United Nations

Framework Convention on Climate Change

FCCC/TAR/2020/KEN

Distr.: General
23 December 2020

English only

Report on the technical assessment of the proposed forest reference level of Kenya submitted in 2020

Summary

This report covers the technical assessment of the voluntary submission of Kenya on its proposed forest reference level (FRL) in accordance with decision 13/CP.19 and in the context of results-based payments. The FRL proposed by Kenya covers the activities reducing emissions from deforestation, reducing emissions from forest degradation, sustainable management of forests and enhancement of forest carbon stocks, which are among the activities included in decision 1/CP.16, paragraph 70. For its submission, Kenya developed a national FRL. The FRL presented in the original and modified submission, for the reference period 2002–2018, corresponds to 52,204,059 tonnes of carbon dioxide equivalent per year. The assessment team notes that the data and information used by Kenya in constructing its FRL are transparent, complete and in overall accordance with the guidelines contained in the annex to decision 12/CP.17. This report contains the assessed FRL and a few areas identified by the assessment team for future technical improvement in accordance with the provisions on the scope of the technical assessment contained in the annex to decision 13/CP.19.

Abbreviations and acronyms

AD	activity data
AT	assessment team
COP	Conference of the Parties
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
EF	emission factor
FREL	forest reference emission level
FRL	forest reference level
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance for LULUCF	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
NFI	national forest inventory
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
SLEEK	System for Land-based Emission Estimation in Kenya
TA	technical assessment
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*

I. Introduction and summary

A. Overview

1. This report covers the TA of the voluntary submission of Kenya on its proposed FRL,[1] submitted on 31 December 2019, in accordance with decisions 12/CP.17 and 13/CP.19. The remote TA[2] took place from 8 to 12 June 2020 and was coordinated by the secretariat.[3] The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts[4] (hereinafter referred to as the AT): Manuel Estrada (Mexico) and Shumpei Iida (Japan). In addition, Gervais Ludovic Itsoua Madzous, an expert from the Consultative Group of Experts, participated as an observer[5] during the remote session. The TA was coordinated by Dirk Nemitz (secretariat).

2. In response to the invitation of the COP and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15 and annex, Kenya submitted its proposed FRL on a voluntary basis. The proposed FRL is one of the elements[6] to be developed in implementing the activities referred to in decision 1/CP.16, paragraph 70. Pursuant to decision 13/CP.19, paragraphs 1–2, and decision 14/CP.19, paragraphs 7–8, the COP decided that each submission of a proposed FREL or FRL, as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments.

3. The objective of the TA is to assess the degree to which the information provided by Kenya is in accordance with the guidelines for submissions of information on reference levels[7] and to offer a facilitative, non-intrusive, technical exchange of information on the construction of the FRL with a view to supporting the capacity of Kenya for the construction and future improvement of its FRL, as appropriate.[8]

4. The TA of the FRL submitted by Kenya was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs.[9] This report on the TA was prepared by the AT following the same guidelines and procedures.

5. Following the process set out in those guidelines and procedures, a draft version of this report was communicated to the Government of Kenya. The facilitative exchange during the TA allowed Kenya to provide clarifications and additional information, which were considered by the AT in the preparation of this report.[10] As a result of the facilitative interactions with the AT during the TA, Kenya provided a modified version of its submission on 18 August 2020, which took into consideration the technical input of the AT. The modifications improved the clarity and transparency of the submitted FRL without needing to alter the approach used to construct it. This TA report was prepared in the context of the modified FRL submission. The modified submission, containing the assessed FRL, and the original submission are available on the UNFCCC website.[11]

B. Proposed forest reference level

6. In decision 1/CP.16, paragraph 70, the COP encouraged 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

[1] The submission of Kenya is available at https://redd.unfccc.int/submissions.html?country=ken.
[2] Owing to the circumstances related to the coronavirus disease 2019, the TAs of the FREL and FRL submissions of developing country Parties in 2020 had to be conducted remotely.
[3] Per decision 13/CP.19, annex, para. 7.
[4] Per decision 13/CP.19, annex, paras. 7 and 9.
[5] Per decision 13/CP.19, annex, para. 9.
[6] See decision 1/CP.16, para. 71(b).
[7] Decision 12/CP.17, annex.
[8] Decision 13/CP.19, annex, para. 1(a–b).
[9] Decision 13/CP.19, annex.
[10] Per decision 13/CP.19, annex, paras. 1(b), 13 and 14.
[11] https://redd.unfccc.int/submissions.html?country=ken.

national circumstances, in the context of providing adequate and predictable support. The FRL proposed by Kenya, on a voluntary basis for a TA in the context of results-based payments, covers the activities reducing emissions from deforestation, reducing emissions from forest degradation, sustainable management of forests and enhancement of forest carbon stocks, which are four of the five activities referred to in that paragraph. Pursuant to paragraph 71(b) of the same decision, Kenya developed a national FRL that covers its entire territory. For its submission, Kenya applied a stepwise approach to developing its FRL in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve their FRELs or FRLs by incorporating better data, improved methodologies and, where appropriate, additional pools.

