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Report on the individual review of the inventory submission of Turkey submitted in 2018*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas inventory covering emissions and removals of greenhouse gas emissions 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 inventory review of the 2018 inventory submission of Turkey, 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 24 to 29 September 2018 in Bonn.

* In the symbol for this document, 2018 refers to the year in which the inventory was submitted, not to the year of publication.

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Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
AWMS	animal waste management system
C	carbon
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CORINE	Coordination of Information on the Environment
CRF	common reporting format
DOM	dead organic matter
EF	emission factor
ERT	expert review team
EU	European Union
F-gas	fluorinated gas
$Frac_{LEACH-[H]}$	fraction of nitrogen input to managed soils that is lost through leaching and run-off
GHG	greenhouse gas
HFC	hydrofluorocarbon
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
MMS	manure management system
MSW	municipal solid waste
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NEU	non-energy use
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
TAM	typical animal mass
Tplant	degree of utilization of modern, centralized wastewater treatment plants
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"

I. Introduction

1. This report covers the review of the 2018 inventory submission of Turkey organized by the secretariat, in accordance with the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (decision 13/CP.20). The review took place from 24 to 29 September 2018 in Bonn and was coordinated by Ms. Lisa Hanle (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Turkey.

Table 1
Composition of the expert review team that conducted the review of Turkey

Area of expertise	*Name*	*Party*
Generalist	Ms. Daniela Romano	Italy
	Mr. Marius Ţăranu	Republic of Moldova
Energy	Ms. Ana Carolina Avzaradel Szklo	Brazil
	Mr. Hiroshi Ito	Japan
	Ms. Kristine Tracey	Canada
	Mr. Shengmin Yu	China
IPPU	Ms. Niculina Mihaela Bălănescu	Romania
	Mr. Jacek Skoskiewicz	Poland
Agriculture	Mr. Jacques Kouazounde	Benin
	Mr. Nidup Peljor	Bhutan
	Mr. Asaye Ketema Sekie	Ethiopia
LULUCF	Mr. Johannes Brötz	Germany
	Ms. Thelma Krug	Brazil
	Ms. Valentyna Slivinska	Ukraine
Waste	Mr. Jose Manuel Ramirez Garcia	Spain
	Mr. Hiroyuki Ueda	Japan
Lead reviewers	Ms. Romano	
	Mr. Yu	

2. The basis of the findings in this report is the assessment by the ERT of the consistency of the Party's 2018 inventory submission with the UNFCCC review guidelines. The ERT notes that the individual inventory review of Turkey's 2017 inventory submission did not take place in 2017 owing to insufficient funding for the review process.

3. The ERT has made recommendations that Turkey resolve the findings related to issues.[1] Other findings, and, if applicable, the encouragements of the ERT to Turkey to resolve them, are also included.

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

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

5. Annex I shows annual GHG emissions for Turkey, including totals excluding and including the LULUCF sector, indirect CO_2 emissions and emissions by gas and by sector.

II. Summary and general assessment of the 2018 inventory submission

6. Table 2 provides the assessment by the ERT of the 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 inventory of Turkey

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
Dates of submission	Original submission: 14 April 2018 (NIR), 14 April 2018, version 1 (CRF tables) Revised submission: 20 April 2018 (NIR) Unless otherwise specified, the values from the latest submission are used in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories	No	
	(b) Selection and use of methodologies and assumptions	Yes	E.15, I.7, A.6, A.17, A.18, L.10, L.37, W.7, W.9, W.10, W.11
	(c) Development and selection of EFs	Yes	I.27, I.31, A.7, A.19, A.20, A.21, L.28, L.36
	(d) Collection and selection of AD	Yes	E.8, E.25, I.4, I.17, I.23, I.26, L.5, L.8, L.13, L.20, L.32
	(e) Reporting of recalculations	Yes	E.1
	(f) Reporting of a consistent time series	Yes	E.17, E.23, E.26, E.27, A.22, A.23, L.4, L.29, L.30, L.40, W.3, W.4
	(g) Reporting of uncertainties, including methodologies	Yes	E.24, L.22
	(h) QA/QC	Yes	G.4, L.15, L.21, L.23
	(i) Missing categories/completeness[b]	Yes	I.1, I.2, I.3, I.18, I.20, I.22, I.25, I.28, I.30, A.24, A.27, L.1(b–f), L.2, L.24, W.8
	(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	L.41, W.5
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	G.6, A.26, L.19

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
National inventory arrangements	Have any issues been identified with the effectiveness and reliability of the institutional, procedural and legal arrangements for estimating GHG emissions, including the changes to the national inventory arrangements since the previous inventory submission?	Yes	L.3
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 the assessment of 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] The ERT identified additional issues in all sectors that are not listed in this table but are included in table 3 and/or 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 issues raised in the previous review report

7. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 24 April 2017.[2] For each issue, the ERT specified whether it believes the issue has been resolved by the conclusion of the review of the 2018 inventory submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

Table 3
Status of implementation of issues raised in the previous review report of Turkey

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	Inventory submission (G.13, 2016) (G.14, 2015) Transparency	Further develop the assessment of completeness reported in the NIR, providing more information in the body of the NIR on the categories reported as "NE" and "IE" as well as improving the information presented in the annex on completeness, including explanations for the use of the notation keys.	Resolved. A list of source and sink categories reported as "NE" and "IE" was provided in annex 5 to the NIR as well as in CRF table 9. In section 1.7 of the NIR it is explained that categories were reported as "NE" in table A7.1 of annex 5 to the NIR mainly because of insufficient data or lack of a methodology in the 2006 IPCC Guidelines. Table A7.2 of annex 5 to the NIR now includes a list of categories reported as "IE".
G.2	Recalculations (G.1, 2016) (G.1, 2015) (9, 2014) (18, 2013) (24, 2012) Transparency	Include detailed information on the performed recalculations in the specific NIR chapters and relevant CRF tables and provide explanatory information, including the rationale for the recalculations.	Resolved. Information on the performed recalculations has been provided in section 10 of the NIR as well as in the specific NIR chapters (see ID#s E.10 and L.17 below and G.7 in table 5).

[2] FCCC/ARR/2016/TUR.

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
G.3	Uncertainty analysis (G.11, 2016) (G.11, 2015) (17, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Use the results of the uncertainty analysis to prioritize improvements to the inventory.	Addressing. There is no information in the NIR on how Turkey uses the results of the uncertainty analysis to prioritize improvements to the inventory. However, during the review, the Party explained that using the results of the uncertainty analysis for prioritizing improvements is one of the elements of its internal inventory improvement plan, and that it will report in the next inventory submission on how the results of the uncertainty analysis are considered. In addition, the ERT notes that it is stated in the recently approved QA/QC plan (dated 10 October 2017), provided to the ERT during the review, that as part of the inventory planning phase the Turkish Statistical Institute (known as TurkStat) considers the QA/QC summary report from the previous year along with other materials, including the category-level uncertainty analyses to help to prioritize inventory improvements and planning.
Energy			
E.1	1. General (energy sector) (E.2, 2016) (E.2, 2015) (24, 2014) (18, 2013) Transparency	Include a separate section in the energy chapter of the NIR providing all detailed information on, and the rationale for, recalculations.	Addressing. For each category of the energy sector a recalculations section was included; however, only a brief explanation was provided with regard to the recalculations performed. Revision of AD has been given as the reason for recalculations for several categories (e.g. energy industries, manufacture of solid fuels and other energy industries, and several subcategories of manufacturing industries and construction); however, there is no further explanation as to which AD have been changed and why.
E.2	1. General (energy sector) (E.4, 2016) (E.4, 2015) (25, 2014) Transparency	Provide transparent explanations of the methodologies used to estimate the emissions from the energy sector.	Resolved. The Party has explained the methodologies used for its calculations in the methodological issues section for each category in section 3 of the NIR. The Party has also provided a national energy balance in annex 4 and a summary of facility-level data for public electricity and heat production. In addition, it is committed to providing a similar summary of facility-level data for petroleum refining. The Party provided annual carbon contents, oxidation factors, country-specific CO_2 EFs and default CH_4 and N_2O EFs in response to questions raised by the ERT. Annex 3 to the NIR contains information on how the carbon content and oxidation factors were derived.
E.3	1. General (energy sector) (E.7, 2016) (E.7 2015) (29, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Implement strong QC procedures to avoid mistakes and input errors.	Resolved. The Party has developed a national inventory system QA/QC plan, which it implemented for the 2018 inventory submission. The Party included a section in the NIR detailing category-specific QC procedures for each sector (pp.10–11). As such, the Party has corrected the calculation errors, input errors in the CRF tables, misallocation of fuel types, inappropriate choice of net calorific values and EFs, errors due to changes in data sources and statistical definitions, and

