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Report on the individual review of the inventory submission of Türkiye submitted in 2023*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). This report presents the results of the individual review of the 2023 inventory submission of Türkiye, conducted by an expert review team in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories". The review took place from 2 to 7 October 2023 in Ankara.

* In the symbol for this document, 2023 refers to the year in which the inventory was submitted, not to the year of publication.

Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
Annex I Party	Party included in Annex I to the Convention
BOD	biochemical oxygen demand
C	carbon
C_2F_6	hexafluoroethane
CF_4	carbon tetrafluoride
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
COPERT	software tool for calculating road transport emissions
CRF	common reporting format
DOM	dead organic matter
EF	emission factor
ERT	expert review team
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	statistical database of the Food and Agriculture Organization of the United Nations
F-gas	fluorinated gas
$Frac_{LEACH-(H)}$	fraction of nitrogen input to managed soils that is lost through leaching and run-off
GE	gross energy intake
GHG	greenhouse gas
GWP-100	100-year time-horizon global warming potential values
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MBT	mechanical biological treatment
MENR	Ministry of Energy and Natural Resources of Türkiye
MMS	manure management system(s)
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride

NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
SF_6	sulfur hexafluoride
SOC	soil organic carbon
SOM	soil organic matter
SWDS	solid waste disposal site(s)
TAM	typical animal mass
TOW	total organic load in wastewater
TurkStat	Turkish Statistical Institute
UNECE	United Nations Economic Commission for Europe
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
Y_m	methane conversion rate

I. Introduction

1. This report covers the review of the 2023 inventory submission of Türkiye, organized by the secretariat in accordance with the UNFCCC review guidelines, particularly part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (annex to decision 13/CP.20). The review took place from 2 to 7 October 2023 in Ankara, and was coordinated by Javier Hanna Figueroa and Claudia do Valle (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Türkiye.

Table 1
Composition of the expert review team that conducted the review for Türkiye

Area of expertise	*Name*	*Party*
Generalist	Roberto Acosta Moreno	Cuba
Energy	Dario Gómez	Argentina
IPPU	Ioannis Sempos	Greece
Agriculture	Olga Gavrilova	Estonia
LULUCF	Iordanis Tzamtzis	Greece
Waste	Ivan Chirino-Valle	New Zealand
	Hans Oonk	Kingdom of the Netherlands
Lead reviewers	Dario Gómez	
	Ioannis Sempos	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2023 inventory submission in accordance with the UNFCCC review guidelines.

3. The ERT has made recommendations that Türkiye resolve identified findings related to issues.[1] Other findings, and, if applicable, the encouragements of the ERT to Türkiye to resolve related issues, are also included in this report.

4. A draft version of this report was communicated to the Government of Türkiye, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

5. Annex I presents the annual GHG emissions of Türkiye, including totals excluding and including LULUCF, indirect CO_2 emissions and emissions by gas and by sector.

II. Summary and general assessment of the Party's 2023 inventory submission

6. Table 2 provides the assessment by the ERT of the Party's 2023 inventory submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
Summary of review results and general assessment of the 2023 inventory submission of Türkiye

Assessment		*Issue ID#(s) in table 3 or 5[a]*
Date of submission	Original submission: NIR, 14 April 2023; CRF tables (version 1), 14 April 2023	
Review format	In country	
Source of GWP-100	IPCC Fourth Assessment Report	

[1] Issues are defined in decision 13/CP.20, annex, para. 81.

Assessment			*Issue ID#(s) in table 3 or 5*[a]
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	Yes	L.24
	(b) Selection and use of methodologies and assumptions?	Yes	E.17, I.28, I.33, A.5, A.6, L.7
	(c) Development and selection of EFs?	Yes	I.24, A.14, L.14, L.33, W.1, W.2, W.7
	(d) Collection and selection of AD?	Yes	E.4, E.23, E.24, I.18, I.19, I.23, I.30, I.32, I.36, A.10, L.6, L.16, L.22, L.26
	(e) Reporting of recalculations?	Yes	G.4
	(f) Reporting of a consistent time series?	Yes	E.7, E.13, E.19, E.20, L.4, L.5, L.26
	(g) Reporting of uncertainties, including methodologies?	Yes	E.8, L.23, L.28
	(h) QA/QC?	Yes	G.3, L.1, L.2, L.12
	(i) Missing categories, or completeness?[b]	Yes	E.16, E.18, E.25, I.9, I.22, I.25, I.27, I.29, I.34, I.35, A.15, A.17, L.15, L.21, L.31, L.35
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	No	A.16, L.18, L.20, L.35
National inventory arrangements	Have any issues been identified with the effectiveness and reliability of the institutional, procedural and legal arrangements for estimating GHG emissions?	No	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	L.17
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for assessing conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	

[a] Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.
[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex II.

III. Status of implementation of recommendations included in the previous review report

7. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 5 May 2022,[2] and had not been resolved by the time of publication of the report on the review of the Party's 2021 inventory submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances.

Table 3
Status of implementation of recommendations included in the previous review report for Türkiye

ID#	*Issue classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
General			
G.1	NIR (G.2, 2021) (G.1, 2019) (G.6, 2018) Transparency	Improve the transparency of the reported information on the key drivers of the PFC emission trends by providing in NIR chapter 2 detailed information, in particular on the decrease in PFC emissions in recent years.	Resolved. The Party provided in NIR chapter 2 (p.31) an explanation of the key drivers of the decreasing trend in PFC emissions (i.e. a change in aluminium production system from the Søderberg process to prebaked cell technology in 2015 and a decline in the number of anode effects after switching to a prebaked smelter system). In NIR section 4.4.3 (pp.210–211), the Party provided more detailed explanations for the decreasing trends in PFC emissions observed between 2014 and 2015 and from 2016 onward, noting that, in addition to the above-mentioned drivers, total aluminium production in the country decreased.
Energy			
E.1	Fuel combustion – reference approach – all fuels – CO_2 (E.24, 2021) Comparability	Report apparent energy consumption excluding non-energy use, reductants and feedstocks of liquid, solid and gaseous fuels in the reference approach for 2018–2019 in CRF table 1.A(c).	Not resolved. The Party did not report apparent energy consumption excluding non-energy use, use as reductants and feedstocks of liquid, solid and gaseous fuels in the reference approach for 2018–2021 in CRF table 1.A(c) and left the corresponding cells blank. During the review, the Party clarified that the correct apparent energy consumption will be reported in the next GHG inventory submission.
E.2	Feedstocks, reductants and other non-energy use of fuels – liquid fuels – CO_2 (E.3, 2021) (E.4, 2019) (E.6, 2018) (E.54, 2016) (E.54, 2015) Transparency	Include explanations in the documentation box of the relevant CRF table and in the NIR for fuels with non-energy use consumption reported without any associated emissions reported in the inventory.	Resolved. The Party provided (1) information on the alternative allocation of fuels with non-energy use consumption in the documentation box of CRF table 1.A(d) and (2) explanations regarding the non-energy use of fuels in the NIR (p.64). NIR table 3.14 (p.64) provides a summary of the use of fuels as feedstocks, reductants and other non-energy uses, the associated category where they are reported and the source of information for the following fuels: coke, coke oven coke, coking coal, naphtha, natural gas and other oil. Under other oil the Party aggregated bitumen, lubricants, refinery feedstock and solvents.

[2] FCCC/ARR/2021/TUR. The ERT notes that the report on the review of Türkiye's 2022 inventory submission has not been published yet owing to insufficient funding for the review process. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2021 inventory submission.

ID#	*Issue classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
E.3	Feedstocks, reductants and other non-energy use of fuels – liquid fuels – CO_2 (E.4, 2021) (E.19, 2019) Convention reporting adherence	Check the notation keys used in CRF tables 1.A(b) and 1.A(d) for reporting CO_2 emissions from bitumen and correct them, as appropriate, including by providing explanations for the use of the notation keys in their documentation boxes.	Resolved. The Party reported bitumen as "IE" in CRF tables 1.A(b) and 1.A(d) and provided information on the alternative allocation of this fuel in the documentation box of CRF table 1.A(d). In the NIR (p.64), the Party indicated that bitumen was included under other oil in the reference approach. Further information was reported in NIR table 3.14 (see ID# E.2 above).
E.4	International bunkers and multilateral operations – liquid fuels – CO_2, CH_4 and N_2O (E.5, 2021) (E.5, 2019) (E.8, 2018) (E.19, 2016) (E.19, 2015) (39, 2014) (25, 2013) Accuracy	Determine a reliable data source for international bunker fuels and improve time-series consistency.	Addressing. The Party reported in its NIR (p.60) that the AD for international aviation were taken from the national energy balance. The ERT noted that these AD, which were reported in CRF table 1.D, have no apparent time-series inconsistencies. The Party reported in its NIR (p.62) that the AD for international navigation were provided by the Energy Market Regulatory Authority. Fuel consumption of gas/diesel oil and residual fuel oil used in international navigation continued to exhibit the time-series inconsistencies observed in previous reviews. These inconsistencies were particularly noticeable for gas/diesel oil in 2002–2006, during which the AD (11,911.00–24,252.00 TJ) were three to five times higher than those for both 1990–2001 and 2007–2019. In 2007–2019, the AD of residual fuel oil showed significant decreases of up to 18.9 per cent (between 2008 and 2009) and significant increases of up to 37.3 per cent (between 2009 and 2010). The NIR (pp.62–64) does not include an explanation for these time-series inconsistencies but states that a comparison was made of the AD for international navigation reported by the Energy Market Regulatory Authority with those reported by the General Directorate of Petroleum Affairs to the IEA. During the review, the Party clarified that the data provided by the Energy Market Regulatory Authority were consistent with those reported in the national energy balance and data from the General Directorate of Petroleum Affairs. Furthermore, Türkiye indicated that it will discuss the indicated above inconsistencies in the data with the relevant institutions and correct them in the next GHG inventory submission. The ERT considers that the recommendation has not yet been fully addressed because while the Party has identified reliable data sources for international bunkers, it has not yet resolved time-series inconsistencies in the international navigation AD.
E.5	1.A Fuel combustion – sectoral approach – solid fuels – CO_2 (E.6, 2021) (E.20, 2019) Transparency	Investigate the accuracy of the country-specific CO_2 EF for lignite and provide a reference in the NIR to the relevant background documentation or study describing the methodology for determining the CO_2 EF, and revise, as appropriate, the CO_2 EF, if inaccuracies are identified.	Resolved. The Party provided in its NIR (p.72) a brief description of how it determined the carbon contents of and oxidation factors for solid fuels, including lignite. For 1990, 2000, 2010, 2015 and 2018–2021, NIR table 3.5 (p.50) lists the carbon contents of lignite and other solid, liquid and gaseous fuels, while NIR table 3.6 (p.51) lists the oxidation factors for lignite, diesel oil, fuel oil and hard coal. In annex 3 to the NIR (pp.486–490), the Party provided a detailed description of the standard methodology used for determining the CO_2 EFs of lignite and other solid and liquid fuels by determining the carbon content (through elemental analysis of the fuel), oxidation factor (through ash content analysis) and NCV (through calorimetry). The values for the country-specific CO_2 EFs for lignite, which lay in the range 104.08–114.12 t CO_2/TJ, were deemed accurate in the sense that (1) while they were higher than the

ID#	Issue classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			corresponding IPCC default CO_2 EF (101.0 t CO_2/TJ), they lay within the corresponding 95 per cent confidence interval (90.9–115.0 t CO_2/TJ) and (2) they exhibited the expected inverse relationship with the corresponding NCVs.
E.6	1.A Fuel combustion – sectoral approach – solid, liquid, gaseous and other fossil fuels – CO_2 (E.8, 2021) (E.22, 2019) Transparency	Provide relevant information in the NIR on the methodology used for determining the country-specific oxidation factors and on the applicability of the analysis reports for solid fuels and the stack gas analysis reports to all fuel combustion activities, including domestic/residential.	Addressing. The Party provided in its NIR (p.66 and pp.486–490) a description of the method used to calculate oxidation factors for fuels used in public electricity and heat production. In NIR table 3.6 (p.51), the Party reported the values of the estimated country-specific oxidation factors for hard coal (0.975–0.988), lignite (0.950–0.973), and residual fuel oil and diesel oil (0.984) for nine selected years between 1990 and 2021. However, the Party did not explain why oxidation factors derived from power plant combustion technologies and conditions were applicable to other inventory categories or subcategories, particularly 1.A.4.b residential and 1.A.4.a commercial/institutional. During the review, the Party confirmed that results from an elemental analysis of fuels for ash, carbon content, hydrogen, sulfur, oxygen moisture, volatile substance contents and calorific values obtained from coal-fired plants were used to calculate the oxidation factor for solid fuels. The ERT considers that the recommendation has not yet been fully addressed because while the Party has provided information on the method used to estimate country-specific oxidation factors for electricity and heat production, it has not yet provided information on the applicability of these oxidation factors to combustion conditions other than those in thermal power and heating plants.
E.7	1.A.1.a Public electricity and heat production – gaseous fuels – N_2O (E.9, 2021) (E.7, 2019) (E.23, 2018) Consistency	Determine an appropriate methodology for addressing the data gaps in the technology split for gaseous fuel combustion prior to 2003 in order to ensure consistency in the time series.	Not resolved. The ERT noted that the N_2O IEFs for gaseous fuels reported for this subcategory remained constant at 0.10 kg/TJ between 1990 and 2002, and then increased to 2.82 kg/TJ in 2003. The Party indicated in its NIR (p.72) that for estimating N_2O (and CH_4) emissions from public electricity and heat production, tier 3 EFs from table 2.6 of the 2006 IPCC Guidelines (vol. 2, chap. 2, p.2.25) were used for 2000 onward, while tier 1 default N_2O EFs (and CH_4) were used for earlier years of the time series. The ERT noted that (1) the 2006 IPCC Guidelines indicate that the technology-specific EFs in table 2.6 are provided for example purposes and national experts working on detailed bottom-up inventories may use these factors as a starting point or for comparison and (2) these EFs are representative of uncontrolled emissions for each of the technologies indicated and most of them come from a 2005 United States Environmental Protection Agency source. Consequently, the adopted EFs may not be representative of Turkish power plant technologies and practices between 2000 and 2021. During the review, the Party clarified that for 2000–2021, for each power plant, data on fuel type, technology type, electricity generation output, amount of fuel for combined heat and power generation, amount of fuel for sold heat, amount of fuel for unsold heat and amount of fuel for electricity generation were obtained from the Turkish Electricity Transmission Corporation. However, for earlier years of the time series, information on the technologies used in power plants is not available and the Party has not yet identified an appropriate method to address these data gaps and thus allow for the application of a consistent higher-tier estimation method throughout the time series.

ID#	*Issue classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
			In this regard, the ERT noted that Annex I Parties preparing emission estimates using tier 3 methods are required by the UNFCCC Annex I inventory reporting guidelines to provide verification information in the NIR that is consistent with the 2006 IPCC Guidelines. The ERT also noted that because N_2O (and CH_4) emissions from public electricity and heat production have not been identified as key categories, the use of a tier 1 method is in accordance with IPCC good practice. The ERT considers that the recommendation has not yet been addressed because the Party did not determine an appropriate methodology for ensuring consistency in the time series and the accuracy of the EFs used for N_2O (and CH_4) emission estimates for gaseous fuels. The Party informed the ERT that it will reconsider the issue and determine the most appropriate way to address it.
E.8	1.A.1.a Public electricity and heat production – solid, liquid, gaseous and other fossil fuels – CH_4 and N_2O (E.10, 2021) (E.8, 2019) (E.24, 2018) Convention reporting adherence	Use in the uncertainty analysis documented country-specific values for the uncertainty of CH_4 and N_2O EFs, in particular for EFs that are country- or plant-specific, or, if this is not possible, choose and use appropriate default uncertainty values for CH_4 and N_2O EFs and document the values selected and associated assumptions in the NIR.	Not resolved. The Party reported in its NIR (p.79) that uncertainties for CH_4 and N_2O EFs are those default uncertainty mid-range values provided in table 2.12 of the 2006 IPCC Guidelines (vol. 2, chap. 2, p.2.38), with these values being 100 per cent for both CH_4 and N_2O. However, in its uncertainty analysis, the Party reported in NIR table A6 uncertainties of 25 per cent for the CH_4 EF (p.461) and 75 per cent for the N_2O EF (p.463) for each fuel type used in subcategory 1.A.1.a. The ERT noted that, according to the NIR of the 2018 GHG inventory submission (p.79), these uncertainty values were the example values reported for the Kingdom of the Netherlands (25 per cent for the CH_4 EF and 75 per cent for the N_2O EF) taken from table 2.14 of the 2006 IPCC Guidelines (vol. 2, chap. 2, p.2.40). When the issue was originally identified in 2018 (FCCC/ARR/2018/TUR, ID# E.24), these uncertainty values were considered unlikely to be representative for Türkiye. The ERT agrees with this assessment. During the 2021 review, the Party stated that it will use default values or develop country-specific values, as recommended (FCCC/ARR/2021/TUR, ID# E.10). During the review, the Party informed the ERT that it is planning to consider the use of default values for the uncertainty analysis. The ERT considers that the recommendation has not yet been addressed because the Party has not yet implemented either of the two options (using country-specific or correct default values) in its uncertainty analysis.
E.9	1.A.1.a Public electricity and heat production – solid, liquid, gaseous and other fossil fuels, and biomass – CO_2, CH_4 and N_2O (E.11, 2021) (E.9, 2019) (E.25, 2018) Comparability	Investigate how to allocate emissions from autoproducers of electricity to the category relevant to where the electricity is generated in accordance with the 2006 IPCC Guidelines.	Not resolved. The Party indicated in its NIR (p.68) that the AD of autoproducers of electricity and heat sold to the market were allocated to subcategory 1.A.1.a, while the AD for unsold heat were allocated to the corresponding subcategory under 1.A.2 manufacturing industries and construction for the entire time series. In the case of subcategory 1.A.1.a, plant-specific AD were collected from the Turkish Electricity Transmission Corporation. During the review, the Party informed the ERT that, owing to New Electricity Market Law 6446, autoproducers have become the primary producers of electricity and, in order to ensure that consistent data sets are used in the GHG inventory, the Party decided to allocate all emissions from autoproducers to category 1.A.1.a. In addition, the Party clarified that in the national energy balance, the electricity and heat production of autoproducers to be sold to the market is included under the public electricity and heat production item. The ERT considers that the recommendation

ID#	*Issue classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
			has not yet been addressed because although the above-mentioned law redefined the concept of autoproducers, the Party has access to disaggregated information from the Turkish Electricity Transmission Corporation that would allow for the allocation of emissions from autoproducers in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines.
E.10	1.A.1.b Petroleum refining – liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.12, 2021) (E.10, 2019) (E.12, 2018) (E.56, 2016) (E.56, 2015) Transparency	Improve the transparency of the reporting by including a comparison of facility-level data with the sectoral totals from the national energy balance in the NIR.	Addressing. While the Party did not provide a comparison of facility-level data with sectoral totals from the national energy balance in the NIR, it indicated (NIR, p.81) that, as part of its QA/QC plan, plant-specific data were cross-checked against country-specific information and IPCC default values; in particular, emissions reported by refineries were compared with emission estimates made using data from the national energy balance. For 2021, a difference of 23 per cent was identified. The Party considered it plausible to assume that the difference arises from process gases that are used as fuel in refineries but could not have been identified in the national energy balance. The Party reported in its NIR (pp.80–81) that a tier 2 method was used to estimate CO_2 emissions from petroleum refining using plant-specific data on fuel consumption, NCV and carbon content of fuels for 1990–2017. For 2018–2021, CO_2 emissions were taken directly from plant-reported data. CH_4 and N_2O emissions for 1990–2021 were estimated by using the refineries' total fuel consumption, average NCVs from all refineries and default EFs from the 2006 IPCC Guidelines (vol. 2, chap. 2, pp.2.16–2.17). During the review, the Party clarified that owing to the changes in the calculation method and source of AD, it plans to conduct a comparison of facility-level data with the corresponding totals from the energy balance after reviewing the emissions for this subcategory, the findings of which will likely be reported in the next GHG inventory submission. The ERT considers that the recommendation has not yet been fully addressed because although the Party reported some details of a comparison of plant-specific data with country-specific information and IPCC default values, compared emissions reported by refineries with emission estimates made using data from the national energy balance and attributed the identified difference in emissions to the use of process gases not reported in the energy balance, it did not report details or the results of the comparison of the data of those fuels used by refineries that are reported in the energy balance with the corresponding facility-level data.
E.11	1.A.1.b Petroleum refining – liquid fuels – CO_2 (E.13, 2021) (E.23, 2019) Transparency	Provide relevant information in the NIR regarding the large inter-annual change in the CO_2 IEF for liquid fuels between 2015 and 2016.	Not resolved. The Party did not provide information in the NIR regarding the large inter-annual change in the CO_2 IEF between 2015 and 2016, which amounted to 10.91 t/TJ (67.90 t CO_2/TJ in 2016 versus 56.99 t CO_2/TJ in 2015). In the 2021 review report (FCCC/ARR/2021/TUR), it is stated that the Party indicated that the difference was due to the addition of a new fuel with a high carbon content, as reported by the refinery in question. During the review, the Party clarified that the new fuel, which started to be used in 2016, was sequential pressure-swing adsorption off-gas, or 'tail-gas', resulting from the pressure-swing adsorption pressurization/depressurization purification process. The ERT considers that the recommendation has not yet been addressed because the Party has not yet provided in the NIR an explanation of the impact of the use of