7. The national FRL proposed by Kenya is derived from its average annual historical emissions from deforestation, forest degradation, sustainable management of forests and enhancement of forest carbon stocks in the reference period 2002–2018, which were monitored over four-year intervals. The FRL includes only the gross emissions from deforestation that are associated with clear-cuts and excludes any subsequent emissions and removals from deforested areas. The proposed FRL excludes perennial tree crops such as coffee and tea, irrespective of whether they meet the forest definition thresholds. The AD used in constructing the FRL are based on a time series of maps. The 34 Landsat images used to create the wall-to-wall map of Kenya were available for 1990–2018, while the land-cover products were available for 1990, 1995, 2000, 2002–2015 and 2018. The EFs were generated using one data set for stock change and another for forest growth rates. The FRL presented in the modified submission, with the aim of accessing results-based payments for REDD+ activities for 2002–2018, corresponds to 52,204,059 t CO_2 eq/year as in the original submission.

8. The proposed FRL includes the above-ground and below-ground biomass pools and excludes the soil organic carbon, litter and deadwood pools. Regarding GHGs, the modified submission includes CO_2 only.

9. During the TA, the Party provided the AT with a technical manual on mapping land-cover change in Kenya, which was not part of the country's submission and was therefore not subject to the TA.

II. Data, methodologies and procedures used in constructing the proposed forest reference level

How each element in the annex to decision 12/CP.17 was taken into account in constructing the forest reference level

1. Information used by the Party in constructing its forest reference level

10. For constructing its FRL, Kenya used the 2006 IPCC Guidelines. AD and EFs for specific land-use conversions were used to calculate the CO_2 emissions associated with each land-use change.

11. Deforestation is defined in the submission as the conversion of forest to non-forest land use across all management systems in three forest ecozones: montane and western rain, mangrove and coastal, and dryland. It does not include planned and periodic felling of forests in public plantations and the associated carbon stock changes. Forest degradation is defined as the degradation of forest canopy that changes from dense to moderate and open canopy coverage, and from moderate to open canopy coverage in the three forest strata of montane and western rain, mangrove and coastal, and dryland. Sustainable management of forests, which is limited to an area of 136,902 ha forests in public plantations managed by the Kenya Forest Service, is defined as the conversion of non-planted forest land to planted forest land and the sustainable management of these forests. Enhancement of forest carbon stocks refers to activities that increase carbon stocks in the montane and western rain, coastal and mangrove, and dryland forest strata through rehabilitation of degraded areas, and reforestation and afforestation efforts. The reference period of the proposed FRL is 2002–2018. Kenya used the complete time series of maps to estimate the trend in forest cover for

2002–2018, which shows a decline from 6.2 per cent (3,669,768 ha) in 2002 to 5.9 per cent (3,462,536 ha) in 2018.

12. Kenya used SLEEK to create the land-cover and land-use maps for 1990, 1995, 2000, 2002–2015 and 2018 based on satellite imagery from Landsat 4, 5, 7 and 8 using a semi-automated method. The map production methodology applied by SLEEK is pixel based (supervised classification using a random forest algorithm). The site training data used for the supervised classification were extracted from a ground-truth survey supplemented by data obtained from Google Earth for areas with poor accessibility. The minimum mapping unit of land cover and land use was 0.09 ha owing to the pixel-based image classification methodology used. However, a filtering process was applied to ensure that forest was mapped in accordance with Kenya's forest definition (minimum area of 0.5 ha).The land-cover maps classify forests into four strata, three of which are consistent with the three forest ecozones of Kenya (dryland, montane and western rain, and coastal and mangrove forest areas) defined by altitude and climate (Wass, 1995). The fourth stratum is a management stratum comprising commercial plantation forest areas managed by the Kenya Forest Service that spread across the three ecozones. A second-level stratification of the three strata based on ecozones (dryland, montane and western rain, and coastal and mangrove forest areas) was performed on the basis of the level of canopy closure, resulting in three canopy classes: 15–40 per cent (open), 40–65 per cent (moderate) and above 65 per cent (dense). However, for the plantation forest managed by the Kenya Forest Service, no subdivision by canopy closure was performed, resulting in a total of 10 forest strata (see table 1 of the FRL submission). The conversion of forest from a lower canopy class (e.g. open forest) to a higher canopy class (e.g. dense forest) results in the enhancement of forest carbon stocks. Similarly, the conversion of forest from a higher canopy class to a lower canopy class results in the reduction of forest carbon stocks and is therefore a forest degradation activity. The process of mapping land-use transitions involved comparing changes in maps for two time periods sequentially for four time intervals (2002–2006, 2006–2010, 2010–2014 and 2014–2018). This resulted in a land-use change map showing the areas that had remained in the same land-use type and those that had changed to a different land-use type between two time periods for the specific REDD+ activities covered by the FRL submission. The process was repeated for each of the four time intervals to generate AD that were then used to calculate the emissions. On the basis of the identified forest strata, the AD on land-use changes were assigned to each REDD+ activity to calculate the land-area change. A matrix was prepared to facilitate assigning REDD+ activities to the different land-use transitions, identifying the specific areas of transition and the associated EFs, and calculating the overall emissions.

