



Report on the technical expert review of the first biennial transparency report of Colombia*

Addendum

Summary

This addendum to the report on the technical expert review of the first biennial transparency report of Colombia, conducted by a technical expert review team in accordance with the modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement, contains the results of the review of the consistency of the information submitted by the Party with those modalities, procedures and guidelines, and presents capacity-building needs identified by the Party and by the technical expert review team in consultation with the Party during the review. The review took place from 27 to 31 October 2025 in Bogotá.

* In the symbol for this document, 2024 refers to the year in which the original biennial transparency report was submitted, not to the year of publication.



Abbreviations and acronyms

2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
2019 Refinement to the 2006 IPCC Guidelines	<i>2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
AD	activity data
AFOLU	agriculture, forestry and other land use
BTR	biennial transparency report
C	carbon
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CRT	common reporting table
CSC	carbon stock change
CTF	common tabular format
DANE	National Administrative Department of Statistics
DOM	dead organic matter
EF	emission factor
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	statistical database of the Food and Agriculture Organization of the United Nations
FOD	first-order decay
GHG	greenhouse gas
HWP	harvested wood products
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MMS	manure management system(s)
MPGs	modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement
N	nitrogen
N ₂ O	nitrous oxide
NA	not applicable
NDC	nationally determined contribution
NE	not estimated
Nex	nitrogen excretion
NID	national inventory document
NIR	national inventory report
NO	not occurring
PaMs	policies and measures
R	ratio of below-ground to above-ground biomass
SMBByC	National Forest and Carbon Monitoring System
SWDS	solid waste disposal site(s)
TERT	technical expert review team
Wetlands Supplement	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>
WM	‘with measures’
WOM	‘without measures’
Y _m	methane conversion rate

I. Areas of improvement¹ identified during the technical expert review of the Party's first biennial transparency report

1. Tables 1–14 present the results of the review of the consistency with the MPGs² of the information submitted by Colombia in its BTR1. All recommendations and encouragements contained in the tables are for the next BTR or NIR, unless otherwise specified.

A. General reporting provisions

Table 1

Areas of improvement relating to general reporting provisions

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
NA	NA	No areas of improvement identified

B. Greenhouse gas emissions and removals

Table 2

Areas of improvement relating to general findings on greenhouse gas emissions and removals

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
2.G.1	Specified in paragraph 47 of the MPGs Completeness	<p>The Party did not report emissions or removals for several categories and subcategories for which methodologies are included in the 2006 IPCC Guidelines. This includes emissions for categories reported as “NE” in CRT 9 for, inter alia, emissions from metal industry, field burning of agricultural residues, biomass burning (for some land categories), biological treatment of solid waste and waste incineration; emissions or removals for all relevant pools under grassland converted to cropland; and emissions from liquid biomass fuel blending across categories and subcategories in the energy sector. The TERT noted that the Party has elaborated improvement plans, including for the collection of relevant AD, which are included in the sectoral chapters of the NID.</p> <p>During the review, the Party discussed with the TERT its plans to improve the completeness of the inventory, including by evaluating the presence of liquid biomass in combusted fuel reported in all relevant subcategories under the energy sector; reallocating emissions from field burning of agricultural residues from LULUCF to the agriculture sector; and assessing the recovery of CH₄ from landfills and wastewater treatment plants and emissions from biological treatment of waste and waste incineration for activities prior to 2009.</p> <p>The TERT recommends that Colombia collect the necessary AD and use methodologies from the 2006 IPCC Guidelines for estimating emissions and removals for all categories previously reported as “NE” or for which emissions or removals occur in the country.</p>

Table 3

Areas of improvement of the reporting on greenhouse gas emissions and removals – energy sector

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
3.E.1	Specified in paragraph 21 of the MPGs Fuel combustion – reference approach – all fuels – CO ₂	<p>The Party reported in its NID (p.114) the use of default carbon content values from the 2006 IPCC Guidelines (vol. 2, chap. 1, p.1.21) as part of its reference approach for estimating CO₂ emissions from fuel combustion. However, the TERT noted that the 2006 IPCC Guidelines (vol. 2, chap. 6, p.6.7) state that the default carbon content values are suggested for use only if country-specific values are not available. Moreover, the Party did not specify in its NID why country-specific carbon content values were not used, even though country-specific CO₂ EFs were</p>

¹ As referred to in paras. 7, 8, 146(d) and 162(d) of the MPGs, contained in the annex to decision 18/CMA.1.

² Decision 18/CMA.1, annex.

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
3.E.2	Specified in paragraphs 26 and 39 of the MPGs 1.A Fuel combustion – sectoral approach – all fuels – CO ₂ , CH ₄ and N ₂ O	<p>used by the Party for its sectoral approach calculations. For liquid and solid fuels, these CO₂ EFs were developed using an elemental fuel analysis.</p> <p>During the review, the Party explained that the Mining and Energy Planning Unit of the Ministry of Mines and Energy did not publish country-specific carbon content values corresponding to the country-specific CO₂ EFs (Incombustion Union Temporal, 2016), requiring the Party to source default carbon content values from the 2006 IPCC Guidelines.</p> <p>The TERT recommends that the Party, in consultation with the Mining and Energy Planning Unit, improve the accuracy of its reference approach estimates by using country-specific carbon content values where country-specific CO₂ EFs are available.</p> <p>The Party reported in its NID (pp.38–40, 135, 166, 167, 177, 186, 187, 192, 196 and 209) a number of sources for the AD used to estimate emissions from fuel combustion (e.g. Colombia’s national energy balance, Ecopetrol, the Ministry of Mines and Energy and the Oil and Gas Information System). However, the TERT noted that these data sources are not described in enough detail in the NID to enable it to determine how the sources were used and whether there may have been potential double counting for fuel consumption. In addition, the TERT identified multiple cases where approaches to obtaining AD are inconsistent across the time series. For example, table 3.25 of the NID (p.187), which provides AD sources for subcategory 1.A.3.b road transportation, identifies the national energy balance as a source of fossil fuel consumption data for 1990–2021, and Ecopetrol as a source of fossil fuel consumption data for 2005–2021. Table 1.7 of the NID (p.39), however, does not mention Ecopetrol as an AD source for road transportation. In addition, it is not clear from table 3.25 of the NID whether biofuel consumption data for road transportation were determined independently of fossil fuel consumption data.</p> <p>During the review, the Party explained that the national energy balance served as the main source for disaggregating AD by IPCC category, while data sources such as Ecopetrol were used to complement and validate specific categories within the energy sector, where needed and possible. The Party also explained that fuel consumption is separated into fossil fuel and biofuel components using mixture ratios.</p> <p>The TERT encourages the Party to use a consistent approach to obtaining AD for each reporting year. In addition, the TERT recommends that the Party report the rationale for using each source of AD used for estimating emissions reported in its NID and provide a detailed description of each of those sources.</p>
3.E.3	Specified in paragraphs 30 and 47 of the MPGs 1.A Fuel combustion – sectoral approach – biomass – CO ₂ , CH ₄ and N ₂ O	<p>The Party’s reporting of AD and emissions for the combustion of liquid biomass (i.e. biodiesel and ethanol) is limited to subcategory 1.A.3.b road transportation. The TERT noted that it is possible that liquid biomass, when blended with an appropriate fossil fuel, may also be combusted under other energy sector categories, including, but not limited to, subcategories 1.A.3.e.ii other transportation and 1.A.3.c railways.</p> <p>During the review, the Party acknowledged this possible issue and stated that the Mining and Energy Planning Unit is continuing to work towards adopting international recommendations, such as those contained in the International Energy Agency’s Energy Statistics Manual, with a view to strengthening the compilation of the national energy balance. The Party also noted that it will evaluate the methodological treatment of biofuel blending across other energy sector categories and subcategories with a view to ensuring improved representation of liquid biomass combusted in future reports, as possible treating of liquid biomass as a fossil fuel may have led to the Party overestimating AD and emissions relating to fossil fuel combustion.</p> <p>The TERT encourages the Party to evaluate whether liquid biomass is combusted under energy sector categories and subcategories other than subcategory 1.A.3.b road transportation and report its findings in the NID. Depending on the outcomes of the evaluation, the TERT recommends that the Party revise its emission estimates for the relevant categories and subcategories correspondingly.</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
3.E.4	Specified in paragraph 22 of the MPGs 1.A.3.e.ii Other (other transportation) – gas/diesel oil – CO ₂ , CH ₄ and N ₂ O	<p>The CO₂, CH₄ and N₂O IEFs for gas/diesel oil combusted in off-road vehicles/machinery reported in CRT 1.A(a) (sheet 3) are significantly higher than the default EFs specified in table 3.3.1 of the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.36). For example, the CO₂ IEF calculated for 2021 and reported under subcategory 1.A.3.e.ii other (other transportation) is 216.82 t/TJ, whereas the IPCC default EF is 74.1 t/TJ. For additional context, the CO₂ IEF reported by Colombia for diesel oil combusted for subcategory 1.A.3.b road transportation is 74.23 t/TJ. After reviewing the methodology reported for subcategory 1.A.3.e.ii in the NID (pp.201–203), the TERT noted that the observed differences are primarily due to the application of a 34.25 per cent efficiency factor for the purpose of converting EFs that are defined on an energy basis to a useful energy basis. This finding also applies to emissions from agricultural off-road vehicles/machinery reported under subcategory 1.A.4.c.ii off-road vehicles and other machinery.</p> <p>During the review, the Party explained that the efficiency factor is required because the method used to estimate emissions for off-road vehicles/machinery requires EFs to be defined on the basis of useful work generated. In addition, the Party confirmed that AD reported in CRT 1.A(a) (sheet 3) for off-road vehicles/machinery were provided in terms of useful work generated. The TERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 1, p.1.16), which require AD to be reported in common energy units, which in the case of fuel combustion would require reporting in terms of combustible energy.</p> <p>The TERT recommends that the Party ensure accurate reporting of AD for off-road vehicles/machinery in the CRTs in terms of combustible energy instead of useful energy in accordance with the 2006 IPCC Guidelines and explain transparently in the NID the method, data and parameters used for deriving the estimates.</p>
3.E.5	Specified in paragraphs 39 and 47 of the MPGs 1.A.3.e.ii Other (other transportation) – CO ₂ , CH ₄ and N ₂ O	<p>The Party reported in table 1.16 of its NID (p.82) that emissions from off-road construction vehicles/machinery to be reported under subcategory 1.A.2.g.vii off-road vehicles and other machinery were reported under subcategory 1.A.3.e.ii to avoid double counting. The TERT noted that double counting likely occurred regardless of where those emissions were reported because under the tier 3 method used for off-road vehicles and mobile machinery, AD were estimated independently of the data in the Party’s national energy balance, which is not consistent with the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.25).</p> <p>During the review, the Party explained that for off-road diesel consumption, correction factors were applied to the AD used for the estimates under subcategory 1.A.3.b to ensure that no double counting occurred. In addition, the Party stated that emissions from off-road construction vehicles/machinery could be reported under subcategory 1.A.2.g.v.ii in the future.</p> <p>The TERT recommends that the Party document and justify its use of off-road diesel consumption correction factors as part of the methodology described in its NID and revise, as necessary, and report AD and emissions for off-road construction vehicles and mobile machinery under subcategory 1.A.2.g.v.ii, avoiding any double counting and ensuring consistency with the 2006 IPCC Guidelines.</p>
3.E.6	Specified in paragraphs 21 and 23 of the MPGs 1.A.4.b Residential – biomass – CH ₄	<p>The Party reported in table 3.42 of its NID (p.208) the use of a default CH₄ EF (300 kg/TJ) from the 2006 IPCC Guidelines (vol. 1, chap. 2, table 2.5, p.2.23) for estimating CH₄ emissions from firewood consumption under subcategory 1.A.4.b residential. However, this is not in accordance with the corresponding decision tree from the 2006 IPCC Guidelines (vol. 2, chap. 2, figure 2.1, p.2.15), which requires the use of country-specific EFs for estimating emissions from stationary combustion for key categories, given that subcategory 1.A.4.b (CH₄ emissions) is a key category according to tables 1.8 and 1.9 of the NID (pp.55–56). Moreover, the Party did not document in its NID why a country-specific EF was not used, which is not in accordance with the decision tree for choosing a good practice method provided in the 2006 IPCC Guidelines (vol. 1, chap. 4, figure 4.1, p.4.6).</p> <p>During the review, the Party explained that no country-specific EF is available for this activity because national studies have not yet been conducted to derive such values or are still under development owing to a lack of resources. In addition, the Party recognized the importance of this category and stated that it will explore the</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		<p>possibility of developing country-specific EFs in the future, subject to the availability of technical studies and resources.</p> <p>The TERT recommends that the Party explain in its NID the reasons why the decision tree for estimating stationary combustion emissions from the 2006 IPCC Guidelines (vol. 2, chap. 2, figure 2.1, p.2.15) was not followed for firewood consumption under subcategory 1.A.4.b. The TERT encourages the Party to make every effort to use country-specific CH₄ EFs in line with the good practice outlined in the 2006 IPCC Guidelines, and to report information on how it is addressing or intends to address this issue.</p>

Table 4

Areas of improvement of the reporting on greenhouse gas emissions and removals – industrial processes and product use sector