ID#	*Issue classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
			pressure-swing adsorption off-gas on the inter-annual change in the CO_2 IEF for liquid fuels between 2015 and 2016.
E.12	1.A.2 Manufacturing industries and construction – liquid, solid and gaseous fuels – CO_2 (E.14, 2021) (E.11, 2019) (E.13, 2018) (E.34, 2016) (E.34, 2015) (51, 2014) Transparency	Provide sufficient information on the inter-annual changes in the CO_2 EFs in the NIR.	Resolved. The Party reported in its NIR (p.86) that the inter-annual changes in CO_2 EFs are largely related to the variability in the use of the different types of fuels aggregated under liquid and solid fuels by the diverse industries composing this category and the varying carbon content of natural gas purchased from different countries. The ERT noted that, in general, the CO_2 IEFs were consistent with the range of the values of country-specific carbon contents for the fuels and years reported in NIR table 3.5 (p.50). The ERT considers that the information provided by the Party is sufficient and the issue is resolved.
E.13	1.A.2 Manufacturing industries and construction – liquid, solid and gaseous fuels, and biomass – CO_2, CH_4 and N_2O (E.15, 2021) (E.12, 2019) (E.26, 2018) Consistency	Improve the comparability and consistency of the inventory and separate the emissions from pulp, paper and print (1.A.2.d), food processing, beverages and tobacco (1.A.2.e) and non-metallic minerals (1.A.2.f) from the emissions reported for subcategory 1.A.2.g other (manufacturing industries and construction) for the entire time series.	Addressing. The Party reported in CRF table 1.A(a) (sheet 2) emissions for subcategory 1.A.2.f non-metallic minerals separately from subcategory 1.A.2.g other (manufacturing industries and construction). It reported in CRF table 1.A(a) (sheet 2) emissions for 1.A.2.d pulp, paper and print under 1.A.2.g other for 1990–2010 and under the proper subcategory (1.A.2.d pulp, paper and print) from 2011 onward. The Party reported in its NIR (p.83) that subcategory 1.A.2.e food processing, beverages and tobacco covered different industries with different contributions across the time series: for 1990–2010, only sugar production was included, and from 2011 onward, all food processing industries were included, while beverages and tobacco were included under subcategory 1.A.2.g other for the whole time series. The Party reported in its NIR (pp.83–84) that for 2015–2021, the subcategories under manufacturing industries and construction were allocated in line with the reporting subcategories in the CRF tables because the national energy balance provided energy consumption data with adequate disaggregation. The Party also reported in the NIR (p.89) that this allocation was based on information reported in the national energy balance, which was not entirely consistent across the time series, and that all relevant institutions in the recent past started to work together to overcome the problem of inconsistency as part of a planned improvement. However, during the review, the Party indicated that MENR, which is responsible for the preparation of national energy balances, does not intend to carry out this planned improvement in the near future. The Party explained that the improvement may instead be implemented by TurkStat in the near future by using statistical methods for subcategory separation. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully separated the emissions from subcategories 1.A.2.d and 1.A.2.e from the emissions reported for subcategory 1.A.2.g for the entire time series
E.14	1.A.2.a Iron and steel – liquid fuels – CH_4 and N_2O (E.16, 2021) (E.13, 2019)	Include information on significant changes in the trend in AD composition for the different shares of oil products and on how these impact the CH_4 and N_2O IEFs.	Not resolved. The Party reported total liquid fuel consumption for 1990–2021 in its NIR (p.90) but did not report how this total fuel consumption was broken down into the different types of liquid fuel used over the time series. The ERT noted that inclusion of the variability in the use of each liquid fuel over the time series would have allowed the

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	(E.14, 2018) (E.57, 2016) (E.57, 2015) Transparency		Party to explain the fuel's impact on CH_4 and N_2O IEF values. The ERT also noted that (1) Türkiye used IPCC default CH_4 and N_2O EFs to estimate emissions from iron and steel production; (2) in 1990–2007, CH_4 and N_2O IEFs were constant and equal to the corresponding IPCC default EF values for manufacturing industries and construction for liquid fuels (3.00 kg/TJ for the CH_4 EF and 0.60 kg/TJ for the N_2O EF), which are in the liquid phase at standard reference conditions (288.15 K and 101.325 kPa); (3) in 2008, the CH_4 IEF decreased to 2.79 kg/TJ and the N_2O IEF to 0.55 kg/TJ, from the IPCC EF default values respectively, marking the likely introduction of LPG in the fuel mix consumed by the industry; (4) notable decreases in IEFs also occurred for 2011 and 2012 (the CH_4 IEF with a value of 2.18 kg/TJ in 2011 decreased to 1.40 kg/TJ in 2012; and the N_2O IEF with a value of 0.40 kg/TJ in 2011 decreased to 0.20 kg/TJ in 2012); and (5) in 2017–2021, the IEFs were close to IPCC default EFs (values in the range of 2.85–2.97 kg/TJ for CH_4 and 0.56–0.60 kg/TJ for N_2O). During the review, the Party clarified that diesel oil and LPG consumption contributing to the total fuel consumption of liquid fuels fluctuated, which affected the CH_4 and N_2O IEFs. The ERT considers that the recommendation has not yet been addressed because the Party has not yet included in the NIR relevant information on significant changes in the trend in AD composition for the different shares of oil products and on how these impact the CH_4 and N_2O IEFs.
E.15	1.A.2.c Chemicals – solid fuels – CO_2, CH_4 and N_2O (E.25, 2021) Convention reporting adherence	Report the consumption of solid fuels for 2019 using the correct unit of measurement, namely TJ, in CRF table 1.A(a) (sheet 2).	Resolved. The Party reported the consumption of solid fuels for 2019 in TJ in CRF table 1.A(a) (sheet 2).
E.16	1.A.3.a Domestic aviation – liquid fuels – CO_2, CH_4 and N_2O (E.17, 2021) (E.24, 2019) Completeness	Estimate emissions from aviation gasoline consumption in domestic aviation or report these emissions as "IE" if this consumption is included elsewhere, or alternatively, use "NE" in CRF table 1.A(a) (sheet 3) with a justification in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party did not estimate emissions from aviation gasoline consumption in domestic aviation and reported the use of aviation gasoline in CRF table 1.A(a) (sheet 3) as "NO" for 1990–2016 and as "IE" for 2017–2021. No information was reported in the NIR with regard to the reporting of this activity as "NO". In addition, neither the NIR nor CRF table 9 included any information on the alternative allocation of the use of aviation gasoline for 2017–2021. During the review, the Party indicated that the use of aviation gasoline was allocated under subcategory 1.A.3.b road transportation and informed the ERT that "NO" will be corrected to "IE" in the next GHG inventory submission. The ERT considers that the recommendation has not yet been fully addressed because the Party did not estimate emissions from aviation gasoline consumption in domestic aviation or report these emissions as "IE" for the complete time series (except for 2017–2021) and provide information on the alternative allocation of the use of this fuel, confirming that the resulting emissions were estimated and included in the GHG inventory.
E.17	1.A.3.b Road transportation – liquid	Move to a higher-tier method for calculating N_2O (and CH_4) emissions, as it is likely that	Not resolved. The Party reported in its NIR (p.121) that it continued to estimate CO_2 emissions from road transportation using a hybrid tier 1/tier 2 method (tier 1 for gasoline

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	fuels – CH_4 and N_2O (E.18, 2021) (E.14, 2019) (E.15, 2018) (E.43, 2016) (E.43, 2015) (58, 2014) Accuracy	subcategory 1.A.3.b would be a key category if using appropriate EFs.	and LPG and tier 2 for diesel oil and natural gas), while a tier 1 method was used to estimate CH_4 and N_2O emissions. When preparing the 2020 GHG inventory submission, the Party conducted an exercise to estimate GHG emissions for 2016–2018 using the COPERT V model. A comparison between the reported CO_2, CH_4 and N_2O emissions and those calculated using the model was reported in NIR table 3.44 (p.122) of the current GHG inventory submission. However, no information was reported on progress in implementing a higher-tier method, such as the use of the COPERT V model, to estimate CH_4 and N_2O emissions for the entire time series. During the review, the Party clarified that the Ministry of Transport and Infrastructure, together with other institutions, was working on preparing the input data required by COPERT V.
E.18	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O (E.19, 2021) (E.25, 2019) Completeness	Estimate emissions from gasoline consumption in domestic navigation or report these emissions as "IE" if this consumption is included elsewhere, or alternatively, use "NE" in CRF table 1.A(a) (sheet 3) with a justification in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party did not estimate emissions from gasoline consumption in domestic navigation. It reported the use of gasoline as "IE" for 2020 and 2021; "NO" was reported for 1990–2019, and no information was reported in the NIR with regard to the reporting of this activity as "NO" for these years. In addition, neither the NIR nor CRF table 9 included any information on the alternative allocation of the use of gasoline for 2020 and 2021. During the review, the Party indicated that the use of gasoline for domestic navigation was allocated under subcategory 1.A.3.b road transportation and informed the ERT that "NO" will be corrected to "IE" in the next GHG inventory submission. The ERT considers that the recommendation has not yet been fully addressed because the Party did not estimate emissions from gasoline consumption in domestic navigation or report these emissions as "IE" for the complete time series (except for 2020 and 2021) and provide information on the alternative allocation of the use of this fuel, confirming that the resulting emissions were estimated and included in the GHG inventory.
E.19	1.A.4 Other sectors – liquid, solid and gaseous fuels, and biomass – CO_2, CH_4 and N_2O (E.20, 2021) (E.15, 2019) (E.27, 2018) Comparability	Separate the emissions under subcategory 1.A.4.a commercial/institutional from the emissions reported under subcategory 1.A.4.b residential for the entire time series.	Not resolved. The Party did not separate the emissions under subcategory 1.A.4.a from the emissions reported under subcategory 1.A.4.b for the entire time series and it continued to report in CRF table 1.A(a) (sheet 4) the use of liquid, solid and gaseous fuels as "IE" for 1990–2014 under subcategory 1.A.4.a commercial/institutional. The NIR (p.131) indicates that the use of liquid, solid and gaseous fuels is allocated under 1.A.4.b residential because consumption of these fuels in commercial/institutional activities is not broken down in the national energy balance for 1990–2014, but is included under residential activities. In the NIR (p.134), no planned improvement was reported for this subcategory. During the review, the Party indicated that MENR, which is responsible for the preparation of national energy balances, does not intend to carry out the breakdown of fuel consumption between commercial/institutional and residential activities for 1990–2014 in the short term. Instead, in the near future, this improvement could be carried out by TurkStat by using statistical methods to separate the categories.
E.20	1.A.4.c Agriculture/forestry/ fishing – liquid fuels –	Revise the emission estimates, reallocating the diesel oil used for agricultural purposes to subcategory 1.A.4.c	Addressing. The Party reported in its NIR (p.137) that agricultural diesel oil consumption for 2015–2021 was estimated using a modelling approach developed by MENR based on a comparative analysis of total crop harvested area and petroleum

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	CO_2, CH_4 and N_2O (E.21, 2021) (E.16, 2019) (E.17, 2018) (E.37, 2016) (E.37, 2015) (54, 2014) Consistency	agriculture/forestry/fishing by using assumptions based on the historical trend of the ratio of diesel oil used for agriculture to the total diesel oil used in the country.	product consumption data of countries similar to Türkiye. However, the ERT noted that the diesel oil consumption reported in CRF table 1.A(a) (sheet 4) under subcategory 1.A.4.c agriculture/forestry/fishing continued to exhibit three distinct levels: (1) 79,826.24–208,431.48 TJ (1990–2011); (2) 41,162.81–38,728.13 TJ (2012–2014); and (3) 118,170.13–133,679.06 TJ (2015–2021). The decrease between 2011 and 2012, as explained in the NIR (p.136), was due to a change in diesel oil consumption associated with the sulfur content of the fuel. Until 2011, Turkish regulations provided for two types of diesel oil based on the maximum allowable sulfur content: diesel oil intended for road transportation (sulfur content up to 10 mg/kg) and rural diesel oil (maximum sulfur content up to 1,000 mg/kg). After 2011, a single maximum content of 10 mg/kg was established and differentiation of diesel oil for rural and road transportation on the basis of sulfur content was no longer possible. As a consequence, diesel oil intended for rural use was allocated to road transportation in the national energy balance, which was reflected in the above-mentioned decrease in diesel consumption in subcategory 1.A.4.c. The ERT noted, however, that the modelled diesel oil consumption levels for 2015–2021 were in the order of those reported for 2003–2006, which ranged from 116,038.60 to 135,148.62 TJ, and were 34.4–43.6 per cent lower than consumption levels in 2011. During the review, the Party indicated that MENR, which is responsible for the preparation of national energy balances, does not intend to carry out the breakdown of diesel oil consumption between diesel intended for road transportation and that for rural use for 2012–2014 in the short term. Instead, in the near future, this improvement could be carried out by TurkStat by using statistical methods to separate the categories. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reallocated the use of diesel oil for agricultural purposes to subcategory 1.A.4.c for 2012 onward, or at least for 2012–2014, in a consistent manner.
E.21	1.A.4.c Agriculture/forestry/fishing – liquid fuels – CO_2, CH_4 and N_2O (E.22, 2021) (E.17, 2019) (E.18, 2018) (E.37, 2016) (E.37, 2015) (54, 2014) Transparency	Provide a clear explanation in the NIR of the allocation of diesel oil used for agricultural purposes to subcategory 1.A.4.c agriculture/forestry/fishing, using assumptions based on the historical trend of the ratio of diesel oil used for agriculture to the total diesel oil used in the country.	Resolved. The Party provided in its NIR (p.137) a clear explanation of the allocation of diesel oil for agricultural purposes to subcategory 1.A.4.c agriculture/forestry/fishing. However, the ERT noted that there are still issues with the allocation of diesel oil used for agricultural purposes (see ID# E.20 above).
E.22	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.23, 2021) (E.26, 2019) Transparency	Present in the NIR the assumptions regarding the treatment of lignite as sub-bituminous coal; report the number of abandoned underground coal mines per type of coal and their respective years of closure.	Not resolved. The Party did not report in its NIR the assumptions underlying the treatment of lignite as sub-bituminous coal nor did it report the number of abandoned underground coal mines per type of coal and their respective years of closure. During the review, the Party clarified that according to a coal analysis made by MENR, the low quality of Turkish lignite means it can be assumed to be sub-bituminous coal. The Party also provided the ERT with information on each closed underground coal mine, including its name, type of coal mined and year of closure, and informed the ERT that the number of abandoned underground coal mines will be added to the NIR.

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IPPU			
I.1	2. General (IPPU) (I.29, 2021) Convention reporting adherence	Review and, if necessary, revise the text in the NIR (chap. 10, p.456) on the recalculations performed for categories 2.E electronics industry and 2.F product uses as substitutes for ozone-depleting substances, and change the title of figure 4.9 in the NIR to indicate that it shows total GHG emissions (CO_2, CH_4 and N_2O) and not just CO_2 emissions.	Resolved. The Party reported transparently in NIR chapter 10 (pp.431–432) a complete summary of the recalculations performed for the 2023 GHG inventory submission. The ERT did not identify any errors in the titles of figures and tables in the IPPU chapter of the NIR.
I.2	2. General (IPPU) (I.30, 2021) Transparency	Explain in CRF table 9 the notation keys used for CO_2 and CH_4 emissions for subcategory 2.B.8.b ethylene in CRF table 2(I).A-H (sheet 1), and for HFC emissions (except HFC-134a) from manufacturing for category 2.F.6 other applications in CRF table 2(II).B-H (sheet 2).	Addressing. The Party provided a relevant explanation in CRF table 9 for most categories and subcategories of the IPPU sector for which it used the notation keys "NE" and "IE" to report emissions, including subcategory 2.B.8.b ethylene. However, it did not include explanations for the use of "IE" to report HFC emissions (except HFC-134a) from manufacturing for category 2.F.6 other applications. During the review, the Party indicated that it provided explanations for the use of notation keys for relevant gases in CRF table 9.
I.3	2.A.1 Cement production – CO_2 (I.31, 2021) Convention reporting adherence	Complete the information on CO_2 emissions and AD (e.g. clinker and cement production) for all years, including 2019, in NIR table 4.3.	Resolved. The Party reported in NIR table 4.4 (p.157), which corresponds to NIR table 4.3 of the 2021 GHG inventory submission, complete information about CO_2 emissions and AD for all relevant years, including 2019–2021, for this category.
I.4	2.A.2 Lime production – CO_2 (I.3, 2021) (I.2, 2019) (I.2, 2018) (I.2 and I.10, 2016) (I.2 and I.10, 2015) (72, 2014) Completeness	Include captive lime production emissions in the estimates for this category.	Resolved. The Party reported in its NIR (p.159) that, on the basis of information received from the Turkish Sugar Refineries Corporation, which currently operates 15 sugar factories in the country with processing capacities ranging from 1,750 to 8,500 t sugar beet per day, lime used in the treatment process is produced in the lime quarries at the factory sites. The CO_2 emitted during the decomposition of limestone into lime is reabsorbed into lime cake and emissions are balanced by the CO_2 sink associated with sugar production. During the review, the Party clarified that an examination of data on the sugar refining and pulp and paper industries from the Turkish monitoring, reporting and verification system for GHG emissions did not detect emission sources related to the use of lime. In this system, more than 700 plants submit verified annual emission data in line with the requirements of the Ministry of Environment, Urbanization and Climate Change.
I.5	2.A.2 Lime production – CO_2 (I.4, 2021) (I.3, 2019) (I.3, 2018) (I.47, 2016)	Provide evidence of the 100 per cent CO_2 recovery rate associated with lime use during sugar refining and precipitate production in the NIR (any proven and validated method used to calculate the amount of CO_2 that	Resolved. The Party reported in its NIR (p.159) that, based on information received from the Turkish Sugar Refineries Corporation, the CO_2 emitted during the decomposition of limestone into lime is fully reabsorbed. During the review, the Party clarified that data on the sugar refining and pulp and paper industries from the Turkish

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	(I.47, 2015) Completeness	reacts with lime to reform calcium carbonate or the amount of CO_2 that is not recarbonated to limestone in the refining process can be provided as evidence), or report the CO_2 emissions from the lime produced in sugar mills together with the emissions from marketed lime under the lime production category.	monitoring, reporting and verification system for GHG emissions were examined and no emission sources related to the use of lime were detected (see ID# I.4 above).
I.6	2.A.2 Lime production – CO_2 (I.32, 2021) Convention reporting adherence	Correct the CO_2 emissions from lime production in NIR table 4.5 and report values for all years, including 2018–2019, that are consistent with the values in CRF table 2(I).A-H (sheet 1).	Resolved. The Party corrected information in NIR table 4.5 (p.161) by reporting values for AD, country-specific EFs and CO_2 emissions for all relevant years of the time series, including 2018–2021, that are consistent with the values in CRF table 2(I).A-H (sheet 1).
I.7	2.B.8 Petrochemical and carbon black production – CO_2 (I.6, 2021) (I.27, 2019) Transparency	Investigate the rationale for the significant increase in vinyl chloride monomer production of 26.2 per cent between 2015 and 2016 and report the results of the investigation in the NIR.	Addressing. The Party reported in its NIR (p.193) that there is a single petrochemical producer in Türkiye and that investigations on petrochemical production have been undertaken; however, the NIR did not include information on the large fluctuations in the production of vinyl chloride monomer between 2015 and 2016 in Türkiye. During the review, the Party clarified that the large fluctuations in production arose from a high volatility in demand. Furthermore, in 2016 and 2017, the plant produced more than its standard capacity by increasing its operational working time. In addition, once every four years, the plant decreases production and even ceases production for a few months for maintenance. In its comments to the draft review report, Türkiye indicated that it intends to provide an explanation for the fluctuations in the production of vinyl chloride monomer in its next GHG inventory submission.
I.8	2.B.9 Fluorochemical production – HFCs, PFCs and SF_6 (I.7, 2021) (I.6, 2019) (I.9, 2018) (I.50, 2016) (I.50, 2015) Convention reporting adherence	Use the notation key "NO" to report fluorochemical production.	Resolved. The Party reported emissions for category 2.B.9 fluorochemical production in CRF table 2(II) as "NO". The Party reported in its NIR (p.194) that there was no fluorochemical production in Türkiye in 1990–2021.
I.9	2.B.10 Other (chemical industry) – CH_4 (I.8, 2021) (I.7, 2019) (I.10, 2018) (I.28, 2016) (I.28, 2015) (92, 2014) Completeness	Validate and double-check the AD on styrene production for the complete time series, provide the missing estimates if emissions occurred in the country and include explanations for the emission trend in the NIR.	Not resolved. The Party reported CO_2, CH_4 and N_2O emissions for category 2.B.10 other (chemical industry) in CRF table 2(I).A-H (sheet 1) as "NO" for the complete time series. The ERT noted that the Party did not report CH_4 emissions from styrene production or information on the coverage of these emissions and corresponding AD in the NIR. During the review, the Party clarified that 8–32 t styrene was produced between 2007 and 2012 at a single plant in the country. Given this low amount, the Party considers that a disproportionate amount of effort would be required to collect data for estimating CH_4 emissions from styrene production, which would be

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			insignificant in terms of the overall level and trend in national emissions. The ERT noted that the 2006 IPCC Guidelines do not provide a methodology for estimating CH_4 emissions from styrene production. However, the ERT considers that the Party should continue reporting the CH_4 emissions from styrene production that were reported in the 2014 GHG inventory submission in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, which stipulate that once emissions from a specific category have been reported in a previous GHG inventory submission, they shall be reported in subsequent GHG inventory submissions, and provide an explanation on the approach and data used for the estimation of CH_4 emissions from styrene production in the NIR.
I.10	2.C.1 Iron and steel production – CO_2 (I.9, 2021) (I.8, 2019) (I.21, 2018) Transparency	Either update the equation on page 207 of the NIR to clarify that it is applied at the plant level to estimate emissions from iron and steel or sinter (not pig iron or sinter) or clarify that the equation currently included in the NIR represents an overall carbon mass balance calculation conducted as a QA/QC check in estimating emissions from iron and steel and sinter production.	Resolved. The Party reported in its NIR (p.198) that it used the tier 3 method for calculating CO_2 emissions from iron and steel production at integrated plants with the plant-specific data that it collects annually from each of the three facilities in the country. In addition, the Party updated the corresponding equation used for the calculations in the NIR (p.198).
I.11	2.C.1 Iron and steel production – CO_2 (I.10, 2021) (I.28, 2019) Accuracy	Make efforts to retain the enhanced data-collection method in order to revert to the use of a higher-tier method (tier 2) for the estimation of CO_2 emissions for category 2.C.1 iron and steel production.	Resolved. The Party estimated CO_2 emissions for category 2.C.1 iron and steel by applying a higher-tier method. Specifically, the NIR (pp.198–199) reports that a tier 3 method was used for calculating CO_2 emissions from iron and steel production in integrated plants, and the tier 2 method was used for calculating CO_2 emissions from electric arc furnaces.
I.12	2.C.3 Aluminium production – PFCs (I.33, 2021) Accuracy	Estimate PFC emissions using a tier 2 method, including tier 2 parameters from the 2006 IPCC Guidelines (vol. 3, chap. 4, section 4.4.2.4), in particular the ratio between C_2F_6 and CF_4 emissions, until the proper monitoring system for tier 3 estimations is in place; and explain the recalculation in the NIR.	Resolved. The Party estimated PFC emissions for this category by applying the tier 2 method from the 2006 IPCC Guidelines. Plant-specific data and information from the sole producer of aluminium in the country were used in the estimates for primary aluminium production and anode effects (in minutes per day), and tier 2 default values were used for the CF_4 and C_2F_6 ratio and slope coefficients from the 2006 IPCC Guidelines (vol. 3, chap. 4, p.4.54). The Party explained the recalculation performed for this category in the NIR (pp.210–214).
I.13	2.C.3 Aluminium production – PFCs (I.33, 2021) Transparency	Explain the change in the production technology in 2015 in the NIR.	Resolved. The Party reported in its NIR (p.211) on the change made in aluminium production technology in 2015. The sole aluminium plant in the country switched to the prebaked cell technology in 2015 after using the Søderberg process for many years.
I.14	2.C.4 Magnesium production – SF_6 (I.11, 2021) (I.11, 2019)	Correct the notation key used to report SF_6 emissions from magnesium foundries from "NA" to "NE".	Resolved. The Party reported in its NIR (pp.215–217) that CO_2 and SF_6 emissions from magnesium metal production were reported for the first time in the 2023 GHG inventory submission. SF_6 emissions for this category were reported as "NO" for 1990–2015 and

