed deciduous forests in eight years is a practicable assumption for the time being.

24.   The Lao People's Democratic Republic implemented a design-based area estimation approach, following the methodology provided by Olofsson et al. (2014), which provides a method for assessing the accuracy of a change map and estimating area based on higher resolution reference data. The Lao People's Democratic Republic provided information on the results of implementing this method in the modified submission (section 5). The AT noted that although the modified submission itself did not include sufficient information to understand how this method was applied, particularly regarding the estimation of overall uncertainties and the adjustment of areas, a spreadsheet provided to the AT during the TA provided detailed information on these elements. The AT commends the Lao People's Democratic Republic for sharing this information with the AT and notes that the Party may wish to enhance the description of the application of the method in the main text of the report so as to make it self-explanatory, in order to increase the transparency of future FREL/FRL submissions.

25.   To determine forest carbon stocks the Lao People's Democratic Republic used data from the second survey of the NFI conducted during the period 2015–2017. As mentioned in the modified submission, the second NFI was conducted in the dry seasons of 2015–2016 and 2016–2017, with a total of 559 survey plots being randomly distributed across five forest classes. The Party also explained in the modified FREL/FRL submission that the data from the first NFI survey conducted in 1991–1999 could not be used due to poor archiving and methodological inconsistencies with the second NFI. During the TA, the Lao People's Democratic Republic clarified that the number of survey plots was determined based on the parameters "mean" and "standard deviation" derived from the first NFI survey data and "target precision" based on expert judgment. During the TA, in response to a question from the AT, the Party provided further clarification that out of the 559 survey plots randomly located in the five forest classes, 139 survey plots were excluded because during the on-the-ground survey, either they were found to be non-forest or an equal number of subplots within each of those survey plots (each survey plot contained four subplots) fell under two different forest classes (i.e. two subplots each in two different forest classes) thus leading to an inability to decide the forest class of that survey plot. The AT noted that the survey plot-level carbon stock estimates provided for 420 plots were consistent with the aggregated carbon stock values reported in the submission (table 4–2, annex II). The AT considers that the sample size used by the Lao People's Democratic Republic (420 survey plots) is small relative to the large variability in biomass carbon stocks and the sampled forest area (over 13.5 Mha) and thus may lead to a high uncertainty in the FREL/FRL estimates (see para. 10 above). The AT notes that the Lao People's Democratic Republic may consider increasing sampling intensity in the next NFI cycle in order to further enhance the accuracy of its FREL/FRL estimates.

26.   The Lao People's Democratic Republic presented its FREL/FRL as two independent values of emissions and removals, which are averages of emissions and removals over the historical reference period. The AT noted that instead of presenting a net value of FREL/FRL, the Lao People's Democratic Republic presented values of gross emissions and removals for groups of REDD-plus activities with the values of emissions and removals relating to the emissions from deforestation and forest degradation, and removals from enhancement of forest carbon stocks (reforestation and restoration) respectively. The AT further noted that this separation is done by type of activity rather than by emissions and removals, as all activities may include emissions and removals. The AT considers that the Lao People's Democratic Republic may wish to include this description to increase the transparency of future submissions.

27.   The Lao People's Democratic Republic defined its FREL/FRL as averages of emissions and removals over the historical reference period 2005–2014 (10 years) and assumed it to be valid for the next 11 years (i.e. 2015–2025). While recognizing the current efforts by the Lao People's Democratic Republic, and the difficulty in determining a trend based on a limited number of data points, the AT considers that the Lao People's Democratic Republic may wish to revisit the methodology for FREL/FRL projection when more information is available, to better reflect the future evolution of emissions and removals.