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
4.I.1	Specified in paragraphs 21 and 23 of the MPGs 2.A.1 Cement production – CO ₂	<p>The Party reported in its NID (pp.277–281) that emissions for category 2.A.1 cement production were estimated using a tier 1 method from the 2006 IPCC Guidelines (vol. 3, chap. 2.2.1.1, equation 2.1, p.2.8), clearly documenting that it was unable to adopt a higher-tier method owing to a lack of resources. Colombia also included this category in the improvement plan and prioritized this issue for future improvement. In addition, the Party reported in its NID (table 4.8, p.280) that it used data on clinker imports for 2013 onward for estimating CO₂ emissions for category 2.A.1. However, the Party did not provide information on clinker exports or explain how these data were considered in the calculations.</p> <p>During the review, the Party explained that it does not export clinker, and that data on clinker imports were only available for 2013 onward. However, the TERT noted that AD are available from open access international sources for 1991 onward for clinker exports and for 1992 onward for imports, and these AD correspond closely to data reported in the NID (e.g. for 2021, the United Nations Comtrade Database reports 729,750 t clinker imports, compared with 730,000 t reported in the NID). On this basis, the TERT considers that the accuracy of the emission estimates for category 2.A.1 may be affected by the omission of data on clinker exports and imports, particularly for the first part of the time series.</p> <p>The TERT recommends that, if a higher-tier method is not used for this key category, the Party use for its estimates accurate and complete AD on clinker exports and imports from national sources (e.g. customs data) or open access international sources (e.g. the United Nations Comtrade Database). The TERT encourages the Party to make every effort to use a higher-tier method for this key category in line with the good practice described in the 2006 IPCC Guidelines (vol. 3, chap. 2, figure 2.1, p.2.9).</p>
4.I.2	Specified in paragraph 39 of the MPGs 2.A.3 Glass production – CO ₂	<p>Colombia reported in table 4.13 of the NID (p.285) that under category 2.A.3 glass production AD for flat glass without bevelling or silvering were estimated for 2017, 2018 and 2021 owing to a lack of statistical data. However, data for flat glass without bevelling or silvering were reported for 1992–2021 in table 4.15 of the NID (pp.286–287).</p> <p>During the review, the Party explained that it used splicing techniques to obtain AD for flat glass without bevelling or silvering for 2017, 2018 and 2021 because the annual manufacturing survey carried out by DANE did not provide corresponding data.</p> <p>The TERT recommends that the Party transparently document the splicing techniques used to fill AD gaps for production of flat glass without bevelling or silvering for 2017, 2018 and 2021, demonstrate that these methods are in accordance with the splicing techniques suggested in the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.10–5.13) and clearly describe all parameters and assumptions used.</p>
4.I.3	Specified in paragraph 39 of the MPGs	<p>Colombia reported in the NID (p.285) that it estimated emissions for category 2.A.3 glass production using a tier 2 method and equation 2.11 from the 2006 IPCC Guidelines (vol. 3, chap. 2.4.1.1, p.2.28). The TERT noted that the Party did</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
	2.A.3 Glass production – CO ₂	<p>not report information on the cullet ratio used for its estimation of CO₂ emissions from glass production.</p> <p>During the review, the Party explained that it used national parameters based on DANE data for the cullet ratio, namely 0 for flat glass and 0.38 for bottles, and provided the TERT with the source of these parameters (guidelines for estimating air emissions accounting for production processes and use of materials, published by DANE, 2016). Colombia also indicated that it used the default cullet ratio for fibreglass of 0.3 from the 2006 IPCC Guidelines (vol. 3, chap. 2.4.1.2, table 2.6, p.2.30).</p> <p>The TERT recommends that the Party clearly report in the NID descriptions and the source of the parameters used to estimate CO₂ emissions for category 2.A.3, in particular the cullet ratios used.</p>
4.I.4	<p>Specified in paragraph 47 of the MPGs</p> <p>2.A.4 Other process uses of carbonates – CO₂</p>	<p>The Party reported in table 4.19 of the NID (p.290) the AD on other uses of soda ash used for the emission estimates for subcategory 2.A.4.b other process uses of carbonates. According to the 2006 IPCC Guidelines (vol. 3, chap. 2.5.1, p.2.33), emissions from soda ash used in glass production shall be included under category 2.A.3 glass production and, to ensure that there is no double counting of emissions, the amount of soda ash used in glass production for a certain year shall not be accounted for in the total soda ash consumed for other processes in that year. The TERT noted that the Party did not report in the NID that it excluded the amount of soda ash used in glass production from the amount of soda ash used for estimating emissions under subcategory 2.A.4.b.</p> <p>During the review, the Party explained that the total national soda consumption used for CO₂ estimates under subcategory 2.A.4.b is based on data reported in the DANE annual manufacturing survey, which does not report end use. The TERT noted this may result in double counting of CO₂ emissions.</p> <p>The TERT recommends that the Party check the AD and revise, if necessary, its CO₂ estimates under subcategory 2.A.4.b and category 2.A.3 to ensure that double counting of emissions from soda ash use does not occur and provide corresponding explanations in the NID.</p>
4.I.5	<p>Specified in paragraph 39 of the MPGs</p> <p>2.C.1 Iron and steel production – CO₂ and CH₄</p>	<p>The Party reported in table 4.40 of the NID (p.313) the assumptions used for estimating emissions for category 2.C.1 iron and steel production. However, Colombia did not provide information on the source of information for the iron content in ore and pig iron, the pig iron content in steel or the sinter/pig iron ratio, or justify the use of these country-specific parameters in the calculations.</p> <p>During the review, the Party clarified that these parameters and assumptions were validated with members of the Colombian Committee of Steel Producers of the National Association of Entrepreneurs of Colombia, which updated the sinter/pig iron ratio for the purposes of reporting for the BTR1.</p> <p>The TERT recommends that the Party clearly document in its NID descriptions, assumptions, references and sources of information for the parameters used to estimate emissions for category 2.C.1.</p>
4.I.6	<p>Specified in paragraphs 26–27 of the MPGs</p> <p>2.C.2 Ferroalloys production – CO₂</p>	<p>The Party reported in its NID (p.316) that for CO₂ emission estimates for category 2.C.2 ferroalloys production, it used AD provided by the Colombian Mining Information System for 1990–1997, and AD provided by the company Cerro Matoso for 1998–2021. The TERT noted, therefore, that the AD time series for category 2.C.2 is likely inconsistent.</p> <p>During the review, the Party confirmed that data provided by the Colombian Mining Information System were used only for the first few years of the time series (1990–1997). For subsequent years (1998–2021), ferronickel production data were obtained from the company Cerro Matoso and corroborated using the DANE annual manufacturing surveys for 1998–2021. Notwithstanding this explanation, the TERT concluded that the Party used inconsistent data sets to estimate CO₂ emissions for category 2.C.2.</p> <p>The TERT encourages the Party to resolve the inconsistency between the AD sets used for the CO₂ emission estimates for category 2.C.2 by harmonizing the overall data set on the basis of the most reliable data source and using splicing techniques</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		to construct the time series in a consistent manner, and to clearly explain in the NID how it ensured time-series consistency.

Table 5

Areas of improvement of the reporting on greenhouse gas emissions and removals – agriculture sector

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
5.A.1	Specified in paragraphs 21–22 of the MPGs 3.A.1 Cattle – CH ₄	<p>Colombia reported CH₄ emissions from enteric fermentation in CRT 3.A for seven cattle subcategories. The TERT noted that for three of these subcategories, the average Y_m reported is in the range of 8.58–8.81 per cent, which is higher than the ranges for cattle provided in the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.12, p.10.30) and the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.12, p.46), which are 3.0–6.5 and 3.0–7.0 per cent respectively. Given the importance of the Y_m value in estimating CH₄ EFs and driving emissions, the TERT considers that Colombia may have overestimated emissions for some cattle subcategories, namely pre-weaning calves, replacement heifers and beef cattle.</p> <p>During the review, the Party explained that the Y_m values were obtained from the AFOLU 1 Colombia model, for which equations were developed on the basis of Ellis et al. (2007). After further discussing the information in the model with the TERT, the Party agreed to review the relevance of the Y_m values owing to the high EFs produced for some cattle subcategories for pre-weaning calves, replacement heifers and beef cattle and the significance of the level of emissions in this key category.</p> <p>The TERT recommends that the Party reassess the appropriateness of the Y_m values used in the AFOLU 1 Colombia model to determine whether their use is justified, include references to supporting documentation and technical justification and, if it is concluded that the values are not representative of Colombian agricultural feeding practices, revise the CH₄ estimates using revised country-specific Y_m values or the values provided in table 10.12 of the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.30) or, if considered appropriate, the values provided in the updated table 10.12 of the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 10, p.46).</p>
5.A.2	Specified in paragraph 47 of the MPGs 3.B Manure management – N ₂ O	<p>Colombia did not report most of the required information in CRT 3.B(b) on Nex per animal and per MMS. Most of the Nex rates for cattle subcategories were reported as “NA” and some of the Nex amounts in pasture range and paddock MMS were reported as “IE” (in particular for cattle subcategories and sheep). The TERT noted that information relating to Nex is provided in tables annex 1.3.22 and annex 1.3.23 in annex 1.3 to the NID (pp.928–941) in kg N per 1,000 kg animal mass per day.</p> <p>During the review, the Party provided the Nex rates for the six cattle subcategories reported as “NA” in CRT 3.B(b), which correspond to default values for Latin America provided in the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.19, p.46).</p> <p>The TERT recommends that Colombia complete CRT 3.B(b) by providing all the information required on Nex for each animal subcategory and report all information required on Nex for each MMS and animal subcategory, including pasture range and paddock, in order to enable an assessment and comparison of total N excreted across MMS, and a comparison between the information reported on N excreted on pasture during grazing and related data reported under category 3.D agricultural soils.</p>
5.A.3	Specified in paragraphs 47 and 50 of the MPGs 3.D.1.e Mineralization/immobilization associated with loss/gain of soil organic matter – N ₂ O	<p>Colombia reported N₂O emissions from mineralization/immobilization associated with gain/loss of soil organic matter in CRT 3.D. The TERT noted that, according to section 5.6.7 of the NID (p.428), N₂O was estimated from carbon loss in forest soils and reported in the agriculture sector under subcategory 3.D.1.e, which is not in accordance with the CRT requirements to report these emissions under the LULUCF sector. The TERT also noted that, according to table 5.45 of the NID (p.421), Colombia’s planned improvements include reporting emissions from only cropland and grassland under subcategory 3.D.1.e in CRT 3.D.</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		<p>During the review, the Party explained that owing to time constraints N₂O emissions from carbon loss in forest soils were reported under the agriculture sector instead of the LULUCF sector and confirmed that it plans to correct this.</p> <p>The TERT recommends that Colombia report N₂O emissions from mineralization/immobilization associated with gain/loss of soil organic matter for both cropland and grassland in the agriculture sector under subcategory 3.D.1.e and N₂O emissions from carbon loss in forest soils in in CRT 4(III), rather than CRT 3.D.</p>
5.A.4	Specified in paragraphs 47 and 50 of the MPGs 3.D.1.f Cultivation of organic soils (i.e. histosols) – N ₂ O	<p>Colombia reported N₂O emissions from cultivation of histosols in CRT 3.D. The TERT noted that in the NID (p.352) Colombia mentioned that N₂O from histosols was estimated for forest land and reported in the agriculture sector under subcategory 3.D.1.f. However, N₂O emissions from histosols for cropland and grassland were not reported under subcategory 3.D.1.f. In addition, the TERT noted that Colombia’s improvement plan, outlined in table 5.45 of the NID (p.421), reports a medium- to long-term timescale for disaggregating organic soil areas into the land-use categories for both cropland and grassland in the agriculture sector for estimating N₂O emissions from cultivation of histosols.</p> <p>During the review, Colombia stated that there are crop-cover areas on histosols; however, the scale of cover inputs for these areas does not allow for disaggregation by crop type.</p> <p>The TERT recommends that Colombia report N₂O emissions from cultivation of histosols for both cropland and grassland in the agriculture sector under subcategory 3.D.1.f and report N₂O emissions from other land uses in CRT 4(II).</p>
5.A.5	Specified in paragraphs 47 and 50 of the MPGs 3.F Field burning of agricultural residues – CH ₄ and N ₂ O	<p>The TERT noted that, in CRT 3.F, under category 3.F.4 field burning of agricultural residues Colombia reported CH₄ and N₂O emissions as “IE” for sugarcane and as “NE” for all other crop residues (cereals, pulses, tubers, etc.). In addition, in section 5.8 of the NID (p.432), Colombia indicated that emissions from field burning of sugarcane agricultural residues were included in the LULUCF sector under the biomass burning category and reported in CRT 4(IV).</p> <p>During the review, the Party explained that although other crop types were included under the biomass burning category and reported in CRT 4(IV), they are not specified, as the source of the AD, the National Forestry Information System, does not differentiate between crop types or identify whether burning was accidental or prescribed. Therefore, “NE” was reported for all other crop residues under category 3.F as the scale of the crop coverage map only shows the ‘crop-cover’ level, without differentiating between specific crop type. In the case of sugarcane, however, there is a factor that allows for the exact area subject to burning to be estimated on the basis of the cultivated area.</p> <p>The TERT recommends that Colombia report CH₄ and N₂O emissions from burning of sugarcane agricultural residues in category 3.F.4 under the agriculture sector and estimate and report CH₄ and N₂O emissions from all other crop residues in CRT 3.F, rather than reporting them as “NE”.</p>

Table 6

Areas of improvement of the reporting on greenhouse gas emissions and removals – land use, land-use change and forestry sector