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	(I.13, 2018) (I.39, 2016) (I.39, 2015) (95, 2014) Convention reporting adherence		SF_6 emission estimates were reported for 2016–2021, because magnesium production started in 2016 in the country. The tier 1 method was used for CO_2 emissions and the tier 2 method for SF_6 emissions. Both methods were from the 2006 IPCC Guidelines (vol. 3, chap. 4, pp.4.61–4.62).
I.15	2.D.1 Lubricant use – CO_2 (I.12, 2021) (I.29, 2019) Transparency	Investigate and then report in the NIR the reason for the significant decrease in the AD for lubricant use between 2015 and 2016 (47.0 per cent) and explain the trend in the NIR.	Resolved. The Party reported in its NIR (p.225) the reason for the significant decrease in the AD for lubricant use between 2015 and 2016 and explained the trend in emissions for this category. Detailed AD on lubricant use in Türkiye are not available; CO_2 emission calculations are thus based on the amount of lubricant consumed, as obtained from the table for oil from the IEA–Eurostat–UNECE Energy Questionnaire for Türkiye. AD are calculated by subtracting the net balance of exports and imports, as well as stock changes, from production data. Inter-annual changes in AD between some years can be attributed to normal fluctuations in lubricant exports, imports and stock changes. Specifically, a decrease in lubricant imports from 421 kt in 2015 to 199 kt in 2016 resulted in a 47.0 per cent decrease in AD for lubricant use.
I.16	2.D.2 Paraffin wax use– CH_4 and N_2O (I.13, 2021) (I.31, 2019) Transparency	Investigate and then report in the NIR the reason for the significant increase in the AD for paraffin wax use between 2013 and 2014 (109.1 per cent); include information on the AD variations in the NIR.	Resolved. The Party reported in its NIR (p.227) the reason for the significant increase in the AD for paraffin wax use between 2013 and 2014. Detailed AD on paraffin wax use in Türkiye are not available; CO_2 emission calculations are thus based on the amount of paraffin wax consumed, as obtained from the oil table for Türkiye from the IEA–Eurostat–UNECE Energy Questionnaire for Türkiye. AD are calculated by subtracting the net balance of exports and imports, as well as stock changes, from production data. Inter-annual changes in AD between some years can be attributed to normal fluctuations in paraffin wax exports, imports and stock changes. Specifically, an increase in paraffin wax imports from 2013 to 2014 resulted in a 109.1 per cent increase in AD for paraffin wax use.
I.17	2.D.2 Paraffin wax use – CH_4 and N_2O (I.14, 2021) (I.31, 2019) Convention reporting adherence	Use the correct notation key, that is replace "NE" with "NA", in the CRF tables for reporting CH_4 and N_2O emissions from paraffin wax use.	Resolved. The Party corrected the notation key in CRF table 2(I).A-H (sheet 2) as recommended. It reported CH_4 and N_2O emissions from paraffin wax use as "NA" for the complete time series.
I.18	2.E.5 Other (electronics industry) – HFCs, PFCs and SF_6 (I.15, 2021) (I.12, 2019) (I.23, 2018) Accuracy	Collect the necessary updated AD to reflect national market tendencies and report the corresponding emissions.	Not resolved. The ERT noted that the AD and emissions for HFCs, PFCs and SF_6 reported in CRF table 2(II).B-H (sheet 1) are constant for 2010–2016. The Party reported in its NIR (p.228) that it conducted a survey targeting the electronics industry to investigate the potential use of F-gases and indicated that the use of these F-gases started in 2010. Drawing from the survey's findings and using expert judgment, emissions of HFCs, PFCs and SF_6 were estimated and reported under category 2.E.5 for 2010–2021. These emissions are linked to research and development activities, which are the only activities occurring under this category (see ID# I.19 below). During the review, the Party clarified it does not currently have access to reliable AD on the use of F-gases in category 2.E electronics industry and that it plans to conduct further research to obtain reliable data for this category in the coming years. The ERT considers that the

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			recommendation has not yet been addressed because the Party did not collect updated and reliable AD reflecting national market tendencies and report the corresponding emissions.
I.19	2.E.5 Other (electronics industry) – SF_6 (I.34, 2021) Accuracy	Base the SF_6 emission estimates on annual AD, by estimating the part of the SF_6 imports that is used in category 2.E electronics industry and the part used in category 2.G other product manufacture and use; if this is not possible, use, for 2018 onward, the updated economic growth with an explanation for the recalculation provided in the NIR.	Addressing. The Party estimated SF_6 emissions for category 2.E.5 for 2018 onward by applying economic growth as a driver, but it did not correct the assumed emissions increase between 2017 and 2018 and perform recalculations for this category. The Party reported in its GHG inventory SF_6 emissions associated with research and development activities only. The Party reported in the NIR (p.228) that F-gases are not used in the manufacturing of flat panel displays, photovoltaic products and semiconductors (see ID# I.18 above). During the review, the Party clarified that the national GHG inventory compiler does not currently have access to reliable AD on the use of F-gases in category 2.E electronics industry and that import and export data were considered in the estimates for category 2.G.1 electrical equipment (see ID# I.33 below). It plans to conduct further research to obtain reliable data for these categories in the coming years. The ERT considers that the recommendation has not yet been fully addressed because the Party did not obtain annual AD and report associated SF_6 emissions or correct the assumed emissions increase between 2017 and 2018 and perform relevant recalculations for this category.
I.20	2.F Product uses as substitutes for ozone-depleting substances – HFCs (I.35, 2021) Transparency	Report accurately in the NIR the parameters used in the estimations for calculating emissions for category 2.F product uses as substitutes for ozone-depleting substances, together with the assumptions used and justification for their use.	Not resolved. The Party did not report transparently or accurately in its NIR on the parameters used in estimating emissions for category 2.F product uses as substitutes for ozone-depleting substances and on the assumptions used and justification for their use. During the review, the Party explained that it is in the process of implementing the tier 2 method from the 2006 IPCC Guidelines for estimating emissions for this category. The ERT acknowledges that there is no substantial benefit for Türkiye to dedicate time and resources towards enhancing documentation and justification of the parameters and assumptions used under the presently applied tier 1 method. Rather, focus should pivot towards developing a consistent time series of emissions for category 2.F by implementing the tier 2 method (see ID# I.28 below).
I.21	2.F.3 Fire protection – HFCs (I.18, 2021) (I.15, 2019) (I.24, 2018) Comparability	Provide estimates of HFC-227ea emissions from manufacturing, operation and disposal separately, or, if this is not possible, continue using "IE" for manufacturing and disposal and indicate clearly in CRF table 9 and the NIR that all HFC-227ea emissions are reported under operating systems (stocks).	Not resolved. The Party did not report in CRF table 2(II).B-H (sheet 2) the HFC-227ea emissions from manufacturing, operation (stocks) and disposal separately, as it reported all HFC-227ea emissions under operating systems, and did not include information about the use of notation key "IE" for emissions from manufacturing and disposal in CRF table 9. During the review, the Party indicated that it will take the recommendation into account for the next GHG inventory submission, in conjunction with its ongoing efforts to implement the tier 2 method from the 2006 IPCC Guidelines for estimating emissions for this category (see ID# I.28 below).
I.22	2.F.4 Aerosols – HFCs (I.19, 2021) (I.16, 2019) (I.25, 2018) Completeness	Taking into account the high probability that metered dose inhalers are used in Türkiye, estimate and report HFC emissions from metered dose inhalers or provide evidence	Not resolved. The Party did not report in its NIR or CRF tables HFC emissions from metered dose inhalers or provide evidence that these emissions do not occur in the country. During the review, the Party clarified that this issue will be investigated in the future.

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		that these emissions are not occurring in the country.	
I.23	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.20, 2021) (I.17, 2019) (I.26, 2018) Comparability	Report complete emissions from refrigeration and air-conditioning equipment from manufacturing, operation and disposal by subcategory under category 2.F.1 instead of category 2.F.6 in accordance with the UNFCCC Annex I inventory reporting guidelines, or, if this is not possible, report the notation key "IE" in the appropriate cells of the CRF tables and include information in CRF table 9 and the NIR on where these emissions are reported.	Not resolved. The Party did not report in its NIR or CRF tables complete emissions from refrigeration and air-conditioning equipment from manufacturing, operation and disposal by subcategory under category 2.F.1 refrigeration and air-conditioning instead of category 2.F.6 other applications. It also did not report the notation key "IE" in the appropriate cells of the relevant CRF tables. However, the Party briefly clarified in CRF table 9 and the NIR (p.230) that owing to a lack of information, in particular for disaggregating HFCs by different uses and applications, even though it considers that HFCs are used in different industrial applications it assumed that most HFCs, excluding HFC-227ea (which is used only in fire extinguishers), are used in refrigeration and air-conditioning equipment. Consequently, these gases are calculated using the assumptions for category 2.F.1 and a tier 1 method, and for the reasons stated by the Party above the results were reported as emissions from stocks under category 2.F.6. During the review, the Party indicated that it will consider the recommendation in future GHG inventory submissions.
I.24	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.21, 2021) (I.18, 2019) (I.27, 2018) Accuracy	Improve the consistency and accuracy of the reporting between CRF table 2(II).B-H and the NIR with respect to the reporting of HFC-32 emissions; and verify the product life factor for HFC-32 and revise the estimates, if necessary.	Addressing. The information reported in CRF table 2(II).B-H (sheet 2) and the NIR with respect to HFC-32 emissions is consistent and a value of 15 is reported for the product life factor. However, the Party did not report in its NIR on any activity conducted to verify the HFC-32 product life factor or to revise the estimates. During the review, the Party indicated that it will take the recommendation into account for the next GHG inventory submission, in conjunction with its ongoing efforts to implement the tier 2 method from the 2006 IPCC Guidelines for estimating emissions for this category (see ID# I.28 below).
I.25	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.22, 2021) (I.19, 2019) (I.28, 2018) Completeness	Estimate HFC emissions for 1999 by collecting data for 1999 or using interpolation in accordance with the 2006 IPCC Guidelines for between 1998 and 2000 (assuming that in 1998 no HFCs were consumed).	Not resolved. The Party reported in its NIR (p.230) that HFCs have been used as alternatives to chlorofluorocarbons since 1999 for applications under this category. However, HFC emissions were reported as "NO" for 1999. During the review, the Party acknowledged an error in the compilation and reporting of these emissions in the CRF tables and stated that the error will be rectified in the next GHG inventory submission. The emissions for 1999 were estimated to be 60.8 t HFC-134a. The ERT considers that the recommendation has not yet been addressed because the Party has not yet corrected and reported HFC emissions for 1999.
I.26	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.23, 2021) (I.20, 2019) (I.29, 2018) Transparency	Provide in the NIR a more detailed description of the main assumptions applied and F-gas used in the F-gas model for estimating HFCs, in particular the assumed average initial filling and the number of units of equipment on the market for all years of the time series.	Not resolved. The Party did not report in its NIR the recommended information on the main assumptions applied and F-gas used in the model for estimating HFCs. During the review, the Party explained that it is in the process of implementing the tier 2 method from the 2006 IPCC Guidelines for estimating emissions for category 2.F. The ERT acknowledges that there is no substantial benefit for Türkiye to dedicate time and resources towards enhancing documentation and justification of the parameters and assumptions used under the presently applied tier 1 method. Rather, the focus should

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			pivot towards developing a consistent time series of emissions for category 2.F by implementing the tier 2 method (see ID# I.28 below).
I.27	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.24, 2021) (I.21, 2019) (I.30, 2018) Completeness	Calculate and report HFC disposal emissions from retired refrigeration and air-conditioning equipment, and, if applicable, the amount of recovery of these gases.	Not resolved. The Party did not report in its NIR or CRF tables HFC disposal emissions from retired refrigeration and air-conditioning equipment (reported under category 2.F.6), and, if applicable, the amount of recovery of these gases. During the review, the Party indicated that it will take the recommendation into account for the next GHG inventory submission, in conjunction with its ongoing efforts to implement the tier 2 method from the 2006 IPCC Guidelines for estimating emissions for this category (see ID# I.28 below).
I.28	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs (I.36, 2021) Accuracy	Estimate the emissions for category 2.F.6 other applications (product uses as substitutes for ozone-depleting substances) using a tier 2 method and explain the recalculation in the NIR.	Not resolved. For its 2023 GHG inventory submission, the Party estimated HFC emissions for category 2.F.6 by applying the tier 1 method. During the review, the Party referred to the study "2019–2020 survey on alternatives to ozone-depleting substances, Turkey", which provides a detailed breakdown of AD for F-gases, each of them disaggregated per subcategory within category 2.F for 2019 and 2020. In addition, the Party indicated that a database established under the national regulation on F-gases (Official Gazette number 30291, 4 January 2018), which mandates that every individual and legal entity involved with products or equipment containing F-gases report their consumption, became effective in March 2023. The Party informed the ERT that it is in the process of implementing the tier 2 method from the 2006 IPCC Guidelines to estimate emissions for category 2.F using the findings of the above-mentioned study and data from the above-mentioned database. In addition to these efforts, the ERT considers that, to develop a consistent time series of emission estimates that include the years for which AD are not available (i.e. 1999–2018), Türkiye could apply the splicing techniques suggested in the 2006 IPCC Guidelines (vol. 1, chap. 5, pp.5.7–5.14).
I.29	2.G Other product manufacture and use – N_2O (I.25, 2021) (I.22, 2019) (I.20, 2018) (I.2 and I.45, 2016) (I.2 and I.45, 2015) (66 and 100, 2014) Completeness	Report all likely occurring emissions, such as N_2O emissions from anaesthesia and other applications.	Not resolved. The Party did not report in its NIR or CRF tables N_2O emissions from anaesthesia and other applications. During the review, the Party clarified that this issue will be considered for future GHG inventory submissions.
I.30	2.G.1 Electrical equipment – SF_6 (I.26, 2021) (I.23, 2019) (I.31, 2018) Accuracy	Report SF_6 emissions from manufacturing, operation and disposal of electrical equipment separately, taking into account the long-term use of such equipment, in accordance with the 2006 IPCC Guidelines.	Not resolved. The Party did not report in its NIR or CRF tables SF_6 emissions from manufacturing, operation and disposal separately for this category. All SF_6 emissions are reported from manufacturing. The Party indicated in the NIR (p.234) that there is no information available on the number and capacity of used, imported or exported equipment and the number of destroyed equipment. Therefore, 2 per cent of the imported gas amount was assumed to be emitted in the year that the SF_6 was imported.

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			During the review, the Party clarified that this issue will be considered for future GHG inventory submissions (see ID# I.32 below).
I.31	2.G.1 Electrical equipment – SF_6 (I.27, 2021) (I.32, 2019) Convention reporting adherence	Maintain consistency between CRF table 9 (last row) and the corresponding NIR table.	Not resolved. The Party did not provide consistent information for category 2.G.1 between the NIR (pp.233–235) and CRF table 9 (last row). In CRF table 9, the Party explained that "NE" was used for this category owing to a lack of data, instead of explaining the use of "IE" for reporting SF_6 emissions from stocks and disposal, and recovery in CRF table 2(II).B-H (sheet 2). At the same time, in the NIR the Party indicated that no information about the number and capacity of used, imported or exported equipment and the number of destroyed equipment is available and that it used a global average default EF, which includes natural leakage and emissions during operation, maintenance and disposal. During the review, the Party clarified that this issue will be considered for the next GHG inventory submission.
I.32	2.G.1 Electrical equipment – SF_6 (I.28, 2021) (I.33, 2019) Comparability	Report SF_6 emissions from manufacturing, operation and disposal separately, taking into account the long-term use of such equipment, in accordance with the 2006 IPCC Guidelines (vol. 3, table 6.2).	Not resolved. The Party did not report in its NIR or CRF tables SF_6 emissions from manufacturing, operation and disposal separately for this category. All SF_6 emissions are reported from manufacturing. The Party indicated in the NIR (pp.233–234) that emissions are estimated based on the import and export data for SF_6 (for 2013 onward) and the trend of electricity consumption as a driver for back-casting data on the imports of SF_6 for previous years. During the review, the Party clarified that this issue will be considered for future GHG inventory submissions (see ID# I.30 above).
I.33	2.G.1 Electrical equipment – SF_6 (I.37, 2021) Accuracy	Correct the overestimation of SF_6 emissions in category 2.G.1 electrical equipment (other product manufacture and use) by deducting the SF_6 emitted from 2.E electronics industry from the amount of net imported SF_6 used to estimate emissions for category 2.G.1.	Not resolved. The Party reported in its NIR (pp.233–235) that SF_6 emissions from circuit breakers are estimated by applying the default EF of 2 per cent provided in the 2006 IPCC Guidelines (vol. 3, chap. 8, table 8.2, p.8.15) to the annual trade data for SF_6 provided by the Ministry of Trade. The ERT noted that according to the 2006 IPCC Guidelines, the 2 per cent default EF should be applied to the nameplate capacity of the equipment and not to the SF_6 used. Therefore, the Party appears to be applying the 2006 IPCC Guidelines tier 1 method and default EF in a manner that is not correct. In addition, the Party did not provide any information on whether it deducted the SF_6 emitted from 2.E electronics industry from the amount of net imported SF_6 used to estimate emissions for category 2.G.1. During the review, the Party clarified that this issue will be considered for future GHG inventory submissions (see IDs# I.19 above and I.36 in table 5).
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O (A.1, 2021) (A.20, 2019) Transparency	Address the inconsistency between the definitions of the population of dairy and non-dairy cattle and include information in the NIR on the reasons for the rise in dairy cattle and the decrease in non-dairy cattle in the animal population trend in 2003.	Resolved. The Party revised the method for estimating the dairy cattle population for 2003 (as the average of the population figures for 2002 and 2004), addressed the inconsistency in the definitions of the populations and described in NIR section 5.1 (p.245) the types of dairy cattle. In addition, the Party provided in the NIR (p.245) the definitions of three categories of dairy cattle (culture cattle, hybrid cattle and domestic cattle) and also provided (footnote to NIR table 5.6, p.245) the reasons for the increase in dairy cattle and the decrease in non-dairy cattle in the animal population trend in

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			2003. During the review, the Party clarified that the definitions of cattle are in line with those reported in the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.10). The ERT agreed with the clarification provided.
A.2	3. General (agriculture) – CH_4 and N_2O (A.2, 2021) (A.21, 2019) Transparency	Provide the rationale and a data source for the TAM values for all animal groups in chapter 5 of the NIR and in the reference list of the NIR.	Addressing. The Party reported in the footnotes to NIR tables 5.15–5.16 (p.261) some information on the data sources for cattle livestock mass, clarifying that all mass values are live weight figures, and that these figures are country-specific. It indicated that the country-specific figures for cattle were gathered from a variety of sources, including the Ministry of Agriculture and Forestry and TurkStat. The ERT noted, however, that the Party did not provide the exact references to the data sources or records for the expert judgment used to obtain country-specific figures on live weight for cattle categories, including the rationale behind these values. Furthermore, the ERT noted that, in the NIR, the Party did not clarify how the average values for dairy and non-dairy cattle were obtained (e.g. whether data on herd structure of cattle were considered). Moreover, in the footnotes to NIR tables 5.15–5.16 (p.261), the Party reported that country-specific poultry mass data were gathered from the Ministry of Agriculture and Forestry, and that mass values given for sheep (domestic and merino) and goats are country-specific. The ERT noted, however, that the Party did not provide the exact references to the data sources or records for the expert judgment used to obtain country-specific figures on live weight for poultry and sheep and goats, including the rationale behind these values. During the review, the Party presented a calculation sheet and explained how the average values of performance parameters for dairy and non-dairy cattle were obtained. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided clear details in the NIR of its data sources for the TAM values for all animal groups, including the rationale behind these values.
A.3	3. General (agriculture) – CH_4 and N_2O (A.20, 2021) Transparency	Improve in the NIR the transparency of the description of the methodology used to estimate CH_4 and N_2O emissions for sheep, swine and poultry.	Addressing. In annex 3 to the NIR (p.494), the Party provided an explanation of the source for the EFs used to calculate CH_4 emissions from enteric fermentation of domestic and merino sheep (see ID# A.14 in table 5). However, a description of the methodology and the underlying assumptions applied to estimate manure management CH_4 and N_2O emissions from sheep (domestic and merino) were not provided in the NIR. Moreover, the ERT noted that the Party continued to report data on the swine population together with data on the camel population in NIR table 5.6 (p.245), decreasing the transparency of this information. The ERT also noted that the underlying data on poultry used for the estimates, including typical animal mass, Nex values and population numbers, were provided in NIR tables 5.6 and 5.15 (pp.245 and 261 respectively). However, the data were reported in an aggregated manner, as for a single poultry category, with no data given for the subcategories. During the review, the Party clarified that this recommendation was not prioritized to be addressed in the 2023 GHG inventory submission, but it will consider addressing this issue in the next GHG inventory submission.