13. The EFs for changes in forest carbon stocks were based on the first-level (ecozones and commercial plantation areas) and second-level (canopy closure) stratification of forests. Stratified sampling was used, and forest stock data collected through a pilot forest inventory conducted through the projects Improving Capacity in Forest Resources Assessment in Kenya (KFS, 2016) and Capacity Development Project for Sustainable Forest Management in Kenya (JICA, 2017) were used to assign biomass stock to each stratum and substratum. In the modified submission it was noted that Kenya had not conducted a comprehensive NFI that would have effectively supported the establishment of EFs, although Kenya expects that such an inventory will be carried out in the future. Therefore, the data from the pilot forest inventory that covered all the forest strata were used. The data were collected for 121 plots and a simple average of the field data for each stratum was used as the biomass stock for each substratum. The EFs for deforestation (conversion of forest to non-forest) were estimated by calculating the above-ground biomass in each plot using the data from the pilot forest inventory and four allometric equations. Below-ground biomass was calculated by applying the root-to-shoot ratio per forest stratum on the basis of the 2006 IPCC Guidelines. Forest biomass, calculated as the sum of above-ground and below-ground biomass, was converted into carbon using the carbon fraction of 0.47 provided in the 2006 IPCC Guidelines. Further, the calculation of the conversion of carbon to CO_2 was based on the IPCC ratio of molecular weights (44/12). Lastly, the EFs for land-use conversions were estimated as the difference in carbon stock in an area between two points in time (e.g. 2002 and 2006). For the conversion of forest to non-forest, immediate oxidation was assumed for the carbon stocks. Forest conversions to cropland, wetlands, and settlements and other land retain carbon stocks of zero after conversion. The EF was therefore calculated as the difference between the carbon

stock of the forest prior to conversion and zero. Forest conversions to grassland attain carbon stocks equivalent to 14.99 t CO_2/ha after conversion. The EF in this case was calculated as the difference between the CO_2 value of the forest prior to conversion and 14.99 t CO_2/ha. Instantaneous oxidation was assumed for all forest degradation. Therefore, the EF was calculated as the difference between the CO_2 value of the initial forest canopy class and the CO_2 value of the new forest canopy class within a stratum.

14. The EFs for afforestation (conversion of non-forest to forest) were calculated using a growth rate for each of the forest strata for trees <20 years old. The choice of EFs for afforestation was based on the fact that a forest undergoes a process of growth after planting and does not immediately achieve the carbon stock of the category of forest it is mapped into but attains a carbon stock value consistent with its growth rate and the number of years of growth. Since Kenya cannot monitor single land units over time, it mapped cumulative areas that changed over the four time intervals between 2002 and 2018, and assumed that land areas converted from non-forest to forest are young forests, applying the growth factor for trees of <20 years old provided in the 2006 IPCC Guidelines. The growth rates were also calculated on the basis of the 2006 IPCC Guidelines. In cases where the calculation of growth resulted in a stock that was higher than the stock factor of the assigned canopy class, the calculated value was capped at the level of the stock of the specific canopy class. The EFs for the conversion of cropland, wetlands, and settlements and other land to forest land were calculated as the difference between zero and the CO_2 value after four years of growth. The EF for conversion of grassland to forest land was calculated as the difference between 14.99 t CO_2/ha and the CO_2 value of the forest after four years of growth.

15. The EFs for enhancement of forest carbon stocks (improvement of carbon stocks where a canopy improvement (i.e. from open to moderate or dense forest) was noted between two time periods of mapping) were calculated using a growth rate associated with each of the forest strata for trees ≥20 years old. The value of ≥20 years was selected on the basis that such trees are grown in forests that had previously been degraded and are undergoing stock enhancement. The choice of EFs was based on the fact that a forest undergoes a process of growth after conservation measures are initiated, and that a canopy improvement does not result in the forest achieving the carbon stock of the category of forest it is mapped into, but it attains a carbon stock value consistent with its growth rate and the number of years of growth typical for its forest stratum. In cases where the calculation of growth resulted in a stock that was higher than the stock factor of the assigned canopy class, the calculated value was capped at the level of the stock of the specific canopy class.