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
6.L.1	Specified in paragraphs 20 and 39 of the MPGs 4. General (LULUCF) – CO ₂	<p>The Party reported in CRTs 4.A, 4.B and 4.C the areas of organic soils corresponding to relevant categories and subcategories. Related CO₂ emissions were reported only in CRTs 4.B and 4.C. In the NID (pp.468–469 and 484) Colombia stated that soil AD represent the areas of histosols in all types of land; however, it is not clear whether these refer to drained histosols or total organic soils. In addition, in the NID (p.463) Colombia stated that annual losses of carbon content from organic soils in forest areas were reported under subcategory 4.A.1.a forest land remaining forest land (fuelwood consumption), assuming that all soil carbon content is lost owing to soil management practices. In table 6.8 of the NID (p.468), the Party reported for subcategory 4.A.1.d forest land remaining forest land (forest plantations) a single EF for organic soils in short-rotation plantations, which was sourced from table 2.1 of the Wetlands Supplement (chap. 2, pp.2.11–</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
		<p>2.15) and used in calculations. The TERT noted that IEFs for organic soils reported for subcategory 4.B.1.1. other (cropland remaining cropland) and category 4.C.1 grassland remaining grassland differ from the default EFs provided in table 2.1 of the Wetlands Supplement, which were used according to the NID (tables 6.8, 6.14 and 6.21). For example, for category 4.C grassland, a total organic soil area of 171.55 kha was reported for 2021 in CRT 4.C. Using the default EF value (9.6 t CO₂-C/ha) from table 2.1 of the Wetlands Supplement results in estimated emissions of 1,646.88 kt CO₂-C or 6,038.56 kt CO₂; however, in CRT 4.C the Party reported a value of 449.14 kt C for this category, with an IEF of only 2.62 t C/ha. Therefore, the TERT concluded that the Party did not transparently report methods, EFs and AD used to estimate emissions for drained organic soils for categories 4.A forest land, 4.B cropland and 4.C grassland and that, in particular:</p> <ul style="list-style-type: none"> (a) The NID does not transparently indicate whether the area used for calculations only corresponds to drained organic soils in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.28), or to total organic soil area; (b) The basis for the assumption of full carbon losses for drained organic soils in forests is not documented in the NID; (c) The choice of default CO₂ EFs is not transparently justified in the NID (e.g. the decision to use only the EF for short-rotation forest plantations), considering that table 2.1 of the Wetlands Supplement provides an EF for unknown and long rotations (15 t CO₂-C/ha/year); (d) The CO₂ EFs used in calculations for subcategory 4.B.1.1 and category 4.C.1 differ from the default EFs provided in table 2.1 of the Wetlands Supplement, which were used according to the NID. <p>During the review, the Party explained that emissions from organic soils were reported in grassland, crops, plantations and natural forests, irrespective of whether they are drained or not. Depending on soil use, grassland, crops and plantations can be categorized as drained histosols. However, for natural forests reported under subcategory 4.A.1.a forest land remaining forest land (fuelwood consumption), there is no certainty that soils are drained. The Party also indicated that the EF for short rotation was applied because it was considered more appropriate for most species in commercial forest plantations. Regarding the assumption of full carbon loss on organic soils in natural forests, the Party confirmed that this assumption will be adjusted.</p> <p>The TERT recommends that the Party transparently explain in the NID whether AD used to estimate CO₂ emissions correspond to drained organic soils for subcategories 4.A.1.a and 4.B.1.1 and category 4.C.1. The TERT also recommends that the Party check the correctness of the assumption of full carbon losses on organic soils for subcategory 4.A.1.a forest land remaining forest land (fuelwood consumption) and transparently report in the NID the methodology and the EFs used for the calculations. The TERT further recommends that the Party transparently justify the choice of the default EF for subcategory 4.A.1.d forest land remaining forest land (forest plantations) in its NID. In addition, the TERT recommends that the Party check the correctness of EFs used to calculate CO₂ emissions from organic soils for subcategory 4.B.1.1 and category 4.C.1 and clearly report the EFs used in the NID.</p>
6.L.2	<p>Specified in paragraphs 20 and 47 of the MPGs</p> <p>4. General (LULUCF) – CH₄ and N₂O</p>	<p>The Party reported CH₄ and N₂O emissions from drainage of organic soils in CRT 4.(II) as “NE”. The TERT noted that default CH₄ and N₂O EFs for estimating these emissions are provided in tables 2.3, 2.4 and 2.5 of chapter 2 of the Wetlands Supplement (pp.2.25–2.27, p.2.30 and pp.2.33–2.34 respectively).</p> <p>During the review, the Party acknowledged that its reporting of these emissions needs to be adjusted and indicated that estimating these emissions will be added to the improvement plan for future versions of the NID.</p> <p>The TERT encourages the Party to estimate and report CH₄ and N₂O emissions from drainage of organic soils using, for example, the default EFs provided in tables 2.3, 2.4 and 2.5 of chapter 2 of the Wetlands Supplement (pp.2.25–2.27, p.2.30 and pp.2.33–2.34 respectively).</p>
6.L.3	<p>Specified in paragraphs 27 and 57 of the MPGs</p>	<p>The Party reported in table 6.22 of the NID (p.499) that AD on the annual area planted of intensive silvopastoral systems are only available for 2002 onward; however, in the NID (section 6.7.2, p.494, and figure 6.15, p.495), the Party also</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
4.	General (LULUCF) – CO ₂	<p>stated that removals were only reported for 2004 onward (not from 2002). In CRT 4.C Colombia reported biomass gains for category 4.C.1 grassland remaining grassland for 2004 onward and reported biomass gains as “NE” for 1990–2003. In CRT 4.B, Colombia reported carbon losses of living biomass for many crops as “NO” for 1990–1999. The TERT noted that the Party’s reporting is not in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.8–5.14) because the time series of CSCs in living biomass for categories 4.B cropland and 4.C grassland is not complete and consistent.</p> <p>During the review, the Party explained that AD on the annual area planted of intensive silvopastoral systems are available for 2004 onward, noting that the mention of 2002 may have been the result of a typing error, which will be reviewed and corrected. The Party also indicated that there are no records of AD corresponding to the annual planted area of intensive silvopastoral systems for years prior to 2004, which explains why the removal estimates presented in the NID (section 6.7.2, p.494, and figure 6.15, p.495) begin from that year. Regarding data for crops prior to 1990, the Party clarified that data are only available for coffee cultivation. Therefore, to estimate losses resulting from changes in crop types after 1990, the cultivated areas must be extrapolated using backcasting, taking into account the growth cycle of each crop. Regarding the reporting of “NO” for some years, the Party indicated that according to the available data, neither emissions nor removals were recorded for some crops in those years.</p> <p>The TERT recommends that the Party improve time-series consistency and report removals from intensive silvopastoral systems for 1990–2003 and carbon losses in living biomass of crops for 1990–1999 and clearly document assumptions made and limitations of the reported estimates, noting that AD for intensive silvopastoral systems are only available from 2004 onward. The TERT encourages the Party to use splicing techniques provided in the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.8–5.14) to estimate missing AD; for example, by using a surrogate method involving any indicative data (e.g. annual number of pasture animals) for silvopastoral systems, and using assumptions for extrapolating annual planted areas (e.g. by backcasting the trend for known years) or assuming the area of planted crops in 1990 to be constant for years before 1990 for carbon losses due to harvesting of crops planted before 1990.</p>
6.L.4	Specified in paragraph 39 of the MPGs 4. General (LULUCF) – CO ₂	<p>For subcategory 4.A.1.c forest land remaining forest land (conversion from natural forest to forest land), the Party reported in table 6.8 of the NID (p.467) the default R value used for shrublands (0.221), which corresponds to the value for tropical rainforest reported in table 4.4 of the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 4, p.4.18). In table 6.8 of the NID Colombia reported country-specific EFs for below-ground biomass by region for subcategory 4.A.1.c. In tables 6.14 (pp.481–483) and 6.21 (pp.497–498) of the NID, Colombia reported an average of default R values for crops (0.25), which was indicated as having been taken from table 5.2 of the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 5, pp.5.9–5.11) for subcategory 4.B.2.a forest land converted to cropland, and an average of default R values for grassland (1.6), which was indicated as having been taken from table 6.1 of the 2006 IPCC Guidelines (vol. 4, chap. 6, p.6.8) for subcategory 4.C.2.a forest land converted to grassland; however, the same tables of the NID report country-specific EFs by region for below-ground biomass for these subcategories. The TERT noted that the R values for crops indicated by the Party are not provided in table 5.2 of the 2019 Refinement to the 2006 IPCC Guidelines. Furthermore, the rationale for using an average of default R values is not reported in the NID, even though national data on below-ground biomass are available, making the use of default values unnecessary. Therefore, the TERT considers that the reason for choosing the EFs used to calculate CSCs for below-ground biomass in the above-mentioned subcategories is unclear.</p> <p>During the review, the Party explained that the R values used are based on measurements for natural forests from the national forest inventory. However, for land-use changes, when forest land is converted to grassland, the Party’s EFs for pastures do not consider data on below-ground biomass. Therefore, the default R value from the 2006 IPCC Guidelines was used to calculate the total biomass. The Party also explained that the R value for crops was calculated using the average of data provided in table 5.2 of the 2019 Refinement to the 2006 IPCC Guidelines.</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
		<p>These data were used because no country-specific data are available for calculating an R value for agroforestry systems.</p>
		<p>The TERT recommends that the Party provide detailed and accurate information on the EFs, parameters and assumptions used to estimate CSCs in below-ground biomass for forest land, cropland and grassland.</p>
6.L.5	<p>Specified in paragraph 40 of the MPGs 4. General (LULUCF) – CO₂</p>	<p>The Party reported the EFs used for the estimation of CSCs in table 6.8 of the NID (pp.466–468) for category 4.A forest land and in table 6.14 of the NID (pp.481–483) for category 4.B cropland. However, the Party did not report all parameters used in the estimations; for example, table 6.8 lacks information on average carbon stocks for all carbon pools in shrublands and plantations under subcategory 4.A.1.c forest land remaining forest land (conversion from natural forest to forest land) and on carbon stocks in lands before conversion to forest land under category 4.A.2 land converted to forest land, while table 6.14 does not contain the EFs used to estimate carbon losses due to replanting or renovation of crops under category 4.B.1 cropland remaining cropland and final carbon stocks in mineral soils and DOM for land after conversion from forest land to cropland under category 4.B.2 land converted to cropland.</p> <p>During the review, the Party explained that carbon stock data for shrublands and plantations for subcategory 4.A.1.c come from the national forest inventory, managed by SMBByC. The system established 1,479 clusters, distributed across the different regions of the country, and five soil samples were collected from each cluster to determine the organic carbon content. From the analysis of this data set, the EFs used for the forest land categories were estimated. For category 4.A.2, where pre-conversion carbon stock information is unavailable, the following values were assumed: 140 t C/ha in biomass (20-year transition period), 48 t C/ha in soil (20-year transition period) and 0 t C/ha in DOM. The Party provided additional information on the EFs used for above-ground biomass for the estimates for category 4.B.1, as follows: 5,555 t C/ha for avocado, 9,236 t C/ha for cocoa, 14,400 t C/ha for lemon, 20,079 t C/ha for mandarin orange, 22,157 t C/ha for orange, 4,125 t C/ha for tangelo, 93,242 t C/ha for rubber, 28,556 t C/ha for cashew and 24,495 t C/ha for mango. For land-use conversion from forest land to cropland under category 4.B.2, the change in soil carbon content was calculated using equation 2.25 of the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.30) for each region. For biomass, the change was determined by comparing the carbon content of forest to the carbon content of crops, calculated using the average value of above-ground biomass for agricultural land of 25.9 t C/ha (42.58 t C/ha for oil palm) and an R value of 0.25 to estimate below-ground biomass.</p> <p>The TERT recommends that the Party report in the NID, to the extent possible, a complete set of EFs and parameters used to estimate CSCs for subcategory 4.A.1.c and categories 4.A.2, 4.B.1 and 4.B.2, including information on average carbon stocks for all carbon pools of shrublands and plantations, carbon stocks in lands before conversion to forest land, EFs used to estimate carbon losses due to replanting or renovation of crops, and final carbon stocks in mineral soils and DOM for cropland after conversion from forest land.</p>
6.L.6	<p>Specified in paragraph 39 of the MPGs 4. General (LULUCF) – CO₂</p>	<p>The Party reported in its NID (charts 6.2, p.481, and 6.3, p.497) that equation 2.25 of the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.30) on annual change in organic carbon stocks in mineral soils was used in its calculations; however, the results of these calculations were not reported in CRT 4.B or CRT 4.C. In CRT 4.B, Colombia reported net CSCs for DOM per area (in t C/ha) for all crops; however, net CSCs in DOM were reported as “NA”. In addition, in table 6.14 of the NID (pp.481–482) Colombia reported net CSCs for DOM per area as “NA”. The TERT noted that the data reported for category 4.B.1 in CRT 4.B differ from the information provided in table 6.14 of the NID. For example, Colombia reported values of EFs are 0.15 and 0.33 t C/ha/year for cocoa litter and deadwood respectively in the NID, which gives a total of 0.48 t C/ha for DOM, but in CRT 4.B reported values of EFs for DOM are 0.07 t C/ha for 2019 and 0.53 t C/ha for 2021; cocoa soil organic carbon was reported as 5.15 t C/ha/year in the NID, but as 2.73 t C/ha for 1990 and 1.69 t C/ha for 2021 in CRT 4.B; and cashew soil organic carbon was reported as 1.95 t C/ha/year in the NID, but as 0.57 t C/ha/year in CRT 4.B. The TERT noted that inconsistent information is provided in the NID and</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
6.L.7	Specified in paragraphs 21 and 39 of the MPGs Land representation – CO ₂ , CH ₄ and N ₂ O	<p>CRTs for categories 4.B and 4.C, and the methodology and EFs used to estimate CSCs in the DOM and soil organic carbon pools are not transparently described.</p> <p>During the review, the Party explained that equation 2.25 of the 2006 IPCC Guidelines was only used for subcategories 4.B.2.a forest land converted to cropland and 4.C.2.a forest land converted to grassland. Colombia also explained that, with regard to its estimates for DOM, it applied the assumption for tier 1 estimates from the 2006 IPCC Guidelines (vol. 4, chap. 5, p.5.13) that stocks of deadwood and litter do not occur in agricultural land or that they are in equilibrium. The Party also clarified that the EFs reported in table 6.14 of the NID for cocoa (under subcategory 4.B.1.c) were sourced from table 8 (p.31) of a report (Proyecto Biocarbono, 2023), which presents CO₂ removal values based on carbon stocks in biomass (cocoa plants and accompanying shade species), leaf litter, deadwood and soil, which were converted to carbon using the stoichiometric factor of 12/44.</p> <p>The TERT recommends that the Party report clear and consistent information in the NID and CRTs on the methodology and EFs used, including on the data sources, for the estimation of CSCs in the DOM and soil organic carbon pools for categories 4.B and 4.C.</p> <p>The Party reported in its land transition matrix in CRT 4.1, for each year of the time series, the final area for the previous year and the initial area for the following year. However, in many cases, the TERT noted that these values in the matrices do not match (e.g. for settlements, for 2020 the initial area was reported as 0.13 kha, and the final area as 0.32 kha, while for 2021, the initial area was reported as 0.14 kha, and the final area as 0.33 kha). This issue is observed for all land-use categories. The TERT also noted that in CRT 4.E the total area of settlements decreased from 2.08 to 0.33 kha between 1990 and 2021; however, conversion from forest to settlements was reported for every year of the time series. Moreover, the NID lacks an aggregated land transition matrix table for the complete time series, and the Party did not provide a clear definition of forest land, or clearly explain the quantitative differences in the definitions of forest plantations, woody crops and silvopastoral systems (e.g. in table 6.3 of the NID, pp.454–455), which is also the case for national definitions for other land categories and subcategories. Finally, the TERT noted that the methodology used for reporting areas in the land matrices is not in accordance with the guidance on consistent representation of lands specified in the 2006 IPCC Guidelines (vol. 4, chap. 3, pp.3.8–3.10) because the final area in a given year does not match the initial area for the following year, and the land conversions are not reflected in the total area of reported land-use categories for subsequent years.</p> <p>During the review, the Party explained that it was unable to develop complete and consistent annual land transition matrices owing to a lack of annual and spatially explicit land-cover information. The main data set available for analysing land-use change is the national ‘forest–non-forest’ map produced by the Institute of Hydrology, Meteorology and Environmental Studies, which allows for the identification of total areas converted to and from forest land but does not provide information on transitions to and among other land-use categories (e.g. cropland, grassland, wetlands and settlements). Consequently, the transition matrices developed for the whole time series are not fully disaggregated and do not allow the Party to ensure that the final area for a particular year matches the initial area for the next year for all land-use categories. Therefore, the inconsistencies observed in CRT 4.1 are due to data gaps, rather than methodological errors. The Party indicated that it will include an aggregated land transition matrix summarizing the available information and will continue working with the Institute of Hydrology, Meteorology and Environmental Studies to improve the temporal resolution and completeness of the national land-cover data sets with the aim of achieving full annual consistency in future inventories. The Party clarified that for category 4.E.2 land converted to settlements, and for categories involving land converted to other land uses, the data source for the land transition matrices is SMyC, which only provides annual information for 2013 onward. The available data for other years are not annual and do not cover all years of the time series. For this reason, to cover the data gap between 1990 and 1999, existing data on areas for 1990 and 1999 were interpolated by subdividing the values into equal proportions. Similarly, as information on areas between 2000 and 2012 was</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
6.L.8	Specified in paragraphs 21 and 40 of the MPGs 4.A Forest land – CO ₂	<p>available on a biennial basis, to obtain the missing areas for a given year, the data available for each two-year period were proportionally interpolated. Therefore, permanence and changes in land coverage were calculated for 1990–2021 using data from SMByC and the above-mentioned interpolation procedures. The Party also clarified that, although a specific definition for forest land was not provided in the NID, conceptually the definition refers to the sum of all land uses within areas primarily covered by trees, that is, forested land which may also contain shrubs, palm trees, bamboo, grasses and vines, with a predominant tree canopy cover of at least 30.0 per cent and a minimum tree height of 5 m. This definition encompasses both naturally occurring forests and commercial tree plantations. The Party also provided information on the definitions of shrublands, forest plantations, woody crops and silvopastoral systems, which complements the information provided in table 6.3 of the NID.</p> <p>The TERT recommends that the Party develop and report in the NIR a consistent representation of lands and land transitions for the complete time series in accordance with the methodology outlined in the 2006 IPCC Guidelines (vol. 4, chap. 3, p.3.9) and ensure that for each year, all land conversions are included in the total initial area for the land use reported for the following year. The TERT also recommends that the Party provide in the NID detailed information on annual land transitions for the complete time series (e.g. a table integrating the land transition matrices) and definitions of forest land, shrublands, forest plantations, woody crops and silvopastoral systems, including corresponding quantitative thresholds.</p> <p>The Party reported in CRT 4.A the net CSC per area for mineral soils under subcategory 4.A.1.d forest land remaining forest land (forest plantations) as – 0.0004 t C/ha for 2021. There is no data on net CSC per area for other subcategories under category 4.A.1 forest land remaining forest land for soils. However, the net mineral soil CSC per area for category 4.A.1 was reported as – 0.65 t C/ha. In addition, in CRT 4.A the net CSC in soils for subcategory 4.A.1.a forest land remaining forest land (fuelwood consumption) was reported as –487.56 kt C for mineral soils for 2021, whereas organic soils were reported as “IE”; however, the areas for these types of soil were reported in the opposite way (i.e. “IE” was reported for mineral soils, and organic soils were reported as 337.31 kha). Further, the IEFs reported in CRT 4.A for cropland converted to forest land under category 4.A.2 land converted to forest land are unrealistically high (e.g. for 2020, the Party reported 10,539.47 t C/ha for biomass, 735.28 t C/ha for DOM and 5,566.15 t C/ha for mineral soils). CRT 4.A contains similar inconsistencies for other years. The TERT noted that the information reported in CRT 4.A on IEFs and AD is not entirely accurate or clear.</p> <p>During the review, the Party clarified that emissions for all years from drained organic soils on forest land were estimated as 1,787.72 kt CO₂ eq for subcategory 4.A.1.a forest land remaining forest land (fuelwood consumption) and as 0.76 kt CO₂ eq for subcategory 4.A.1.d forest land remaining forest land (forest plantations). As noted in the NID, these emission estimates are the same for the entire time series. However, the CRTs are not able to reflect these values because subcategory 4.A.1.a was estimated on the basis of data on people that consume firewood and subcategory 4.A.1.d was estimated on the basis of records that accumulate biomass data in different years, which makes reporting in the CRTs difficult. The Party explained that the high IEFs for biomass, DOM and mineral soils under cropland converted to forest land are due to the estimation process for category 4.A.2, which involved the following steps:</p> <ol style="list-style-type: none"> (a) The AD were provided by SMByC; however, since they do not include information on the annual area regenerated by biome between 1990 and 2002, the Party carried out interpolation between these two data points, with equal areas for each year. Similarly, for 2003–2012, SMByC provided biennial information, so the Party interpolated between two points of biennial data for the missing years. For 2013 onward, SMByC provided information on an annual basis; (b) The amount of carbon stored by type of biome was determined by using data on carbon storage factors for each region (t C/ha); (c) Using AD (area) and ecosystem carbon storage factors (t C/ha), the Party calculated cumulative carbon storage content annually by region, assuming the transition period for the type of biome over a maximum period of 20 years.