Description of relevant policies and plans, as appropriate

28.   In its modified submission, the Lao People's Democratic Republic mentioned relevant policies and plans including the 8th National Socio-Economic Development Plan, the Green Growth Strategy (currently being drafted), the Central Party's Resolution on Land, 2017, the Forestry Strategy 2020, and the Lao People's Democratic Republic's nationally determined contribution. The Lao People's Democratic Republic conducted a thorough analysis of its national circumstances, including the country context and drivers of forest-cover change as part of the development of its National REDD-plus Strategy (NRS), which provides a strategic direction for the implementation of REDD-plus actions. During the TA, in response to a question from the AT, the Lao People's Democratic Republic shared a revised draft of the NRS which provided more details on such policies and plans and included a description of the key drivers of deforestation and forest degradation, as well as actions to address them. Among the main drivers are expansion of agriculture, conversion of forest land for infrastructure development and mining, forest degradation from unsustainable timber harvesting and non-timber forest produce collection, shifting cultivation and forest fires, and conversion of natural forest to commercial tree plantation areas. The actions envisaged as part of the NRS include the development of sustainable agriculture, mining and infrastructure expansion in coordination with forest protection, promoting sustainable timber harvesting and forest management, converting shifting cultivation to sedentary cultivation, controlling forest fires and improving forest restoration, and establishing commercial tree plantations.

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

29.   According to decision 12/CP.17, annex, subparagraph (c), reasons 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.

30.   The pools included in the FREL/FRL are above-ground biomass and below-ground biomass. The dead organic matter (litter and deadwood) and soil organic carbon pools were not included. With the exception of deadwood (see para. 31 below), the Party has cited a lack of data as the reason for excluding other carbon pools.

31.   With regard to emissions from the deadwood pool, the AT noted that although the deadwood pool was measured in the second NFI, it was excluded from the FREL/FRL. The Lao People's Democratic Republic provided a justification for its exclusion from the FREL/FRL (section 3.2, table 5) on the basis of the results from the second NFI. According to the Lao People's Democratic Republic, emissions from the deadwood pool account for 2.3 per cent of the sum of the emissions from the biomass and deadwood pools from deforestation and are, therefore, considered insignificant. The Party also explained that deadwood was measured only for forest classes in the second NFI and thus its inclusion would likely increase the overall uncertainty. The Party also noted that even though excluding deadwood is conservative, it considers its inclusion in the FREL/FRL as an area of future improvement.

The AT, however, noted that the 2006 IPCC Guidelines consider it good practice to develop accurate and not conservative estimates. While acknowledging the Party's justification for excluding this pool on the basis of lack of data and insignificance, the AT notes that given that the Party already estimates emissions from deadwood from land conversions based on country-specific data, it may wish to consider including this pool in the FREL/FRL to further enhance accuracy in future submissions or to provide more comprehensive information to justify excluding the pool from the FREL/FRL, by using data on deadwood carbon stocks in non-forest land-use categories collected from future NFIs or other national studies.

32.   With regard to litter, in its modified submission the Lao People's Democratic Republic explained that it did not include litter in the FREL/FRL because it did not measure litter stocks in its second NFI, assuming the emissions from litter to be smaller than those from deadwood based on the relatively smaller default value of litter carbon stocks per hectare for tropical climate provided in the 2006 IPCC Guidelines (2.1 t/ha). The Party also noted including this pool in the FREL/FRL as an area of future improvement. The AT noted that the default value of litter carbon stock in tropical forest is a globally applicable value characterized by a high level of uncertainty, which should not be used as the basis for not including a pool in the FREL/FRL. While acknowledging the Party's justification for excluding this pool on the basis of lack of data, the AT notes that the Lao People's Democratic Republic may wish to include litter in future submissions to increase the accuracy of the FREL/FRL or to provide additional information to justify excluding the pool from the FREL/FRL based on its insignificance, by using data collected from future NFIs or other national studies.

33.   With regard to soil organic carbon, the Lao People's Democratic Republic provided a justification for excluding this pool on the basis of lack of country-specific data. The Lao People's Democratic Republic noted that it will consider including this pool as part of the stepwise improvement of the FREL/FRL. The AT notes that the Lao People's Democratic Republic may wish to include soil organic carbon in future submissions or to provide additional information to justify excluding the pool from the FREL/FRL based on its insignificance, by using data collected from future NFIs or other national studies.