16. For sustainable management of forests, the EFs were calculated as the difference between the CO_2 value of the non-forest prior to conversion to forest and the CO_2 value of the plantation based on growth rate. Conversion of cropland, wetlands, and settlements and other land to forest land resulted in carbon stock changes from a CO_2 value of zero to 87.56 t CO_2/ha. Conversion of grassland to forest land resulted in carbon stock changes from 14.99 t CO_2/ha to 87.56 t CO_2/ha.

17. Kenya projected the emissions and removals from the four selected activities by estimating the average of historical emissions. In its submission, the Party indicated that the linear relationship developed from the data for the four time intervals (2002–2006, 2006–2010, 2010–2014 and 2014–2018) had a weak coefficient of determination, which explains why the trend in emissions is not accurately defined by the time-series monitoring. The use of a historical average therefore indicates that a 'business as usual' scenario was assumed to project future emissions. The related assumptions used by Kenya are clearly explained in the chapter of the FRL submission on national circumstances, which does not identify any need to adjust the estimated average emissions because there are no specific development and human livelihood activities prioritized by the Government that may result in the reversal of the ongoing forest conservation activities.

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

(a) Methodological information, including description of data sets, approaches and methods

18. Kenya reported information on the methodology used for estimating the FRL in its submission (chaps. 2–3) and provided a technical manual for mapping land-cover change in Kenya. During the TA, with the aim of providing sufficient information to reconstruct the FRL, Kenya provided additional information on the data and methodology used for estimating the FRL, including land-use change and EF matrices, which enhanced the understanding of the AT with regard to the construction of the FRL. During the TA, Kenya explained that the mapping programme, SLEEK, can detect land-use change in a pixel in one four-year interval but does not monitor the historical changes in each pixel over time. If an area is detected as afforested between 2002 and 2006, then the same area is detected as having canopy improvement between 2006 and 2010 and the IPCC default growth factor for trees >20 years old is applied for this area, although trees in that area can be assumed to be nine years old at most. The AT considers that the SLEEK mapping programme used by Kenya, which is not able to monitor the changes in each pixel over several four-year intervals, could lead to the under- or overestimation of emissions and removals because accurate land-use transitions cannot be monitored and proper application of EFs may not occur. Kenya explained that the SLEEK mapping programme will be improved to enable monitoring of a single pixel over several four-year intervals, which the AT considers to be an area for future technical improvement.

19. Kenya defined a second-level stratification for three forest strata (dryland, montane and western rain, and coastal and mangrove forest areas) on the basis of canopy closure (15–40 per cent (open), 40–65 per cent (moderate) and above 65 per cent (dense)). During the TA, the AT sought clarification on how these thresholds were chosen. Kenya explained that it used experience from the previous land-cover mapping carried out under the Africover programme of the Food and Agriculture Organization of the United Nations described in the Ministry of Environment and Forestry's technical manual for land-cover change mapping in Kenya. The manual classifies vegetation into three categories by openness: above 60–70 per cent, 70–60 to 40 per cent, and 40 to 20–10 per cent. Kenya decided to use 65 and 15 per cent as the maximum and minimum levels, respectively, in developing the FRL by applying the middle points of the percentages used in the land-cover classification system (65 per cent is the middle point of 70–60 per cent and 15 per cent is the middle point of 20–10 per cent). The AT notes that the inclusion of this information in the modified FRL submission increased the transparency of the proposed FRL.

20. In assigning AD to forest land remaining in the same canopy class for two mapping years (e.g. 2002 and 2006) in the three forest strata except plantation forests (i.e. dryland, montane and western rain, and coastal and mangrove forest areas), Kenya assumed that no carbon stock change occurs in this type of forest land. The AT sought clarification on the rationale for this assumption, because even if forest land remains in the same canopy class, the carbon stock of the forest land would increase. In response, Kenya explained that it does not have a sufficient number of permanent sample plots to provide periodic data on forest change. Together with the issue regarding the capability of the mapping programme (see para. 18 above), the AT notes that not including carbon stock change in forest land remaining in the same canopy class in the FRL could lead to an underestimation of carbon stocks. The AT considers that implementing the sampling design for an increased number of permanent sample plots could capture the carbon stock changes in forest land remaining in the same canopy class and is therefore an area for future technical improvement, which would also help to enhance the accuracy of removal estimates.

21. Kenya explained that it does not consider changes in canopy cover in plantation forests in the same way as it does for forest degradation or enhancement of forest carbon stocks. Kenya applied a single canopy cover classification for plantation forests. However, the AT notes that the land-use and EF matrices provided to the AT during the TA include information on plantation areas where the canopy cover changes, which could lead to emissions or removals from plantation forests. In response to a question raised by the AT,

Kenya explained that, even though canopy changes in plantation forests are detected, it is difficult to reflect such changes when estimating carbon stock changes because of the lack of sample data in the NFI. The AT considers estimating carbon stock changes for changes in canopy cover in public plantations using an improved NFI with sample plots located in plantations to be an area for future technical improvement, which would also help to enhance the transparency of the Party's estimates.