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
6.L.9	Specified in paragraphs 21 and 39 of the MPGs 4.A.1 Forest land remaining forest land – CO ₂	<p>This carbon accumulation over a period of 20 years resulted in the high IEF values reported in the CRTs compared with the annual area data.</p> <p>The TERT noted that the methodology for calculating cumulative CSCs over a number of years (more than one year) is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 2, pp.2.6–2.10), which refer to estimates of annual CSCs.</p> <p>The TERT recommends that the Party calculate and report in the CRTs correct annual, rather than cumulative, CSC data in accordance with the provisions of the 2006 IPCC Guidelines (vol. 4, chap. 2, pp.2.6–2.10) and provide consistent information, to the extent possible, on the AD and EFs used for the estimates in categories 4.A.1 and 4.A.2 for living biomass and soils.</p> <p>The Party reported in its NID (p.440) that all lands in the country are considered managed for the purposes of the GHG inventory. Further, in the NID (p.443) Colombia stated that there is no specific information on the part of the natural forest that is managed, and therefore carbon stock gains in living biomass were reported as “NE” in CRT 4.A for subcategories 4.A.1.a forest land remaining forest land (fuelwood consumption) and 4.A.1.b forest land remaining forest land (degradation). The TERT noted that this methodology is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 1, pp.1.4–1.5) because for the purposes of the GHG inventory, managed lands need to be defined. Moreover, in accordance with the equation 2.7 of the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.12), the calculation of annual CSCs for each carbon pool requires estimates of carbon stock gains for managed lands.</p> <p>During the review, the Party explained that only one official definition is in use in the country for natural forest, which is used to delimit the forest and determine changes (deforestation and regeneration). Likewise, there are regulations for forest management in the country. Commercial forest plantations are also considered to fall within forest land. However, there is no operational definition that would enable the Party to separate natural forests into managed and unmanaged forest. The TERT noted that according to the 2006 IPCC Guidelines (vol. 4, chap. 3, p.3.6), countries should describe the methods and definitions used to determine areas of managed and unmanaged lands.</p> <p>The TERT recommends that the Party clearly define managed lands using national definitions, for example those concerning functional characteristics of lands aligned with national forestry regulations, and any assumptions in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 3, p.3.6); report the definitions used and related assumptions in the NID; revise its estimates of CSCs accordingly, as necessary; and report carbon stock gains in living biomass for managed forest land remaining forest land.</p>
6.L.10	Specified in paragraphs 21 and 23 of the MPGs 4.A.1 Forest land remaining forest land – CO ₂	<p>The Party reported in table 6.9 of the NID (pp.469–470) for subcategories 4.A.1.a forest land remaining forest land (fuelwood consumption) and 4.A.1.d forest land remaining forest land (forest plantations) that CSCs in DOM were not estimated as it was assumed that there is no change in carbon content for this pool in accordance with the tier 1 method. There are no further explanations in the NID to support this assumption. However, the TERT noted that firewood is often removed from the DOM pool and carbon stock in DOM may change during the replanting of forest plantations. The TERT also noted that the assumption applied by the Party under the methodology used is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 4, p.4.20) because fuelwood consumption and replanting of forest correspond to significant changes in forest types, disturbances or management regimes in forests, in which case countries are encouraged to develop domestic data to quantify the impacts of these changes using tier 2 or tier 3 methodologies and report CSCs in the DOM pool. The TERT noted that CO₂ emissions for subcategory 4.A.1.a is a key category according to the level and trend assessment reported by the Party in annex I to the NID (table 1, pp.782–783, and table 2, pp.784–785) and considered that, if estimated, DOM may constitute a significant carbon pool for subcategories 4.A.1.a and 4.A.1.d in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 4, p.4.8), for which an appropriate method from the 2006 IPCC Guidelines is to be used.</p> <p>During the review, the Party explained that it lacks data and robust national factors for quantifying the fraction of harvest residues (branches, leaves and fine roots)</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
6.L.11	Specified in paragraphs 21 and 47 of the MPGs 4.A.2 Land converted to forest land – CO ₂	<p>incorporated in DOM as opposed to the fraction removed. Colombia confirmed that, although changes in the carbon content of DOM due to firewood consumption were not quantified, it assumed that these changes are estimated at the tier 1 level, and that therefore DOM remains in equilibrium. The TERT noted that these explanations do not justify use of the tier 1 method.</p> <p>The TERT recommends that the Party assume the ratio of fuelwood consumption removed from the DOM pool (e.g. using the ratio of live above-ground biomass and deadwood in natural forests) and report CSCs in DOM for subcategory 4.A.1.a forest land remaining forest land (fuelwood consumption), and therefore use a tier 2 method to estimate possible CSCs due to replanting of forest plantations in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 4, p.4.20). If this is not possible, the TERT recommends that the Party include in the NID the explanation provided during the review on lack of available data and provide documented evidence that a tier 1 method was used owing to a lack of resources.</p> <p>The Party reported in its NID (p.443) that under category 4.A.2 land converted to forest land, all land conversions were reported in an aggregated manner in CRT 4.A under subcategory 4.A.2.a cropland converted to forest land. It is unclear whether the assumption that all land conversions to forest land were from cropland was applied in the calculations because data on initial carbon stocks were not provided in table 6.8 of the NID (pp.466–468). The TERT noted that, unless it is supported by robust evidence, the use of the assumption that all land conversions to forest land were from cropland may have resulted in an overestimation of carbon removals, as initial crop carbon stocks are typically one of the lowest among the land categories.</p> <p>During the review, the Party clarified that, as indicated in the NID (p.443), all conversions to forest land were reported in the CRTs under subcategory 4.A.2.a. The Party adopted this approach because it currently lacks annual and spatially consistent information that is disaggregated by previous land-use category. The only available data set corresponds to the ‘forest–non-forest’ conversion, which enables the identification of total areas converted from non-forest land to forest land, but not the specific prior land use (e.g. cropland, grassland, wetlands, settlements). Therefore, Colombia reported all land conversions to forest land in an aggregated manner, and reported “IE” for the remaining categories under category 4.A.2. The Party clarified that, for the actual calculations, the initial carbon stocks for all carbon pools before conversion to forest land were assumed to be zero. While the current aggregated approach used could, in theory, introduce some uncertainty, the potential for overestimating removals is expected to be limited, as the area of land converted to forest land is relatively small compared with the total forest area. However, Colombia recognized the importance of improving the disaggregation of data on land-use change with a view to reducing uncertainty in future inventories. The Party is taking steps to enhance land-monitoring systems through SMByC and related initiatives, which aim to facilitate the incorporation of more detailed land-use change matrices by category into future submissions. The TERT noted that assuming zero carbon stocks before land conversion is not in accordance with the 2006 IPCC Guidelines and results in an overestimate of carbon removals for category 4.A.2.</p>
6.L.12	Specified in paragraphs 21 and 40 of the MPGs 4.B.1 Cropland remaining cropland – CO ₂	<p>The TERT recommends that the Party disaggregate the total area of land converted to forest land into the corresponding land categories (e.g. cropland, grassland and other land), where such conversion is possible, for example by using the average ratio of forests converted to each corresponding land-use category or developing other assumptions based on the most common type of land reforestation in the country, and estimate corresponding emissions and removals for category 4.A.2 in accordance with the 2006 IPCC Guidelines.</p> <p>The Party reported in chart 6.2 of the NID (p.480) that it used equation 2.11 of the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.16) on the annual decrease in carbon stocks due to biomass losses in land remaining in the same land-use category (stock difference method) to calculate emissions for category 4.B.1 cropland remaining cropland and that carbon losses from disturbances, including fires, were estimated together with annual changes in biomass carbon stocks in land remaining land of a particular crop type. The Party clarified in the NID (p.476) that it reported CO₂ emissions from burning of living biomass and DOM for category 4.B.1 in</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
		<p>CRT 4.B. The TERT noted that the methodology used by the Party is not in accordance with equation 2.7 of the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.12) because the IPCC gain–loss method requires the biomass carbon loss, including fire carbon losses, to be subtracted from the biomass carbon gains. The TERT noted that reporting additional CO₂ emissions under subcategory 4.B.1.1 other in CRT 4.B, which includes estimates for CO₂ emissions generated by biomass burning and emissions from organic soil management, could potentially lead to the double counting of fire carbon losses.</p>
		<p>During the review, the Party explained that there was no double counting for its estimates and specified that in the procedure used for the calculations, losses due to fires were not explicitly included for the overall calculation of CSCs in crop biomass using the stock difference method (equation 2.11 of the 2006 IPCC Guidelines), and losses due to fires in agricultural crops were accounted for separately. Consequently, emissions from fires were not double counted and were only reported under subcategory 4.B.1.1, while the biomass balance for cropland does not include twice these losses due to fires. In addition, Colombia indicated that, to improve transparency, it will specify in the NIR that fires are treated as a separate flow under subcategory 4.B.1.1 and clarify that losses due to disturbances are not included in the calculations performed using equation 2.11 of the 2006 IPCC Guidelines in order to avoid double counting. The TERT noted that reporting fires in an aggregated manner in a separate subcategory is not in accordance with equation 2.7 of the 2006 IPCC Guidelines and may result in overestimation or underestimation of CO₂ emissions. The TERT recommends that the Party check its emission estimates for category 4.B.1 to ensure that double counting of carbon fire losses does not occur and provide corresponding detailed explanations in the NID, to the extent possible. The TERT also recommends that the Party disaggregate AD on annual fire areas by crop type and calculate CSCs in accordance with equation 2.11 of the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.16).</p>
6.L.13	<p>Specified in paragraphs 39–40 of the MPGs</p> <p>4.B.1 Cropland remaining cropland – CO₂</p>	<p>The Party reported in its NID (section 6.6.2, p.478) on technological advancements in coffee cultivation over time and explained that it is developing a technology that is leading to more shaded areas in coffee agroforestry systems, which will allow for more carbon storage in biomass. The TERT noted that in CRT 4.B the carbon accumulation rate in living biomass for subcategory 4.B.1.a coffee was reported as 0.86 t C/ha for 1990 and 1.09 t C/ha for 2021, which represents an increase of 26.7 per cent and an annual change of 0.02 t C/ha. The NID (p.478) provides the source for these values (Farfán Valencia, 2014), but does not contain a justification for the use of data from this 2014 source for a later period (2015–2021) or report information on the assumptions applied by Colombia in its calculations for the complete time series.</p> <p>During the review, the Party explained that the citation in the NID was provided with a view to explaining technological developments in coffee cultivation and the publication does not refer to the overall estimates of the total carbon stock in coffee in 1990 or 2021. The Party provided a table with assumptions for the changes in the percentages of area in sun and shade systems for the entire time series.</p> <p>The TERT recommends that the Party provide in the NID transparent information, including sources and justifications, on the country-specific parameters used across the time series for subcategory 4.B.1.a, including information on the assumptions applied for coffee cultivation, to the extent possible.</p>