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			errors in the underlying energy balance originally identified in the 2014 annual review report.
E.4	1. General (energy sector) (E.9, 2016) (E.9 2015) (29, 2014) Accuracy	Enable and improve an appropriate data-collection system and enhance cooperation among relevant stakeholders to improve the quality of the energy balance.	Resolved. The Party has provided an improved national energy balance in annex 4 to the NIR that addresses the issues identified in the 2014 annual review report (see ID# E.3 above). The Party used facility-level data for public electricity and heat production and has outlined the QA/QC steps undertaken to ensure the accuracy of the facility-level data (see ID# E.21 in table 5).
E.5	Feedstocks, reductants and other NEU of fuels – solid fuels – CO_2 (E.23, 2016) (E.23, 2015) (41, 2014) Transparency	Provide information on feedstocks and NEU of coking coal.	Not resolved. Coking coal is reported as "NO" in CRF table 1.A(d). No additional information to that provided in the 2016 inventory submission has been provided in the NIR regarding the use of coking coal.
E.6	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO_2 (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 NEU consumption reported without any associated emissions reported in the inventory.	Addressing. Some explanations have been provided in the documentation box of CRF table 1.A(d). However, the explanations could be made clearer because the comments are not specific to any fuel. For example, the explanation provided in the documentation box of CRF table 1.A(d) states that no emissions have been reported because "it" (presumably bitumen) is used for road paving and asphalt roofing purposes only. Relevant explanations are included in the NIR (p.62).
E.7	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO_2 (E.54, 2016) (E.54, 2015) Transparency	Further improve the explanations in the NIR on the reporting of emissions from NEU between the energy sector and the IPPU sector.	Resolved. Sufficient explanation is provided of the reporting of emissions from NEU between the energy sector and the IPPU sector in the NIR (pp.61–62). AD and emissions associated with NEU of fuels are reported in CRF table 2(I).A-H under the IPPU sector in categories 2.B.1, 2.B.5 and 2.C.1.
E.8	International bunkers and multilateral operations – liquid fuels – CO_2, CH_4 and N_2O (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. AD for both international navigation and aviation are taken from the national energy balance. During the review, the Party stated that all relevant institutions are working together to determine a reliable data source for international bunker fuels; however, specific information on the stakeholders involved and the possible timeline for implementing any improvements was not provided.
E.9	International bunkers and multilateral operations – liquid fuels – CO_2, CH_4 and N_2O (E.21, 2016) (E.21, 2015) (40, 2014) (25, 2013) (43, 2012) (40, 2011) Adherence to the UNFCCC Annex I	Improve the consistency between CRF tables 1.C and 1.A(b), harmonize and correct the information reported in these tables and apply QC measures to the estimates.	Addressing. The consistency between CRF tables 1.D (formerly CRF table 1.C) and 1.A(b) has been improved for both jet kerosene and residual fuel oil. However, there is still a 7.3 per cent difference in the reported consumption of residual fuel oil for marine bunkers between CRF table 1.A(b) and 1.C. During the review, the Party explained that the remaining differences in reported fuel consumption for residual fuel oil are due to unit conversion, as in CRF table 1.A(b) fuel consumption values are reported in kt and in CRF table 1.D they are reported in TJ. The ERT notes that the 7.3 per cent

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	inventory reporting guidelines		difference is too large to be due only to unit conversion.
E.10	International navigation – liquid fuels – CO_2, CH_4 and N_2O (E.1, 2016) (E.1, 2015) (24, 2014) Transparency	Address the problem of the unrecorded recalculation on marine bunkers by revising the CRF tables, providing sufficient explanation in the NIR and further checking the impact of this recalculation on the emission estimates for navigation and total GHG emissions.	Resolved. No recalculation has been performed for waterborne or international navigation.
E.11	1.A.1.a Public electricity and heat production – liquid, solid and gaseous fuels – CO_2, CH_4 and N_2O (E.55, 2016) (E.55, 2015) Transparency	Include in the NIR a comparison of facility-level energy data and the sectoral totals from the national energy balance with the aim of ensuring the transparency of the reported estimates.	Resolved. The Party included a comparison of facility-level data with the national energy balance data in section 3, table 3.16, of the NIR.
E.12	1.A.1.b Petroleum refining – liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.56, 2016) (E.56, 2015) Transparency	Improve the transparency of the reporting by including a comparison of facility-level data and the sectoral totals from the national energy balance in the NIR.	Not resolved. The Party has not provided for this subcategory a comparison of facility-level data with the sectoral totals from its national energy balance in the NIR. During the review, the Party indicated that it will analyse this information and provide it in the next inventory submission.
E.13	1.A.2 Manufacturing industries and construction – liquid, solid and gaseous fuels – CO_2 (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.	Not resolved. The Party has not provided information about inter-annual changes in the CO_2 EFs for this category in the NIR. During the review, the Party provided the ERT with the CO_2 EFs used in the emission estimation for the whole time series along with a table of fuel shares over time and an explanation of the impact on the CO_2 IEFs of changing fuel shares over time.
E.14	1.A.2.a Iron and steel – liquid fuels – CO_2, CH_4 and N_2O (E.57, 2016) (E.57, 2015) Transparency	Improve the transparency of the NIR by including 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 NIR does not include an explanation of the changing liquid fuel AD composition and the effect on CH_4 and N_2O IEFs between 2009 and 2014. However, the Party has included in annex 4 to the NIR a national energy balance for 2016 that splits liquid fuels, and provided a link to historical national energy balance data. However, in the national energy balance data liquid fuels are not split prior to 2014. In the 2016 annual review report it was reported that Turkey indicated that the share of liquefied petroleum gas and gas diesel oil in liquid fuels caused the AD fluctuations between 2009 and 2014. During the review, the Party provided the CH_4 and N_2O EFs used in the estimations for liquid fuels, which supported its previous analysis, as described in the 2016 annual review report.

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.15	1.A.3.b Road transportation – liquid fuels – CH_4 and N_2O (E.43, 2016) (E.43, 2015) (58, 2014) Accuracy	Move to a higher-tier method for calculating N_2O (and CH_4) emissions, as it is likely that this will be a key category if using appropriate EFs.	Addressing. A project is under way in Turkey to estimate emissions due to road transportation using the COPERT model. Vehicle kilometres will be calculated by vehicle type and fuel, allowing for the COPERT model to be used and a higher-tier method to be implemented.
E.16	1.A.3.b Road transportation – liquid fuels – CO_2, CH_4 and N_2O (E.44, 2016) (E.44, 2015) (58, 2014) (30, 2013) (50, 2012) (44, 2011) Transparency	Improve the transparency of the NIR on the methods applied for estimating emissions from road transportation.	Resolved. Relevant information on the methods applied for estimating emissions from road transportation was provided in the NIR (p.111). Emissions were calculated by multiplying fuel consumption by a default or country-specific EF.
E.17	1.A.4 Other sectors – liquid, solid and gaseous fuels – CO_2 (E.37, 2016) (E.37, 2015) (54, 2014) Consistency	Revise the emission estimates by reallocating the diesel oil used for agricultural purposes to this subcategory by using assumptions based on the historical trend of the ratio of diesel oil used for agriculture against the total diesel oil used in the country.	Addressing. The ERT commends the Party for its efforts to separate diesel used for agricultural purposes in 2015 and 2016 and to revise its emission estimates for those years. During the review, Turkey provided disaggregated data for 2012–2014. In addition, the Party explained to the ERT that its method of disaggregation involved a comparison method using data from similar countries on total crop harvested area and petroleum product consumption. According to the NIR (p.140), the Ministry of Energy and Natural Resources will work to further improve these estimates for the time series.
E.18	1.A.4 Other sectors – liquid, solid and gaseous fuels – CO_2 (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 this subcategory, using assumptions based on the historical trend of the ratio of diesel oil used for agriculture against the total diesel oil used in the country.	Addressing. An explanation for the reallocation of diesel oil was not clearly provided in the NIR and disaggregated data for 2012–2014 were not reported.
E.19	1.B.1 Solid fuels – solid fuels – CH_4 (E.59, 2016) (E.59, 2015) Completeness	Conduct surveys of abandoned mines to gather AD and estimate CH_4 emissions for this mandatory category to ensure the completeness of the inventory.	Resolved. CH_4 emissions from abandoned underground mines have been estimated for the entire time period.
IPPU			
I.1	2. General (IPPU) (I.58, 2016) (I.58, 2015) Completeness	Provide a consistent time series of emissions of SF_6 under the appropriate categories of electrical equipment (2.G.1), fire protection (2.F.3) and SF_6 and PFCs from other product use (2.G.2).	Addressing. A consistent time series of SF_6 emissions was reported only for electrical equipment (2.G.1). The ERT finds the Party's explanation provided during the review reasonable that SF_6 emissions from fire extinguishers do not occur (see ID# I.19 below). Turkey did not report any information on SF_6 and PFC emissions from other product use (2.G.2).