22. In assigning AD to plantation forests, Kenya defines conversion of plantation forests to non-forest land as remaining plantation forests. The AT requested the Party to explain the rationale for defining conversion from plantation forest to non-forest land as remaining plantation forest instead of defining it as deforestation. In response, Kenya explained that the aim of sustainable management of forests in relation to plantation forests is to replant them in the future, but gaps exist between harvesting and replanting. During the TA, Kenya further explained that there is a practice whereby some harvested plantation forests are used for farming for a few years and then replanted. The AT noted that this practice, when conducted for plantation forests, could justify considering the conversion from plantation forests to cropland as remaining plantation forests; however, the conversion from plantation forests to grassland, wetlands, and settlements and other land would not be justified. Therefore, the AT sought further clarification on the definitions used by Kenya. In response, Kenya explained that some plantation forests that are converted to dams, roads and settlements could have been detected as non-forest, but other plantation forests could have been detected as converted to non-forest because of measurement errors due to the limitations of the SLEEK mapping programme and the lack of sample data. The AT considers refining the mapping programme and increasing sampling to be an area for future technical improvement, which would also help to enhance the transparency of land-use transitions and the accuracy of emission and removal estimates.

23. For deforestation to grassland, Kenya applied the EF of 14.99 t CO_2/ha for woody grassland instead of the EF of 6.95 t/ha for open grassland; and, for land-use change from forest land to cropland, Kenya applied the EF of 0 for annual cropland instead of the EF of 89.47 t/ha for perennial cropland. During the TA, the AT sought clarification on why Kenya applied the higher EF for deforestation to grassland and the lower EF for land-use change from forest land to cropland. In response, the Party explained that grassland in Kenya comprises a significant amount of woody material and the EF for woody grassland was therefore used for deforestation to grassland. Kenya further explained that the EF for annual cropland was used for deforestation to cropland as a conservative value because of the lack of consistent data on carbon stocks in annual cropland. Since this lack of data could lead to an over- or underestimation of emissions from deforestation, Kenya intends to update the EF used for deforestation to cropland on the basis of recent literature that captures carbon stocks in annual cropland more appropriately. The AT considers this to be an area for future technical improvement.

24. Kenya defines "capping" manipulation as applying carbon stocks from NFI sampling data to the EF in cases where the calculation of carbon stocks using the growth factor exceeds the carbon stock calculated from NFI sampling data. Kenya explained that capping was used for the EF of –43.23 t/ha for conversion from cropland to open forest in montane and western rain forest areas instead of the carbon stock changes using the growth factor of –94.44 t/ha. The AT noted that this capping manipulation might be more accurate than using the EF for the growth factor; however, there seems to be a contradiction in that open forest newly growing on former cropland in montane and western rain forest areas is assumed to reach full biomass after four years. The AT considers resolving this contradiction to be an area for future technical improvement. This could be achieved through an improved NFI by collecting data on biomass accumulation in young forests or appropriate literature references, which would also enhance the transparency of the FRL submission.

25. In establishing the EFs for carbon stock changes, Kenya applied the IPCC default carbon fraction of 0.47 to calculate forest biomass from above-ground and below-ground biomass for all types of forest. The AT sought further clarification on the use of this EF because using the same carbon fraction for 10 forest strata could result in an under- or overestimation of emissions. In response, Kenya explained that different forest types and forest species exist in Kenya, and developing a carbon fraction corresponding to each forest

type and forest species would be both costly and time-consuming. Kenya further explained that developing carbon fractions specific to each forest type and forest species could be an area for future technical improvement. The AT notes that developing carbon fractions for each forest type and species would enhance the accuracy of the emission and removal estimates in future FRL submissions.

26. Although Kenya provided information on tree species in public and private plantation forests in its submission (annex 2, p.81) for the purpose of subcategorizing plantation forests, it did not classify public plantations by tree species or consider plantations in three forest strata (dryland, montane and western rain, and coastal and mangrove) except plantation forests. During the TA, the AT requested the rationale for not subcategorizing public and private plantations. In response, Kenya explained that the purpose of the information on tree species in public plantations is to supplement ground data records and that plantation practices on private land are too complicated for Kenya to differentiate plantation forests growing on private land. The AT acknowledges that this differentiation could be challenging, but that it could be an area for future technical improvement to enhance the accuracy of the emission and removal estimates.