34.   With regard to non-CO_2 emissions, the Lao People's Democratic Republic provided a justification for excluding these emissions from the FREL/FRL on the basis of lack of data. The AT noted that the Lao People's Democratic Republic stated in its FREL/FRL submission that extensive slash-and-burn practices associated with shifting cultivation affect 170,000 ha of forest land in the Lao People's Democratic Republic annually, resulting in emissions of methane and nitrous oxide amounting to 2.9 per cent of the CO_2 emissions from forests in the reference period (2005–2014). However, the Lao People's Democratic Republic did not include non-CO_2 emissions in the FREL/FRL because of a lack of AD and parameters. The Lao People's Democratic Republic noted that it did not have information on the areas affected by shifting cultivation because, owing to the non-permanence of shifting cultivation, the area affected by it can only be finally determined through a retrospective confirmation of plots not continuing to be cultivated, which can only take place during the next mapping cycle. The Lao People's Democratic Republic further explained in the modified submission that it currently does not have a national system for monitoring forest fires, which are caused mostly by uncontrolled spreading of fire from slash-and-burn activities, which constitute another important source of non-CO_2 emissions. The Lao People's Democratic Republic also noted that it does not have a country-specific value of biomass combustion factor for slash-and-burn activities. While recognizing the challenges faced by the Lao People's Democratic Republic, the AT noted that during the TA the Lao People's Democratic Republic shared with it a spreadsheet detailing the area of forest burned, mass of fuel available for combustion and carbon fractions in all forest types and RV for the periods 2005–2009 and 2010–2014. The AT is therefore of the view that, given that the Lao People's Democratic Republic has access to data enabling it to estimate non-CO_2 emissions from biomass burning in line with the IPCC guidance, it could consider including these emissions in the FREL/FRL to enhance accuracy and to maintain consistency with the national GHG inventory and the information presented on national policies and plans. The AT notes that this is particularly important because the Lao People's Democratic Republic has identified reducing forest fire impacts as one of its REDD-plus policies and plans.

35.   The AT acknowledges that the Lao People's Democratic Republic included the most significant activities (reducing emissions from deforestation, reducing emissions from forest degradation and enhancement of forest carbon stocks) of the five activities identified in

decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. The AT also notes that only a portion of emissions and removals have been included for forest land remaining forest land and that significant emissions and removals may have been excluded; for example, carbon gains from forest growth as well as carbon losses (and associated non-CO_2 emissions) due to firewood collection and natural disturbances (see para. 19 above).

4. Definition of forest

36.   In its submission, the Lao People's Democratic Republic provided the definition of forest used in the construction of its FREL/FRL. As stated in the modified submission (chapter 1, p.2), although this definition is the same as the one included in the latest national GHG inventory, it is different from that used for the Party's reporting to the Food and Agriculture Organization of the United Nations Global Forest Resources Assessment. The Lao People's Democratic Republic's forest definition, as included in the FREL/FRL, covers both forests currently meeting the forest definition ("current forests") and those with a potential to do so ("potential forests"). Current forests are defined as lands with a minimum stand diameter at breast height (dbh) of 10 cm, minimum crown cover density of 20 per cent and a minimum area of 0.5 ha. Potential forests are defined as previously forested lands not being permanently used for other purposes (e.g. residential and agriculture) that are presently not meeting the definition of current forest due to being subject to various disturbances, but are expected to be restored to the status of current forest if continuously left undisturbed. The definition of potential forest also does not include upland cropland, despite that being commonly observed as a cropping stage of shifting cultivation cycle.

37.   The AT noted that the Lao People's Democratic Republic used a dbh threshold instead of the more commonly used height threshold in its definition of current forest (a minimum dbh of 10 cm). The Lao People's Democratic Republic explained in the modified submission that this has been done mainly to facilitate the correct classification of forest fallow, typically classified as RV, which are regenerating forests often covered by small diameter trees over 5.0 m in height. Lao considers that despite meeting the height threshold, such lands should not be considered as current forest because repeated disturbances may maintain them in an understocked condition for an indeterminate period, and therefore are better classified as potential forest. The AT notes that the Lao People's Democratic Republic aims to distinguish those areas that would meet the definition of forest at maturity from those that are already considered to be forests consistent with the national definition.

III. Conclusions

38.   The information used by the Lao People's Democratic Republic in constructing its FREL/FRL is transparent and complete and in overall accordance with the guidelines for submissions of information on FRELs/FRLs (as contained in the annex to decision 12/CP.17).

39.   The FREL/FRL presented in the modified submission, for the reference period 2005–2014, corresponds to 41,013,316 t CO_2 eq/year (emissions) and –7,533,558 t CO_2 eq/year (removals). The AT noted that these are independent values.