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.2	2.A.2 Lime production – CO_2 (I.2 and 10, 2016) (I.2 and I.10, 2015) (66 and 72, 2014) Completeness	Include captive lime production emissions in the estimates for this category.	Addressing. Turkey estimated AD on captive lime production in the sugar industry and synthetic soda ash production for 1990–2016 (table 4.6 of the NIR). However, the AD and CO_2 emissions reported in CRF table2(I).A-Hs1 (3,836.95 kt) reflect quick lime production (minus the amount produced in the sugar industry and synthetic soda ash) plus dolomitic lime production. The ERT notes that the Party has not provided evidence of 100 per cent CO_2 recovery (see ID# I.3 below) to justify subtracting the CO_2 from captive lime production.
I.3	2.A.2 Lime production – CO_2 (I.47, 2016) (I.47, 2015) Completeness	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 methods used to calculate the amount of CO_2 that 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.	Addressing. Evidence of the 100 per cent CO_2 recovery rate associated with lime use during sugar production was not provided in the NIR and therefore the Party has not sufficiently justified subtracting the CO_2 from captive lime production from the reported estimates. During the review, Turkey stated that a sectoral expert from the sugar industry reported that the 100 per cent CO_2 recovery rate was achieved, and provided a link that indicated the use of CO_2 emissions in sugar production. The ERT considers that the evidence provided is not sufficient proof of the 100 per cent CO_2 recovery rate because it was only a general schema of the process and did not demonstrate the validated methods used to calculate the amount of CO_2 that reacts with lime to reform calcium carbonate or the amount of CO_2 that is not recarbonated to limestone.
I.4	2.A.4 Other process uses of carbonates – CO_2 (I.48, 2016) (I.48, 2015) Accuracy	Undertake limestone and dolomite mass balances to cross-check the estimates in order to increase the accuracy of the inventory.	Not resolved. Turkey did not report in the NIR information on using limestone and dolomite mass balances to cross-check the estimates in this category. During the review, the Party indicated that it will consider this issue in its future submissions.
I.5	2.A.4 Other process uses of carbonates – CO_2 (I.49, 2016) (I.49, 2015) Completeness	Either estimate CO_2 emissions from non-metallurgical magnesia production for the period 1990–2004 or use the appropriate gap-filling procedures suggested in the 2006 IPCC Guidelines to report the complete time series.	Resolved. CO_2 emissions from non-metallurgical magnesia production are reported in category 2.A.4.c in table 2(I).A-H for the entire time series. The methodology is described in section 4.2.4.3 of the NIR (p.181).
I.6	2.B.1 Ammonia production – CO_2 (I.51, 2016) (I.51, 2015) Accuracy	Justify the use of a carbon oxidation factor of 0.9 or apply 1.0 as the oxidation factor, unless country-specific information is available, in line with the 2006 IPCC Guidelines (table 3.1, page 3.15, volume 3, chapter 3).	Resolved. Turkey applied an oxidation factor for natural gas of 1.0 (the same as used in the energy sector) for its CO_2 emission estimates for this category.
I.7	2.B.1 Ammonia production – CO_2	Clarify if the CO_2 emissions used for urea production are	Addressing. The reporting is described in the NIR (pp.187 and 287). Turkey subtracted the amount of

ID#	Issue classification[a,b]	Recommendation made in previous review report	ERT assessment and rationale
	(I.51, 2016) (I.51, 2015) Accuracy	included under category 2.D.3 (other (non-energy products from fuels and solvent use)) or under the agriculture sector in line with the 2006 IPCC Guidelines, and transparently report the emissions between the two sectors.	CO_2 recovered from ammonia production that is used to produce urea, and subsequently reported emissions resulting from urea application under the agriculture sector. However, emissions from urea use have not been reported under category 2.D.3.
I.8	2.B.5 Carbide production – CO_2 (I.52, 2016) (I.52, 2015) Accuracy	Justify the use of a carbon oxidation factor of 0.9 or apply 1.0 as the oxidation factor, unless country-specific information is available, in line with the 2006 IPCC Guidelines (table 1.4, volume 2, chapter 1), and check if metallurgical coke is included in NEU under the energy sector and the CO_2 emissions from the feedstock use reported under the IPPU sector are deducted from combustion use in the energy sector.	Resolved. Turkey applied an oxidation factor of 1.0 for its CO_2 emission estimation for carbide production and subtracted the amount of metallurgical coke from the energy sector, while corresponding CO_2 emissions were reported under the IPPU sector. In 2016, carbide production activity ceased in the country.
I.9	2.B.9 Fluorochemical production – HFCs, PFCs and SF_6 (I.50, 2016) (I.50, 2015) Comparability	Use the notation key "NO" to report fluorochemical production.	Not resolved. The notation key "NO" is not reported for fluorochemical production in CRF table 2(II).B-Hs1 (the cells are blank). The ERT noted that there is no fluorochemical production in Turkey (NIR, p.238) but this is not yet reflected in the CRF tables.
I.10	2.B.10 Other (chemical industry) – CH_4 (I.28, 2016) (I.28, 2015) (92, 2014) Transparency	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.	Addressing. The coverage of CH_4 emissions from styrene production and corresponding AD were not reported in the NIR. CH_4 emissions were not reported in CRF table2(I).A-Hs1. During the review, Turkey explained that emissions from styrene production were calculated on the basis of fuels flared, and referred to page 198 of the NIR. The ERT agrees with the Party's method, which assumes a closed system and involves reporting only emissions from the flare, thereby not requiring separate reporting of emissions from styrene production. However, the ERT noted that the section of the NIR referenced by Turkey (p.198) refers to CH_4 emissions from petrochemical production and carbon black production (the latter ceased in 2001) but does not explain the trend in CH_4 emissions from the flare.
I.11	2.C.3 Aluminium production – PFCs (I.36, 2016), (I.36, 2015) (66 and 94, 2014) (52, 2013) Completeness	Allocate emissions for the whole time series under the category other (metal production) to maintain confidentiality.	Resolved. The Party reported PFC emissions for the whole time series under this category. The ERT considers that the Party's reporting is consistent with the 2006 IPCC Guidelines. Emissions and AD have been reported.
I.12	2.C.3 Aluminium production – PFCs (I.53, 2016) (I.53,	Report the estimates as described in ID# I.36 in the 2016 annual review report (for instance by aggregating them	Resolved (see ID# I.11 above). Relevant information on the methodology used to estimate

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	2015) Transparency	with the PFC emissions of other categories to maintain confidentiality), indicating in the CRF tables "IE" for the category aluminium production, together with information on the methodology used for their estimation across the time series.	PFC emissions is provided in the NIR (pp.221–224).
I.13	2.C.4 Magnesium production – SF_6 (I.39, 2016) (I.39, 2015) (95, 2014) Comparability	Correct the notation key used to report SF_6 emissions from magnesium foundries from "NA" to "NE".	Not resolved. Neither values nor notation keys are reported for this category in CRF table 2(II)B-Hs1. According to the NIR (p.203) there is no magnesium production in Turkey. This was confirmed by Turkey during the review.
I.14	2.C.5 Lead production – CO_2 (I.54, 2016) (I.54, 2015) Accuracy	Report CO_2 emission estimates on the basis of the current technologies in use in the country.	Resolved. Turkey reported CO_2 emissions from lead production in CRF table2(I).A-Hs2, estimated on the basis of the current technologies used in the country as reported in the NIR (p.227).
I.15	2.C.6 Zinc production – CO_2 (I.55, 2016) (I.55, 2015) Accuracy	Reassess the AD for zinc production and, if zinc production does not occur in the country, use the appropriate notation key, explaining the reasons for the recalculations in the NIR.	Resolved. Turkey reassessed the AD for zinc production (the AD reported in the 2016 inventory submission were on zinc ore mining not zinc production). It reported CO_2 emissions for 1990–1999, when zinc production occurred in the country. The notation key "NO" has been reported for 2000–2016.
I.16	2.E Electronics industry – HFCs, PFCs, SF_6 and NF_3 (I.56, 2016) (I.56, 2015) Completeness	Provide estimates of emissions from the electronics industry. If the emissions are insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, use the appropriate notation key "NE" for reporting the emissions, providing a qualitative and quantitative justification in the NIR.	Resolved. The Party estimated HFC, PFC and SF_6 emissions from the electronics industry and reported them in this category. According to the NIR (p.237), F-gases are used only in research and development activities in the area of semiconductors. A description of the methodology is reported in the NIR (p.237) (see ID# I.23 in table 5).
I.17	2.F Product uses as substitutes for ozone-depleting substances – HFCs (I.2 and I.40, 2016) (I.2 and I.40, 2015) (66 and 96, 2014) (43, 2013) (67, 2012) Accuracy	Establish sound data-collection methods to estimate and report actual emissions from different F-gas applications under this category and investigate the possibility of moving to a higher-tier method (only potential emissions calculated) for refrigeration and air-conditioning equipment.	Addressing. As described in the NIR (p.421), the Party has an ongoing capacity-building project on F-gases that began in 2017 and will conclude in 2020. This recommendation is being addressed as part of that ongoing project.
I.18	2.F Product uses as substitutes for ozone-depleting substances – HFCs and SF_6 (I.42, 2016) (I.42,	Implement the mandatory data-collection system (ministerial regulation of F-gases) as planned and increase the	Addressing. This issue is being addressed as part of the Party's ongoing capacity-building project (see ID# I.17 above). The project includes transposing EU legislation and capacity-building on F-gases, aiming to prepare national legislation, establish a