27. In relation to decision 12/CP.17, paragraph 8, the AT noted that there is no consistency in the methods, data and assumptions used by Kenya between the FRL and its most recent national GHG inventory included in its second national communication, submitted in 2015. During the TA, Kenya clarified that the national GHG inventory included in its second national communication was not developed using the same data sets as those used for the FRL. Kenya also informed the AT that it is making efforts to incorporate the improved methods and data sources used for the FRL in the national GHG inventory included in its next national communication, which is being prepared. With regard to the time intervals used, Kenya explained that four-year intervals are applied for the FRL, while five-year intervals are applied for the GHG inventory included in the national communication, which means that the emissions reported in the FRL submission and in the GHG inventory cannot be exactly the same. The AT notes that ensuring consistency in the methods, data sources and time intervals used for the FRL and GHG inventory is an important area for future technical improvement.

28. Kenya carried out an uncertainty analysis of the land-cover maps, AD and EFs used for constructing its FRL. The AT commends Kenya for providing detailed information on the data and methodologies used to conduct the uncertainty analysis, but also notes some areas for possible future improvement. For example, the overall accuracy of the land-cover maps appears to exceed 70 per cent for all years of the time series used in developing the FRL; however, for some land classes, such as moderate forest and open forest, Kenya reported lower accuracy (see table 33 of the FRL submission). The AT acknowledges that the validity of the overall accuracy of the land-cover maps would be improved by providing further information on the low level of accuracy for individual classes. Another example where information could be improved is the limited number of sample plots used in calculating the uncertainty of the EFs. Since this is mainly caused by the limited number of sample plots used in the NFI, the AT considers that increasing the number of sample plots in the NFI would greatly improve the future analysis of the uncertainty of the EFs.

(b) Description of relevant policies and plans, as appropriate

29. In its FRL submission, Kenya provided a detailed description of relevant policies and plans. In 2010, the Government of Kenya set a target under the Constitution to enhance forest cover to a minimum of 10 per cent, while the national development blueprint, Vision 2030, and the National Climate Change Response Strategy are aimed at achieving this target by 2030. As a Party to the Convention, Kenya has developed its nationally determined contribution as part of its commitment to contributing to the mitigation of and adaptation to climate change by using the forest sector as the main sink for GHG emissions.

30. Kenya defined 2002–2018 as the historical reference period for estimating the FRL, considering it to be the most appropriate period for predicting future emissions and removals because a major update of policies and measures related to forest governance was introduced in and after 2002. In 2002, calls for a change in Kenya's Forest Act peaked and consensus was reached within the newly elected Government that governance of forests should change,

which led to changes in forest management and made deforestation more difficult than previously. The newly elected Government introduced planning of large-scale developments under Vision 2030, which has affected management and conservation of forests in a manner that is not necessarily positive; for example, development targets in the construction industry expose forests to further degradation because forests are a major source of construction material. Furthermore, the reference period is appropriate because many environmentally friendly policies, including the Kenya Climate Change Act 2016, Climate Change Action Plan 2018, Kenya Land Act of 2016, and Wildlife Conservation and Management Act 2016, were enacted after 2002. The AT commends Kenya for providing such a detailed description of relevant policies and plans covering the historical reference period.

3. Pools, gases and activities included in constructing the forest reference level

31. According to decision 12/CP.17, annex, paragraph (c), reasons for omitting a pool or activity in constructing the FRL should be provided, noting that significant pools and activities should not be excluded.

32. The pools included in the Party's FRL are above-ground and below-ground biomass. The soil organic carbon, litter and deadwood pools were not included.

33. With regard to emissions from the soil organic carbon, litter and deadwood pools, the AT requested clarification on the reasons for omitting the pools. In response, Kenya explained that the non-inclusion of the pools was based on lack of data and information. The AT considers that Kenya's FRL submission does not contain sufficient information to determine whether the emissions from soil organic carbon, litter and deadwood are not significant. Furthermore, the AT notes that the IPCC good practice guidance for LULUCF provides a method for estimating carbon stock change in soil organic carbon, litter and deadwood and the corresponding default EFs. The AT considers the treatment of emissions from soil organic carbon, litter and deadwood (i.e. including the pools or providing more information justifying their omission) to be an area for future technical improvement of the FRL.

34. Kenya's FRL covers CO_2 emissions only. Non-CO_2 emissions such as methane and nitrous oxide have not been considered because Kenya does not have quantitative spatial data for such gases (e.g. emissions from forest fires and emissions from forests in wetlands). Nevertheless, forest fires and mangrove forests are major sources of non-CO_2 gases and Kenya explained that they may be considered in future submissions. The AT considers the treatment of non-CO_2 gases as an area for future technical improvement given their potential significance so as to maintain consistency with the GHG inventory included in the Party's most recent national communication.

35. The AT acknowledges that Kenya included the most significant activities, namely reducing emissions from deforestation, reducing emissions from forest degradation, sustainable management of forests 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. On the basis of the response provided by Kenya during the TA, the AT noted that Kenya has no agreed definition of conservation of forest carbon stocks under REDD+; however, on the basis of the coverage of the four REDD+ activities included in the FRL, emissions and removals from conservation of forest carbon stocks should not be considered to be significant.