40.   The AT acknowledges that the Lao People's Democratic Republic included in the FREL/FRL the most significant activities and pools in terms of emissions from forests. In doing so, the AT considers that the Lao People's Democratic Republic followed the encouragement in decision 1/CP.16, paragraph 70, on activities undertaken, paragraph 71(b), and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. The AT commends the Lao People's Democratic Republic for the information provided on the ongoing work on the development of the FREL/FRL and for its intention to improve the methods and data over time, following the stepwise approach.

41.   As a result of the facilitative interactions with the AT during the TA, the Lao People's Democratic Republic provided a modified submission, which took into consideration the technical inputs of the AT. The AT notes that the transparency and completeness of information was improved significantly in the modified FREL/FRL submission and commends the Lao People's Democratic Republic for the efforts made. As a result of the facilitative process during the TA, the FREL/FRL was modified to 41,013,316 t CO_2 eq/year (emissions) and –7,533,558 t CO_2/year (removals). The new information provided in the

modified submission as well as the information shared by the Party during the TA (e.g. spreadsheets and additional technical documents) increased the transparency and reproducibility of the FREL/FRL calculations.

42. The latest GHG inventory estimates included in the second national communication submitted by the Lao People's Democratic Republic in 2013 are for the year 2000. Given that the selected historical reference period for the FREL/FRL is 2005–2014, the AT was unable to assess whether the FREL/FRL maintains consistency with the corresponding forest-related estimates of emissions and removals contained in its GHG inventory. The AT notes that, overall, the FREL/FRL does not maintain consistency, in terms of sources of AD and emission factors, with the GHG inventory included in the Lao People's Democratic Republic's second national communication.[12] The AT commends the Party for the measures undertaken to enable it to maintain such consistency in the future, as explained by the Lao People's Democratic Republic in the modified FREL/FRL submission.

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

(a) Implement land representation based on the six land-use categories and their conversions and apply the land-use category-specific methods provided in the 2006 IPCC Guidelines (see para. 16 above);

(b) Use the existing information on the areas of post-deforestation land-use categories and their carbon stocks to estimate the land-use category-specific emissions from forest land conversions to those land-use categories (see para. 17 above);

(c) Use the terminology and references to the equations and parameters from the 2006 IPCC Guidelines consistently throughout the submission (see para. 18 above);

(d) Include all the emissions and removals from the forest land remaining forest land areas by applying the default method provided in the 2006 IPCC Guidelines together with above-ground biomass increment factors appropriate to its national circumstances from local or regional scientific research (see para. 19 above);

(e) Include the emissions from natural disturbances in managed lands (see para. 20 above);

(f) Include in its study other sites that have been abandoned for more than nine years in order to more accurately reflect the dynamics of conversion of abandoned upland crops to mixed deciduous forests for determining the years required for the RV areas to regenerate to meet the national forest definition (see para. 23 above);

(g) Enhance the description of the application of the method provided in Oloffsson et al. (2014) in the main text of the submission, so as to make it self-explanatory (see para. 24 above);

(h) Consider increasing sampling intensity in the next NFI cycle (see para. 25 above);

(i) Include information that the separation of the FREL/FRL values is done by type of activity rather than by emissions and removals (see para. 26 above);

(j) Revisit the methodology for FREL/FRL projection when more information is available, to better reflect the future evolution of emissions and removals (see para. 27 above).

44. In assessing the pools and gases included in the FREL/FRL, pursuant to decision 13/CP.19, annex, paragraph 2(f), the AT identified the following additional areas for future technical improvement:

(a) Treatment of emissions from the deadwood pool (i.e. the inclusion of this pool or the provision of more information on the justification of its omission) (see para. 31 above);

(b) Treatment of emissions from litter (i.e. the inclusion of this pool or the provision of more information on the justification of its omission) (see para. 32 above);

(c) Treatment of emissions from soil organic carbon (i.e. the inclusion of this pool or the provision of more information on the justification of its omission) (see para. 33 above);

---

[12] In reference to the scope of the TA, decision 13/CP.19, annex, paragraph 2(a).

(d)   Inclusion of non-CO_2 emissions from biomass burning (including those from shifting cultivation) (see para. 34 above).