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	2015) (97, 2014) Completeness	completeness and overall data quality of the inventory.	database, conduct e-reporting and undertake registry activities.
I.19	2.F.3 Fire protection – SF_6 (I.2 and I.57, 2016) (I.2 and I.57, 2015) Comparability	Report emissions of SF_6 from fire extinguishers under category 2.F.3 (fire protection) instead of under category 2.G (other product manufacture and use).	Resolved. No SF_6 emissions have been reported in this category. The Party confirmed during the review that SF_6 is not used in fire extinguishers. The ERT is of the view that fire protection systems do not use SF_6. Further, according to the 2006 IPCC Guidelines (chapter 7.6), only HFC and PFC emissions are expected to be emitted from fire extinguishers. In addition, the ERT notes that no other Party included in Annex I to the Convention reports SF_6 emissions from this application.
I.20	2.G Other product manufacture and use – N_2O (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 use for anaesthesia and other applications.	Not resolved. N_2O emissions from anaesthesia were reported as "NE". During the review, the Party indicated that studies are ongoing and, depending on the quality of the resulting data, emissions for this category will be calculated in the future.
Agriculture			
A.1	3. General (agriculture) (A.3, 2016) (A.3, 2015) (105, 2014) (65, 2013) (90, 2012) (72, 2011) Accuracy	Use the national data on milk productivity, gross energy intake and average animal mass.	Resolved. Turkey used in its estimates and provided national data on milk productivity, gross energy intake and animal mass in table 5.12 of the NIR.
A.2	3. General (agriculture) (A.4, 2016) (A.4, 2015) (106, 2014) (61, 2013) (88, 2012) Transparency	Provide more transparent information in annexes 3 and 7 to the NIR (including information on the sources of uncertainties, any issues affecting time-series consistency and category-specific QA/QC and verification procedures) and provide tables showing the time series for the EFs and AD by category, as well as detailed documentation supporting the choice of EFs, including when default EFs are applied.	Not resolved. Turkey did not provide transparent information on the source of uncertainty values for AD, or a table showing the time series of AD used (e.g. milk yield, inorganic fertilizer, organic fertilizer, both above- and below-ground crop residue, area of cultivated organic soil). Turkey noted in the NIR that it applies IPCC default EFs for all categories, except for cattle enteric fermentation (p.248). During the review, Turkey explained that it will add the information in its next inventory submission, and provided a link to the AD used for the milk yield calculation (http://www.turkstat.gov.tr/PreTablo.do?alt_id=1002).
A.3	3.A Enteric fermentation – CH_4 (A.6, 2016) (A.6, 2015) (108, 2014) (64, 2013) (89, 2012) (71, 2011) Accuracy	Estimate emissions for significant livestock categories using the tier 2 method, including enhanced livestock population characterization, taking into account the relevant IPCC guidance, or, if not possible, provide documentation supporting any expert judgment regarding estimation assumptions, taking	Resolved. Dairy and non-dairy cattle are significant subcategories. Turkey estimated emissions for dairy cattle and non-dairy cattle using the tier 2 method but applying some default parameters from the 2006 IPCC Guidelines. During the review, Turkey explained that, to ensure uniform livestock classification for all livestock-related categories (CH_4 emissions from enteric fermentation and CH_4 and N_2O emissions from manure management), cattle are only classified and reported as dairy cattle and non-dairy cattle using option A. The Party indicated that it will report using an enhanced

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		into account that this is a key category.	livestock characterization once the issue is resolved with the other livestock-related categories.
A.4	3.B Manure management – CH_4 and N_2O (A.14, 2016) (A.14, 2015) Transparency	Validate the AD on manure handled in different MMS and include the relevant information in the NIR and in CRF tables 3.B(a)s2 and 3.B(b).	Resolved. Turkey provided a revised distribution of AWMS in table 5.12 of the NIR using the default AWMS distribution from the 2006 IPCC Guidelines. Information was reported in CRF table 3.B(b). Because a tier 1 method was applied, information is not required to be reported in CRF table 3.B(a)s2.
A.5	3.B Manure management – CH_4 and N_2O (A.14, 2016) (A.14, 2015) Transparency	Include further explanation of the sources and assumptions used for deriving the AD, including information on why all AD and the distribution to the MMS reported for the "dairy cattle – hybrid" category always represent the mean values of the categories "dairy cattle – culture" and "dairy cattle – domestic".	Not resolved. Turkey did not provide further explanation in the NIR of the sources and assumptions used for deriving AD and as to why the "dairy cattle – hybrid" category is the mean value of the categories "dairy cattle – culture" and "dairy cattle – domestic" (see ID# A.19 in table 5).
A.6	3.B Manure management – CH_4 (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 enhanced livestock population characterization, and taking into account the relevant IPCC guidance.	Not resolved. Turkey estimated CH_4 emissions from manure management for all categories using a tier 1 method and default EFs from the 2006 IPCC Guidelines. During the review, Turkey expressed an interest in acquiring country-specific EF values, including enhanced livestock population characterization, but no further information was provided.
A.7	3.B Manure management – N_2O (A.10, 2016) (A.10, 2015) (110, 2014) (68, 2013) Accuracy	Revise the emission estimates by applying national values of Nex and AWMS distribution.	Not resolved. Turkey reported the use of default Nex values (NIR, p.266) and MMS distribution (NIR, p.269) from the 2006 IPCC Guidelines. During the review, Turkey expressed an interest in acquiring country-specific Nex values, but no further information was provided (see ID# A.20 in table 5).
A.8	3.B Manure management – N_2O (A.11, 2016) (A.11, 2015) (110, 2014) (68, 2013) Transparency	Include documentation on Nex per AWMS, or information on the distribution of AWMS used for the different animal groups.	Resolved. Turkey provided a revised distribution of MMS for all animal groups in the NIR (table 5.12) using default AWMS distribution in accordance with the 2006 IPCC Guidelines. Turkey reported the use of default Nex values (NIR, p.266).
A.9	3.D.a.2 Organic N fertilizers – N_2O (A.15, 2016) (A.15, 2015) Completeness	Collect AD for this source and include in the submission the N_2O emissions from sewage sludge applied to soils.	Resolved. Turkey reported N_2O emissions from sewage applied to soils in table 5.15 of the NIR and in CRF table 3.D for the entire time series.
A.10	3.D.a.5 Mineralization/immobilization associated with loss/gain of soil organic matter – N_2O (A.16, 2016) (A.16, 2015) Adherence to the	Report N_2O emissions from land-use changes under the LULUCF sector in CRF table 4(III) and not under the agriculture sector and include N_2O emissions under the agriculture sector only from	Resolved. Turkey correctly reported N_2O emissions from mineralization/immobilization associated with loss of soil organic matter using the notation key "NO" in CRF table 3.D under the agriculture sector and N_2O emissions from land-use changes in CRF table 4(III) under the LULUCF sector.