4. Definition of forest

36. Kenya provided in its submission the definition of forest used in constructing its FRL. The definition is different from that used by the Party for its national GHG inventory and its reporting to the Food and Agriculture Organization of the United Nations for the Global Forest Resources Assessment (i.e. minimum area of 0.5 ha, height of 2 m or more and at least 15 per cent canopy cover). During the TA, Kenya explained that the forest definition was modified for two reasons. Firstly, Kenya has vast areas of bushland and thickets in the northern rangelands that can easily be confused with forest land. One of the characteristics of this bushland is the deciduous nature of the acacia trees growing there. Adopting a 10 per cent forest canopy cover may include these areas as forest land, which makes it difficult for

Kenya to monitor such land-cover types in future, especially if they are classified as forest land. Secondly, Kenya's forest is highly influenced by climatic and edaphic conditions with a significant portion of the country being described as arid and semi-arid land; therefore, tree growth and characterization could minimally be described using the parameters of 15 per cent canopy cover and a height of 2 m. Those two thresholds exclude bushland and their application is technically feasible as determined by the best previous wall-to-wall mapping exercise in the country (performed under the Africover programme). In its submission, Kenya noted that for its third national communication the forest definition will be harmonized with that used for constructing the FRL. This definition will also be used to inform monitoring of forest sector performance and reporting under other international treaties and protocols to which Kenya is a party. The AT commends Kenya for its plans to enhance the consistency of the forest definition used for reporting purposes.

III. Conclusions

37. The information used by Kenya in constructing its FRL for reducing emissions from deforestation, reducing emissions from forest degradation, sustainable management of forests and enhancement of forest carbon stocks is transparent and complete and in overall accordance with the guidelines for submissions of information on reference levels.

38. The FRL presented in the modified submission, for the reference period 2002–2018, corresponds to 52,204,059 t CO_2 eq/year.

39. The AT acknowledges that Kenya included in its FRL the most significant activities and the most significant pools in terms of emissions from forests. The AT considers that, in doing so, Kenya followed decision 1/CP.16, paragraph 70, on activities undertaken, and decision 12/CP.17, paragraph 10, on applying the stepwise approach.

40. As a result of the facilitative interactions with the AT during the TA, Kenya provided a modified submission that took into consideration the technical input of the AT. The AT notes that the transparency and completeness of the information provided were significantly improved in the modified FRL submission, without having to alter the approach or values used to construct the FRL, and commends Kenya on its efforts. The new information provided in the modified submission increased the reproducibility of the FRL calculations.

41. The AT notes that, overall, the FRL does not maintain consistency, in terms of sources of AD and EFs, with the GHG inventory included in Kenya's second national communication.[12] However, Kenya explained that consistency will be ensured between the FRL and the GHG inventory included in its next national communication.

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

(a) Improving the SLEEK mapping programme, making it possible to monitor a single pixel over several four-year intervals and preventing the under- or overestimation of emissions and removals (see para. 18 above);

(b) Implementing the sampling design for an increased number of permanent sample plots, which could capture the carbon stock changes in forest land remaining in the same canopy class and would in turn enhance the accuracy of future removal estimates (see para. 20 above);

(c) Estimating carbon stock changes for changes in canopy cover in public plantations using an improved NFI (see para. 21 above);

(d) Refining the SLEEK mapping programme and increasing sampling, which would help to enhance the transparency of land-use transitions and the accuracy of emission and removal estimates (see para. 22 above);

(e) Updating the EF used for deforestation to cropland, which could capture carbon stocks in annual cropland more appropriately in the future (see para. 23 above);

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

(f) Resolving the contradiction in the capping manipulation using an improved NFI or appropriate literature references (see para. 24 above);

(g) Developing carbon fractions corresponding to each forest type and species (see para. 25 above);

(h) Differentiating between tree species in public and private plantations (see para. 26 above);

(i) Ensuring consistency in the methods, data sources and time intervals used for the FRL with those used for the GHG inventory included in Kenya's next national communication (see para. 27 above);

(j) Improving the uncertainty analysis, for example by analysing not only the overall accuracy of land-cover maps but also individual land classes and by increasing the number of sample plots used in the NFI (see para. 28 above).

43. Pursuant to decision 13/CP.19, annex, paragraph 2(f), in assessing the pools and gases included in the FRL the AT noted that Kenya's submission does not contain sufficient information to determine whether the emissions from soil organic carbon, litter and deadwood are insignificant. Furthermore, the AT notes that the IPCC good practice guidance for LULUCF provides a method for estimating carbon stock changes in soil organic carbon, litter and deadwood and the corresponding default EFs. Pursuant to decision 13/CP.19, annex, paragraph 3, the AT identified the following additional areas for future technical improvement regarding the exclusion of pools and gases from the FRL:

(a) Treatment of emissions from soil organic carbon, litter and deadwood (i.e. the inclusion of the pools or the provision of more information justifying their omission) (see para. 33 above);

(b) Treatment of non-CO_2 gases (see para. 34 above).