6.L.14	<p>Specified in paragraphs 39–40 of the MPGs</p> <p>4.B.1 Cropland remaining cropland – CO₂</p>	<p>The Party reported in table 6.14 of the NID (pp.481–482) the biomass increment rates for cocoa (4.336 t C/ha/year) and rubber (5.780 t C/ha/year), which are higher than the corresponding values for other crops (e.g. 1.57 t C/ha/year for shade coffee cultivation and up to 2.271 t C/ha/year for citrus fruits). In the same table Colombia also reported the accumulation rate for soil organic carbon for cocoa (5.15 t C/ha/year), which is higher than the biomass accumulation rate for that crop. The TERT noted that information on the assumptions underlying the selection of these country-specific factors used in the calculations was not provided in the NID.</p> <p>During the review, the Party clarified that the parameters reported in table 6.14 of the NID for subcategory 4.B.1.c cocoa were sourced from table 8 (p.31) of a report (Proyecto Biocarbono, 2023), which presents CO₂ removal values based on carbon</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
6.L.15	Specified in paragraph 21 of the MPGs 4.D.1.2 Flooded land remaining flooded land – CH ₄	<p>stocks in biomass (cocoa plants and accompanying shade species), leaf litter, dead matter and soil, which were then converted to carbon using the stoichiometric factor of 12/44. No information was provided during the review for rubber.</p> <p>The TERT recommends that the Party clearly report in the NID information on the rationale for the choice of the country-specific values used for biomass increment rates of cocoa and rubber and the accumulation rate for soil carbon for cocoa, as well as on the applicability of those values and related assumptions underlying the choice, to the extent possible.</p> <p>The Party reported in section 6.8.1 of the NID (p.503) that for subcategory 4.D.1.b flooded land remaining flooded land, CO₂ and CH₄ emissions from water reservoirs were estimated for the first 10 years after the reservoirs entered into operation. In chart 6.4 of the NID (p.505) Colombia reported equations 2A.1 and 3A.1 from the 2006 IPCC Guidelines (vol. 4, appendix 2, p.Ap2.3, and appendix 3, p.Ap3.2, respectively) as one equation, and, according to chart 6.4, the fraction of total reservoir area flooded within the last 10 years (known as f_A) was used to calculate CO₂ and CH₄ emissions. The TERT noted that the methodology used is not in accordance with equations 2A.1 and 3A.1 of the 2006 IPCC Guidelines, because the fraction of total reservoir area flooded should only be applied to CO₂. The TERT also noted that CH₄ emissions are to be estimated for all years in which land remains flooded. Moreover, land converted to flooded land during the previous 20 years should be reported under subcategory 4.D.2 land converted to wetlands, and CO₂ emission estimates do not apply for flooded land remaining flooded land according to the 2006 IPCC Guidelines (vol. 4, chap. 7, p.7.20).</p> <p>During the review, the Party confirmed that, in the calculations for subcategory 4.D.1.b, it estimated diffusive emissions of CO₂ and CH₄ from flooded land used for electricity production (dams) and that the fraction of total reservoir area flooded within the last 10 years was used to estimate both CO₂ and CH₄ emissions.</p> <p>The TERT recommends that the Party report CH₄ emissions from flooded land correctly, using equation 3A.1 of the 2006 IPCC Guidelines (vol. 4, appendix 3, p.Ap3.2) for all years in which land remains flooded. The TERT also recommends that the Party report CO₂ emissions from land flooded less than 20 years ago under category 4.D.2 correctly, using equation 2A.1 from the 2006 IPCC Guidelines (vol. 4, appendix 2, p.Ap2.3).</p>
6.L.16	Specified in paragraphs 21 and 39 of the MPGs 4.E.1 Settlements remaining settlements – CO ₂	<p>The Party reported in its NID (table 6.33, p.515) the biomass emission/removal factor (0.005 t C/ha) used for estimates under category 4.E.1 settlements remaining settlements. In chart 6.5 of the NID (p.514) the Party stated that equation 8.3 from the 2006 IPCC Guidelines (vol. 4, chap. 8, p.8.7) on annual biomass growth based on the number of individual woody plants by general class was used in the calculations. This means that emission/removal factors were calculated per individual tree, not per ha. Further, in the NID (p.512) the number of trees planted was reported as 30,664 for 1990, equivalent to a removal of 0.56 kt CO₂ eq, and as 57,238 for 2021, corresponding to a removal of 17.64 kt CO₂ eq. The Party stated that this increase is due to the fact that biomass accumulated in 2021 includes the growth of trees planted in previous years in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 8, p.8.9). Using these data, the TERT calculated IEFs for those years: 4.98 kg C/tree/year for 1990 and 84.05 kg C/tree/year for 2021. In the NID (p.512) Colombia also stated that, in terms of emissions, 12,466 trees were felled in 1990, representing emissions of 4.57 kt CO₂ eq, while 4,990 trees were felled in 2021, representing emissions of 1.83 kt CO₂ eq. Using these data, the TERT estimated an IEF of 100 kg C/year/tree, which seems to be low for trees of large age classes. The TERT noted that information on the EFs and assumptions used in the calculation of CSCs in living biomass of trees under category 4.E.1 was not reported in the NID and that all trees, both those planted in years before 1990 and those planted in the reporting years, should be included in the annual increment estimate for each year.</p> <p>During the review, the Party explained that to estimate CO₂ emissions for category 4.E.1, it used default EFs for the mixed tree class at the city level from table 8.2 of the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 8, p.8.6), which suggests a range of 0.005–0.01 t C/year for the default value for annual carbon accumulation per tree. Regarding carbon absorption, the Party assumed that trees accumulate biomass annually at the default rate for a 20-year period, as suggested</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
6.L.17	Specified in paragraphs 27 and 47 of the MPGs 4(IV) Biomass burning – CO ₂ , CH ₄ and N ₂ O	<p>in the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 8, p.8.5). Therefore, the absorption values for 1990 reflect the absorption for that year, while the values for each subsequent year also reflect the accumulated absorption from previous years. Finally, the Party explained that emissions were calculated on a per tree basis, assuming that a felled tree was mature and had accumulated carbon at the default annual rate over 20 years, which corresponds to 0.005 t C multiplied by 20 years. The TERT noted that annual carbon accumulation should be reported for each year for all trees under 20 years of age, including those planted before 1990.</p> <p>The TERT recommends that the Party clearly report in the NID the CSC factors used to estimate the increment rate for living biomass and carbon losses per tree for subcategory 4.E.1 and provide clear explanations of the rationale for selecting them and the assumptions used. The TERT also recommends that Colombia estimate carbon stock gains for each reporting year for all trees under 20 years of age, including those planted before 1990, using assumptions to extrapolate from data available for years after 1990 to obtain the missing data for years before 1990 (e.g. by backcasting the trend from existing data or assuming that the area of trees planted in 1990 was the same for all previous years).</p> <p>In CRT 4.IV, the Party only reported CH₄ and N₂O emissions from biomass burning (wildfires) for subcategories 4.A.1 forest land remaining forest land, 4.B.1 cropland remaining cropland and 4.C.1 grassland remaining grassland. In CRT 9 the Party explained that “NE” was reported for biomass burning emissions for categories 4.A.2 land converted to forest land, 4.B.2 land converted to cropland, 4.C.2 land converted to grassland, 4.D wetlands, 4.E settlements and 4.F other land because no AD were available. However, the TERT noted that this reporting is not in accordance with the 2006 IPCC Guidelines because carbon losses and non-CO₂ emissions from fires are not included under categories 4.A.2, 4.B.2, 4.C.2, 4.D, 4.E and 4.F.</p> <p>During the review, the Party explained that in the inventory, CSCs for category 4.A.2 were estimated using approach 2 for land representation and the stock difference method, which was used for estimating carbon gains in living biomass, DOM and soils following the 2006 IPCC Guidelines (vol. 4, chaps. 2–3). The Party also explained that only carbon removals were reported for category 4.A.2 because the spatial and temporal resolution of the data from SMBYC did not enable the disaggregation or identification of carbon losses associated with disturbances (e.g. fires, harvest or illegal logging) within the same reporting period as that for land recently converted to forest. These converted areas predominantly correspond to land undergoing natural regeneration processes, not to managed or harvested forests. Therefore, it was assumed that no significant biomass carbon losses occur during the establishment phase. In addition, disturbance-related emissions (from fires, biomass burning and degradation) were accounted for separately under category 4(IV) biomass burning, avoiding double counting. Consequently, carbon losses in living biomass were reported as “NE” or “IE” under category 4.A.2 since emissions from forest disturbances were included under other LULUCF sector categories or subcategories. The TERT noted that, in accordance with equation 2.7 from the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.12), estimates of biomass carbon losses are required for estimating the annual change in biomass carbon stocks.</p> <p>The TERT recommends that the Party obtain missing AD on fires for land converted to forest land, cropland and grassland under categories 4.A.2 , 4.B.2 and 4.C.2 respectively and AD on biomass burning for wetlands, settlements and other land (if any) in order to report complete estimates for carbon losses and non-CO₂ emissions for these categories. For obtaining these missing AD, the TERT encourages the Party to use methods consistent with the splicing techniques provided in the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.8–5.14), for example by applying the same ratio of burned area reported for forest land remaining forest land, cropland remaining cropland and grassland remaining grassland respectively.</p>
6.L.18	Specified in paragraphs 21 and 39 of the MPGs 4.G HWP – CO ₂	<p>The Party reported in table 6.46 of the NID and CRT 4.G (sheet 2) AD on HWP for 1990 onward. The TERT noted that, since AD before 1990 were not reported, the approach used for the estimates is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 12, p.12.9) because providing valid estimates of the total release of carbon from HWP for any reporting year requires knowledge of change</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		<p>to the total existing HWP pool before 1990. In the absence of surveys or census data on HWP in use, information on inputs to and outputs from stocks of HWP since 1900 is needed in order to produce valid estimates for recent years. For this purpose, the 2006 IPCC Guidelines (vol. 4, chap. 12, p.12.13) indicate that FAO data back to 1961 can be used, and data back to 1900 can be estimated by assuming that the annual rate of change in the two product-in-use pools from 1900 to 1961 is the same as the annual rate of change in industrial roundwood production between 1900 and 1961. The TERT noted that data for Colombia are available in FAO (1961).</p> <p>During the review, the Party confirmed that AD are available for 1961 onward and explained that while the 2006 IPCC Guidelines indicate that data can be used back to 1960 for estimates related to HWP, the estimates for the BTR1 were calculated using equation 12.4 from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 12, p.12.18), using an average of the data for the first five years of the time series, starting in 1990 and following the described procedure. However, the TERT noted that equation 12.4 is only applicable to countries that lack FAO AD for 1961 onward.</p> <p>The TERT recommends that the Party estimate stocks of HWP for 1900 onward using FAO data back to 1961, assuming that the annual rate of change is the same as the annual rate of change in industrial roundwood production from 1900 to 1961, and report the results in the CRTs and provide related supporting information in the NID, including on the method used and on assumptions, references and sources of information used for the EFs and AD used.</p>
6.L.19	Specified in paragraphs 21 and 39 of the MPGs 4.G HWP – CO ₂	<p>The Party reported in the NID (p.529) that the production approach from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 12, table 12.3, p.12.28) was used to estimate HWP in products in use with default half-lives. However, it is not clear whether HWP in SWDS are included in the LULUCF reporting of the Party in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 12, table 12.1, p.12.8). In CRT 5.A a memo item on annual change in total long-term carbon storage in HWP in waste was reported as “NO”. The TERT noted that CSCs of long-term carbon storage in HWP in SWDS should be reported under the LULUCF sector to ensure completeness.</p> <p>During the review, the Party confirmed that long-term carbon stored in HWP (i.e. paper, wood and garden waste) in SWDS was estimated along with the waste sector emissions using the IPCC FOD model, but was not included in the reporting in CRT 4.G.</p> <p>The TERT recommends that the Party include CSC estimates of long-term carbon storage in HWP in SWDS in CRT 4.G and provide corresponding information in the NID, including on the method used, and on assumptions, references and sources of information for the EFs and AD used.</p>