ID#	Issue classification[a,b]	Recommendation made in previous review report	ERT assessment and rationale
	UNFCCC Annex I inventory reporting guidelines	loss of soil carbon on cropland remaining cropland.	
A.11	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O (A.17 2016) (A.17, 2015) Completeness	Make use of available AD on organic soils and include the N_2O emissions from agricultural use of organic soils.	Resolved. Turkey reported N_2O emissions from cultivation of organic soils in CRF table 3.D (0.27 kt N_2O in 2016) and in table 5.15 of the NIR for the entire time series.
A.12	3.D.b.2 Nitrogen leaching and run-off – – N_2O (A.19 2016) (A.19, 2015) Accuracy	Investigate the actual leaching conditions in the country and estimate the most likely $Frac_{LEACH-(H)}$ for the national conditions and include justification of the $Frac_{LEACH-(H)}$ value used in the NIR.	Resolved. Turkey revised the $Frac_{LEACH-(H)}$ value (0.015) applicable to its national conditions and provided an appropriate explanation on page 282 of the NIR.
A.13	3.G Liming – CO_2 (A.20 2016) (A.20, 2015) Completeness	Include estimates of CO_2 emissions from liming in order to improve the completeness of the inventory, or justify further the use of the "NE" notation key in case the emissions are assessed to be insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Resolved. Turkey explained in the NIR (p.285) that on the basis of research it estimated that the CO_2 emissions from liming are below 100 kt CO_2 eq, which is below the level of significance. The Party reported "NE" in CRF table 3.G-I and explained in CRF table 9 that there were insufficient AD.
LULUCF			
L.1	4. General (LULUCF) – CO_2 and N_2O (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 the mandatory categories, subcategories and pools identified in the review report and, for clarity, listed below:	
		(a) Carbon stock changes in mineral soils for cropland converted to forest land and grassland converted to forest land;	(a) Resolved. Carbon stock changes in mineral soils are reported for grassland converted to forest land. For cropland converted to forest land, Turkey reported carbon stock changes as "NO" for all pools, assuming that only grassland is converted to cropland (see ID# L.32 in table 5);
		(b) Carbon stock changes in mineral soils for grassland;	(b) Not resolved. There are no changes in the reporting since the 2017 inventory submission. Owing to lack of data, Turkey continues to report carbon stock changes in mineral soils for grassland remaining grassland as "NE". For land converted to grassland Turkey reported CO_2 emissions and removals for mineral soils;
		(c) CO_2 emissions/ removals from forest land converted to grassland (all pools);	(c) Addressing. Turkey reported CO_2 emissions and removals for forest land converted to grassland for all pools except organic soils, for which it lacks AD. It is expected that this will be resolved once the results of the ongoing EU-funded project, initiated in 2017, on technical assistance for

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			developing an analytical basis for LULUCF have been finalized;
		(d) Carbon stock changes for wetlands converted to grassland (biomass and mineral soils pools);	(d) Not resolved. Turkey still reports carbon stock changes as "NE" for the biomass and mineral soils pools and did not provide an explanation in CRF table 9 or the NIR;
		(e) CO_2 emissions/ removals from forest land, cropland and grassland converted to settlements (all pools);	(e) Addressing. Turkey reported that there is no conversion of forest land to settlements in the country and reported CO_2 emissions and removals for all pools for grassland and cropland converted to settlements except organic soils, for which no AD are available. It is expected that this will be resolved once data from the above-mentioned ongoing EU-funded project have been finalized;
		(f) CO_2 emissions/ removals from forest land and cropland converted to other land (all pools);	(f) Addressing. No conversion from forest land to other land occurs in Turkey, and the Party reported CO_2 emissions and removals as "NO" for all pools. For emissions and removals from conversion from cropland to other land for all pools, "NE" is still reported. Turkey indicated that it will report the notation key "NO" in the next submission as this conversion does not occur in the country;
		(g) N_2O emissions from disturbance associated with land-use conversion to cropland.	(g) Resolved. Turkey has reported N_2O emissions from conversion of grassland to cropland and assumed that no other type of conversion to cropland occurs.
L.2	4. General (LULUCF) – CO_2 (L.15, 2016) (L.15 2015) Completeness	Improve the completeness of the reporting by providing estimates for the land-use categories and transitions that occur in the country and for which there are default IPCC methods. Where the notation key "NE" is used, indicate in both the NIR and the CRF completeness table why the emissions and removals have not been estimated in accordance with paragraph 37 of the UNFCCC Annex I inventory reporting guidelines.	Addressing. Turkey still reports "NE" for many land-use categories and subcategories without providing an explanation in the NIR or CRF table 9 (e.g. wetlands and other land converted to grassland, and land converted to other land, except forest land). Turkey has improved the reporting for some previously not estimated categories (see ID# L.1(e) above) and reported land converted to settlements for the first time.
L.3	4. General (LULUCF) – CO_2 (L.3, 2016) (L.3, 2015) (115, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Strengthen the institutional arrangements to improve the inventory preparation process, specifically the integration of data and information for the LULUCF sector.	Not resolved. The integration of land-use data remains an issue still to be resolved and the institutional arrangements (as mentioned in document FCCC/ARR/2014/TUR (para. 115)) need to be strengthened to provide a coherent, integrated, consistent and transparent inventory report for the LULUCF sector.
L.4	4. General (LULUCF) – CO_2 (L.5, 2016) (L.5, 2015) (117, 2014) (74	Clarify the description of land categories, check the integrity of the total land area over the	Addressing. Turkey has not provided any further clarification of the descriptions of land categories (see ID# L.24 in table 5). CRF table 4.1 shows that the reported land representation covers the entire

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	and 75, 2013) Accuracy	entire time series and report on the findings.	land area of the country in 2016; however, the integrity of the area data has not been maintained over time. The NIR did not provide information on checks undertaken of the integrity of the total land area over the entire time series.
L.5	4. General (LULUCF) – CO_2 (L.6, 2016) (L.6, 2015) (117, 2014) (73, 2013) Accuracy	Using domestic data and information, undertake the necessary work to develop an internally consistent land framework and harmonize the two major data sources in order to produce a spatially consistent breakdown of land-use categories for the whole country, over time, and report on progress.	Addressing. The use of two different sources of data and information (CORINE land-cover maps and the Turkish inventory and statistical system ENVANIS for forest land) still leads to inconsistencies between forest land and other land-use categories. The above-mentioned EU-funded project is expected to provide Turkey with the capacity to develop land-use matrices and improve its reporting by the next inventory submission (p.422). Some results from the study are presented in the NIR but considered to be preliminary.
L.6	4. General (LULUCF) – CO_2 (L.7, 2016) (L.7, 2015) (119, 2014) (72, 2013) Comparability	Consistently use the notation key "NO" to report an activity that does not occur, and the notation key "NE" to report an activity that occurs but the emissions are not estimated.	Resolved. Turkey has consistently reported activities that do not occur as "NO" (e.g. forest land conversion to cropland, conversion of settlements to wetlands or grassland) and emissions from activities that have not been estimated, due mainly to lack of data, as "NE".
L.7	4. General (LULUCF) – CO_2 (L.8, 2016) (L.8, 2015) (120, 2014) Adherence to the UNFCCC Annex I inventory reporting guidelines	Calculate uncertainty estimates for each LULUCF category and for the total sector according to the relevant IPCC guidance.	Resolved. Annex 2 to the NIR provided uncertainty estimates for AD and EFs for each LULUCF land category, all reported with the same value (see ID# L.22 in table 5).
L.8	4. General (LULUCF) – CO_2 (L.16, 2016) (L.16, 2015) Accuracy	Treat with priority the issue of land representation under the LULUCF sector and provide a complete land-use matrix for the entire time series.	Addressing. The ERT considers that the Party is addressing this issue as a priority, by undertaking the above-mentioned EU-funded project, which has the potential to improve Turkey's capacity to report land-use change matrices and associated GHG emissions and removals. Turkey provided incomplete information in CRF table 4.1 on land-use changes for all years of the time series.
L.9	4. General (LULUCF) – CO_2 (L.16, 2016) (L.16, 2015) Transparency	Prioritize the integration of ENVANIS and CORINE and include information on the progress with the integration and data validation.	Addressing. Although Turkey has prioritized the integration of ENVANIS and CORINE through the above-mentioned EU project, it did not include in the NIR information on progress in the integration of the two data sources and data validation, or on how the EU-funded project will be useful in this regard.
L.10	4.A Forest land – CO_2 (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 needed.	Addressing. Turkey is engaged in many projects that will enhance its capacity to improve its reporting on forest land and will provide the means to conduct a thorough scientific assessment of its estimation methods. Ongoing projects include one, initiated in 2013, on an integrated approach to forest management in Turkey, and the above-mentioned EU-funded project. A study on mapping soil organic carbon stocks in Turkey was finalized in 2015 and the results will be used in the next inventories.