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A.4	3.A.1 Cattle – CH_4 (A.7, 2021) (A.23, 2019) Transparency	Update the methodological description in the NIR for the estimation of enteric CH_4 emissions from cattle to reflect the tier 2 method and enhanced livestock characterization used, and include AD (animal population data, TAM values, GE, Y_m, feed digestibility) and the relevant data sources for all three cattle subcategories (mature dairy cattle, other mature cattle and growing cattle).	Addressing. In tables NIR 5.12–5.13 (p.255), the Party provided the underlying data used to obtain country-specific enteric fermentation EFs for both dairy and non-dairy cattle to reflect the tier 2 method used. However, the ERT noted that the Party did not provide updated methodological descriptions and detailed information on how the underlying performance parameters for dairy and non-dairy cattle were obtained. Furthermore, data sources for all cattle subcategories were not reported by the Party. During the review, the Party presented a calculation sheet containing the performance parameters relevant to each subcategory of dairy and non-dairy cattle that were used in compiling the average performance parameters (see ID# A.2 above). The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided updated methodological descriptions and information on how the underlying performance parameters for dairy and non-dairy cattle were obtained and did not provide the data sources for the cattle subcategories.
A.5	3.B Manure management – CH_4 (A.8, 2021) (A.6, 2019) (A.6, 2018) (A.8, 2016) (A.8, 2015) (109, 2014) (67, 2013) Accuracy	Estimate emissions for significant livestock categories using the tier 2 method with country-specific EFs, including enhancing livestock population characterization and taking into account the relevant IPCC guidance.	Not resolved. The Party reported in NIR section 5.3 (p.262) that it applied a tier 1 method to estimate CH_4 and N_2O emissions from manure management for all livestock categories. During the review, the Party clarified that it cannot consider using a higher-tier method for estimating CH_4 emissions in the short term owing to insufficient data and parameters for the calculations.
A.6	3.B Manure management – CH_4 and N_2O (A.9, 2021) (A.7, 2019) (A.18, 2018) Accuracy	Collect the necessary AD and estimate and report CH_4 and N_2O emissions from manure management using country-specific EFs and appropriate tier methods from the 2006 IPCC Guidelines.	Not resolved. The Party reported in NIR section 5.3 (p.262) that it applied a tier 1 method with default EFs for estimating CH_4 and N_2O emissions from manure management. The ERT noted that according to the information reported in annex 1 to the NIR (p.440) regarding the key category analysis, both CH_4 and N_2O emissions from manure management were identified as key categories so they should be estimated using a higher-tier method. During the review, the Party clarified that it cannot consider using a higher-tier method for estimating these emissions in the short term owing to insufficient data and parameters for the calculations. The ERT considers that the Party has sufficient AD required to move to a higher-tier method for estimating CH_4 and N_2O emissions from the manure management of cattle (dairy and non-dairy), namely the same underlying data that were used to estimate CH_4 emissions from enteric fermentation of dairy and non-dairy cattle, combined with some available parameters and equations, such as equations 10.23–10.24 of the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.41).
A.7	3.B Manure management – N_2O (A.10, 2021) (A.24, 2019) Transparency	Include the data source for the country-specific MMS distribution in the NIR.	Addressing. The Party reported in NIR table 5.19 (p.265) the constant values used for the distribution of manure across MMS for all livestock categories over the whole time series. The ERT noted that the Party provided explanations in the NIR (pp.256 and 257) on how the country-specific data on MMS distribution were derived by mentioning that data were obtained from various sources, including expert opinion, comparison of data from countries in the Mediterranean basin, data from the Ministry of Agriculture and

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			Forestry and TurkStat data. However, the Party did not provide clear information on the sources of these country-specific data or any specific reference or documented expert judgment to support these data. During the review, the Party clarified that it had not prioritized this recommendation to be addressed in the 2023 GHG inventory submission.
A.8	3.B Manure management – N_2O (A.11, 2021) (A.25, 2019) Transparency	Describe the method used for estimating emissions from manure burned for fuel in the NIR; and include a description in NIR chapter 5 of where in the energy sector or waste sector the emissions from burning of manure are reported.	Addressing. In NIR section 5.3 (p.264), the Party reported that 50 per cent of burned manure was reported under subcategory 1.A.4.b residential of the energy sector, while the remaining 50 per cent was calculated and reported for pasture, range and paddock under subcategory 3.D.a.3 urine and dung deposited by grazing animals. The Party explained that this allocation was made in accordance with section 10.5.2 of the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.58). However, the ERT noted that section 10.5.2 refers to the allocation of N excreted wherein 50 per cent of the N is contained in dung and 50 per cent in urine, and not to the proportion of manure that is burned. During the review, the Party clarified that this recommendation had not been prioritized to be addressed in the current submission and that it will consider addressing this issue in the next GHG inventory submission. The ERT considers that the recommendation has not yet been fully addressed, because the Party has not yet clearly explained in the NIR the method and assumptions used to estimate the N_2O emissions from manure burned for fuel.
A.9	3.B.3 Swine – CH_4 (A.12, 2021) (A.13, 2019) (A.23, 2018) Transparency	Assess the significant inter-annual changes in the CH_4 IEF for swine manure management, in particular in the latest years of the time series, and include the results in the NIR.	Not resolved. The ERT noted that Türkiye reported the same CH_4 IEFs for swine manure management in CRF table 3.B(a) (sheet 1) as in previous GHG inventory submissions, showing the same significant inter-annual changes identified in previous reviews. The NIR does not contain any information that clarifies the significant inter-annual changes in the CH_4 IEFs for swine manure management. During the review, the Party clarified that this issue was not considered a priority for further attention during the latest reporting period, and therefore no resources have been allocated to assessing these CH_4 IEF inter-annual changes, because swine is not a significant livestock category for the country and emissions are potentially negligible.
A.10	3.B.3 Swine – CH_4 and N_2O (A.13, 2021) (A.14, 2019) (A.22, 2018) Consistency	Check the population of swine used in the calculations and assess and report in the NIR the reasons for any significant inter-annual changes observed in the population of swine across the time series. In cases where large inter-annual changes cannot be explained, consider whether using a splicing technique from the 2006 IPCC Guidelines would provide more accurate estimates.	Not resolved. The ERT noted that Türkiye reported the same population of swine in the relevant CRF tables as in previous GHG inventory submissions, showing the same inter-annual changes identified in previous reviews. The NIR does not contain any information that clarifies the significant inter-annual changes in the population of swine used in calculating CH_4 and N_2O emissions from manure management, or that indicates that the Party has checked the population of swine used in the calculations or that the Party has considered using splicing techniques from the 2006 IPCC Guidelines to obtain more accurate estimates. Moreover, data on the swine population are reported together with data on the camel population in NIR table 5.6 (p.245). The Party indicated in the NIR (p.244) that data on the swine population are from official statistics obtained from TurkStat. During the review, the Party clarified that no resources have been allocated to assessing the inter-annual changes in the population of swine because it is not a significant livestock category for the country and emissions are potentially negligible.

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A.11	3.B.5 Indirect N_2O emissions – N_2O (A.21, 2021) Transparency	Explain in the NIR how the likely level of indirect N_2O emissions from leaching and run-off was estimated.	Resolved. In the footnote to NIR table 5.14 (p.258), the Party provided information on how the fraction of managed manure N losses due to leaching and run-off was derived and how the Party estimated the likely level of indirect N_2O emissions from leaching and run-off, which is considered insignificant.
A.12	3.D.a.2.c Other organic fertilizers applied to soils – N_2O (A.16, 2021) (A.27, 2019) Transparency	Include information on which other organic fertilizers applied to soils are included in the reporting and a justification for the assumption that compost N covers the main N input in this subcategory and no other N input of significance exists. Include information on the data sources used for the fertilizers reported under the source for subcategory 3.D.a.2.c other organic fertilizers applied to soils and relevant references in the reference list in the NIR. Finally, revise the calculations so that the N content in the compost used as fertilizer is reflected properly.	Resolved. In its NIR (p.275), the Party provided information on the types of other organic fertilizers (compost) and the sources for the data (TurkStat) on other organic fertilizers applied to soils reported under subcategory 3.D.a.2.c, as well as a justification for the assumption that compost N covers the main N input for this subcategory and no other N input of significance exists. The Party stated that "there are neither AD available on possibly other organic fertilizers except for compost data nor an indication of such an activity". During the review, the Party provided the ERT with a copy of the expert judgment evaluation that clarifies how the data used in the calculations were developed. In addition, the Party confirmed that the calculations were revised for the 2020 GHG inventory submission.
A.13	3.D.b Indirect N_2O emissions from managed soils – N_2O (A.24, 2021) Transparency	Explain how the country-specific value for $Frac_{LEACH-(H)}$ (0.015, based on a ratio between wet and dry areas that has no relationship with the fraction of N that is leached) is calculated and how it is consistent with equation 11.10 and the footnote to table 11.3 of the 2006 IPCC Guidelines (vol. 4, chap. 11), which includes guidance to determine the regions where the IPCC default value (0.3) should be applied.	Resolved. In annex 3 to the NIR (p.496), the Party provided extensive information on how the country-specific value for $Frac_{LEACH-(H)}$ (0.015) was derived and how it is consistent with equation 11.10 and the footnote to table 11.3 of the 2006 IPCC Guidelines (vol. 4, chap. 11, p.11.24).
LULUCF			
L.1	4. General (LULUCF) – (L.3, 2021) (L.8, 2019) (L.21, 2018) Convention reporting adherence	Strengthen the sector-level QC procedures to ensure consistency between the information provided in the NIR and the CRF tables, particularly with respect to NIR tables 6.2, 6.3, 6.13, 6.15 and 6.16.	Addressing. The ERT noted that the Party has not yet ensured full consistency between the information provided in the NIR and the CRF tables. In particular, inconsistencies still remain between NIR table 6.12 (p.308) (table 6.13 in the NIR of the 2018 GHG inventory submission) and CRF table 4.1, for example in the areas reported for grassland and cropland converted to forest land for 2011–2018. In NIR table 6.12 reported annual area changes for different land-use change categories converted to forest land (grassland, cropland and other land) do not align with information reported in CRF table 4.1. Furthermore, the Party continued to report inconsistent information in NIR table 6.6 (p.298) (table 6.3 in the NIR of the 2018 GHG inventory submission) and the CRF tables, namely (1) emissions from controlled biomass burning in forest land are reported as "NO" in NIR table 6.6 and as "NA" in CRF table 4(V) for forest land

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			remaining forest land and land converted to forest land and (2) non-CO_2 emissions from drained organic soils in forest land are reported as "NE" in NIR table 6.6 and as "NO" in CRF table 4(II). Tables 6.2, 6.15 and 6.16 of the NIR of the 2018 GHG inventory submission are not included in the current NIR. During the review, the Party informed the ERT that the inconsistencies will be corrected in the next GHG inventory submission. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully strengthened the sector-level QC procedures for ensuring consistency between the information provided in the NIR and the CRF tables.
L.2	4. General (LULUCF) – (L.5, 2021) (L.42, 2019) Convention reporting adherence	Strengthen sector-level QC procedures to ensure consistency between the information provided in the NIR and the CRF tables, and between CRF table 4.1 and the background tables for the sector.	Addressing. The Party reported consistent information on net GHG removals in LULUCF between NIR figure 6.1 (p.287) and CRF table 10 (sheet 1) for 1990–2021. Furthermore, the information presented in NIR figure 6.9 (p.319) (figure 6.10 in the NIR of the 2019 GHG inventory submission) is consistent with the area reported in CRF table 4.B for cropland remaining cropland for 1990–2021, to the extent this comparison can be made, given that figure 6.9 presents areas in a chart. However, differences were identified between the total area reported for forest land, cropland and grassland in CRF tables 4.A, 4.B and 4.C respectively and the final area reported for the same land-use categories in CRF table 4.1 for all years of the inventory period (1990–2021). During the review, the Party informed the ERT that these inconsistencies had already been identified as part of the QC activities it carried out; however, it could not explain the reasons for such discrepancies after 2015. For the years before 2015, Türkiye informed the ERT that it will revise all maps by using new updated maps to be developed as part of a new project, which is in the planning phase. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet demonstrated that it fully strengthened the sector-level QC procedures for ensuring consistency between the information provided in CRF table 4.1 and the background CRF tables 4.A, 4.B and 4.C.
L.3	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.28, 2021) Transparency	Include in the inventory submission the figure referred to as figure 10 in the 2021 NIR and include a correct reference to table 6.8 in section 6.2 of the NIR.	Resolved. The Party included NIR table 6.5 (p.298) with the confusion matrix (referred to as figure 10 in the NIR of the 2021 GHG inventory submission) presenting the outcomes of the accuracy assessment for the areas of land-use categories. The table numbered 6.8 in the NIR of the 2021 GHG inventory submission (p.324) is not included in the current NIR, therefore the part of the recommendation to include a correct reference to NIR table 6.8 in section 6.2 is no longer relevant.
L.4	Land representation – (L.6, 2021) (L.10, 2019) (L.23, 2018) Consistency	Strengthen QC procedures to ensure consistent representation of land between the end of one inventory year and the beginning of the next, and report correctly and consistently initial and final areas in CRF table 4.1.	Not resolved. The ERT noted that Türkiye did not ensure consistency in land representation by reporting in CRF table 4.1, for all land-use categories and for the entire time series, a final area at the end of one year that is equal to the initial area at the beginning of the following year. The ERT identified differences between the final areas reported in one year and the initial area reported in the following year in CRF table 4.1, except for forest land for 1990–1991 and 1991–1992, and for cropland and grassland for 1990–1991. During the review, the Party clarified that it could not explain the reasons

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			for the inconsistencies identified after 2015, and that all maps for the years before 2015 will be revised by using new updated maps to be developed as part of a new project, which is in the planning phase. The ERT noted that regardless of its plans for developing new updated maps, the Party must ensure consistency in land representation with the available data currently being used. Therefore, it considers that the recommendation has not yet been addressed because the Party has not yet strengthened the QC procedures for ensuring consistent representation of land between the end of one inventory year and the beginning of the next and correct reporting of initial and final areas in CRF table 4.1.
L.5	Land representation – (L.8, 2021) (L.43, 2019) Consistency	Provide a consistent land-use matrix for the entire time series, presenting land-area changes related to conversions of forest land to other land uses, to facilitate a better assessment and understanding of how land-use changes are used in the emission calculations, and accurately document in the NIR how land-use changes from forest land to other land uses are assessed and detected.	Addressing. The Party reported land-area changes of forest land conversions to all other land-use categories in CRF tables 4.B–4.F. However, the Party did not provide a consistent land-use matrix for the entire time series for forest land conversions to other land uses (see ID#s L.2 and L.4 above, L.6 and L.16 below and L.25 in table 5). The Party reported in NIR section 6.1 (pp.291–298) on how land-use changes from forest land to other land uses have been detected, assessed and used in estimating emissions/removals. During the review, the Party explained that under a new project, maps for the years before 2015 will be updated and a new land-use classification map will be developed, and thus an updated land-use matrix is expected to be included in future GHG inventory submissions. The ERT noted that regardless of whether new updated maps are expected to be developed in the future, the Party must ensure consistency in land representation with the available data currently being used (see ID# L.4 above). The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided a consistent land-use matrix for the entire time series for forest land conversions to other land uses.
L.6	Land representation – (L.9, 2021) (L.44, 2019) Consistency	Report the areas converted to a different land use under the relevant land-use conversion category for 20 consecutive years before reporting them under the corresponding land remaining category (this means that, for each year, the cumulative total area reported under each land-use change category should equal the cumulative area that has been converted to that land use over the past 20 years; however, the area of land under conversion that has been subject to a second land-use change during the 20-year conversion period should be subtracted from the cumulative total).	Not resolved. The Party did not correctly apply the 20-year conversion period for reporting land-use changes in the respective land-use conversion categories for all land-use categories in CRF tables 4.A–4.F. Specifically, the following areas do not correspond to the 20-year cumulative area of the past 20 years for the respective land-use change category as reported in CRF table 4.1: in CRF table 4.A, cropland and grassland converted to forest land for 2011–2021 and other land converted to forest land for 2018–2021; in CRF table 4.B, forest land converted to cropland for 2019–2021; in CRF table 4.C, forest land converted to grassland for 2019–2021; in CRF table 4.D, land converted to wetlands for 1991–2021; in CRF table 4.E, forest land converted to settlements for 2020–2021; and in CRF table 4.F, forest land converted to other land for 2020–2021 and settlements converted to other land for 2018. During the review, the Party explained that further investigation would be needed to identify the reason for these inconsistencies. The ERT noted that, for all land-use categories and for the entire time series, the cumulative annual land-use changes of the previous 20 years should be reported in the land-use conversion subcategories for a particular year and that in the twenty-first year after a land-use change, an equal amount of area should be deducted from the land-use conversion subcategory and be reported in the corresponding land-use

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			remaining in the same land-use subcategory. The ERT considers that the recommendation has not yet been addressed.
L.7	4.A Forest land – CO_2 (L.10, 2021) (L.14, 2019) (L.10, 2018) (L.9, 2016) (L.9, 2015) (122, 2014) Accuracy	Conduct a thorough scientific assessment of the estimation methods used for forest land, ensuring a comprehensive and balanced approach to calculating carbon inputs and outputs for each pool, and revise the estimates, if necessary.	Addressing. The Party did not provide in its NIR a scientific assessment of the estimation methods used for forest land that ensures a comprehensive and balanced approach for estimating carbon stock changes in carbon pools, although the ERT noted that the Party has improved some of the aspects of its estimation methods since previous GHG inventory submissions and recalculated emissions/removals. In the NIR (p.300), the Party reported that the increment data taken from the forestry statistics of the General Directorate of Forestry show large increases in increment volumes in forest land remaining forest land that may be attributable to rehabilitation projects carried out in the early 2000s, but the Party did not provide more evidence for this assumption. The ERT noted that forest land remaining forest land is a key category at both level and trend assessment (the highest in the list of key categories in the trend analysis) and, as such, it is of particular importance that Türkiye verify the accuracy of the estimates. Furthermore, regarding living biomass in forest land remaining forest land, the ERT noted that although the area of forest land remaining forest land was not recalculated between the 2022 (and 2021) and 2023 GHG inventory submissions, net carbon stock changes were recalculated for the entire time series except for 2020, with the changes being significant for several years (e.g. a 20.0 per cent increase for 1990 and a 29.1 per cent decrease for 2018 in the 2023 GHG inventory submission compared with the 2022 GHG inventory submission). The ERT also noted that these recalculations were driven solely by the recalculations in carbon stock gains as a result of the updated biomass increment values presented in NIR table 6.7 (p.300) and explained in the NIR (p.315), whereas carbon stock losses were not recalculated. However, the growing stock and annual volume increment values reported in NIR tables 6.10 and 6.11 (p.304) respectively have not changed compared with the respective values in tables 6.10 and 6.11 of the NIR of the 2022 GHG inventory submission (p.326). For the DOM and SOM mineral pools, the Party did not provide information on the significance analysis (see ID# L.24 in table 5) that would justify the application of the tier 1 method, considering that organic soils do not occur in this category. During the review, the Party clarified that there has been some scientific assessment work using carbon budget models by academia; however, the assessment of the results and the consistency between the models and the database used for the inventory is pending. Moreover, during the discussions between the ERT and the Party, it was confirmed that the Party can use the information available in its forest management plans, which are updated every 10 years, to apply the stock-difference method provided in the 2006 IPCC Guidelines (vol. 4, chap. 2.3.1.1, p.2.12) to compare and verify the accuracy of the estimates obtained from the gain–loss method currently applied. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet adequately verified the accuracy of the estimates of carbon stock changes in living biomass in forest land remaining forest land (e.g. by using as a comparison the stock-difference method) and has not provided a justification for the appropriateness of the

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			application of tier 1 methods for the DOM and SOM mineral pools by reporting information on the significance of these pools within the key category in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 4.2, pp.4.7–4.12, and vol. 4, figure 1.2, p.1.12).
L.8	4.A Forest land – CO_2 (L.29, 2021) Transparency	Check carefully the assumptions used for increment values reported in the inventory, and, if the inconsistencies with the increment reported in tables 1.3 and 1.6 of the General Directorate of Forestry statistics (available at https://www.ogm.gov.tr/tr/e-kutuphane/resmi-istatistikler) correspond to inaccuracies in the statistics themselves rather than in the assumptions used for the inventory, explain in the NIR why the increase over time of the increment of productive forests assumed for the inventory on the basis of the data from the Inventory Statistical System for Forests is more accurate than that which can be estimated using the General Directorate of Forestry statistics for the same types of forest.	Addressing. The Party checked the assumptions and updated increment values presented in NIR table 6.7 (p.300) (see ID# L.7 above). The ERT noted that the large increase in the increment of productive coniferous forests between 2010 and 2015 (approximately 47 per cent) identified in the previous review has substantially decreased in the current submission (to approximately 5 per cent). Furthermore, the updated increment values for productive forests used for the current inventory are closer to the values derived from tables 1.3 and 1.6 of the General Directorate of Forestry statistics. However, inconsistencies remain between the NIR and data derived from these forestry statistics. For example, the increment rate for total productive forests derived from the General Directorate of Forestry statistics (tables 1.1, 1.3 and 1.7) is approximately 3.38 m^3/ha, and for deciduous and coniferous forests is 3.73 and 4.13 m^3/ha respectively, whereas the increment rate applied in the inventory was 3.17, 3.49 and 3.33 m^3/ha for deciduous, coniferous and mixed (coniferous and deciduous) forests respectively. While the Party reported increment rates for mixed forests in NIR table 6.7, increment values for this forest stratum were not separately reported in the forestry statistics. During the review, the Party explained in detail how increment rates were estimated and provided the ERT with tables for the increment and area per forest species from the General Directorate of Forestry statistics. The increment and area per forest species were aggregated at the level of forest type in which the carbon stock changes were estimated, namely deciduous, coniferous, mixed and degraded forests, and then the increment rate for each forest type was estimated. In particular, the Party explained that for mixed forests the increment rate was estimated as the average of coniferous and deciduous forests. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided in the NIR detailed information on how the increment rates for productive forests (deciduous, coniferous and mixed) were estimated and the reasons for the differences between the increment rates reported in the inventory and those derived from the values in tables 1.3 and 1.6 of the General Directorate of Forestry statistics. In its comments on the preliminary main findings, the Party indicated that additional information will be provided in the next GHG inventory submission.
L.9	4.A Forest land – CO_2 (L.30, 2021) Transparency	Clarify in the NIR that other forested land is included as a subcategory of forest land rather than grassland, as it has a vegetation structure that currently falls below, but in situ could potentially reach, the 10 per cent crown cover threshold value used in the definition of forest land.	Resolved. The Party clarified in NIR sections 6.1–6.2 (pp.292, 299 and 301) that other forested land is a subcategory of forest land rather than grassland. Furthermore, it provided details on the crown cover threshold applied for this subcategory, which refers to other forested land with vegetation that has crown cover between 1 and 10 per cent.