Table 7

Areas of improvement of the reporting on greenhouse gas emissions and removals – waste sector

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
7.W.1	Specified in paragraphs 21 and 26 of the MPGs 5.A Solid waste disposal on land – CH ₄	<p>In its description of the method applied for category 5.A solid waste disposal on land in the NID (pp.552–554), the Party reported that total waste disposed of for estimates for category 5.A is based on the total amount of waste collected and sent to disposal sites starting from 2006. Although the Party reported emissions for 1990–2021, it reported that AD were only available for 2006 onward. For waste composition, the Party reported in table 7.11 of the NID (p.554) that the characterization of solid waste covers 1990–2021 and was sourced from the Colombian biogas model. The Party did not provide any further information on this data source, and no values were reported for waste composition in the NID. The TERT noted that, according to the 2006 IPCC Guidelines (vol. 5, chap. 2, pp.2.14–2.15), national waste composition studies should be repeated periodically to cover changes in waste generation and management over time. Additionally, the TERT noted that the lack of AD and waste-specific parameters may result in inconsistent emission estimates owing to the potential use of different types of AD and waste parameters in the time series.</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
7.W.2	Specified in paragraphs 27, 39 and 40 of the MPGs 5.A Solid waste disposal on land – CH ₄	<p>During the review, the Party clarified that it used population data and default waste generation rates for the 1990–2005 emission estimates, and data on the total amount of waste disposed of for the emission estimates for 2006 onward. The Party provided a copy of the Colombian biogas model, which contains information on waste composition by department of the country for 2010 only, and clarified that the same waste composition was used for all years of the time series. The Colombian biogas model, developed as a tool for estimating biogas generation in landfills, also contains waste characterization information for each geographical region of the country (the user manual is available at https://www.globalmethane.org/documents/models/pdfs/UsersManualColombiaLFGModelEnglish.pdf). The TERT concluded that (1) the assumptions applied by the Party for waste composition, which remains the same across the time series, are not consistent with the 2006 IPCC Guidelines and (2) the Party used two distinct methodologies (tier 1 and tier 2) for its time series of emission estimates.</p> <p>The TERT encourages the Party to resolve the inconsistencies in the methodologies, AD and parameters used for estimating emissions for category 5.A, which is a key category, by using only one methodological tier across the entire time series. For this purpose, the TERT recommends that the Party follow the recommendations contained in the 2006 IPCC Guidelines (vol. 5, chap. 3, pp.3.6–3.7) and revise the emission estimates accordingly.</p> <p>In its description of the AD used for category 5.A solid waste disposal on land in the NID (p.554), the Party reported that AD from disposal sites (total waste disposed of), which are only available starting from 2006, are submitted directly through the Party’s Single Information System. The TERT noted that the NID does not contain information on (1) the assumptions used by the Party to complete the times series by filling data gaps (i.e. where no waste disposal totals are available for years before 2006) or (2) the AD and country-specific parameters used for the complete time series, in particular for waste characterization, in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 2, p.2.11).</p> <p>During the review, the Party clarified that for years prior to 2006, it used the default waste generation rate from the 2006 IPCC Guidelines (vol. 5, chap. 2, p.2.19) and population data to derive values for total waste generation in the country. The TERT noted that the Party did not provide a clear justification for using different sets of AD and parameters across the time series for the emission estimates.</p> <p>The TERT recommends that the Party report the assumptions applied to obtain missing waste disposal AD for estimating emissions for category 5.A for the entire time series in line with the 2006 IPCC Guidelines. The TERT also recommends that the Party provide information on the AD used at the most disaggregated level, including on country-specific parameters used, particularly for waste characterization, to the extent possible. In addition, the TERT encourages the Party to use splicing techniques provided in the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.8–5.14) to estimate missing emission values resulting from lack of AD and information on waste characterization in order to ensure time-series consistency, and to report the emission estimates accordingly.</p>
7.W.3	Specified in paragraphs 21 and 47 of the MPGs 5.A Solid waste disposal on land – carbon stored in landfills	<p>In CRT 5 the Party reported “NO” for memo items 5.F.1, 5.F.2 and 5.F.3, which relate to long-term storage of carbon. The TERT noted that, since the Party stated in the NID (p.552) that the IPCC FOD model was used for its calculations and country-specific waste characterization was used for the emission estimates, long-term stored carbon is implicitly estimated on the basis of default parameters used by the Party.</p> <p>During the review, the Party clarified that it estimated long-term carbon stored using the same level of disaggregation of emissions as that used under category 5.A solid waste disposal on land, but this information was erroneously omitted from its reporting as a result of the use of “NO” in CRT 5.</p> <p>The TERT recommends that the Party revise its reporting of “NO” for memo items 5.F.1, 5.F.2 and 5.F.3 in line with the data and corresponding estimates available and report long-term stored carbon following the method provided in the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.23).</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
7.W.4	Specified in paragraphs 39–40 of the MPGs 5.A.1 Managed waste disposal sites – CH ₄	<p>The Party reported in the NID (p.552) that it used the IPCC FOD model to estimate CH₄ emissions from managed waste disposal sites. However, the NID does not contain information on how climate zone specific parameters were applied, even though multiple climate zones are listed for the country’s territory in the NID (table 7.8, p.553). Further, the description of the estimation method indicates that the FOD model was applied to individual landfills at the regional and departmental level. However, the Party did not describe how EFs and parameters were selected and applied in the calculations on the basis of the country-specific data available for each region.</p> <p>During the review, the Party provided to the TERT the Colombian biogas model file, which includes a map of the country, split into five geographical regions. The Party clarified that each of the individual FOD model calculations used is associated with one of the five regions, and each region is mapped to the IPCC climate zones. Hence, the corresponding IPCC default factors were selected for each FOD model on the basis of the corresponding climate zone.</p> <p>The TERT recommends that the Party report the descriptions, assumptions, references and sources of information used to select the appropriate and representative EFs, derived on the basis of climate zones, used for estimating CH₄ emissions for category 5.A.1 managed waste disposal sites. The TERT also recommends that the Party provide information on the EFs and AD used at the most disaggregated level, to the extent possible.</p>
7.W.5	Specified in paragraphs 39 and 47 of the MPGs 5.A.1 Managed waste disposal sites – CH ₄	<p>The Party reported in table 7.11 of the NID (p.554) that AD for biogas flaring and utilization for category 5.A.1 managed waste disposal sites are available for 2009–2021. CH₄ emissions recovered for flaring were reported in CRT 5.A for the same years. The Party stated in the NID (p.555) that, currently, the inventory only reports CH₄ recovery data for flaring from one site; however, other disposal sites are developing activities related to CH₄ recovery. No additional documentation was provided in the NID regarding the methodology, assumptions or approach to data collection in relation to biogas flaring and/or utilization in disposal sites. In CRT 5.A the Party reported total annual recovery from flaring since 2009, but “IE” was reported for the amount of CH₄ for energy recovery for the same period.</p> <p>During the review, the Party clarified that only one landfill (Doña Juana) currently reports the total amount of CH₄ flared and recovered, and no other data source is available that would enable the Party to estimate a complete time series of flared CH₄ that may occur within its territory. Further, the Party clarified that the Doña Juana site, which was originally under a clean development mechanism project, applies clean development mechanism methodologies for its emission and recovery estimates (see https://www.ecoregistry.io/projects/CDC-51).</p> <p>The TERT recommends that the Party estimate and report CH₄ for energy recovery and related emissions under the relevant categories and sectors and further describe the methodology used to estimate emissions from CH₄ flaring and energy recovery in the Doña Juana landfill and other disposal sites where activities related to CH₄ recovery took place, following the good practice considerations in the 2006 IPCC Guidelines (vol. 5, chap. 3, pp.3.18–3.19) related to data-collection processes, references, assumptions used and the heating value of the CH₄ recovered.</p>
7.W.6	Specified in paragraph 47 of the MPGs 5.C.1 Waste incineration – N ₂ O	<p>The TERT noted that the Party reported conflicting information regarding the estimation of N₂O emissions for category 5.C.1 waste incineration. The Party stated in section 7.5.8 of its NID (p.562) that the 2006 IPCC Guidelines do not provide EFs for estimating N₂O emissions from incineration of hazardous, hospital and liquid fossil waste. Further, the Party stated that it assumed all incinerators in the country operate under controlled conditions, thereby avoiding the generation of CH₄ and N₂O emissions. However, the 2006 IPCC Guidelines (vol. 5, chaps. 5.4.2–5.4.3, pp.5.20–5.22) provide default EFs for liquid fossil waste for applying a tier 1 method to estimate CH₄ and N₂O emissions. Further, controlled incinerators do not have negligible N₂O emissions and hence these emissions should be estimated.</p> <p>During the review, the Party clarified that, on the basis of consultations with incinerator operators in the country, it was assumed that N₂O emissions do not occur owing to the operational conditions of incinerators. However, it noted that since liquid fossil waste is incinerated, N₂O emissions may be estimated using default EFs and reported.</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
7.W.7	Specified in paragraphs 27, 39 and 47 of the MPGs 5.C.1 Waste incineration – CO ₂ , CH ₄ and N ₂ O	<p>The TERT recommends that the Party estimate and report N₂O emissions for category 5.C.1 in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 5, pp.5.13–5.15).</p> <p>The TERT noted that in CRT 5.C the Party reported “NE” for emissions for category 5.C.1 waste incineration for years prior to 2009. In the NID (p.561), the Party stated that this notation key was reported because information was not available. However, it is unclear whether incineration is known to have taken place before 2009 as related information was not provided in the NID.</p> <p>During the review, the Party clarified that regulation of waste incineration practices began in 2009. The Party stated that it does not have enough data to ensure completeness and consistency of emission estimates prior to 2009. Further, the Party is not currently able to determine the exact point in time at which incineration practices were first implemented in the country.</p> <p>The TERT recommends that the Party collect all necessary incineration-related AD, from the starting point in time at which the activity began in the country; clearly document that starting point in the NID; and report emission estimates for category 5.C.1. If the Party is unable to collect the AD needed for consistent estimation of emissions, the TERT encourages the Party to use splicing techniques from the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.8–5.14) to estimate missing emission values resulting from lack of AD with a view to providing a complete time series of estimates, starting from the point in time at which incineration activities began in the country, and the splicing technique and assumptions used.</p>
7.W.8	Specified in paragraph 40 of the MPGs 5.C.2 Open burning of waste – CO ₂ , CH ₄ and N ₂ O	<p>The Party reported AD and emissions as “IE” in the NID and CRT 5.C for subcategory 5.C.2.a biogenic, but AD and all emissions for subcategory 5.C.2.b non-biogenic (municipal solid waste) were reported as total emissions for category 5.C.2 open burning of waste. The Party did not report the waste characterization used for estimating emissions for subcategory 5.C.2.b or document assumptions regarding the types of waste that are open burned. Further, while the Party reported the use of default EFs in the NID (p.567) for each type of waste, it did not report any information on the breakdown of waste composition over the time series. The TERT was unable to determine on the basis of the information provided whether the Party’s reporting of emissions originating from the open burning of all types of waste was complete.</p> <p>During the review, the Party clarified that a national average of the quantitative data on waste characterization was derived from the waste characterization from the Colombian biogas model (see ID# 7.W.1 above) and used to estimate emissions from open burning. The characterization includes all identified types of waste provided in the 2006 IPCC Guidelines and includes both biogenic and non-biogenic waste. The TERT concluded that although the Party estimated emissions from all identified sources of waste of both biogenic and non-biogenic origin, the use of “IE” is not justified given that complete waste characterization exists and separate reporting is possible. Furthermore, the Party incorrectly used “IE” for CO₂ emissions of biogenic origin as such emissions should not be included elsewhere in the totals.</p> <p>The TERT recommends that the Party estimate emissions from open-burned waste and report them separately under subcategories 5.C.2.a and 5.C.2.b and provide information on the methodology used for estimating these emissions for biogenic and non-biogenic sources at the most disaggregated level, to the extent possible, including information on waste characterization and clarifying the methodology for estimating both types of waste, in accordance with the 2006 IPCC Guidelines.</p>
7.W.9	Specified in paragraphs 21 and 23 of the MPGs 5.D Wastewater treatment and discharge – CH ₄	<p>According to the information on the key category analysis conducted by the Party reported in the NID (p.541), CH₄ emissions for categories 5.D.1 domestic wastewater and 5.D.2 industrial wastewater were identified as key categories. However, the Party applied a tier 1 methodology from the 2006 IPCC Guidelines for category 5.D.1 and a tier 1 methodology from the 2019 Refinement to the 2006 IPCC Guidelines for category 5.D.2. The Party did not explain why it did not use the appropriate methodological tier from the 2006 IPCC Guidelines.</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
7.W.10	Specified in paragraph 39 of the MPGs 5.D.1 Domestic wastewater – N ₂ O	<p>During the review, the Party clarified that owing to data dispersion and a lack of resources, it was not able to collect and consolidate all the data necessary to advance the development of and adopt a tier 2 methodology.</p> <p>The TERT recommends that the Party include in the NID an explanation for not adopting a higher-tier method for estimating CH₄ emissions for key categories 5.D.1 and 5.D.2. The TERT encourages the Party to make every effort to use a higher-tier method, in line with the good practice outlined in the 2006 IPCC Guidelines, and report information on how it is addressing or intends to address this issue.</p> <p>The Party’s NID lacks information regarding the treatment of sludge data for the N₂O emission estimates for category 5.D.1 domestic wastewater. The Party stated in the NID (p.578) that, for this category, the wastewater-related data used for calculating total N in effluent include data on annual per capita protein consumption (from FAOSTAT), population, fraction of N in the protein, fraction of protein not consumed, fraction of industrial and commercial co-discharged protein and N removed with the sludge. However, in table 7.29 of the NID (p.577), the Party reported that it used a default parameter of 0 kg N/year from the 2006 IPCC Guidelines (vol. 5, chap. 6, equation 6.8, p.6.25) for estimating N removed with sludge.</p> <p>During the review, the Party clarified that emissions related to the treatment of sludge from domestic wastewater were not considered owing to the lack of consolidated information on this activity at individual sites. The TERT concluded that the Party’s decision to use a default parameter of 0 kg N/year for estimating N removed with sludge aligns with the tier 1 method applied for category 5.D.1.</p> <p>The TERT recommends that the Party report in the NID information on assumptions related to sludge treatment data and the rationale for selecting a tier 1 default parameter for N removed with sludge for estimating N₂O emissions for category 5.D.1.</p>
7.W.11	Specified in paragraphs 39–40 of the MPGs 5.D.1 Domestic wastewater	<p>The Party’s NID does not provide information on AD related to the share of collected and uncollected wastewater or the share of wastewater treated on-site compared with untreated wastewater over the time series. In table 7.30 of the NID (p.579), the Party reported that the national quality of life survey was used to obtain information for 1990–2021 on the fraction of the population with sewage access, and the fraction of the population discharging to bodies of water or to wastewater treatment systems. However, it is not clear whether these values reflect periodical changes to wastewater management practices over time. According to the 2006 IPCC Guidelines (vol. 5, chap. 6, p.6.16), Parties should be able to construct an entire time series for wastewater treatment pathways. If data are missing, the 2006 IPCC Guidelines recommend using surrogate data and/or extrapolation or interpolation splicing techniques.</p> <p>During the review, the Party clarified that data from national quality of life surveys carried out by DANE (1997, 2003, 2007, 2008 and 2010–2024) are collected from existing annual surveys (i.e. for 1997, 2003, 2007 and 2008, and for all years from 2010). The Party hence confirmed that, for the emission estimates, it used data from the respective year, where available, or from the closest available one.</p> <p>The TERT recommends that the Party report detailed references and the source of information used to determine the wastewater access parameters needed to estimate emissions for category 5.D.1 domestic wastewater over the time series, such as share of collected and uncollected wastewater and share of wastewater treated on-site compared with untreated wastewater.</p>
7.W.12	Specified in paragraphs 27 and 39 of the MPGs 5.D.2 Industrial wastewater – CH ₄	<p>The TERT noted that the Party recalculated the time series of CH₄ and N₂O emissions for category 5.D.2 industrial wastewater (NID, p.571). The rationale for this recalculation is based on the availability of more recent data for the manufacturing sector for 2015–2021, collected from the Single Environmental Registry, for calculating the weighted average EFs for CH₄ and N₂O on the basis of industry data. From the information provided in the NID (pp.571–572), it is not clear for which period weighted average EFs were used for the recalculations or whether the Party used the same EFs across the time series. The TERT also noted that the 2006 IPCC Guidelines indicate the need to conduct periodical surveys for industrial sources, particularly for rapidly growing industries (vol. 5, chap. 6,</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		<p>p.6.24). Although the Party's rationale for using weighted EFs is appropriate, the Party did not clarify whether the representation of the industries and their activity is consistent throughout the time series of the inventory.</p> <p>During the review, the Party clarified that a new weighted EF was calculated for each industrial group using data available from the Single Environmental Registry (covering 2015–2021) and applied across the time series. The Party gave no further consideration to the representation of industries or their activity for the rest of the time series in order to comply with the good practice outlined in the 2006 IPCC Guidelines (vol. 5, chap. 6, p.6.24).</p> <p>The TERT recommends that the Party report the methods and assumptions applied for calculating the CH₄ and N₂O EFs used to estimate emissions for category 5.D.2. The TERT encourages the Party to use splicing techniques from the 2006 IPCC Guidelines to estimate missing emission values resulting from lack of EFs and information on other industry-specific parameters in order to ensure a consistent representation of industrial operations in the country across the time series.</p>