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
L.11	4.A Forest land – CO_2 (L.10, 2016) (L.10, 2015) (122, 2014) (77–79, 2013) (98, 2012) Transparency	Provide clear and complete information in the NIR on the data sources and estimation methodology.	Addressing. Turkey provided information on the methodology, AD and EFs used for estimating CO_2 from forest land (in section 6.2 of the NIR), but the NIR still lacks transparency on how ENVANIS is used to calculate carbon stock changes and on the coverage of measurements and the frequency of updating them.
L.12	4.A Forest land – CO_2 (L.17, 2016) (L.17 2015) Transparency	Continue efforts to improve the transparency of underlying forest data and the methods used for determination and calculation of forest stock and increment as well as data on removals in the ENVANIS system.	Not resolved. Although Turkey provided country-specific data for many of the parameters needed to convert growing stock volume to above-ground biomass, or net annual increment in volume to above-ground biomass, and the annual wood removals for estimation of the annual loss in biomass of wood removals (in section 6.2 of the NIR), there is no explanation of how these parameters have been obtained, how they are aggregated for use in ENVANIS or how the data are updated (e.g. through submissions of forest management plans or by extrapolation of older records).
L.13	4.A.2.2 Grassland converted to forest land – CO_2 (L.18, 2016) (L.18, 2015) Accuracy	Verify the accuracy of the estimates for mineral soil net carbon stock change and apply a recalculation if deemed necessary.	Not resolved. Turkey has not provided in the NIR information regarding any verification procedures of the estimates of stock change in soil organic carbon in mineral soils since the last inventory submission. No recalculation has been performed.
L.14	4.A.2.2 Grassland converted to forest land – CO_2 (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 the calculation of net emissions and removals from soils and further document the country-specific values used.	Not resolved. Turkey provided essentially the same information in section 6.4 of the NIR as in the previous inventory submission. No additional background data have been provided on grassland converted to forest land.
L.15	4.B Cropland – CO_2 (L.19, 2016) (L.19, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Correct detected inconsistencies and, as part of QA/QC routines, check that data presented in the NIR in tables, text and figures are consistent and match the latest data reported in the CRF tables (i.e. regarding areas of cropland).	Not resolved. The data in CRF table 4.B and in the NIR (p.319) are still inconsistent (e.g. for 1990, the area reported for cropland in the NIR is 31,259.93 kha, whereas in CRF table 4.B it is 32,315.02 kha. For 2012, the NIR provides the area of 28,080.79 kha, whereas in CRF table 4.B the corresponding value is 28,082.39 kha).
L.16	4.B Cropland – CO_2 (L.12, 2016) (L.12, 2015) (123, 2014) (83, 2013) Accuracy	Assume biomass carbon stocks of 0 Mt/ha (tier 1) for annual crops, unless sufficient evidence is obtained to support a revision of this assumption.	Resolved. On page 325 of the NIR (on cropland remaining cropland), Turkey states that for annual crops the increase in biomass stock in a single year is assumed equal to biomass losses from harvest and mortality in that same year (tier 1) (see ID# L.28 in table 5).
L.17	4.B Cropland – CO_2 (L.20, 2016) Transparency	Clearly explain the rationale for and impact of any performed recalculation and provide clear numerical	Resolved. Turkey has not performed a recalculation of emissions for cropland; the values reported are consistent between the 2017 and 2018 inventory submissions (see ID# L.40 in table 5).

ID#	*Issue classification*[a,b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		information on such recalculation in the NIR.	
L.18	4.B Cropland – CO_2 (L.20, 2016) Transparency	Check that the NIR text is updated to reflect the content of the present year's reporting in the CRF tables.	Not resolved. In its 2017 NIR, Turkey indicated that it had performed recalculations for cropland owing to having updated CORINE maps and as a result of comparing CORINE maps for 2006–2012. These recalculated values, however, were not fully reflected in either the 2017 or the 2018 inventory submission, which contain the same values as the 2016 inventory submission (without the recalculation) (e.g. in the 2016 inventory submission, net CO_2 emissions reported for 2001 in CRF table 4.B were –516.08 kt CO_2 eq, whereas the corresponding recalculated value in the NIR of the 2017 inventory submission (table 6.30, p.360) is –509.33 kt CO_2 eq). However, CRF table 4.B in the 2017 and 2018 inventory submissions maintains the value of –516.08 kt CO_2 eq. Only for 2007 onward do the recalculated values presented in table 6.30 of the 2017 NIR correspond to the values in CRF table 4.B (see ID# L.29 in table 5).
L.19	4.D Wetlands – CO_2 (L.13, 2016) (L.13, 2015) (I.24, 2014) Transparency	Explain the trends in AD, taking into consideration the recommendations on consistent land-use information and on the proper use of the notation keys.	Not resolved. There is no explanation of AD trends in the NIR. Since 2012 this category has been reported as "NE" or "NO" without the rationale for the use of these notation keys being provided, except for lack of data.
L.20	4.G Harvested wood products – CO_2 (L.21, 2016) Accuracy	Check that data presented in the CRF tables for harvested wood products are complete and correct and report a corrected time series for the category.	Addressing. Turkey has reported a complete time series since 1960 and fixed the production data for sawn wood and wood panels. The ERT noted, however, that imports and exports of sawnwood and wood panels are reported as "NE" with no explanation provided in CRF table 9 or the NIR. In addition, domestic production, imports and exports of paper and paperboard are reported as "NE" in CRF table 4.Gs2 but as "NO" in CRF table4.Gs1.
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.16, 2016) (W.16, 2015) Transparency	Provide estimated emissions from unmanaged waste disposal sites and managed waste disposal sites disaggregated.	Addressing. The Party has reported CH_4 emissions from unmanaged and managed waste disposal sites separately in the CRF tables; however, they have not been reported in a disaggregated manner in the NIR.
W.2	5.C.2 Open burning of waste – CO_2 (W.17, 2016) (W.17, 2015) Accuracy	Recalculate the CO_2 emissions from open burning of waste, correctly applying equation 5.2 of the 2006 IPCC Guidelines.	Resolved. Turkey has recalculated CO_2 emissions from open burning of waste, and correctly applied equation 5.2 from the 2006 IPCC Guidelines (volume 5, chapter 5). The file with the estimates was provided to the ERT to confirm the accuracy of the updated estimates. Methodological information is provided in the NIR (pp.379–388).
W.3	5.D.1 Domestic wastewater – N_2O (W.18, 2016) (W.18,	Use available data from the Food and Agriculture Organization of the United Nations country profile of food	Addressing. Turkey has updated the N_2O emission estimates using annual per capita protein consumption data originating from FAOSTAT. FAOSTAT values are available for 1990–2013. For

ID#	Issue classification[a,b]	Recommendation made in previous review report	ERT assessment and rationale
	2015) Consistency	security indicators for Turkey for corresponding years of the inventory and IPCC gap-filling techniques for the years with missing data where country-specific information is not available.	2014, 2015 and 2016 Turkey assumed the same values as for 2013, owing to a lack of up-to-date data from the aforementioned data source, and did not apply an IPCC gap-filling technique such as extrapolation to complete the time series.

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

[b] The review of the 2017 inventory submission of Turkey did not take place in 2017 and, as such, the 2017 ARR was not available at the time of this review. Therefore, the recommendations reflected in table 3 are taken from the 2016 annual review report. For the same reason, the year 2017 is excluded from the list of review years in which the issue could have been identified.

IV. Issues identified in three 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 successive reviews, including the review of the 2018 inventory submission of Turkey, and have not been addressed by the Party.

Table 4
Issues identified in three successive reviews and not addressed by Turkey

ID#	Previous recommendation for the issue identified	Number of successive reviews issue not addressed[a]
General		
G.3	Use the results of the uncertainty analysis to prioritize improvements to the inventory	3 (2014–2018)
Energy		
E.1	Include a separate section in the energy chapter of the NIR providing all detailed information on, and the rationale for, recalculations	4 (2013–2018)
E.5	Provide information on feedstocks and NEU of coking coal	3 (2014–2018)
E.8	Determine a reliable data source for international bunker fuels and improve time-series consistency	4 (2013–2018)
E.9	Improve the consistency between CRF tables 1.C and 1.A(b), harmonize and correct the information reported in these tables and apply QC measures to the estimates	6 (2011–2018)
E.13	Provide sufficient information on the inter-annual changes in the CO_2 EFs in the NIR	3 (2014–2018)
E.15	Move to a higher-tier method for calculating N_2O (and CH_4) emissions, as it is likely that this will be a key category if using appropriate EFs	3 (2014–2018)
E.17	Revise the emission estimates by reallocating the diesel oil used for agricultural purposes to this subcategory by using assumptions based on the historical trend of the ratio of diesel oil used for agriculture against the total diesel oil used in the country	3 (2014–2018)
E.18	Provide clear explanations in the NIR on the allocation of diesel oil used for agricultural purposes to this subcategory, using	3 (2014–2018)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	assumptions based on the historical trend of the ratio of diesel oil used for agriculture against the total diesel oil used in the country	
IPPU		
I.2	Include captive lime production emissions in the estimates for this category	3 (2014–2018)
I.10	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	3 (2014–2018)
I.13	Correct the notation key used to report SF_6 emissions from magnesium foundries from "NA" to "NE"	3 (2014–2018)
I.17	Establish sound data-collection methods to estimate and report actual emissions from different F-gas applications under this category and investigate the possibility of moving to a higher-tier method (only potential emissions calculated) for refrigeration and air-conditioning equipment	5 (2012–2018)
I.18	Implement the mandatory data-collection system (ministerial regulation of F-gases) as planned and increase the completeness and overall data quality of the inventory	3 (2014–2018)
I.20	Report all likely occurring emissions, such as N_2O emissions from use for anaesthesia and other applications	3 (2014–2018)
Agriculture		
A.2	Provide more transparent information in annexes 3 and 7 to the NIR (including information on the sources of uncertainties, any issues affecting time-series consistency and category-specific QA/QC and verification procedures) and provide tables showing the time series for the EFs and AD by category, as well as detailed documentation supporting the choice of EFs, including when default EFs are applied	5 (2012–2018)
A.6	Estimate emissions for significant livestock categories using the tier 2 method with country-specific EFs, including enhanced livestock population characterization, and taking into account the relevant IPCC guidance	4 (2013–2018)
A.7	Revise the emission estimates by applying national values of Nex and AWMS distribution	4 (2013–2018)
LULUCF		
L.1	Use existing data, make all the necessary efforts to collect new data and report estimates for the mandatory categories, subcategories and pools identified in the review report and, for clarity, listed below: (b) Carbon stock changes in mineral soils for grassland (c) CO_2 emissions/removals from forest land converted to grassland (all pools) (d) Carbon stock changes for wetlands converted to grassland (biomass and mineral soils pools) (e) CO_2 emissions/removals from forest land, cropland and grassland converted to settlements (all pools) (f) CO_2 emissions/removals from forest land and cropland converted to other land (all pools)	6 (2011–2018)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
L.3	Strengthen the institutional arrangements to improve the inventory preparation process, specifically the integration of data and information for the LULUCF sector	3 (2014–2018)
L.4	Clarify the description of land categories, check the integrity of the total land area over the entire time series and report on the findings	4 (2013–2018)
L.5	Using domestic data and information, undertake the necessary work to develop an internally consistent land framework and harmonize the two major data sources in order to produce a spatially consistent breakdown of land-use categories for the whole country, over time, and report on progress	4 (2013–2018)
L.10	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 needed	3 (2014–2018)
L.11	Provide clear and complete information in the NIR on the data sources and estimation methodology	5 (2012–2018)
L.19	Explain the trends in AD, taking into consideration the recommendations on consistent land-use information and on the proper use of the notation keys	3 (2014–2018)
Waste		
	No issues identified	