44. In conclusion, the AT commends Kenya for showing strong commitment to continuously improving its FRL estimates in line with the stepwise approach. A number of areas for the future technical improvement of Kenya's FRL 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 providing adequate and predictable support.[13] The AT also acknowledges that the TA was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Kenya.

45. The table contained in annex I summarizes the main features of Kenya's proposed FRL.

[13] Per decisions 13/CP.19, annex, para. 1(b); and 12/CP.17, para. 10.

Annex I

Summary of the main features of the proposed forest reference level based on information provided by Kenya

Main features of the FRL		*Remarks*
Proposed FRL	52 204 059 t CO_2 eq/year	The FRL includes emissions and removals from deforestation, forest degradation, sustainable management of forests and enhancement of forest carbon stocks (see para. 7 of this document)
Type and reference period of FRL	FRL = average of historical emissions and removals in 2002–2018	The FRL was constructed on the basis of the annual average of CO_2 emissions and removals from deforestation, forest degradation, sustainable management of forests and enhancement of forest carbon stocks over the historical period 2002–2018 (see para. 7 of this document)
Application of adjustment for national circumstances	No	–
National/subnational	National	See paragraph 7 of this document
Activities included	Reducing emissions from deforestation Reducing emissions from forest degradation Sustainable management of forests Enhancement of forest carbon stocks	Kenya included all activities except conservation of forest carbon stocks in constructing its FRL Deforestation, forest degradation and enhancement of forest carbon stocks were observed in three forest strata, namely montane and western rain, coastal and mangrove, and dryland forests Sustainable management of forests was observed only in public plantations Kenya defines deforestation as the conversion of forest to non-forest, and forest degradation as the conversion of a forest from a higher canopy class (e.g. dense forest) to a lower canopy class (e.g. open forest). Enhancement of forest carbon stocks includes the conversion of non-forests to forests and the improvement of forest canopy from a lower class to a higher class. Kenya defines sustainable management of forests as the conversion of non-planted forest land to planted forest land and the sustainable management of these forests designated as plantation zones (see para. 11 of this document)
Pools included	Above-ground biomass Below-ground biomass	Soil organic carbon, litter and deadwood were not included in the FRL owing to lack of data (see para. 32 of this document)
Gas included	CO_2	Kenya does not have quantitative spatial data for emissions of non-CO_2 gases (see para. 34 of this document)
Forest definition	Included	Minimum 15 per cent canopy cover, minimum land area of 0.5 ha and

Main features of the FRL		*Remarks*
		minimum height of 2 m (see para. 36 of this document)
Consistency with latest GHG inventory	Methods used for estimating the FRL are not consistent with those used for the latest GHG inventory (2015)	Differences in methods are due to the use of more recent data and IPCC guidance (2006 IPCC Guidelines) in constructing the FRL compared with the latest GHG inventory. For the GHG inventory to be included in Kenya's next national communication, which is being prepared, updated methods will be applied that are consistent with those used for the FRL (see para. 27 of this document)
Description of relevant policies and plans	Included	Brief summary information was included for information purposes (see paras. 29–30 of this document)
Description of assumptions on future changes to domestic policies, if included in the construction of the FRL	Not applicable	–
Description of changes to previous FRL	Not applicable	–
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 42–43 of this document)

Annex II

Documents and information used during the technical assessment

A. Reference documents

First FRL submission of Kenya. Available at https://redd.unfccc.int/submissions.html?country=ken.

"Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels". Annex to decision 13/CP.19. Available at https://unfccc.int/sites/default/files/resource/docs/2013/cop19/eng/10a01.pdf#page=36.

"Guidelines for submissions of information on reference levels". Annex to decision 12/CP.17. Available at https://unfccc.int/sites/default/files/resource/docs/2011/cop17/eng/09a02.pdf#page=19.

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

B. Other documents

The following references have been reproduced as received:

Japan International Cooperation Agency (JICA). 2017. *Capacity Development Project for Sustainable Forest Management in the Republic of Kenya* (CADEP-SFM) Component 3 – Progress Report 1st year.

KFS. 2016. *Technical Report on the Pilot inventory*. Improving Capacity in Forest Resources Assessment in Kenya (ICFRA). Project No: MFA Intervention code: 24816701.

Ministry of Environment and Forestry Kenya. 2019. *Technical Manual for Land Cover Change Mapping in Kenya*.

Wass, P. (Ed.). 1995. *Kenya's Indigenous Forests: Status, Management and Conservation.* pp 205. IUCN, Gland, Switzerland, and Cambridge: U.K.