C. Information necessary to track progress in implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

Table 8

Areas of improvement of the reporting on national circumstances and institutional arrangements

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
8.1	Specified in paragraph 60 of the MPGs	<p>Colombia provided in section 2.1.1 of the BTR (pp.27–67) a detailed description of its national circumstances. The Party mentioned that its national circumstances have an influence on trends in GHG emissions and removals and provided some information on how they affect GHG emissions and removals over time; however, the information provided was limited and did not cover all inventory sectors and categories such as energy, transport, agriculture and LULUCF.</p> <p>During the review, the Party elaborated further on the information provided in the BTR, including on its analysis of the social, economic and environmental factors that are considered significant owing to their direct relationship with the trends in GHG emissions and removals, namely armed conflict, population growth, gross domestic product, the El Niño phenomenon and the coronavirus disease 2019 pandemic. However, it did not elaborate further on how its national circumstances influence the trend of emissions and removals over time for the most relevant GHG inventory sectors and categories (i.e. energy, transport, agriculture and LULUCF).</p> <p>The TERT recommends that the Party provide complete information on and a more detailed description of how its national circumstances affect GHG emissions and removals over time by extending the discussion to the most relevant GHG inventory sectors and categories (i.e. energy, transport, agriculture and LULUCF).</p>

Table 9

Areas of improvement of the description of the nationally determined contribution under Article 4 of the Paris Agreement, including updates

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
9.1	Specified in paragraph 64(a) and 64(e) of the MPGs	<p>Colombia reported on its NDC targets in the BTR (table 2.9, pp.106–108), including on its second target, which is to reduce the change in the area of natural forest due to deforestation to 50,000 ha/year by 2030. However, it did not specify in the description whether the target refers to gross deforestation or net deforestation. Moreover, the TERT noted that the description of the coverage of this target seems to imply that the target refers to net deforestation, that is, including regeneration.</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		<p>During the review, the Party clarified that the description of its second target refers to gross deforestation and that the coverage of the target does not include regeneration.</p> <p>The TERT recommends that Colombia improve the description of its second target of reducing the change in the area of natural forest due to deforestation by clarifying whether the target refers to gross or net deforestation.</p>

Table 10

Areas of improvement of the reporting of the information necessary to track progress in implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
10.1	Specified in paragraph 65 of the MPGs	<p>Colombia identified in its BTR (pp.111–131) the indicators it has selected to track progress towards the implementation and achievement of its NDC under Article 4 of the Paris Agreement. However, the TERT identified a possible inconsistency between the second indicator (change in the area covered by natural forest), which refers to net deforestation, and the corresponding second NDC target (reducing the change in the area of natural forest due to deforestation), which does not specify in its description whether it refers to gross or net deforestation.</p> <p>During the review, the Party clarified that the second NDC target for 2030 refers to gross deforestation. On the basis of this explanation, the TERT understands that the definition of the second indicator provided in the BTR (pp.118–119) is inconsistent with the second NDC target, namely that the second indicator refers to net deforestation, while the second NDC target refers to gross deforestation.</p> <p>The TERT recommends that Colombia, when defining the indicator used to track progress towards the implementation and achievement of its NDC in relation to reducing the change in the area of natural forest due to deforestation, explain how it ensures that the indicator is fully relevant and consistent with the corresponding NDC target.</p>

Table 11

Areas of improvement of the reporting on mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
11.1	Specified in paragraph 80 of the MPGs	<p>Colombia’s BTR contains information on 32 PaMs that support the implementation and achievement of its NDC, which were selected in the light of their high mitigation potential and their strategic ‘umbrella’ role in linking national action with territorial and private initiatives, and because they are included in the mitigation scenarios. However, the Party did not clearly explain how these 32 PaMs were selected out of the 148 PaMs provided in the NDC.</p> <p>During the review, Colombia explained that the 32 PaMs presented in the BTR are national in scope, and the other 116 PaMs reported in the NDC are local-level PaMs proposed under specific territorial climate change management comprehensive plans or private sector initiatives. The group of national PaMs together with local PaMs that share common topics or criteria and sectoral PaMs that are part of national strategies or policies are aimed at reducing emissions. Therefore, the 32 PaMs serve as an overarching framework that conceptually links actions at the national level with cooperative initiatives at the local level, as outlined in the NDC.</p> <p>The TERT recommends that the Party provide in the BTR a detailed explanation of the criteria used to select the PaMs reported in the BTR.</p>
11.2	Specified in paragraph 81 of the MPGs	<p>Colombia reported the majority of its PaMs organized by sector, but for three PaMs the sectoral classification reported in CTF table 5 was unclear. Specifically, the Party reported the mitigation actions “Sustainable construction” and “Nationally appropriate mitigation action for domestic refrigeration in Colombia” under the residential sector, and the mitigation action “Promoting thermal districts</p>