[a] The review of the 2017 inventory submission of Turkey did not take place in 2017. Therefore, 2017 was not included when counting the number of successive years for table 4. In addition, as the reviews of the Party's 2015 and 2016 inventory submissions were held in conjunction, they are not considered successive and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2018 inventory submission

9. Table 5 contains findings made by the ERT during the individual review of the 2018 inventory submission of Turkey that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2018 inventory submission of Turkey

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
General			
G.4	QA/QC and verification	It is stated in the NIR that QA/QC and verification procedures are an integral and indispensable part of the national GHG inventory process of Turkey, and that the quality of the national inventory arrangements is ensured by the QA/QC system and through the QA/QC plan adopted by the Climate Change and Air Management Coordination Board in 2014 and implemented for the first time for the 2015 inventory submission. The QA/QC plan introduces the structure and purpose of the QA/QC system and endorses the quality objectives. The main objective of the plan is to ensure that the national GHG inventory is prepared in accordance with the quality objectives of transparency, accuracy, comparability, consistency and completeness, as defined in the UNFCCC Annex I inventory reporting guidelines. Concerning the information provided in section 10 of the NIR (pp.413–415), the ERT noted that during the latest inventory cycles many recalculations were undertaken as a result of the "human factor" (mistakes and input errors in the calculation sheets, mistakes in formulae, double counting, calculation errors, etc.). The same was noted by the ERT during this review (see ID#s E.20, L.15, L.21 and L.23 below), which indicates that the content and/or implementation efficiency of the QA/QC plan still needs to be improved. In this context, the ERT asked the Party during the review if it had evaluated the efficiency of the implementation of the 2014 QA/QC plan recently and if it has any plan to revise or update it or to strengthen the capacity of the national experts and institutions involved in the inventory development process to more effectively implement QA/QC and verification procedures with the purpose of ensuring that the national GHG inventory is prepared in accordance with the above-mentioned quality objectives. The Party informed the ERT that the most recent QA/QC plan was officially approved on 10 October 2017 as result of TurkStat participating in a capacity-building project aiming to improve the overall quality of the GHG inventory. According to the Party, the QA/QC plan, although considered comprehensive and sufficient for the time being, may become insufficient in one or more of its components in a few years because of unanticipated developments, so the Party is planning to review the plan every five years to reflect any improvements or revisions to the plan deemed necessary. The Party stated during the review that TurkStat strives for well-functioning and efficient planning, preparation and management of the Turkish GHG inventory. To date, significant improvements have been made and more improvements are under way. The Party acknowledges that certain mistakes are due to the "human factor"; however, TurkStat considers the current QA/QC plan to be contextually sufficient and comprehensive enough for delivering its role of managing the inventory. As the coordinating body for the preparation of the inventory, TurkStat indicated that it has the objective of overcoming the so-called "human-factor" issue by automating to the extent possible the calculation processes. Establishment of these automated processes is in progress for the IPPU and agriculture sectors, which together with the currently available Excel spreadsheets will enable TurkStat to quality control emission estimation results more diligently. Furthermore, TurkStat has been building and strengthening its capacity for planning, preparing and managing the inventory. For instance, in December 2017, a QA activity regarding the agriculture sector was completed and a similar QA activity was undertaken for the energy sector in August 2018. The EU-funded project	Adherence to the UNFCCC Annex I inventory reporting guidelines

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		on technical assistance for developing an analytical basis for LULUCF has been ongoing since October 2017 and is expected to provide Turkey with the capacity to develop land-use matrices and improve the GHG reporting for the LULUCF sector. Another EU-supported project for the development of the GHG inventory will start in 2019 with the objective of improving the overall quality of the GHG inventory. The ERT commends Turkey for its achievements in developing its QA/QC system and recommends that the Party fully implement the QA/QC procedures envisaged in the latest version of the approved QA/QC plan (approved in 2017), strengthening the quality of the reporting and paying particular attention to the general and specific QC and verification procedures at all stages of the inventory preparation. The ERT encourages Turkey to implement sector-specific QA/QC procedures. It also encourages the Party to continue its efforts to incorporate automated procedures for checking inventory calculations, and to describe these activities in the NIR of its inventory submission.	
G.5	Uncertainty analysis	According to the latest approved QA/QC plan, in its role as national inventory compiler, TurkStat is responsible for ensuring that the uncertainty analysis is properly reported in the inventory submission following approach 2 (Monte Carlo simulation). However, according to the information provided in section 1.6 of the NIR, as well as in annex 2 to the NIR, approach 1 (error propagation method) was used by the Party to assess inventory uncertainty. During the review, the Party explained that one of its inventory team members recently started to undertake scientific research on the Monte Carlo simulation technique to assess inventory uncertainty. The result of this research activity is planned to be used for the next inventory submission. The ERT commends the Party on its intention to use the Monte Carlo simulation (approach 2) to assess inventory uncertainty and encourages the Party to provide in the NIR the results of the uncertainty analysis following approach 2 (Monte Carlo simulation), or, if this is not possible, an update on efforts to follow approach 2 in accordance with its QA/QC plan.	Not an issue
G.6	NIR	According to table 2.3 of the NIR, there was a significant decrease in overall PFC emissions between 2014 and 2015 (from 255.42 to 119.72 kt CO_2 eq) and between 2015 and 2016 (from 119.72 to 24.58 kt CO_2 eq). However, no information was provided in section 2 of the NIR on the main drivers for the decreases (neither in section 2.2 "Emission trends by gas" nor in section 2.3 "Emission trends by sector"). Information was provided in section 4 of the NIR (the IPPU sector) suggesting that there have been changes in the production technologies used in the aluminium industry since 2015. During the review, Turkey informed the ERT that detailed information on the trends in PFC emissions, due to the change in production processes of the country's only aluminium producer, will be provided in section 2.2 and 2.3 of the NIR of its next inventory submission. The ERT recommends that Turkey improve the transparency of the reported information on the key drivers for the PFC emission trends by providing in section 2 of the NIR detailed information, in particular on the decrease in PFC emissions in recent years.	Transparency
G.7	Recalculations	In previous review reports it was recommended that the Party include detailed information on the performed recalculations in the specific NIR chapters and relevant CRF tables and provide explanatory information, including the rationale for the recalculations (see ID# G.2 in table 3). The ERT noted the progress made by the Party,	Not an issue