45.   The AT acknowledges and welcomes the intention expressed by the Lao People's Democratic Republic to:

(a)   Improve the classification of mixed deciduous forests and revegetation (potential forests);

(b)   Update the 2015 forest type map to distinguish between upland crops and other agriculture, including new methods based on "big-data" analysis, multi-temporal satellite data sets and additional geographical information data;

(c)   Undertake further capacity-building of remote sensing, geographical information systems and information technology engineers, including the development of a standard operation procedure for forest mapping in 2019;

(d)   Improve the representativeness of RV carbon stocks (biomass and dead organic matter) by including such measurements in the NFI;

(e)   Collect national data to avoid the need to rely on default values or regionally derived parameters and equations;

(f)   Include emissions from deadwood in the FREL/FRL;

(g)   Include non-CO_2 gases from shifting cultivation and biomass burning in the FREL/FRL;

(h)   Improve the methods for estimating emissions from forest degradation, including emissions from selective logging, by considering remote sensing techniques;

(i)   Avoid double counting of emissions and removals with existing GHG initiatives.

46.   In conclusion, the AT commends the Lao People's Democratic Republic for showing a strong commitment to the continuous improvement of its FREL/FRL estimates, in line with the stepwise approach. A number of areas for future technical improvement have been identified in this report. At the same time, the AT acknowledges that such improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.[13] The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with the Lao People's Democratic Republic.

47.   The table contained in the annex summarizes the main characteristics of the Lao People's Democratic Republic's proposed FREL/FRL.

---

[13]   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/forest reference level based on information provided by the Lao People's Democratic Republic

Main features of the FREL/FRL		*Remarks*
Proposed FREL/FRL (in t CO_2 eq/year) applicable to deforestation, forest degradation and enhancement of forest carbon stocks	41,013,316 (emissions) −7,533,558 (removals)	The Party proposed two independent values for its FREL/FRL for emissions and removals (see para. 6 of this document).
Type and duration of FREL/FRL	FREL/FRL = historical emissions 2005–2014, proposed duration 2015–2025	FREL/FRL is estimated based on the averages of historical emissions during 2005–2014. The proposed validity of FREL/FRL is for the period 2015–2025 (11 years) (see para. 6 of this document).
Adjustment for national circumstances	No	The Lao People's Democratic Republic has not applied adjustments for national circumstances.
National/subnational	National	
Activities included	Deforestation Forest degradation Enhancement of forest carbon stocks	
Pools included	AB, BB	The Party did not include deadwood and litter on the basis of insignificance and lack of data (see paras. 31–32 of this document). The Party did not include soil organic carbon owing to a lack of data (see para. 33 of this document). The AT provided suggestions for including the deadwood and litter pools in future submissions (see paras. 31–32 of this document).
Gases included	CO_2	The Party did not include non-CO_2 emissions in the FREL/FRL from biomass burning associated mainly with shifting cultivation in the FREL/FRL, owing to a relatively low contribution of emissions of non-CO_2 emissions to the total forest-related emissions as well as the methodological challenges associated with their estimation (see para. 34 of this document).
Forest definition	Included	Forest definition of the Lao People's Democratic Republic covers both "current forest" (minimum stand dbh of 10 cm, minimum crown cover density of 20%; and minimum area of 0.5 ha) and "potential forest", which represents previously forested land expected to be restored to "current forest". The AT notes that this definition is consistent with the one used for the national GHG inventory but not with the one used for reporting to the Food and Agriculture Organization of the United Nations Global Forest Resources Assessment (see para. 37 of this document).

Main features of the FREL/FRL		*Remarks*
Relationship with latest GHG inventory	Methods used for FREL/FRL are not consistent with latest GHG inventory (2000) in the second national communication	The AT was not able to check the consistency of emissions and removals estimates included in the FREL/FRL because the Party's latest GHG inventory is for the year 2000, which was not included in the reference period used for the FREL/FRL (see para. 15 of this document).
Description of relevant policies and plans	Included	
Description of assumptions on future changes in policies	Not applicable	
Descriptions of changes to previous FREL	Not applicable	
Future improvements identified	Yes	Several areas for future technical improvements were identified by AT (see paras. 15–27 and 31–34 of this document).

Abbreviations: AB = above-ground biomass, AT = assessment team, BB = below-ground biomass, FREL/FRL = forest reference emission level/forest reference level, GHG = greenhouse gas.