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L.10	4.A.1 Forest land remaining forest land – CO_2 (L.12, 2021) (L.17, 2019) (L.26, 2018) Transparency	Apply the definition of annual wood removals presented in the 2006 IPCC Guidelines (annual wood removals, roundwood, m^3/year), or, if not applicable, provide a justification for including more than the actual wood annually removed in the calculations for this category.	Resolved. The ERT did not identify any changes in the reported information on annual wood removals in the current NIR compared with the information in the NIR of the most recent GHG inventory submission that underwent review (2021). During the review, the Party clarified that there is no country-specific definition for wood removals, but wood removals are regulated by two edicts of the General Directorate of Forestry (No. 299 on forest management and No. 288 on the harvesting of wood-based products in State forests), which set out standards for wood removal, such as rotation period per species, diameter at breast height threshold (130 cm) and minimum diameter (8 cm). Furthermore, the Party provided detailed information on how carbon losses from industrial roundwood and fuelwood removals were estimated. Specifically, the Party indicated that data on annual actual industrial roundwood and fuelwood removals per species from the forestry statistics of the General Directorate of Forestry (available in table 2.8 at https://www.ogm.gov.tr/tr/e-kutuphane/resmi-istatistikler) were used in the estimates, which are in accordance with the definition of annual wood removals in the 2006 IPCC Guidelines. The ERT confirmed that the Party used in its estimates the definition of annual wood removals presented in the 2006 IPCC Guidelines; however, it considers it necessary to update the information in the NIR to reflect clearly this fact. Besides this, the ERT identified a new issue on the annual amounts of industrial roundwood and fuelwood removals that are used to estimate carbon losses in living biomass (see ID# L.30 in table 5).
L.11	4.A.2.2 Grassland converted to forest land – CO_2 (L.13, 2021) (L.19, 2019) (L.14, 2018) (L.18, 2016) (L.18, 2015) Transparency	Include in the NIR a section on grassland converted to forest land under section 6.4, report in the NIR the background data used for calculating net emissions and removals from soils and further document the country-specific values used.	Resolved. The Party included in NIR table 6.12 (p.308) the area of annual grassland conversions to forest land for 1990–2021 and general information on grassland converted to forest land (pp.306–311). With regard to the parameters and stock change factors used to estimate carbon stock changes in soils, the Party reported the country-specific SOC stock and SOC reference values for the different strata in forest land and grassland categories in NIR tables 6.16 (p.311) and 6.27 (p.339) respectively, together with their sources (research units under the Ministry of Agriculture and Forestry). The ERT considers that the recommendation has been addressed, but notes that, although the Party included in NIR section 6.2 (pp.306–311) AD and information on grassland converted to forest land, inconsistencies with the data reported in CRF table 4.1 and background CRF tables remain (see ID#s L.1, L.2 and L.6 above).
L.12	4.B Cropland – CO_2 (L.14, 2021) (L.21, 2019) (L.15, 2018) (L.19, 2016) (L.19, 2015) Convention reporting adherence	Correct detected inconsistencies and, as part of QA/QC routines, check that data presented in the NIR tables, text and figures are consistent and match the latest data reported in the CRF tables (i.e. regarding areas of cropland).	Addressing. The Party presented the area of cropland remaining cropland and land converted to cropland for the entire inventory period in NIR figures 6.9 and 6.10 respectively (section 6.3, p.319). The information in these graphs is consistent, to the extent this comparison can be made, with the data reported in CRF table 4.B for cropland remaining cropland (ranging from 27,157.90 kha in 1990 to 26,976.65 kha in 2021) and for land converted to cropland (ranging from zero in 1990 to 216.20 kha in 2021) for the entire time series. During the review, however, the ERT identified differences between the total area reported for cropland in CRF table 4.B and the final area in CRF table 4.1 for all years of the inventory period (1990–2021) (see ID# L.2 above). During the review, the Party informed the ERT that these inconsistencies had

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			already been identified as part of the QC activities it carried out; however, it could not explain the reasons for such discrepancies after 2015. For the years before 2015, Türkiye informed the ERT that it will revise all maps by using new updated maps to be developed as part of a new project, which is in the planning phase. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet ensured that the total cropland area reported in CRF table 4.B and CRF table 4.1, as well as in the NIR figures, is consistent and matches the latest data reported for all years of the inventory period.
L.13	4.B Cropland – CO_2 (L.16, 2021) (L.26, 2019) (L.31, 2018) Transparency	Provide in the NIR a clear explanation of the carbon stock value for above-ground biomass used in the calculations for perennial crops and the applicability of this value to national circumstances, and indicate whether the ongoing capacity-building projects in the country (e.g. the EU-funded project initiated in 2017) will generate carbon stock factors for perennial crops specific to Türkiye.	Addressing. The Party did not provide a clear explanation in the NIR of the carbon stock value for above-ground biomass in line with the recommendation. It reported in the NIR (p.288) that the EU-funded project on technical assistance for the LULUCF sector initiated in 2017 was completed in July 2019, and that it contributed to several improvements to the inventory. Furthermore, in NIR section 6.3 (pp.320–321), the Party reported that 15 t C/ha was used as the carbon stock value for above-ground biomass in perennial cropland with a 20-year rotation period and indicated the source of this value (Canaveira et al., 2018), which provides biomass data on cropland in the Mediterranean region. However, the Party did not explain the applicability of this value to Türkiye's national circumstances. Furthermore, the ERT could not find the carbon stock value of 15 t C/ha for above-ground biomass in perennial cropland in the source provided. During the review, the Party clarified that none of the improvements made as part of the EU-funded project addressed the development of country-specific carbon stock factors for perennial crops in the country. With regard to the carbon stock value for above-ground biomass in perennial cropland, the Party acknowledged the incorrect application of the value and stated that it will resolve the issue for the next GHG inventory submission. In its comments on the preliminary main findings, the Party further clarified that according to national experts the carbon stock value for above-ground biomass for perennial crops presented in Canaveira et al. (2018) is considered appropriate to Türkiye's national circumstances since it is based on a study conducted in the Mediterranean region. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet explained adequately in the NIR which specific carbon stock value for above-ground biomass from Canaveira et al. (2018) was used in the calculations for perennial crops and the applicability of this value to national circumstances as explained during the review.
L.14	4.B.2.1 Forest land converted to cropland – CO_2 (L.32, 2021) Accuracy	Use accurate EFs for changes in biomass, capturing non-woody biomass, for the assessment of the impact of land-use change from degraded forest land to other land use.	Not resolved. As indicated in the NIR, the Party continued to use the same stock factor (i.e. 4.05 t C/ha) for estimating carbon stock changes in living biomass in degraded forest land converted to cropland (table 6.21, p.325), grassland (table 6.25, p.338), wetlands (table 6.29, p.345) and settlements (table 6.34, p.354), as well as to other land (the same stock factor is assumed for this conversion). However, the Party provided no background information in the NIR justifying the accuracy of this country-specific stock factor. During the review, the Party indicated that data on stock factors for different forest types, including degraded forest, are developed from annual statistics from the

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			General Directorate of Forestry, which are based on forest inventories conducted by its Forest Management and Planning Department. In the forest inventories, sampling methods that vary by type of forest stand species are applied. The Party noted that areas with non-woody biomass are not excluded from the forest inventories, and that further investigation is needed to verify if non-woody biomass is included in the biomass density values. The ERT considers that the recommendation has not yet been addressed because the Party has not yet provided in the NIR background information to justify the accuracy (i.e. representativeness) of the country-specific stock factor used for degraded forest land or a clarification of whether non-woody biomass is included in the value of the stock factor.
L.15	4.C.1 Grassland remaining grassland – CO_2 and N_2O (L.17, 2021) (L.1, 2019) (L.1, 2018) (L.1, 2016) (L.1, 2015) (table 3, 2014) (72, 2013) (105, 2012) (91, 2011) Completeness	Use existing data, make all the necessary efforts to collect new data and report estimates for carbon stock changes in mineral soils for grassland.	Not resolved. The Party continued to report "NA" for carbon stock changes in the mineral soils pool for grassland remaining grassland for the entire time series, and did not provide in the NIR the reasons for not reporting carbon stock changes in mineral soils using at least the tier 1 methodology, in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 6.2.3, p.6.14). During the review, the Party clarified that management is carried out for pasture areas in the country, that grassland rehabilitation activities, which vary by region, are carried out every year, and that some AD available for grassland management practices were deemed unsuitable for reporting, but intensive work is being done to make the AD suitable for their use in the inventory. In addition, Türkiye expressed a strong commitment to report carbon stock changes in the SOM mineral pool for grassland remaining grassland.
L.16	4.C.2.1 Forest land converted to grassland – CO_2 (L.19, 2021) (L.34, 2019) (L.37, 2018) Consistency	Ensure that all land areas in transition from forest land to grassland that reach the end of transition time (default 20 years) are subtracted from that state and added to the grassland remaining grassland category in CRF table 4.C.	Not resolved. The Party did not ensure the correct application of the default 20-year transition period in forest land converted to grassland (see ID# L.6 above). For example, based on the information reported in CRF table 4.1, the correct areas for forest land converted to grassland for 2019, 2020 and 2021 would be 51.59, 54.58 and 57.07 kha respectively, but the Party reported the values for these years as 51.81, 54.98 and 57.75 kha respectively in CRF table 4.C. During the review, the Party explained that further investigation is needed to identify the reason for these inconsistencies and that they are likely to be due to the currently inconsistent land-use matrix. The ERT noted that, taking into account the areas reported in CRF table 4.1 and CRF table 4.C, the Party should report an area of forest land converted to grassland in the conversion subcategory for 20 consecutive years, after which an equal amount of area is subtracted from the forest land converted to grassland subcategory and added to the grassland remaining grassland category. Therefore, the ERT considers that the recommendation has not yet been addressed.
L.17	4.D Wetlands – CO_2 (L.20, 2021) (L.35, 2019) (L.19, 2018) (L.13, 2016) (L.13, 2015) (124, 2014) Transparency	Explain the trends in AD, taking into consideration the recommendations made in the previous review report on consistent land-use information and on the proper use of notation keys.	Not resolved. The Party reported in NIR figures 6.15a and 6.15b (p.344) the trends in the areas of managed wetlands and unmanaged wetlands respectively. However, the trends were not explained in the NIR. Furthermore, the ERT identified inconsistencies in the land-use information reported, in particular in the following cases:

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			(a) The area of wetlands reported in NIR figures 6.15a–6.15b does not match the area of wetlands reported in CRF table 4.D and CRF table 4.1. For example, the total area reported in NIR figures 6.15a–6.15b for 1990 and 2021 is approximately 2,990 and 3,150 kha respectively, while the corresponding values of total final area reported in CRF table 4.1 are 1,633.07 and 1,810.94 kha for these years respectively, and the total areas reported in CRF table 4.D are 1,637.12 and 1,978.49 kha respectively; (b) Although the area of flooded land remaining flooded land reported in CRF table 4.D varies throughout the time series, within an overall increasing trend, the area of land converted to flooded land in the same table is reported as "NE" (for cropland converted to flooded land) and "NO" (for grassland converted to flooded land); (c) The Party did not ensure the correct application of the default 20-year transition period in land converted to wetlands in CRF table 4.D on the basis of the area reported in CRF table 4.1 (see also ID# L.6 above), therefore consistency in the total wetlands area was not ensured; (d) The Party defined in NIR section 6.5 (p.344) managed wetlands as all human-made reservoirs and unmanaged wetlands as natural water bodies; however, the structure of CRF table 4.D does not facilitate a review of the information on managed and unmanaged wetlands and consequently a review of the consistency of the trends in AD. With regard to the use of notation keys, the Party did not properly use them in the following cases: (a) "NO" was used for the area of land converted to peat extraction in CRF table 4.D for the entire time series. However, under the tier 1 method, which the Party applied, the AD do not distinguish between peatlands under peat extraction and land converted to peat extraction (2006 IPCC Guidelines, vol. 4, chap. 7.2.2, p.7.17), therefore, the appropriate notation key to be used is "IE", with relevant information to be provided in CRF table 9; (b) "NE" was used for the area of cropland converted to flooded land in CRF table 4.D for the entire time series owing to the "insignificant" contribution of this land-use conversion to emissions and removals, as indicated in the NIR (p.342), although a numerical value should have been reported for the AD; (c) "NO" was used for the area of grassland converted to flooded land in CRF table 4.D for the entire time series because emissions and removals are assumed to be zero, as indicated in the NIR (p.342), although a numerical value should have been reported for the AD; (d) "NO" was used for the area of drained organic soils in peat extraction lands under wetlands in CRF table 4(II) for the entire time series, although a numerical value should have been reported for the AD. During the review, the Party clarified that this recommendation will be addressed in the next GHG inventory submission. The ERT considers that the recommendation has not

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			yet been addressed because the Party has not yet adequately explained the trends in AD, reported consistent land-use information or ensured the proper use of notation keys.
L.18	4.D.2 Land converted to wetlands – CO_2 (L.21, 2021) (L.36, 2019) (L.38, 2018) Transparency	Include a justification in the NIR for the discontinuity of previously reported information on emissions and areas related to wetlands (e.g. the area of cropland or grassland converted to wetlands) and the reporting of "NO" and "NE" in CRF table 4.D.	Resolved. The Party did not include in the NIR a justification for the discontinuity of the previously reported information on emissions and areas related to wetlands. In contrast, the ERT noted that in CRF table 4.D, the Party reported, for the entire time series, "NE" for the area and carbon stock changes for all carbon pools under cropland converted to flooded land and "NO" for the area and carbon stock changes for all carbon pools under grassland converted to flooded land. The Party included a justification in its NIR (p.342) and in CRF table 9 for the use of "NE", indicating that the carbon gains in biomass and SOC in cropland converted to flooded land are relatively low ("insignificant") and that "NO" was used on the basis that carbon stock changes in biomass and SOC are assumed to be zero because the same carbon stock factors were used for biomass and soils in grassland and wetlands. The ERT considers the issue of including in the NIR a justification for the discontinuity of the previously reported information on emissions and areas related to wetlands is no longer relevant because, according to paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, once emissions for a specific category have been reported in a previous submission, emissions for this specific category shall be reported in future GHG inventory submissions. Therefore, a new issue on this matter was raised by the ERT (see ID# L.35 in table 5).
L.19	4.E.2 Land converted to settlements – CO_2 (L.22, 2021) (L.37, 2019) (L.39, 2018) Transparency	Provide information in the NIR regarding the equations used to estimate the changes in carbon stock for biomass, litter and soils for land converted to settlements and their consistency with the 2006 IPCC Guidelines, as well as the AD and parameters used and their source.	Addressing. The Party reported in NIR tables 6.33–6.36 (pp.352–356) the parameters used for estimating carbon stock changes in biomass, DOM and soils in the different subcategories of land converted to settlements. The source of these parameters was provided in the NIR (pp.351–352) for some subcategories, namely for forest land, cropland and grassland. AD were not reported in the NIR, but these were reported in CRF tables 4.E and 4.1. The Party did not provide in the NIR information on the equations used to estimate carbon stock changes in all carbon pools in land converted to settlements and their correspondence with the 2006 IPCC Guidelines, or the source of the parameters used for estimating carbon stock changes in soils for wetlands and other land converted to settlements. During the review, the Party provided a general statement indicating that the required information is provided in the NIR (pp.350–357).
L.20	4(III) Direct N_2O emissions from N mineralization/immobilization – N_2O (L.24, 2021) (L.40, 2019) (L.41, 2018) Transparency	Provide information in the NIR regarding the expert judgment that led to the conclusion that N_2O emissions from mineralization occurring in other land are negligible in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Not resolved. In CRF table 4(III), the Party reported N_2O emissions from mineralization occurring in other land as "NE", justifying the use of this notation key only by stating in CRF table 9 that it was used "on the basis of provision 37(b) of the UNFCCC Annex I inventory reporting guidelines". In its NIR (p.362), the Party explained the use of "NE" in CRF table 4(III) by noting that N_2O emissions from mineralization occurring in other land were shown to be negligible. However, the Party did not demonstrate that N_2O emissions from N mineralization in other land are insignificant by providing relevant information in the NIR in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, namely the likely level of N_2O emissions and the AD, EFs and methods used to estimate this level of emissions. During the review, the Party

ID#	*Issue classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
			clarified that the N_2O emissions from mineralization occurring in other land were estimated within the scope of an EU-funded project on technical assistance for the LULUCF sector, which found them to be insignificant.
L.21	4(V) Biomass burning – CO_2, CH_4 and N_2O (L.25, 2021) (L.46, 2019) Completeness	Collect information on areas burned owing to wildfires for grassland and estimate emissions in future inventory submissions; and report controlled burning as "NO" and provide a rationale for the use of the notation key in the NIR.	Addressing. Türkiye reported controlled burning as "NO" in CRF table 4(V) for grassland remaining grassland and land converted to grassland, indicating in the NIR (p.366) that controlled burning is not practised in the country. However, the Party did not report emissions from wildfires in grassland remaining grassland and land converted to grassland in CRF table 4(V), reporting these subcategories as "NA" owing to the lack of accurate AD, which was reported in the NIR (p.366). During the review, the Party explained that it is undertaking studies to collect the necessary information for wildfires in grassland (grassland remaining grassland and land converted to grassland) that would allow it to estimate and report associated emissions in CRF table 4(V).
L.22	4.G HWP – CO_2 (L.31, 2021) Accuracy	Use accurate and consistent AD for HWP and explain any recalculations in the NIR.	Not resolved. The Party reported contradictory information on HWP recalculations in NIR section 6.13 (pp.369–370): while the reasons for recalculations are provided at the beginning of section 6.13, in the section on recalculations (p.370) the Party stated that HWP recalculations were not made. Furthermore, although the Party stated in its NIR (p.370) that for all three HWP commodities (sawnwood, wood-based panels, and paper and paperboard) the AD on HWP were from FAOSTAT (http://www.fao.org/faostat/en/#data/FO/), the AD reported in CRF table 4.G (sheet 2) are not consistent with FAOSTAT data. In particular, the ERT identified differences between the information reported in CRF table 4.G (sheet 2) and FAOSTAT data for sawnwood (production in 2019, imports for all years in 1961–2017 and exports for all years in 1961–2018) and for wood panels (production for all years in 1964–2021 except 2018, and imports and exports for all years in 1961–2021). The AD for paper and paperboard (production, imports and exports) reported in CRF table 4.G (sheet 2) are consistent with FAOSTAT data for the entire time series. During the review, the Party clarified that no recalculations were made in the current GHG inventory submission compared with the 2022 GHG inventory submission, which is confirmed in CRF table 4.G (sheet 1). The Party also clarified that FAOSTAT data were not used directly and it shared with the ERT an Excel file containing the AD used in the inventory for industrial roundwood and wood pulp (production, imports and exports) and for sawnwood, wood panels, and paper and paperboard (production). However, the ERT identified differences between the AD in this Excel file and FAOSTAT data, in particular in the production, import and export quantities for industrial roundwood in 2019–2021 and for production, import and export quantities for wood pulp in all years of the time series. The ERT also found that the AD in the Excel file and those in CRF table 4.G (sheet 2) differed in production quantities for wood panels in 2017 and for paper and paperboard in 2005–2007 and 2019. In addition, the Party confirmed that FAOSTAT data were used for estimating the carbon stock changes from HWP and indicated that the inconsistencies between the AD used in the inventory and the FAOSTAT data occurred because the Marketing Department of the General Directorate of Forestry submitted updated HWP

ID#	*Issue classification[a, b]*	*Recommendation from previous review report*	*ERT assessment and rationale*
			data to FAO after it submitted the GHG inventory to the UNFCCC. The Party stated that these inconsistencies will be corrected in the next GHG inventory submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet ensured consistency between the AD used (production, imports and exports) for HWP estimates (sawnwood, wood panels, and paper and paperboard, as well as industrial roundwood and wood pulp) and their source (FAOSTAT), nor has an adequate explanation been provided for the differences in AD when data other than FAOSTAT or expert assumptions are used.
Waste			
W.1	5.D.1 Domestic wastewater – CH_4 (W.7, 2021) (W.10, 2019) (W.9, 2018) Accuracy	Improve the accuracy of the parameter used for the degree of treatment utilization by population class for the whole time series by applying the results of the ongoing study being carried out to determine specific values for this parameter (every two years after 2008) and recalculate the AD and corresponding CH_4 emissions for the time series accordingly. If the aforementioned study is not available for the next GHG inventory submission, improve the transparency of the planned improvement section by mentioning the study, including a brief description of the scope, the progress achieved and the date that the results are expected to be available.	Addressing. Türkiye did not improve the accuracy of the parameter used for the degree of treatment utilization. However, the Party reported in the planned improvement section of the NIR (p.428) that it is preparing to conduct a study, one of the aims of which is to improve the parameter used in the estimation of CH_4 emissions for the degree of treatment utilization by population class (domestic wastewater) for the entire time series, and provided some other details on the study. It did not, however, provide further information on the study, such as a brief description of its scope, the progress achieved and the date that the results are expected to be available. During the review, the Party clarified that the planned study could not be prioritized for this GHG inventory submission because other more important issues needed to be addressed for key categories 5.D and 5.A. In addition, because of ongoing verification and comparison activities concerning CH_4 recovery data, no resources could be allocated to resolving this issue.
W.2	5.D.2 Industrial wastewater – CH_4 (W.9, 2021) (W.13, 2019) (W.11, 2018) Accuracy	Improve the accuracy of the parameter used for the fractional usage for different types of waste treatment and discharge pathways for the whole time series by applying the results achieved from the ongoing study being carried out to determine specific values for these parameters (every two years after 2008) and recalculate the AD and corresponding CH_4 emissions for the whole time series accordingly. If the results are not available for the next inventory submission, improve the transparency of the NIR by including the data source for the fractional usage parameter and mentioning in the planned improvement section the ongoing	Addressing. Türkiye did not improve the accuracy of the parameter used for fractional usage for different types of waste treatment and discharge pathways, and it did not include the data source for the fractional usage parameter. However, the Party reported in the planned improvement section of the NIR (p.428) that it is preparing to conduct a study, one of the aims of which is to improve the parameter used in the estimation of CH_4 emissions for the fraction usage for different types of wastewater treatment and discharge pathways for the entire time series. It did not, however, provide any further information on the study, such as a brief description of its scope, the progress achieved or the date that the results are expected to be available. During the review, the Party clarified that the planned study could not be prioritized for this GHG inventory submission because other more important issues needed to be addressed for key categories 5.D and 5.A. In addition, because of ongoing verification and comparison activities concerning CH_4 recovery data, no resources could be allocated to resolving this issue.