ID#	Reporting requirement	Description of area of improvement with recommendation or encouragement
		<p>for the replacement of cooling systems in cities” under the commercial/institutional and residential sectors, and did not identify a specific IPCC sector.</p> <p>During the review, Colombia explained that the “Sustainable construction” mitigation action belongs to subcategory 1.A.1.a public electricity and heat production because it was developed in response to regulations encouraging energy savings in new buildings and facilities, for application in residential, commercial and industry buildings and healthcare centres (sectoral resolution 549 of 2015). Energy savings achieved through this action would decrease electricity demand, so a reduction in generated electricity is expected. In contrast, the “Nationally appropriate mitigation action for domestic refrigeration in Colombia” targets subcategory 1.A.4.b residential, owing to its aim of reducing electricity consumption as a result of energy efficiency improvements in refrigeration devices used by households, and category 2.F product uses as substitutes for ozone-depleting substances, because it contributes to a reduction in the use of products used as substitutes for ozone-depleting substances. Finally, the action “Promoting thermal districts for the replacement of cooling systems in cities” targets both subcategory 1.A.1.a and category 2.F because it is intended to reduce electricity demand for heating and cooling and reduce the use of ozone-depleting substances.</p> <p>The TERT recommends that the Party, to the extent possible, organize in the BTR the reporting for each policy and measure by specific sector, as defined in the MPGs, taking into account their impact on GHG emissions with a view to improving transparency.</p>
11.3	Specified in paragraph 83(a) of the MPGs	<p>The TERT noted that Colombia reported information on costing for some of its mitigation actions only in the BTR (pp.147–181).</p> <p>During the review, Colombia explained that the feasibility of each action relies on its implementation plan. When the BTR was being written, just a few actions had implementation plans where costs were available.</p> <p>The TERT encourages the Party to provide information on costs for each policy and measure reported in subsequent BTRs.</p>
11.4	Specified in paragraphs 83(c) and 86 of the MPGs	<p>The TERT noted that Colombia reported estimates of expected GHG emission reductions for each policy and measure reported in CTF table 5 but did not clearly describe in the BTR the methodologies and assumptions used to estimate the expected GHG emission reductions or removals or provide information on how the PaMs interact with each other. The Party indicated in its BTR (p.180) that the methodologies and assumptions used to estimate expected GHG emission reductions were provided in section 2.6 of the BTR, on projections. However, the information provided in that section was not fully clear, instead it focused on the methodology and assumptions used for the projections, with information scattered between section 2.6 and section 2.8 (annexes). The Party also indicated that methodologies for estimating GHG emission reductions achieved have not yet been fully consolidated and there is a need to strengthen technical and operational capacities to perform these estimates systematically, consistently and in alignment with international best practices.</p> <p>During the review, Colombia explained that the mitigation (WM) scenario for PaMs was modelled similarly to the reference (WOM) scenario. For this modelling, 2015 was established as the start year for mitigation actions, making it the turning point when the WOM and WM scenarios diverge. Therefore, any action reducing emissions or increasing removals (where applicable) compared with the WOM scenario for each policy and measure is considered a mitigation action if implemented from 2015 onward. Each mitigation policy and measure was modelled separately by considering assumptions that differ from those used in the WOM scenario. Emission reductions from each policy and measure were added together, with the final result making up the aggregated mitigation scenario. The Party also clarified that the PaMs were modelled together in order to allow for the identification of interactions between the individual PaMs, resulting in the aggregate scenarios.</p> <p>The TERT recommends that the Party, to the extent available, clearly describe in the BTR the methodologies and assumptions used to estimate the GHG emission reductions or removals due to each policy and measure. The TERT encourages the</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		Party to provide information on how each policy and measure interacts with other PaMs, as appropriate.

Table 12

Areas of improvement of the summary of greenhouse gas emissions and removals

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
NA	NA	No areas of improvement identified

Table 13

Areas of improvement of the projections of greenhouse gas emissions and removals

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
13.1	Specified in paragraphs 6 and 102 of the MPGs	<p>Colombia applied flexibility with respect to its reporting on projections. The Party indicated in its BTR (p.184) that it used flexibility for its reporting under paragraphs 94, 95, 96(d) and 97 of the MPGs. However, the TERT noted that these paragraphs of the MPGs, except paragraph 95, do not include provisions for flexibility.</p> <p>During the review, Colombia confirmed that flexibility was applied to its reporting on projections in accordance with paragraph 102 of the MPGs, which allows developing country Parties that need flexibility in the light of their capacities to report using a less detailed methodology or coverage with respect to paragraphs 93–101 of the MPGs.</p> <p>The TERT recommends that the Party clearly indicate in its BTR the provision it used and which flexibility it applied for its reporting on projections.</p>
13.2	Specified in paragraph 95 of the MPGs	<p>Colombia reported projections for a WOM scenario and a WM scenario, with 2019 as the starting year, which is not the most recent year in its NIR (i.e. 2021). Colombia applied flexibility in accordance with paragraph 95 of the MPGs by reporting its projections only up until 2030 (the end point of its NDC), rather than extending them at least 15 years beyond the next year ending in zero or five.</p> <p>During the review, the Party explained that the projections were developed for the submission of its NDC in 2020, when information for the 2021 GHG inventory was not yet available, and that once the data for 2021 became available, it was not possible to develop new projections before the BTR1 was submitted.</p> <p>The TERT recommends that the Party report its projections starting from the most recent year in its NIR.</p>
13.3	Specified in paragraphs 6 and 96(d) of the MPGs	<p>Colombia applied flexibility with respect to providing information required under paragraph 96(d) of the MPGs, applying the flexibility provided for under paragraph 102 of the MPGs. The Party did not report a sensitivity analysis for any of its projections in the BTR. However, the TERT noted that the Party did not clarify its capacity constraints regarding the reporting of a sensitivity analysis.</p> <p>During the review, Colombia provided the TERT with information on its capacity constraints, which are related to, inter alia, the need for technical support for maintaining and updating existing tools and instruments for collecting, managing and processing data and performing a sensitivity analysis in line with national projection systems.</p> <p>The TERT recommends that the Party clarify in the BTR its capacity constraints with respect to providing information on a sensitivity analysis for any of its projections, including an explanation of the methodologies and parameters needed.</p>
13.4	Specified in paragraphs 6 and 97 of the MPGs	<p>Colombia reported projections of two of the three indicators it selected to track progress towards the implementation and achievement of its NDC (indicators 1 and 2, namely mitigation required for achieving the target, and change in the area covered by natural forest respectively). Colombia applied flexibility with respect to providing projections for indicator 3 (progress in reducing carbon black emissions) in accordance with the flexibility provision under paragraph 102 of the MPGs. The TERT noted that the projections of indicator 2 are only aspirational and do not involve a projection methodology, drivers or assumptions. The TERT also noted that Colombia provided in the BTR (p.204) information clarifying the capacity</p>

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
		<p>constraints preventing it from reporting actual projections for indicator 2 but did not clarify the capacity constraints faced in relation to providing projections for indicator 3.</p> <p>During the review, Colombia provided the TERT with information on its capacity constraints in relation to reporting projections for indicator 3, which relate to, inter alia, a lack of technical capabilities for incorporating carbon black and other short-lived climate pollutants in national atmospheric emission projection models, difficulties in ensuring consistency with GHG scenarios and using tools such as the “Low Emissions Analysis Platform” and the “Mitigation Inventory Tool for Integrated Climate Action”, the need for methodologies for assessing the effects of mitigation measures on carbon black emissions, a lack of institutional coordination to ensure the systematic inclusion of black carbon in subnational inventories of atmospheric pollutants through collaboration among environmental authorities, and improving data availability on activities and EFs at the territorial level in the country.</p> <p>The TERT recommends that the Party provide projections for indicator 2 (change in the area covered by natural forest), using a methodology, drivers and assumptions for projections, and clarify in the BTR its capacity constraints related to providing projections for indicator 3 (progress in reducing carbon black emissions).</p>

Table 14

Areas of improvement of other information relevant to tracking progress in implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

<i>ID#</i>	<i>Reporting requirement</i>	<i>Description of area of improvement with recommendation or encouragement</i>
NA	NA	No areas of improvement identified

II. Capacity-building needs³ identified by the Party and by the technical expert review team in consultation with the Party during the technical expert review of its first biennial transparency report

2. Table 15 presents capacity-building needs identified by the Party and by the TERT in consultation with the Party during the technical expert review of its BTR1.

Table 15

Capacity-building needs identified in consultation with the Party

<i>ID#</i>	<i>Reporting requirement</i>	<i>Area in which capacity-building is needed</i>
General reporting		
NA	NA	No capacity-building needs identified
NIR – general		
2.G_CBN.1 ^a	Specified in paragraphs 18–19 of the MPGs	Strengthening inter-institutional cooperation (e.g. among associations, institutions, etc.) to facilitate the continuous transfer of information and data for all sectors of the GHG inventory (medium priority)
2.G_CBN.2	Specified in paragraph 19(b) of the MPGs	Further developing the capacity and enhancing knowledge retention of relevant staff in relation to compiling and reporting the GHG inventory, and data management and archiving, including through focused training courses and workshops (high priority)
2.G_CBN.3	Specified in paragraphs 19(c) and 35 of the MPGs	Strengthening quality assurance/quality control in relation to the collection, processing and analysis of inventory data (medium priority)

³ As referred to in paras. 7, 8 and 162(d) of the MPGs.

<i>ID#</i>	<i>Reporting requirement</i>	<i>Area in which capacity-building is needed</i>
2.G_CBN.4	Specified in paragraphs 31–32 of the MPGs	Developing processes for collecting data and estimating GHG emissions for categories for which estimates have not yet been reported or which have previously been reported as “NE” (high priority)
2.G_CBN.5 ^a	Specified in paragraphs 57–58 of the MPGs	Strengthening capacity for and supporting the development and reporting of a consistent time series from 1990 to the latest reporting year, which shall be no more than two years prior to the submission of the NIR (high priority)
NIR – energy		
3.E_CBN.1	Specified in paragraph 23 of the MPGs	Strengthening the institutional capacity for developing a national study for estimating a country-specific CH ₄ EF for the combustion of biomass (firewood) in the residential sector (medium priority)
3.E_CBN.2 ^b	Specified in paragraphs 27 and 57–58 of the MPGs	Strengthening coordination between data providers and inventory compilers to deliver reports within a time frame of less than or equal to two years and facilitate the use of splicing techniques provided in the 2006 IPCC Guidelines to complete the time series (medium priority)
NIR – industrial processes and product use		
NA	NA	No capacity-building needs identified
NIR – agriculture		
NA	NA	No capacity-building needs identified
NIR – LULUCF		
6.L_CBN.1 ^a	Specified in paragraphs 21 and 39 of the MPGs	Developing the ability to construct consistent representation of lands and land uses for the entire time series using satellite data and information available from national or international sources (high priority)
NIR – waste		
7.W_CBN.1	Specified in paragraphs 23 and 39 of the MPGs	Supporting the development of expertise in transforming the existing data-collection mechanism (e.g. statistical surveys) into a system for collecting relevant AD and country-specific parameters on the management, generation and composition of urban and rural solid waste and wastewater (high priority)
Information necessary to track progress in implementing and achieving the NDC under Article 4 of the Paris Agreement		
8_CBN.1 ^b	Specified in paragraph 60 of the MPGs	Enhancing national capacity to improve the understanding of how national circumstances affect GHG emissions and removals and the fulfilment of NDC targets (medium priority)
11_CBN.1	Specified in paragraph 83(a) of the MPGs	Strengthening national capacities to update and standardize methodologies for costing mitigation measures (medium priority)
11_CBN.2 ^{a, b}	Specified in paragraph 85 of the MPGs	Enhancing national capacity to facilitate the measurement and reporting of the mitigation impacts of PaMs (high priority)
11_CBN.3	Specified in paragraph 86 of the MPGs	Enhancing national and institutional capacity to develop the ability to understand, evaluate and report on the methodologies and assumptions used to estimate, with the use of modelling tools, the GHG emission reductions or removals expected and achieved by each policy and measure (high priority)
11_CBN.4 ^b	Specified in paragraph 89 of the MPGs	Strengthening the national capacity to use indicators for assessing the impacts of PaMs on long-term trends in GHG emissions and removals (medium priority)
13_CBN.1 ^{a, b}	Specified in paragraphs 94–95 of the MPGs	Strengthening institutional and sectoral capacity to develop projections, including under a ‘with additional measures’ scenario, and to extend them at least 15 years beyond the next year ending in zero or five and beginning with the most recent year of the NIR, in a timely manner for BTR reporting (medium priority)

<i>ID#</i>	<i>Reporting requirement</i>	<i>Area in which capacity-building is needed</i>
13_CBN.2 ^{a, b}	Specified in paragraph 96(d) of the MPGs	Strengthening institutional capacity to enable the reporting of a sensitivity analysis for the projections (medium priority)
13_CBN.3 ^b	Specified in paragraph 97 of the MPGs	Strengthening capacity, through the exchange of good practices, for monitoring deforestation and including the effects of mitigation measures in the modelling of projections for indicator 2 (change in the area covered by natural forest) (medium priority)
13_CBN.4 ^{a, b}	Specified in paragraph 97 of the MPGs	Increasing technical capabilities to incorporate black carbon in national atmospheric emission projection models and advance the development of methodologies for assessing the effects of mitigation measures on black carbon emissions to allow projections to be developed for indicator 3 (progress in reducing carbon black emissions) (medium priority)

^a Capacity-building need identified by the TERT in consultation with the Party relating to the flexibilities applied by it as per the MPGs.

^b Capacity-building need identified by the Party in its BTR1.

Annex

Documents and information used during the review

A. Reference documents

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BTR1 CTF tables of Colombia.

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B. Additional information provided by the Party

Responses to questions during the review were received from Leonardo Pineda (Institute of Hydrology, Meteorology and Environmental Studies of Colombia), including additional material. The following references were provided by Colombia and may not conform to UNFCCC editorial style as some have been reproduced as received:

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