ID#	Issue classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		study, including a brief description of the scope and progress achieved, as well as the date that the results are expected to be available.	
W.3	5.D.2 Industrial wastewater – CH_4 (W.10, 2021) Accuracy	Review and justify the assumption used when there is a data gap for TOW for the latest reported year to ensure that the assumption is in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3) and does not lead to an over- or underestimation of the emissions.	Resolved. Türkiye reviewed the value of TOW for 2019 using interpolation after obtaining the data for 2020. The Party explained in the NIR (p.420) that data for calculating TOW are obtained every two years from a biennial survey (i.e. data are available for 2016, 2018, 2020, etc.) and missing data for the years when the survey is not conducted (e.g. 2015, 2017 and 2019) are estimated by linear interpolation. The Party estimated the TOW data for 2021 using the trend extrapolation method instead of assuming the data to be the same as for 2020 and included in the NIR (p.420) an explanation of the assumptions considered, which ensured that they do not lead to an over- or underestimation of emissions.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per para. 81 of the same guidelines.

[b] The report on the review of the 2022 inventory submission of Türkiye was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2021 inventory review report. For the same reason, 2022, 2020 and 2017 are excluded from the list of review years in which issues could have been identified.

IV. Issues identified in three or more successive reviews and not addressed by the Party

8. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three or more successive reviews, including the review of the 2023 inventory submission of Türkiye, and had not been addressed by the Party by the time of publication of this review report.

Table 4
Issues identified in three or more successive reviews and not addressed by Türkiye

ID#	Previous recommendation for issue	Number of successive reviews issue not addressed[a]
General	No issues identified.	
Energy		
E.4	Determine a reliable data source for international bunker fuels and improve time-series consistency.	7 (2013–2023)
E.6	Provide relevant information in the NIR on the methodology used for determining the country-specific oxidation factors and on the applicability of the analysis reports for solid fuels and the stack gas analysis reports to all fuel combustion activities, including domestic/residential.	3 (2019–2023)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
E.7	Determine an appropriate methodology for addressing the data gaps in the technology split for gaseous fuel combustion prior to 2003 in order to ensure consistency in the time series.	4 (2018–2023)
E.8	Use in the uncertainty analysis documented country-specific values for the uncertainty of CH_4 and N_2O EFs, in particular for EFs that are country- or plant-specific, or, if this is not possible, choose and use appropriate default uncertainty values for CH_4 and N_2O EFs and document the values selected and associated assumptions in the NIR.	4 (2018–2023)
E.9	Investigate how to allocate emissions from autoproducers of electricity to the category relevant to where the electricity is generated in accordance with the 2006 IPCC Guidelines.	4 (2018–2023)
E.10	Improve the transparency of the reporting by including a comparison of facility-level data with the sectoral totals from the national energy balance in the NIR.	5 (2015/2016–2023)
E.11	Provide relevant information in the NIR regarding the large inter-annual change in the CO_2 IEF for liquid fuels between 2015 and 2016.	3 (2019–2023)
E.13	Improve the comparability and consistency of the inventory and separate the emissions from pulp, paper and print (1.A.2.d), food processing, beverages and tobacco (1.A.2.e) and non-metallic minerals (1.A.2.f) from the emissions reported for subcategory 1.A.2.g other (manufacturing industries and construction) for the entire time series.	4 (2018–2023)
E.14	Include information on significant changes in the trend in AD composition for the different shares of oil products and on how these impact the CH_4 and N_2O IEFs.	5 (2015/2016–2023)
E.16	Estimate emissions from aviation gasoline consumption in domestic aviation or report these emissions as “IE” if this consumption is included elsewhere, or alternatively, use “NE” in CRF table 1.A(a) (sheet 3) with a justification in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	3 (2019–2023)
E.17	Move to a higher-tier method for calculating N_2O (and CH_4) emissions, as it is likely that subcategory 1.A.3.b would be a key category if using appropriate EFs.	6 (2014–2023)
E.18	Estimate emissions from gasoline consumption in domestic navigation or report these emissions as “IE” if this consumption is included elsewhere, or alternatively, use “NE” in CRF table 1.A(a) (sheet 3) with a justification in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	3 (2019–2023)
E.19	Separate the emissions under subcategory 1.A.4.a commercial/institutional from the emissions reported under subcategory 1.A.4.b residential for the entire time series.	4 (2018–2023)
E.20	Revise the emission estimates, reallocating the diesel oil used for agricultural purposes to subcategory 1.A.4.c agriculture/forestry/fishing by using assumptions based on the historical trend of the ratio of diesel oil used for agriculture to the total diesel oil used in the country.	6 (2014–2023)
E.22	Present in the NIR the assumptions regarding the treatment of lignite as sub-bituminous coal; report the number of abandoned underground coal mines per type of coal and their respective years of closure.	3 (2019–2023)
IPPU		

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
I.7	Investigate the rationale for the significant increase in vinyl chloride monomer production of 26.2 per cent between 2015 and 2016 and report the results of the investigation in the NIR.	3 (2019–2023)
I.9	Validate and double-check the AD on styrene production for the complete time series, provide the missing estimates if emissions occurred in the country and include explanations for the emission trend in the NIR.	6 (2014–2023)
I.18	Collect the necessary updated AD to reflect national market tendencies and report the corresponding emissions.	4 (2018–2023)
I.21	Provide estimates of HFC-227ea emissions from manufacturing, operation and disposal separately, or, if this is not possible, continue using "IE" for manufacturing and disposal and indicate clearly in CRF table 9 and the NIR that all HFC-227ea emissions are reported under operating systems (stocks).	4 (2018–2023)
I.22	Taking into account the high probability that metered dose inhalers are used in Türkiye, estimate and report HFC emissions from metered dose inhalers or provide evidence that these emissions are not occurring in the country.	4 (2018–2023)
I.23	Report complete emissions from refrigeration and air-conditioning equipment from manufacturing, operation and disposal by subcategory under category 2.F.1 instead of category 2.F.6 in accordance with the UNFCCC Annex I inventory reporting guidelines, or, if this is not possible, report the notation key "IE" in the appropriate cells of the CRF tables and include information in CRF table 9 and the NIR on where these emissions are reported.	4 (2018–2023)
I.24	Improve the consistency and accuracy of the reporting between CRF table 2(II).B-H and the NIR with respect to the reporting of HFC-32 emissions; and verify the product life EF for HFC-32 and revise the estimates, if necessary.	4 (2018–2023)
I.25	Estimate HFC emissions for 1999 by collecting data for 1999 or using interpolation in accordance with the 2006 IPCC Guidelines for between 1998 and 2000 (assuming that in 1998 no HFCs were consumed).	4 (2018–2023)
I.26	Provide in the NIR a more detailed description of the main assumptions applied and F-gas used in the F-gas model for estimating HFCs, in particular the assumed average initial filling and the number of units of equipment on the market for all years of the time series.	4 (2018–2023)
I.27	Calculate and report HFC disposal emissions from retired refrigeration and air-conditioning equipment, and, if applicable, the amount of recovery of these gases.	4 (2018–2023)
I.29	Report all likely occurring emissions, such as N_2O emissions from anaesthesia and other applications.	6 (2014–2023)
I.30	Report SF_6 emissions from manufacturing, operation and disposal of electrical equipment separately, taking into account the long-term use of such equipment, in accordance with the 2006 IPCC Guidelines.	4 (2018–2023)
I.31	Maintain consistency between CRF table 9 (last row) and the corresponding NIR table.	3 (2019–2023)
I.32	Report SF_6 emissions from manufacturing, operation and disposal separately, taking into account the long-term use of such equipment, in accordance with the 2006 IPCC Guidelines (vol. 3, table 6.2).	3 (2019–2023)
Agriculture		
A.2	Provide the rationale and a data source for the TAM values for all animal groups in chapter 5 of the NIR and in the reference list of the NIR.	3 (2019–2023)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
A.4	Update the methodological description in the NIR for the estimation of enteric CH_4 emissions from cattle to reflect the tier 2 method and enhanced livestock characterization used, and include AD (animal population data, TAM values, GE, Y_m, feed digestibility) and the relevant data sources for all three cattle subcategories (mature dairy cattle, other mature cattle and growing cattle).	3 (2019–2023)
A.5	Estimate emissions for significant livestock categories using the tier 2 method with country-specific EFs, including enhancing livestock population characterization and taking into account the relevant IPCC guidance.	7 (2013–2023)
A.6	Collect the necessary AD and estimate and report CH_4 and N_2O emissions from manure management using country-specific EFs and appropriate tier methods from the 2006 IPCC Guidelines.	4 (2018–2023)
A.7	Include the data source for the country-specific MMS distribution in the NIR.	3 (2019–2023)
A.8	Describe the method used for estimating emissions from manure burned for fuel in the NIR; and include a description in NIR chapter 5 of where in the energy sector or waste sector the emissions from burning of manure are reported.	3 (2019–2023)
A.9	Assess the significant inter-annual changes in the CH_4 IEF for swine manure management, in particular in the latest years of the time series, and include the results in the NIR.	4 (2018–2023)
A.10	Check the population of swine used in the calculations and assess and report in the NIR the reasons for any significant inter-annual changes observed in the population of swine across the time series. In cases where large inter-annual changes cannot be explained, consider whether using a splicing technique from the 2006 IPCC Guidelines would provide more accurate estimates.	4 (2018–2023)
LULUCF		
L.1	Strengthen the sector-level QC procedures to ensure consistency between the information provided in the NIR and the CRF tables, particularly with respect to NIR tables 6.2, 6.3, 6.13, 6.15 and 6.16.	4 (2018–2023)
L.2	Strengthen sector-level QC procedures to ensure consistency between the information provided in the NIR and the CRF tables, and between CRF table 4.1 and the background tables for the sector.	3 (2019–2023)
L.4	Strengthen QC procedures to ensure consistent representation of land between the end of one inventory year and the beginning of the next, and report correctly and consistently initial and final areas in CRF table 4.1.	4 (2018–2023)
L.5	Provide a consistent land-use matrix for the entire time series, presenting land-area changes related to conversions of forest land to other land uses, to facilitate a better assessment and understanding of how land-use changes are used in the emission calculations, and accurately document in the NIR how land-use changes from forest land to other land uses are assessed and detected.	3 (2019–2023)
L.6	Report the areas converted to a different land use under the relevant land-use conversion category for 20 consecutive years before reporting them under the corresponding land remaining category (this means that, for each year, the cumulative total area reported under each land-use change category should equal the cumulative area that has been converted to that land use over the past 20 years; however, the area of land under conversion that has been subject to a second land-use change during the 20-year conversion period should be subtracted from the cumulative total).	3 (2019–2023)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
L.7	Conduct a thorough scientific assessment of the estimation methods used for forest land, ensuring a comprehensive and balanced approach to calculating carbon inputs and outputs for each pool, and revise the estimates, if necessary.	6 (2014–2023)
L.12	Correct detected inconsistencies and, as part of QA/QC routines, check that data presented in the NIR tables, text and figures are consistent and match the latest data reported in the CRF tables (i.e. regarding areas of cropland).	5 (2015/2016–2023)
L.13	Provide in the NIR a clear explanation of the carbon stock value for above-ground biomass used in the calculations for perennial crops and the applicability of this value to national circumstances, and indicate whether the ongoing capacity-building projects in the country (e.g. the EU-funded project initiated in 2017) will generate carbon stock factors for perennial crops specific to Türkiye.	4 (2018–2023)
L.15	Use existing data, make all the necessary efforts to collect new data and report estimates for carbon stock changes in mineral soils for grassland.	9 (2011–2023)
L.16	Ensure that all land areas in transition from forest land to grassland that reach the end of transition time (default 20 years) are subtracted from that state and added to the grassland remaining grassland category in CRF table 4.C.	4 (2018–2023)
L.17	Explain the trends in AD, taking into consideration the recommendations made in the previous review report on consistent land-use information and on the proper use of notation keys.	6 (2014–2023)
L.19	Provide information in the NIR regarding the equations used to estimate the changes in carbon stock for biomass, litter and soils for land converted to settlements and their consistency with the 2006 IPCC Guidelines, as well as the AD and parameters used and their source.	4 (2018–2023)
L.20	Provide information in the NIR regarding the expert judgment that led to the conclusion that N_2O emissions from mineralization occurring in other land are negligible in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	4 (2018–2023)
L.21	Collect information on areas burned owing to wildfires for grassland and estimate emissions in future inventory submissions; and report controlled burning as “NO” and provide a rationale for the use of the notation key in the NIR.	3 (2019–2023)
Waste		
W.1	Improve the accuracy of the parameter used for the degree of treatment utilization by population class for the whole time series by applying the results of the ongoing study being carried out to determine specific values for this parameter (every two years after 2008) and recalculate the AD and corresponding CH_4 emissions for the time series accordingly. If the aforementioned study is not available for the next inventory submission, improve the transparency of the planned improvement section by mentioning the study, including a brief description of the scope, the progress achieved and the date that the results are expected to be available.	4 (2018–2023)
W.2	Improve the accuracy of the parameter used for the fractional usage for different types of waste treatment and discharge pathways for the whole time series by applying the results achieved from the ongoing study being carried out to determine specific values for these parameters (every two years after 2008) and recalculate the AD and corresponding CH_4 emissions for the whole time series accordingly. If the results are not available for the next inventory submission, improve the transparency of the NIR by including the data source for the fractional usage parameter and mentioning in the planned	4 (2018–2023)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
	improvement section the ongoing study, including a brief description of the scope and progress achieved, as well as the date that the results are expected to be available.	

[a] Reports on the reviews of the 2017, 2020 and 2022 inventory submissions of Türkiye have not yet been published. Therefore, 2017, 2020 and 2022 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party's 2015 and 2016 inventory submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2023 inventory submission

9. Table 5 presents findings made by the ERT during the individual review of the 2023 inventory submission of Türkiye that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2023 inventory submission of Türkiye

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
General			
G.2	Key category analysis	The ERT noted that Türkiye identified key categories using approach 1 of the 2006 IPCC Guidelines (vol. 1, chap. 4, p.4.13) and reported the results using tables 4.2 and 4.3 of those guidelines, adapted to the level of category disaggregation used for determining its key categories, as required by the UNFCCC Annex I inventory reporting guidelines (para. 39). The ERT also noted that Türkiye did not use approach 2 of the 2006 IPCC Guidelines (vol. 1, chap.4, p.4.17) to identify key categories, despite having the uncertainty information for all categories necessary to use this approach. The 2006 IPCC Guidelines (vol. 1, chap. 4, p.4.17) indicate that the order of categories resulting from the application of approach 2 can provide useful information for the prioritization of improvement activities. The UNFCCC Annex I inventory reporting guidelines (para. 14) state that Parties are encouraged to also use approach 2 to identify key categories and to add additional key categories to the result of approach 1. During the review, the Party clarified that it prioritized the fulfilment of mandatory requirements in reporting its key category analysis. The Party informed the ERT that it will consider identifying and reporting key categories using approach 2 for its next GHG inventory submissions. The ERT encourages Türkiye to identify key categories using approach 2 of the 2006 IPCC Guidelines, as encouraged in the UNFCCC Annex I inventory reporting guidelines.	Not an issue/problem
G.3	QA/QC and verification	The ERT recognized that the implementation of QA/QC procedures applied by the Party has improved and the number of procedures have increased since the approval of its National Inventory System QA/QC Plan in October 2017, which facilitated a qualitative improvement in the Turkish national GHG inventory. The ERT noted that the QA procedures applied to the energy, IPPU, agriculture and waste sectors have contributed to improving the transparency and completeness of the respective GHG inventories. The ERT also noted that, in the NIR, the only sector not reported to be subject to QA procedures is the LULUCF sector, for which more	Not an issue/problem

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		issues relating to QA/QC were identified than for the other sectors. The UNFCCC Annex I inventory reporting guidelines (paras. 19 and 26(b)) state that each Annex I Party should provide for a basic review of the inventory by personnel that have not been involved in the inventory development process, preferably an independent third party, before the submission of the inventory, in accordance with its planned QA procedures in accordance with the 2006 IPCC Guidelines. During the review, the Party informed the ERT that decisions regarding the implementation of specific QA procedures and improvements in a given sector lie with the institution responsible for the sector's inventory. The Ministry of Agriculture and Forestry, which is responsible for the inventory of the LULUCF sector, informed the ERT that it is seeking to continue the EU-funded project "Technical assistance for developed analytical basis for the land use, land use-change and forestry (LULUCF) sector" completed in July 2019. Specific QA procedures for the sector are planned in the proposal for the project's continuation. The ERT encourages Türkiye to perform QA procedures for the LULUCF sector conducted by personnel that have not been involved in the inventory development process, preferably a third party, as part of the QA/QC procedures Türkiye implements in the preparation of its GHG inventory.	
G.4	Recalculations	The ERT noted that the reporting of recalculations by Türkiye has improved over time, with almost all the information required by the UNFCCC Annex I inventory reporting guidelines (paras. 43–44) now being reported. The ERT also noted that the UNFCCC Annex I inventory reporting guidelines state that a discussion on the impact of the recalculations on the trend in emissions at the category, sector and national total level should be provided in the NIR, as appropriate (para. 43), and information on the procedures used for performing the recalculations (para. 44) should be reported. However, Türkiye did not report this information in its NIR. The ERT considers that a discussion on the impact of the recalculations on the trend in emissions could be particularly important when the impact is high. This is the case, for example, for category 4.A.1 forest land remaining forest land for 2019, where the recalculation produced a decrease of 25.4 per cent in net removals for the sector and an increase of 5.0 per cent in net emissions for the national GHG inventory including LULUCF. For this category, the recalculations resulted in an increase of 20.3 per cent in net removals in 1990 and a decrease of 28.4 per cent in net removals in 2019. During the review, the Party clarified that it prioritized the fulfilment of mandatory requirements in reporting on recalculations. The Party informed the ERT that it will consider reporting information on the procedures used for performing recalculations and providing a discussion on the impact of the recalculations on the trend in emissions in its next GHG inventory submissions. The ERT encourages Türkiye to report information on the procedures used for recalculations and to provide a discussion on the impact of the recalculations on the trend in emissions at the category, sector and national total level, as appropriate, as per the UNFCCC Annex I inventory reporting guidelines.	Not an issue/problem
Energy			
E.23	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O	The Party reported in its NIR (p.48) that the main finding of a QA exercise conducted for the energy sector in 2020 was inconsistency in sectoral emissions over the time series arising from inconsistent time-series data in the national energy balance, which is the main source of the energy sector data published annually by MENR. This inconsistency is reflected in several AD-related issues identified in previous reviews that remain unresolved. These issues relate to the early years of the time series (see ID#s E.4, E.13 and E.19 in table 3) and	Yes. Consistency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		to the breakdown of fuel use between subcategories (see ID#s E.16, E.18 and E.20 in table 3). The ERT noted that the resolution of these specific issues requires a holistic approach to obtaining the AD necessary to ensure time-series consistency and accurate disaggregation of fuel use. During the review, the Party explained that the statistical system of Türkiye is organized in accordance with the Official Statistical Program, which defines the institutional responsibilities of relevant stakeholders. While there is no single national entity responsible for energy statistics, TurkStat is responsible for monitoring the production and dissemination of official statistics and is thus ultimately responsible for national energy statistics. Türkiye indicated that the energy balance time series is divided into two periods: up until the end of 2014 (as the cut-off point) and from 2015 onward. This is because a higher degree of disaggregation was used to report information on energy balances after 2015. The Party also indicated that MENR does not plan in the short term to carry out activities aimed at reviewing the consistency of energy balances in the period up to 2014, and that TurkStat has initiated a project to collect the information necessary to develop a consistent time series of fuel use for the categories where inconsistencies were identified. Unfortunately, the project was interrupted as a result of the coronavirus disease 2019 pandemic and no date has been set to restart it. The ERT recommends that Türkiye ensure the collection of AD for the energy sector that are necessary for estimating and reporting, in accordance with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines, a consistent time series for (1) emissions from food processing, beverages and tobacco (1.A.2.e), commercial/institutional (1.A.4.a) and international bunkers; and (2) emissions from gasoline use, broken down by domestic aviation (1.A.3.a), road transportation (1.A.3.b) and domestic navigation (1.A.3.d); and emissions from diesel oil, broken down by road transportation (1.A.3.b) and agriculture/forestry/fishing (1.A.4.c).	
E.24	1.B.1.a Coal mining and handling – solid fuels – CH_4	The Party reported in its NIR (p.143) that the IPCC tier 1 methodology was applied to estimate CH_4 emissions from coal mining and handling using data on domestic coal production taken from the national energy balance as AD. During the review, the Party clarified that the AD reported in the energy balance correspond to the amount of washed coal reported in statistical coal surveys. The ERT noted that in line with the 2006 IPCC Guidelines (vol. 2, chap. 4, equation 4.1.1, p.4.9), the AD required to be used for the tier 1 methodology are raw coal production, not saleable coal production (i.e. the amount of washed coal). The ERT recommends that Türkiye collect or estimate the necessary data on the amount of raw coal production, and use these data as AD to revise and report the estimates of CH_4 emissions for this subcategory for the entire times series.	Yes. Accuracy
E.25	1.B.2 Oil, natural gas and other emissions from energy production – liquid and gaseous fuels – CO_2, CH_4 and N_2O	The Party reported subcategories 1.B.2.a.1 oil exploration and 1.B.2.b.1 natural gas exploration as “NO” in CRF table 1.B.2. The ERT noted that the State-owned Turkish Petroleum Corporation has carried out exploration activities in recent years (Ackerman, 2020; Essau, 2022). During the review, the Party clarified that, until recently, Türkiye had not identified significant oil and natural gas reserves, therefore, although there were minor exploration activities, the associated emissions were not estimated. Given that exploration activities have increased recently, the ERT considers that the associated emissions should be investigated, estimated and reported in the inventory. The ERT recommends that Türkiye estimate and report the emissions from oil and natural gas exploration (subcategories 1.B.2.a.1 and 1.B.2.b.1 respectively) in its GHG inventory for the years in which this activity	Yes. Completeness

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		occurred in the country or, if unable to do so, report these emissions as "NE" rather than "NO" for the years in which this activity occurred and provide a corresponding explanation in the NIR.	
IPPU			
I.34	2.A.3 Glass production – CO_2	The Party reported in its NIR (pp.163–166) that only CO_2 emissions associated with the major raw materials used in glass production (limestone, dolomite and soda ash) are estimated, using a tier 3 method from the 2006 IPCC Guidelines, and included in the GHG inventory. The ERT noted that according to the 2006 IPCC Guidelines (vol. 3, chap. 2, p.2.27), there are other minor CO_2-emitting raw materials, such as barium carbonate, bone ash, potassium carbonate and strontium carbonate. In addition, powdered anthracite coal or some other organic material may be added to create reducing conditions in molten glass, which will combine with available oxygen in the glass melt to release CO_2. The Party did not include information on whether it uses any of these raw materials in glass production in the NIR. During the review, the Party informed the ERT that it will examine monitoring, reporting and verification reports from plant operators and use the information therein to estimate emissions from these other raw materials used in glass production. The ERT recommends that Türkiye collect the necessary AD and estimate the CO_2 emissions associated with minor CO_2-emitting raw materials used in glass production and powdered coal or other organic material that may be added to create reducing conditions in molten glass and include these emissions in the next GHG inventory submission, or provide information in the NIR to justify that these emissions are not occurring.	Yes. Completeness
I.35	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	The Party did not report CO_2 emissions from the use of urea by vehicles equipped with selective catalytic reduction pollution control technology in CRF table 2(I).A-H (sheet 2) or provide information on these emissions in the NIR. The ERT noted that according to the UNFCCC Annex I inventory reporting guidelines (footnote 6 to CRF table 2(I).A-H (sheet 2)), CO_2 emissions from the use of urea as a catalyst should be reported under category 2.D.3 other. During the review, the Party clarified that these emissions will be included in the next GHG inventory submission. The ERT recommends that Türkiye estimate and report CO_2 emissions from the use of urea as a catalyst in CRF table 2(I).A-H (sheet 2) of the next GHG inventory submission.	Yes. Completeness
I.36	2.G.1 Electrical equipment – SF_6	The Party reported in its NIR (pp.233–235) that SF_6 emissions from circuit breakers are estimated by applying the default EF of 2 per cent provided in the 2006 IPCC Guidelines (vol. 3, chap. 8, table 8.2, p.8.15) to the annual trade data for SF_6 provided by the Ministry of Trade. The ERT noted that according to the 2006 IPCC Guidelines, the 2 per cent default EF should be applied to the nameplate capacity of the equipment and not to the SF_6 used. During the review, the Party clarified that imported SF_6 is partly used to replace annual losses, but also by several manufacturers in the country in the manufacturing of new medium-voltage switchgear. The ERT recommends that Türkiye gather data on the nameplate capacity of all circuit breakers in the national power transmission network and ensure the accurate application of the tier 1 methodology from the 2006 IPCC Guidelines, which uses a default EF of 2 per cent for estimating SF_6 emissions, or, as an alternative approach, use data from the national power transmission system operator on the amount of SF_6 used for refilling circuit breakers, assuming that this amount compensates for SF_6 leakages and therefore represents actual SF_6 emissions.	Yes. Accuracy
Agriculture			

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
A.14	3.A.2 Sheep – CH_4	In its NIR (p.494), the Party explained that the enteric fermentation CH_4 EF for merino sheep (6.5 kg CH_4/head/year) was derived as the average value of the default EFs for sheep farmed in developing and developed countries taken from table 10.10 of the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.28). The ERT considers that the approach employed by Türkiye is not in line with the approach of the 2006 IPCC Guidelines as stated in the footnote to table 10.10 for developing approximate EFs; that is, to use the tier 1 EF for an animal with a similar digestive system and to scale this EF using the ratio of the weights of the animals raised to the 0.75 power (live weight values are included in the table for this purpose). The ERT noted that the Party has country-specific data on the live weight of merino sheep, which were reported in NIR table 5.19 (p.261). During the review, the Party clarified that the approach described in the footnote to table 10.10 of the 2006 IPCC Guidelines was used to derive an adjusted enteric fermentation EF for merino sheep (5.73 kg CH_4/head/year), the results of which are described in the NIR (p.253). However, this adjusted enteric fermentation EF was not used to calculate CH_4 emissions from enteric fermentation of merino sheep in the 2023 GHG inventory submission. The ERT recommends that Türkiye apply the approach described in the footnote to table 10.10 of the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.28), along with its country-specific data on the live weight of merino sheep, to derive an EF that is in accordance with national circumstances for calculating CH_4 emissions from the enteric fermentation of merino sheep.	Yes. Accuracy
A.15	3.B.4 Other livestock – CH_4 and N_2O	The ERT noted that Türkiye did not report AD or CH_4 and N_2O emissions from manure management for rabbits under subcategory 3.B.4 other livestock. However, the ERT noted that FAOSTAT provides population data for rabbits for Türkiye, while tables 10.16 and 10.19 of the 2006 IPCC Guidelines (vol. 4, chap. 10, pp.10.41 and 10.59) provide a default CH_4 EF for manure management and default values for rabbit Nex rates respectively. Moreover, the ERT found a scientific article (Wilson and Yilmaz, 2013) that states that angora rabbit farms exist in Türkiye. During the review, Türkiye referred to two scientific papers (Yigit, 2014; Yilmaz and Wilson, 2012) that demonstrate that while rabbit farming occurred in the country in the past, as a result of high competition in the angora wool market rabbit production has become a very minor activity in the country in recent years. Nevertheless, the Party confirmed that it will make an effort to examine the status of the rabbit population and of rabbit farming practices in the country for the whole reporting period. In its comments on the preliminary main findings, Türkiye clarified that it considers that the resulting potential emissions from rabbit farming in some years of the 1990–2021 time series are expected to be below the significance threshold defined in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that Türkiye collect information on the rabbit population in the country for the complete time series and estimate and report N_2O and CH_4 emissions from manure management for rabbits, or, alternatively, use "NE" for reporting these emissions in the CRF tables with a clear justification in the NIR in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Completeness
A.16	3.G Liming – CO_2	In CRF table 3.G-I, the Party reported CO_2 emissions for this category as "NE". In the NIR (p.283), the Party states that "our research is almost decisive in estimating CO_2 emissions, which amounted to far less than 100 kt for 2015 due to liming applied on soils. Hence, this category is considered insignificant according to 24/CP.19, annex I, paragraph 37(b)". However, the ERT noted that the Party did not report a source for the amount of dolomite and limestone, the parameters used to calculate the likely level of emissions or whether this information is still representative for current practices in the country. During the review, the Party explained	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		that various statistical departments specialized in diverse data sources and nationwide polling initiatives within TurkStat were consulted to ensure a comprehensive and accurate expert judgment on the amounts of limestone and dolomite applied to agricultural soils. The Party informed the ERT that while a written record of these expert inputs on the likely level of emissions from liming exists in the national system archives, it cannot be shared with the ERT during the review because of confidentiality reasons. The ERT recommends that Türkiye provide transparent information in the NIR in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines explaining (1) how data on the amounts of limestone and dolomite applied to agricultural soils were derived, for example by providing the name and background of the experts who were involved in eliciting the judgment on amounts used for liming, and (2) how these data were used for calculating the likely level of CO_2 emissions from liming, including information on the method, EFs and any assumptions applied.	
A.17	3.D.a.5 Mineralization/immobilization associated with loss/gain of soil organic matter – N_2O	The Party reported N_2O emissions from N mineralization associated with losses of SOM in cropland remaining cropland in CRF table 3.D as "NO" for the entire reporting period. However, the ERT noted that the Party reported net SOC gains in mineral soils in CRF table 4.B for cropland remaining cropland. During the review, the Party clarified that the SOC gains in mineral soils reported in CRF table 4.B for cropland remaining cropland correspond to net SOC gains from annual cropland conversions to perennial cropland and SOC losses from perennial cropland conversions to annual cropland (see ID# L.31 below). The ERT considers that the approach followed by Türkiye to report N_2O emissions from mineralization associated with losses of SOM in cropland remaining cropland is not in line with the 2006 IPCC Guidelines (vol. 4, chap. 11, p.11.15) because, according to the guidelines, where there are losses of carbon in mineral soils, N mineralization and related N losses occur. The ERT recommends that Türkiye estimate, for the whole time series, direct and indirect N_2O emissions from N mineralization associated with losses of SOM in cropland remaining cropland using data on SOC losses as AD and equation 11.8 of the 2006 IPCC Guidelines (vol. 4, chap. 11, p.11.16), and report these emissions in CRF table 3.D as well as explain the underlying data used to perform the calculations in the NIR.	Yes. Completeness
LULUCF			
L.23	4. General (LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that despite the encouragement of the previous ERT (FCCC/ARR/2021/TUR, ID# L.27), Türkiye continued to report as "NA" uncertainties at the pool level in cases where the emissions/removals were not estimated, but indicated a relative uncertainty of 0 per cent at the aggregate category level for 1990 and in some cases for 2021, namely land converted to forest land (NIR table 6.18, p.314), land converted to cropland (NIR table 6.24, p.334), grassland remaining grassland and land converted to grassland (NIR table 6.28, p.340), wetlands remaining wetlands and land converted to wetlands (NIR table 6.32, p.348), settlements remaining settlements and land converted to settlements (NIR table 6.37, p.357), other land remaining other land and land converted to other land (NIR table 6.39, p.359), and sources reported in CRF tables 4(I), 4(II), 4(III) and 4(IV) in NIR tables 6.40, 6.41, 6.43 and 6.45 (pp.360, 361, 363 and 365) respectively. During the review, the Party clarified that the encouragement will be implemented for the next GHG inventory submission. The ERT reiterates the encouragement for Türkiye to use the notation key "NA" when presenting relative uncertainties for aggregate categories for which emissions or removals have not been estimated.	Not an issue

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
L.24	4. General (LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that Türkiye did not include any information in the NIR on whether a significance analysis was performed as part of the key category analysis, namely it did not identify significant subcategories and carbon pools for each key category identified and reported in annex 1 to the NIR (pp.439–456) and in CRF table 7. The ERT noted that, in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 4.2, p.4.8, and vol. 4, chap. 1.3.3, pp.1.12–1.13), it is good practice to use the significance of subcategories and carbon pools to determine which tier methodology should be used to estimate GHG emissions and removals from significant sources and sinks. During the review, the Party explained that the key category analysis is carried out by TurkStat and the results are shared with the inventory team of the Ministry of Agriculture and Forestry, which is responsible for the LULUCF sector inventory. The ERT recommends that Türkiye integrate into its key category analysis the significance analysis that determines which subcategories and carbon pools are significant within each key category, in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 4.2, p.4.8, and vol. 4, chap. 1.3.3, pp.1.12–1.13), and report the results of this analysis in the NIR.	Yes. Convention reporting adherence
L.25	4. General (LULUCF) – CO_2 and N_2O	Türkiye developed country-specific SOC values for mineral soils to estimate carbon stock changes in the SOM mineral pool for the different land-use change categories (e.g. NIR table 6.16, p.311, and NIR table 6.20a, p.323). These SOC values, which were stratified by land use and by eight ecozones found in the country, but not by management system or by soil type, were used as SOC reference values (SOC at equilibrium) when estimating carbon stock changes. However, no information was provided in the NIR on how the country-specific values were developed (i.e. method, sampling scheme, sample size, timing of measurement and soil depth for the sampling), how the representativeness of the values was ensured for the different strata applied, and how, if at all, the country-specific values were verified. During the review, Türkiye clarified that its country-specific SOC values were developed as part of the Organic Carbon Project conducted by the Agricultural Research and Development Institute of the Ministry of Agriculture and Forestry. As part of this project, a soil map was produced for 2010–2015 using data collected between 1995 and 2010. For this work, 81 provinces were taken as basis, digital provincial soil maps (at 1/25,000 scale) were used, while the soil sampling considered geology, land use and topography, and samples were taken at depths of 0–30 cm. Türkiye stated that no specific activities to verify the values took place, and expressed its intention to proceed with resampling for estimating new SOC values. The ERT recommends that Türkiye: (a) Provide in the NIR background information on how its country-specific SOC values were developed (i.e. method, sampling scheme, sample size, timing of measurement and soil depth for the sampling) and on how the representativeness of the values was ensured for the different strata applied, as well as its plans and timetable for resampling to produce new SOC values; (b) Verify its country-specific SOC values in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 2.5.1, pp.2.50–2.51, and vol. 1, chap. 6.10, pp.6.19–6.22) and report in the NIR the results of the verification (e.g. by comparing carbon stock changes in mineral soils using tier 1 and 2006 IPCC Guidelines default parameters); (c) Ensure that the country-specific SOC values for mineral soils are estimated by stratifying available data by management system and by soil type, as well as by climate zone and by land use.	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
L.26	Land representation – CO_2, CH_4 and N_2O	In addition to the issues that are being addressed or remain unresolved related to land representation (see ID#s L.2, L.4, L.5, L.6 and L.16 in table 3), the ERT identified the following new issues on land representation: (a) All land-use changes for 1990 were reported as "NO" in CRF table 4.1 and CRF tables 4.A–4.F, except for cropland conversion to flooded land (CRF table 4.D), for which "NE" was reported. At the same time, carbon stock change estimates were reported for 1990 for (1) living biomass in forest land remaining forest land (CRF table 4.A); (2) organic soils in cropland remaining cropland (CRF table 4.B), grassland remaining grassland (CRF table 4.C) and peat extraction remaining peat extraction (CRF table 4.D); (3) biomass burning (wildfires) in forest land remaining forest land and land converted to forest land (CRF table 4(V)); and (4) HWP (CRF table 4.G). The ERT is of the view that it is very unlikely that in the starting year of the inventory, land-use changes did not occur; (b) The total area of the country reported in both CRF table 4.1 and CRF tables 4.A–4.F is not constant throughout the time series. In CRF table 4.1, the total area increases between 2020 and 2021 by 37.97 kha, and in CRF tables 4.A–4.F, the total area changes in 2018–2021; (c) The total area of unmanaged wetlands reported in CRF table 4.1 increases from a previous value in some years (e.g. 1991, 2005) and consistently increases from 2009 onward. However, conversions to unmanaged wetlands from all land-use categories were reported as "NO" for the entire time series in this table; (d) The latest year for which a land-use classification map is available is 2015. For 2016–2021, extrapolation was used to develop the land-use matrix (NIR section 6.1, p.296). No information is included in the NIR as to when a new land-use map is expected to be developed. During the review, the Party provided explanations on the above-mentioned issues as follows: (a) Land-use maps are included from 1990 in the database, which is the reason why land-use changes were reported as "NO" for 1990; (b) The inconsistencies in total land area arose from the extrapolation for land-use changes from 2015 onward. For extrapolation from 2015 to the latest inventory year, the same trend as for 2011–2015 was assumed; (c) In CRF table 4.1, only managed wetlands are included in the total area; (d) The development of a new land-use classification map is part of the inventory improvements foreseen, although no concrete plans or timetable have been set yet (see ID# L.2 in table 3). The ERT recommends that Türkiye: (a) Revise its land-use matrix assuming that the available land-use classification maps represent the start of the year they refer to (e.g. start of 1990) and report land-use changes in 1990 in CRF table 4.1 and CRF tables 4.A–4.F, as appropriate, and associated emissions and removals in CRF tables 4.A–4.F and CRF tables (I)–(V) accordingly; (b) Revise the land-use matrix ensuring that the total country area reported in CRF table 4.1 and CRF tables 4.A–4.F remains constant throughout the entire time series and identical across CRF table 4.1 and CRF tables 4.A–4.F; (c) Revise the land-use matrix ensuring consistency in the areas reported for total unmanaged wetlands and land-use conversion to unmanaged wetlands in CRF table 4.1, namely ensuring that the final unmanaged	Yes. Accuracy

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		wetlands area in year *t* equals the final unmanaged wetlands area in the year *t*–1 plus the land-use conversions to unmanaged wetlands from all other land-use categories in year *t*, minus the land-use conversions from unmanaged wetlands to all other land-use categories in year *t*; (d) Develop a new land-use classification map and use it to recalculate the land-use matrix for 2015 onward.	
L.27	Land representation – CO_2, CH_4 and N_2O	In its NIR (p.288), Türkiye stated that spatially explicit AD were developed for land-use classification and land-use matrices; however, no clear information was provided on which approach from the 2006 IPCC Guidelines (vol. 4, chap. 3, pp.3.10–3.13) the Party applied for land representation. During the review, the Party clarified that approach 3 was used for the entire national territory. However, the ERT noted from the information contained in the NIR and shared during the review that the application of approach 3 could not be verified and it appeared that approach 2 was applied instead. The Party agreed that the way in which the land representation was developed corresponds to approach 2. The ERT recommends that Türkiye report in the NIR clear information on which approach it applied from the 2006 IPCC Guidelines (vol. 4, chap. 3, pp.3.10–3.13) for the development of the land representation.	Yes. Transparency
L.28	Land representation – CO_2, CH_4 and N_2O	Türkiye reported in NIR table 6.5 (p.298) the confusion matrix that was developed as part of the accuracy assessment of land-use classification at the level of the six main land-use categories. This matrix presents measures of uncertainty of area and area changes of the land-use categories, and provides information on overall thematic accuracy, class-specific user's and producer's accuracies, and Kappa coefficients at a confidence interval of 95 per cent. The ERT noted that no information was reported in the NIR as to the year(s) to which the confusion matrix applies and whether the accuracy assessment was also done for the different strata used within each land-use category (e.g. the productive forests stratum in the forest land category). Given the significance of the area of specific strata (e.g. productive forests) in the inventory in terms of their contribution to total emissions/removals, the ERT requested additional information on this matter from the Party. During the review, the Party shared with the ERT a deliverable document prepared as part of a technical assistance project co-financed by Türkiye and the EU. Under this project the land-use maps have been used in developing the land representation. The project document included the confusion matrices for 1990, 2000 and 2015 (the last year for which a land-use classification map is available). These matrices include information on the accuracy assessment of the land-use categories at the stratum level (i.e. deciduous, coniferous, mixed and degraded forests for forest land; annual and perennial crops for cropland; herbaceous cover for grassland; managed and unmanaged wetlands; settlements and other land). The confusion matrices indicate that user accuracy, for example for productive forests (deciduous, coniferous and mixed), ranges from 85.0 to 89.2 per cent for 1990 and from 81.0 to 88.0 per cent for 2015, with existing errors associated with misclassification between productive and degraded forests. The ERT recommends that Türkiye include in the NIR the confusion matrices provided during the review, which contain information on the accuracy assessment of the land-use categories at the stratum level for 1990, 2000 and 2015.	Yes. Transparency
L.29	4.A.1 Forest land remaining forest land – CO_2, CH_4 and N_2O	The ERT noted that information on the strata used in the inventory (according to different criteria applied) is presented in various tables of the NIR. For example, NIR table 6.2 (p.291) presents the eight ecozones of the country, NIR table 6.7 (p.300) presents annual increment rates for the four strata based on species composition (coniferous, deciduous, mixed and other forested land), NIR table 6.8 (p.301) presents the annual area of the	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		two strata based on production criteria (productive forests and degraded forests) and NIR tables 6.10–6.11 (p.304) present the growing stock and volume increment for the two silvicultural systems (high forest and coppice) for productive forests and degraded forests separately. However, from the information provided in the NIR, the disaggregation level at which carbon stock changes in living biomass have been estimated is unclear. CRF table 4.A presents AD (area) and carbon stock changes in living biomass aggregated for total forest land remaining forest land. During the review, the Party clarified that the strata representing the lowest level at which carbon stock changes in living biomass were estimated are coniferous, deciduous, mixed and other forested land. The ERT recommends that Türkiye report AD (area) and carbon stock changes in living biomass in forest land remaining forest land separately for coniferous, deciduous, mixed and other forested land for the entire time series in either CRF table 4.A or the NIR.	
L.30	4.A.1 Forest land remaining forest land – CO_2, CH_4 and N_2O	The ERT noted that no information was provided in the NIR on the actual amount of wood and fuelwood removals that were used to estimate carbon losses in living biomass for the same strata used to estimate carbon gains, namely coniferous, deciduous, mixed and other forested land. During the review, the Party clarified that, for carbon losses from harvesting, annual data on actual industrial roundwood and fuelwood removals per species from the forestry statistics of the General Directorate of Forestry (see ID# L.10 in table 3) were used. The Party provided the ERT with an Excel file containing this information. The ERT recommends that Türkiye include in the NIR a table showing, for the entire time series, the annual amount of industrial roundwood and fuelwood removals that are used to estimate carbon losses in living biomass in forest land remaining forest land, separately for coniferous, deciduous, mixed and other forested land.	Yes. Transparency
L.31	4.A.2 Land converted to forest land – CO_2	The ERT noted that carbon stock changes in deadwood in land converted to forest land were reported as "NO" for the entire time series in CRF table 4.A. At the same time, deadwood carbon stock changes were included in the DOM carbon stock changes in forest land conversions to other land uses, and carbon stock change factors were provided in NIR tables 6.22, 6.26, 6.30 and 6.35 (pp.328, 339, 346 and 355 respectively). During the review, the Party clarified that, according to the assumption made by the Forest Management and Planning Department of the General Directorate of Forestry, areas of land converted to forest land can produce deadwood if they reach a specific age class, namely trees with diameter at breast height of greater than 8 cm and that are over 20 years old. The Party did not, however, provide information to justify this assumption. The ERT recommends that Türkiye either report estimates for deadwood carbon stock changes calculated by applying at least the tier 1 methodology from the 2006 IPCC Guidelines (vol. 4, chap. 2.3.2.2, p.2.25) with the deadwood stock values that have been used to estimate carbon stock changes in the deadwood pool for forest land conversions to other land uses, or provide in the NIR evidence justifying that when land is converted to forest land, deadwood carbon stock changes are zero.	Yes. Completeness
L.32	4.B.1 Cropland remaining cropland – CO_2, CH_4 and N_2O	The ERT noted that Türkiye reported aggregated carbon stock change values in CRF table 4.B for the two strata (annual and perennial) under cropland remaining cropland. The Party also did not provide in NIR section 6.3 (p.317) any disaggregated information on the carbon stock changes for these strata. The ERT noted that, without reporting disaggregated data (either in CRF table 4.B or in the NIR), it is not possible to detect the different dynamics in carbon stock changes estimated for these two strata under cropland remaining cropland	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		(i.e. perennial cropland remaining perennial cropland, annual cropland remaining annual cropland, perennial cropland converted to annual cropland and annual cropland converted to perennial cropland). For example, according to NIR table 6.20a (p.323), perennial cropland conversion to annual cropland leads to carbon loss in mineral soils in all ecozones; however, these carbon losses are not reported separately in CRF table 4.B or in the NIR. During the review, the Party confirmed that mineral soil carbon stocks in perennial crops are higher in all ecozones than in annual crops, thus perennial cropland conversion to annual cropland leads to carbon loss while annual cropland conversion to perennial cropland leads to carbon gains. The ERT recommends that Türkiye either report AD (area) and carbon stock changes in living biomass and mineral and organic soils disaggregated for perennial cropland remaining perennial cropland, annual cropland remaining annual cropland, perennial cropland converted to annual cropland and annual cropland converted to perennial cropland in CRF table 4.B or, if carbon stock changes are reported aggregated in one subcategory under cropland remaining cropland in CRF table 4.B, report the above indicated disaggregated information in the NIR, for the entire time series.	
L.33	4.B.1 Cropland remaining cropland 4.C.1 Grassland remaining grassland – CO_2	The ERT noted that IEFs for carbon stock changes in organic soils in cropland remaining cropland (–0.01 t C/ha) and grassland remaining grassland (–0.0025 t C/ha) reported in CRF tables 4.B and 4.C respectively are by far the lowest of those reported by Annex I Parties. During the review, the Party indicated that the 2006 IPCC Guidelines tier 1 method with default EFs for warm temperate (vol. 4 chap. 5, table 5.6, p.5.19) and cold temperate (vol. 4, chap. 6, table 6.3, p.6.17) zones was used for the carbon stock change calculations. Furthermore, the Party acknowledged an error in estimating emissions from organic soils. The ERT recommends that Türkiye correct the detected error in the calculations, revise the estimates for carbon stock changes in organic soils in cropland remaining cropland and grassland remaining grassland, report accordingly the revised estimates in CRF tables 4.B and 4.C respectively and report in the NIR the EFs used in the calculations.	Yes. Accuracy
L.34	4.D Wetlands – CO_2	The Party reported AD and carbon stock changes for all subcategories of category 4.D.2 land converted to wetlands aggregated under subcategory 4.D.2.3 land converted to other wetlands in CRF table 4.D. At the same time, AD and carbon stock changes for cropland and grassland conversions to flooded land (subcategories 4.D.2.2.2 and 4.D.2.2.3 respectively) were reported as "NE" and "NO" respectively (see ID#s L.17 and L.18 in table 3). AD for the category 4.D.1 wetlands remaining wetlands were reported under subcategories 4.D.1.2 flooded land remaining flooded land and 4.D.1.3 other wetlands remaining other wetlands. However, no information was provided in CRF table 4.D or in the NIR on which types of 'other wetlands' were being referred to under categories 4.D.1.3 and 4.D.2.3. Moreover, although the Party distinguished between managed and unmanaged wetlands, as explained in NIR section 6.5 (p.342) and reported in CRF table 4.1, this disaggregation was not reflected in CRF table 4.D. During the review, the Party explained that there are no 'other wetlands' types in the country other than peat areas, flooded land and unmanaged wetlands, and provided the ERT with detailed information in an Excel file on annual land-use conversions from all land uses to wetlands, separately for all strata used in the inventory, namely for deciduous, coniferous, mixed and degraded forest land, annual and perennial cropland, pasture grassland, managed and unmanaged wetlands, settlements, and other land. The ERT recommends that Türkiye:	Yes. Comparability

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue?[a]
		(a) Revise CRF table 4.D by reporting AD and carbon stock changes separately for (1) forest land, cropland, grassland, settlements and other land converted to managed wetlands under subcategory 4.D.2.2 land converted to flooded land, instead of reporting aggregated information under subcategory 4.D.2.3 land converted to other wetlands, and (2) forest land, cropland, grassland, settlements and other land converted to unmanaged wetlands under subcategory 4.D.2.3 land converted to other wetlands, ensuring that is clearly identifiable where unmanaged wetlands are reported by including a "land converted to unmanaged wetlands" subcategory under subcategory 4.D.2.3 land converted to other wetlands and by providing an explanation in the documentation box and/or in the NIR noting that unmanaged wetlands are reported under subcategory 4.D.2.3; (b) Further disaggregate the reporting of AD and carbon stock changes in land converted to managed and unmanaged wetlands for deciduous, coniferous, mixed and degraded forest land and for annual and perennial cropland under subcategories 4.D.2.2 land converted to flooded land and 4.D.2.3 land converted to other wetlands respectively or provide information at that level of detail in the NIR; (c) Revise CRF table 4.D by reporting (1) AD and the notation key "NE" for carbon stock changes in all carbon pools for subcategory 4.D.1.2 flooded land remaining flooded land (referred to as managed wetlands), with an explanation in the NIR and CRF table 9 indicating that "NE" is used because the 2006 IPCC Guidelines do not provide methodologies for estimating these carbon pools, and (2) AD and the notation key "NA" for carbon stock changes in all carbon pools for unmanaged wetlands remaining unmanaged wetlands under subcategory 4.D.1.3 other wetlands remaining other wetlands, ensuring that is clearly identifiable where unmanaged wetlands are reported by including an "unmanaged wetlands remaining unmanaged wetlands" subcategory under subcategory 4.D.1.3 other wetlands remaining other wetlands and by providing an explanation in the documentation box and/or in the NIR noting that unmanaged wetlands are reported under subcategory 4.D.1.3.	
L.35	4.D.2.2 Land converted to flooded land – CO_2	The ERT noted that Türkiye reported AD and carbon stock changes for subcategory 4.D.2.2.2 cropland converted to flooded land as "NE" in CRF table 4.D on the basis of emissions being insignificant, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The Party explained in the NIR (p.342) and CRF table 9 that "NE" was used because the carbon gains in biomass and SOC in cropland converted to flooded land are relatively low (see ID# L.18 in table 3). The ERT also noted that Türkiye reported emissions from this subcategory in the past (i.e. in the 2018 GHG inventory submission) thus, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, emissions from this subcategory shall continue to be reported. During the review, the Party explained that as part of the EU project on technical assistance for the LULUCF sector in 2018, the land-use matrix was updated and emissions from cropland converted to flooded land were found to be insignificant. The Party acknowledged that emissions and removals from cropland converted to flooded land must continue to be reported. The ERT recommends that Türkiye report AD and carbon stock changes in living biomass for subcategory 4.D.2.2.2 cropland converted to flooded land in CRF table 4.D using the methodology from the 2006 IPCC Guidelines (vol. 4, chap. 7.3.2, p.7.20), which shall continue to be reported in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Completeness

Waste

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
W.4	5.A.1 Managed waste disposal sites – CH_4	Türkiye reported in its NIR (p.388) that it assumes the methane oxidation factor for managed SWDS to be zero, which is the default value for uncovered managed SWDS provided in table 3.2 of the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.15). The ERT reviewed three major Turkish landfills using Google Earth and noted that all three are completely covered. In addition, Turkish legislation for managed landfills is being aligned with the EU directive on the landfill of waste, which calls for daily covers for newly deposited waste and temporary and final covers once a landfill compartment is filled. During the review, Türkiye clarified that, despite the national regulation on managed SWDS, information on landfill covers is not available in the official national statistics and, as a result, the use of 0.1 as the value for the methane oxidation factor for each managed SWDS cannot be justified. The ERT noted that emission estimates need to be accurate, neither overestimating nor underestimating emissions as far as can be judged, therefore even though Türkiye has no statistics available confirming that all managed landfills are completely covered, managed landfills are much more likely to be covered than not; consequently, the ERT considers that using a value of 0.1 for the oxidation factor provided in table 3.2 of the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.15) is more accurate than using a value of zero. The ERT also considers that if the Party would like to improve its estimates and the accuracy of the oxidation factor used, it could do so on the basis of a Google Earth survey of existing landfill covers in a large sample of managed landfills in the country. The ERT recommends that Türkiye recalculate CH_4 emissions from managed landfills, assuming an oxidation factor of 0.1.	Yes. Accuracy
W.5	5.A Solid waste disposal on land – CH_4	Türkiye reported in its NIR (pp.377–379) that waste generation for 1950–1994 was estimated from the midyear population of each year and a constant per capita waste generation rate of 398.5 kg waste/capita/year (which was the per capita waste generation rate in 1994). The ERT noted that the Party assumed historical waste generation to be proportional to the total population. According to the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.12), missing historical data can be estimated by assuming the data to be proportional to the urban population. The use of the total population can only be justified if the Party collects waste in the entire country or if data on the urban population are not available. In addition, the ERT noted that the use of a constant waste generation rate is not adequate because the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.12) indicate that historical data could be proportional to economic indicators, or combinations of population and economic indicators. During the review, the Party explained that it has urban population data for historical years, but these data are not available as a continuous time series. Regarding the use of extrapolation for obtaining the missing data, the Party clarified that it does not use economic indicators to estimate waste generation per capita. The ERT noted that considering the total population and assuming waste generation per capita to be constant results in higher waste generation in 1950–1993 than should be the case and therefore in an overestimation of emissions for the years after 1993, including for 1990 (the base year). If the Party does not have a continuous time series for urban population data, the data it does have could be interpolated for constructing a consistent time series. The ERT recommends that Türkiye estimate the historical waste generation for 1950–1994 using urban population data and per capita gross domestic product as drivers and revise the CH_4 emission estimates for the compete time series.	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
W.6	5.B.1 Composting – CH_4 and N_2O	Türkiye reported in its NIR (p.395) that MSW is delivered to composting plants. However, the ERT noted that considering the pathways for waste treatment taking place in the country, MSW should not be sent directly to a composting plant but first it should be subject to some treatment in order to separate the organic waste component, which will be composted (e.g. by selective collection or in MBT plants). The ERT found information on the existence of MBT plants in the country (e.g. the ISTAC plant in Istanbul). In such plants, MSW sent to MBT plants is mechanically separated into various fractions (to be reused or incinerated) and only a residue of relatively fine materials is, in most cases, biologically treated (composted or digested). Therefore, the amount of organic waste to be composted is always less than the amount of MSW that enters the MBT plant, and thus emission estimates for this category are possibly overestimated. During the review, Türkiye clarified that it makes no distinction between MSW sent to composting plants and that sent to MBT plants. Türkiye also has no official statistics available on what fraction of MSW is composted after being treated in an MBT facility. The ERT notes that this fraction could be quantified using information that can be collected from Turkish MBT facilities or obtained from published reports on material balances in MBT facilities located elsewhere in the world. The ERT recommends that Türkiye differentiate between the amounts of MSW composted and treated in an MBT facility, and for the MSW treated in an MBT facility, quantify the fraction of waste that is composted and use only this fraction as AD to estimate emissions from composting.	Yes. Accuracy
W.7	5.D.1 Domestic wastewater – CH_4 and N_2O	The Party reported in NIR table 7.34 (p.414) that 20.83 per cent of the Turkish population has its wastewater treated in anaerobic digesters for sludge, for which a methane correction factor of 0.80 was assumed in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 6, table 6.3, p.6.13). However, the ERT noted that wastewater is generally treated in two steps: first, wastewater is treated in ponds in which sludge is generated, and then the sludge is treated. The methane correction factor for "anaerobic digester for sludge" of 0.8 in table 6.3 of the 2006 IPCC Guidelines refers only to the TOW removed in the second step, when sludge is digested. The ERT recognizes that anaerobic treatment of sewage is an existing technology, but it is unlikely that 20 per cent of domestic wastewater can be treated by this pathway. During the review, the Party confirmed that, according to available data statistics, a certain percentage of domestic wastewater is treated in anaerobic digesters with the anaerobic treatment of sludge. The ERT evaluated two documents provided by the Party during the review (Municipal Wastewater Statistics Survey, 2014; Sectoral Water and Wastewater Statistics Survey, 2012). According to these documents, the treatment of collected wastewater in Türkiye is largely via advanced treatment, biological treatment and physical treatment. Only a small part (0.3 per cent) is treated via natural treatment. Further, the Party explained which technologies are included under each treatment in accordance with the terminology used in the 2006 IPCC Guidelines and the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (vol. 5, chap. 6, pp.6.7–6.11). Advanced treatment refers to aerobic wastewater treatment plants with biological N removal (advanced biological tertiary treatment). Biological treatment refers to aerobic wastewater treatment plants without biological N removal (secondary treatment). Physical treatment refers to primary (mechanical) treatment. Natural treatment refers to settlement of pollutants in wastewater via artificial wetlands and treatment of wastewater by plants living in this environment. The documents do not refer to anaerobic treatment. The ERT recommends that Türkiye investigate and evaluate the pathway for the treatment of domestic wastewater to identify whether "anaerobic digester for sludge" mentioned in the national statistics actually	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue?*[a]
		refers to anaerobic digestion of domestic wastewater and if, rather, it is found to refer to the anaerobic treatment of the sludge coming from aerobic treatment plants or other treatment pathways, recalculate emissions for sludge following equations 4.1–4.2 and using the EFs in table 4.1 of the 2006 IPCC Guidelines (vol. 5, chap. 4, pp.4.5–4.6).	
W.8	5.D.1 Domestic wastewater – CH_4	The Party reported in its NIR (p.412) that the amount of TOW removed from wastewater as sludge (known as S) is calculated assuming sludge generation of 28 g BOD/capita/day. The ERT noted that this assumption was insufficiently justified and requested further justification. During the review, the Party explained that TOW is calculated using a country-specific per capita BOD of 53 g/capita/day for wastewater collected in sewers, which is based on a study by Uzer (2010). This study includes a country-specific per capita BOD for receiving water bodies of 25 g/capita/day. Country-specific per capita BOD for sludge removed is calculated as the difference between these two values (TOW generated and TOW discharged), resulting in a value of 28 g/capita/day. The ERT noted, however, that this approach to estimate TOW removed from wastewater as sludge is incorrect. The difference between TOW generated and TOW discharged (which equals TOW removed) in water bodies is partially due to TOW being biologically degraded to CO_2 (and, depending on the process, to CH_4). In biological treatment steps, this will be the majority of TOW removed. As a result, TOW removed as sludge will not be equal to the amount of TOW removed in wastewater treatment. The ERT recommends that Türkiye either (1) assume, in the absence of reliable data on sludge generation and removal, that TOW removed from wastewater as sludge is zero, and in this case, as all sludge-related emissions (treatment, reuse and disposal) are implicitly included in the emission estimates for category 5.D wastewater treatment and discharge, remove sludge from the estimates of emissions for agriculture, landfilling, composting and incineration, or (2) estimate the amount of TOW removed as sludge on the basis of the information on sludge removed and treated provided in NIR table 7.36 (p.417) and the sludge factor (known as K_{rem}) used to calculate the TOW removed from wastewater as sludge from the mass of sludge) from the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (vol. 5, chap. 6, p.6.27).	Yes. Accuracy

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines.

Annex I

Overview of greenhouse gas emissions and removals as reported by Türkiye in its 2023 inventory submission

Tables I.1–I.3 provide an overview of the total GHG emissions and removals as reported by Türkiye.

Table I.1
Total greenhouse gas emissions and removals for Türkiye, 1990–2021
(kt CO_2 eq)

	Total GHG emissions and removals excluding indirect CO_2 emissions		*Total GHG emissions and removals including indirect CO_2 emissions*[a]	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*
1990	153 015.20	219 526.15	NA	NA
1995	180 483.15	248 248.91	NA	NA
2000	230 865.09	298 916.75	NA	NA
2010	326 912.69	398 793.16	NA	NA
2015	402 160.97	474 967.53	NA	NA
2020	467 043.21	523 990.82	NA	NA
2021	517 243.99	564 389.75	NA	NA

Note: Emissions and removals reported for the sector other (sector 6) are not included in the total GHG emissions.
[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Table I.2
Greenhouse gas emissions and removals by gas for Türkiye, excluding land use, land-use change and forestry, 1990–2021
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	151 614.98	42 487.54	24 950.82	NO	472.80	NO	NO	NO
1995	181 355.26	42 613.47	23 870.85	NO	409.33	NO	NO	NO
2000	229 936.66	43 667.29	24 774.57	115.66	409.25	NO	13.34	NO
2010	316 193.04	51 645.28	27 447.36	3 054.43	387.57	NO	65.48	NO
2015	384 929.66	52 784.80	32 262.33	4 817.55	91.37	NO	81.83	NO
2020	412 926.87	63 893.76	40 490.57	6 497.73	10.38	NO	171.50	NO
2021	452 702.79	64 020.23	40 306.09	7 209.80	6.79	NO	144.05	NO
Percentage change 1990–2021	**198.6**	**50.7**	**61.5**	**NA**	**–98.6**	**NA**	**NA**	**NA**

Note: Emissions and removals reported for the sector other (sector 6) are not included in this table.
[a] Türkiye did not report indirect CO_2 emissions in CRF table 6.

Table I.3
Greenhouse gas emissions and removals by sector for Türkiye, 1990–2021
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	139 535.55	22 856.10	46 053.68	–66 510.96	11 080.83	NO
1995	166 297.69	25 523.06	44 079.79	–67 765.76	12 348.37	NO
2000	216 044.85	26 198.50	42 332.13	–68 051.66	14 341.27	NO
2010	287 877.78	49 059.96	44 409.31	–71 880.48	17 446.12	NO

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2015	341 993.64	59 718.95	56 133.27	–72 806.57	17 121.68	NO
2020	366 566.98	67 962.30	73 153.50	–56 947.61	16 308.03	NO
2021	402 480.49	75 135.77	72 075.48	–47 145.76	14 698.01	NO
Percentage change 1990–2021	**188.4**	**228.7**	**56.5**	**–29.1**	**32.6**	**NA**

Note: Türkiye did not report indirect CO_2 emissions in CRF table 6.

Annex II

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which estimation methods are included in the 2006 IPCC Guidelines that were reported as "NE" or for which the ERT otherwise determined that there may be an issue with the completeness of the reporting in the Party's inventory are the following:

(a) 1.A.3.a domestic aviation – liquid fuels (CO_2, CH_4 and N_2O) (see ID# E.16 in table 3);

(b) 1.A.3.d domestic navigation – liquid fuels (CO_2, CH_4 and N_2O) (see ID# E.18 in table 3);

(c) 1.B.2 oil, natural gas and other emissions from energy production – liquid and gaseous fuels (CO_2, CH_4 and N_2O) (see ID# E.25 in table 5);

(d) 2.A.3 glass production (CO_2) (see ID# I.34 in table 5);

(e) 2.B.10 other (chemical industry) (CH_4) (see ID# I.9 in table 3);

(f) 2.D.3 other (non-energy products from fuels and solvent use) (CO_2) (see ID# I.35 in table 5);

(g) 2.F.4 aerosols (HFCs) (see ID# I.22 in table 3);

(h) 2.F.6 other applications (product uses as substitutes for ozone-depleting substances) (HFCs) (see ID# I.25 in table 3);

(i) 2.F.6 other applications (product uses as substitutes for ozone-depleting substances) (HFCs) (see ID# I.27 in table 3);

(j) 2.G other product manufacture and use (N_2O) (see ID# I.29 in table 3);

(k) 3.B.4 other livestock (CH_4 and N_2O) (see ID# A.15 in table 5);

(l) 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter (N_2O) (see ID# A.17 in table 5);

(m) 4.A.2 land converted to forest land – deadwood (CO_2) (see ID# L.31 in table 5);

(n) 4.C.1 grassland remaining grassland – mineral soils (CO_2 and N_2O) (see ID# L.15 in table 3);

(o) 4.D.2.2.2 cropland converted to flooded land – land converted to flooded land – living biomass (CO_2) (see ID# L.35 in table 5);

(p) 4(V) biomass burning (grassland – wildfires) (CO_2, CH_4 and N_2O) (see ID# L.21 in table 3).

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

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

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. E Calvo Buendia, K Tanabe, A Kranjc, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2011, 2012, 2013, 2014, 2015, 2016, 2018, 2019 and 2021 inventory submissions of Türkiye, contained in documents FCCC/ARR/2011/TUR, FCCC/ARR/2012/TUR, FCCC/ARR/2013/TUR, FCCC/ARR/2014/TUR, FCCC/ARR/2015/TUR, FCCC/ARR/2016/TUR, FCCC/ARR/2018/TUR, FCCC/ARR/2019/TUR and FCCC/ARR/2021/TUR respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/documents/510888.

Annual status report for Türkiye for 2023. Available at https://unfccc.int/sites/default/files/resource/asr2023_TUR.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Fatma Betül Demirok (TurkStat), including additional material on the methodology and assumptions used. The following references may not conform to UNFCCC editorial style as some have been reproduced as received:

Ackerman, W., 2020. *Turkey: A new emerging gas player with resources and infrastructure*. Middle East Institute (MEI). Available at: https://www.mei.edu/publications/turkey-new-emerging-gas-player-resources-and-infrastructure.

Canaveira, P., Manso, S., Pellis, G., Perugini, L., De Angelis, P., Neves, R., Papale, D., Paulino, J., Pereira, T., Pina, A., Pita, G., Santos, E., Scarascia-Mugnozza, G., Domingos, T., and Chiti, T. (2018). Biomass Data on Cropland and Grassland in the Mediterranean Region. Final Report for Action A4 of Project MediNet.

Essau, I., 2022. *Turkey spuds third exploration well in Black Sea*. Upstream Energy Explored. Available at: https://www.upstreamonline.com/exploration/turkey-spuds-third-exploration-well-in-black-sea/2-1-1171091.

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