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		confirming that more detailed information on the performed recalculations, including the rationale for the recalculations, has been provided in section 10 of the NIR, as well as in the specific NIR sections (including on the energy and LULUCF sectors). However, the Party did not use the documentation box of CRF table 8 to provide references to relevant sections of the NIR to ensure a better understanding of the content of that table. The ERT encourages the Party to use the documentation box of CRF table 8 to indicate the sections of the NIR in which justifications of the changes as improvements in the accuracy, completeness, comparability and consistency of the inventory are reported.	
Energy			
E.20	1. General (energy sector)	During the review, the ERT noted several errors in the energy sector section of the NIR. In table 3.14 the ERT noted that the reference to table 2.6 of the 2006 IPCC Guidelines is not fully correct, as some of the EFs are from table 2.2 of the 2006 IPCC Guidelines (volume 2, chapter 2). In response to a question from the ERT regarding the net calorific value for lignite used in the national energy balance, the Party acknowledged that table 3.16 of the NIR had not been properly updated. In answer to another question from the ERT, the Party explained that errors in section 3.2.5.1 of the NIR related to the amount of fuel consumed, net calorific values and density of derived gas in the iron and steel industry were corrected in the 2017 submission, and the 2018 NIR did not describe the current situation in that category. The ERT also noted that the net calorific values reported for lignite in table 3.12 of the NIR do not agree with the values reported in table 3.5, or with the values provided to the ERT during the review. In addition, the national energy balance provided in annex 4 to the NIR did not indicate the units of the balance. The ERT also identified text obtained from the NIR of the previous inventory submission relating to the estimates for abandoned underground mines that should have been updated to read 1990–2016). The ERT further noted the progress of the Party in its QA/QC efforts, and that annex IV to the QA/QC plan provides a checklist for ensuring that the tables in the NIR are correct; however, errors are still very common in the energy sector section of the NIR. The ERT encourages the Party to conduct a review of its category-specific and sector-level QC procedures to identify where errors are occurring, and to further enhance their implementation ensuring that they are sufficient to avoid input errors and mistakes.	Not an issue
E.21	1. General (energy sector)	The Party has provided a national energy balance for 2016 in annex 4 to the NIR. However, there is no indication of the sources used to compile the balance and no indication of how the data were compiled. During the review, the Party indicated that electricity generation and fuel consumption data are sourced from the Electricity Transmission Corporation, and supply data (import, export, bunkers, stock change) from the Energy Market Regulatory Authority, BOTAŞ Petroleum Pipeline Corporation, Turkish Hard Coal Enterprises, Turkish Coal Enterprise and the General Directorates of Mining Affairs, Mineral Research and Exploration, and Petroleum Affairs. Industrial demand data are obtained from questionnaires supplied to relevant companies. Data on other demand sectors are taken from administrative data collected by the Ministry of Energy and Natural Resources and the General Directorate of Energy Affairs.	Not an issue

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT encourages the Party to provide details in the NIR regarding the sources and methods used to compile the national energy balance.	
E.22	1. General (energy sector)	The ERT noted the progress the Party has made in making the reporting of AD and methodologies more transparent in the NIR; however, it does not provide sufficient and consistent information on the EFs used throughout the energy sector. Although the Party provided CO_2, CH_4 and N_2O EFs in tables 3.13 and 3.14 for the public electricity and heat production sector, EFs for other categories were not provided. The ERT recommends that Turkey provide detailed information on CO_2, CH_4 and N_2O EFs for key categories in the energy sector in the NIR. For country-specific EFs, including the technology-specific EFs used to estimate N_2O emissions from public electricity and heat production, the ERT also recommends that Turkey provide details on how those EFs are determined.	Yes. Transparency
E.23	1.A.1.a Public electricity and heat production – gaseous fuels – N_2O	The ERT observed that the N_2O IEFs for gaseous fuels remained constant at 0.10 kg/TJ between 1990 and 2002, and then increased to 2.82 kg/TJ in 2003 (a 2,700 per cent increase). After 2003 the IEF ranges from 2.61 to 2.83 kg/TJ. During the review, the Party explained that technology-specific EFs were used for 2003 onward that are based on information from the Turkish Electricity Transmission Company and EFs from table 2.6 of volume 2, chapter 2, of the 2006 IPCC Guidelines; however, the technology split was not known prior to 2003. Similar information was provided in the NIR (p.70). In accordance with the 2006 IPCC Guidelines (volume 1, chapter 5, p.5.5), annual inventory trends should aim to reflect the real annual fluctuations in emissions or removals and not be subject to changes resulting from methodological differences. Volume 1, chapter 5, of the 2006 IPCC Guidelines provides recommendations for ensuring a consistent time series when there are data gaps. The ERT recommends that Turkey 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.	Yes. Consistency
E.24	1.A.1.a Public electricity and heat production – solid, liquid, gaseous and other fossil fuels – CH_4 and N_2O	It is indicated in the NIR that the uncertainty of the CH_4 and N_2O EFs was taken from table 2.13 of the 2006 IPCC Guidelines, using the Netherlands as a surrogate as Turkey is not specifically listed in table 2.13. The ERT noted that, in accordance with the 2006 IPCC Guidelines, table 2.12 (volume 2, chapter 2) should be used for the CH_4 and N_2O EF uncertainty values if no country-specific values are available, and that table 2.13 provides values for the uncertainty of the CO_2 EFs. In answer to a question from the ERT, the Party indicated that these values were chosen as a starting point; however, in the absence of country-specific uncertainty values, for future inventories it will consider using the default values published in table 2.12. The ERT notes that as technology-specific EFs for N_2O are applied for gaseous fuels (see ID# E.22 above) any IPCC default uncertainty values for N_2O emissions are not likely to be representative. The ERT recommends that Turkey use in its 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.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
E.25	1.A.1.a Public electricity and heat production – CO_2, CH_4 and N_2O	According to section 3.2.4.1 of the NIR, emissions from autoproducers of electricity are reported under this subcategory (with the exception of heat used on site, which is included in the category relevant to where the heat is used). According to the 2006 IPCC Guidelines (chapter 2, table 2.1), emissions from autoproducers should be assigned to the category relevant to where they were generated. During the review, the Party indicated that this method was chosen to avoid double counting in the respective categories. The ERT noted that autoproduction is separate from electricity generation in the national energy balance; however, the Party clarified that the values for before 2015 are not separate in the national energy balance. The ERT commends the Party for its efforts to avoid double counting; however, in order to increase the comparability of the GHG inventory, the ERT recommends that the Party 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.	Yes. Comparability
E.26	1.A.2 Manufacturing industries and construction – CO_2, CH_4 and N_2O	The ERT noted the progress made by the Party in disaggregating emissions by subcategory under manufacturing industries and construction for the period 2011–2016. The NIR (section 3.2.5) indicates that, prior to 2011, the pulp, paper and print, non-metallic minerals, and food processing, beverages and tobacco categories were not fully separated out in the national energy balance and therefore some or all of the emissions from these categories were reported under category 1.A.2.g other (manufacturing industries and construction). During the review, the Party indicated that it is working with relevant institutions to separate the emissions for these subcategories from those under category 1.A.2.g other (manufacturing industries and construction) for the entire time series. The ERT recommends that Turkey improve the comparability and consistency of its inventory and separate the emissions from pulp, paper and print, non-metallic minerals, and food processing, beverages and tobacco from the emissions reported in category 1.A.2.g other (manufacturing industries and construction) for the entire time series.	Yes. Consistency
E.27	1.A.4 Other sectors – general	The ERT noted the progress the Party has made in separating emissions under category 1.A.4.a commercial/institutional from those under category 1.A.4.b residential for 2015 and 2016. Section 3.2.5 of the NIR indicates that, prior to 2015, emissions under category 1.A.4.a commercial/institutional were included under category 1.A.4.b residential. During the review, the Party indicated that it is working with relevant institutions to separate the emissions for category 1.A.4.a commercial/institutional from those under category 1.A.4.b residential for the entire time series. The ERT recommends that Turkey improve the comparability and consistency of its inventory by separating the emissions under category 1.A.4.a commercial/institutional from the emissions reported in category 1.A.4.b residential for the entire time series.	Yes. Comparability
IPPU			
I.21	2.C.1 Iron and steel production – CO_2	Turkey produces steel through two types of technological flow: integrated (in three industrial units) and electric (in 28 industrial units). The ERT noted that in the NIR (p.207) Turkey stated that it used the 2006 IPCC Guidelines tier 3 method for estimating CO_2 emissions from iron and steel production and sinter production, but then presented the	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		methodology for estimating CO_2 emissions from pig iron production and sinter, which is based on a carbon balance method (a tier 3 method is more detailed, based on plant-specific carbon inputs and outputs). Moreover, the method presented for estimating emissions from pellet production had an error in the description (the equation indicates that multiplying pellet production by the IPPC default EF for pellets results in an estimate of CO_2 emissions from pig iron or sinter). During the review, Turkey clarified the methodologies used for each type of process and the role of the overall carbon mass balance presented in the NIR, which is used as a QA/QC check. The ERT commends the Party for the information provided during the review and agrees with the method used to estimate emissions. The ERT recommends that the Party either update the equation on p.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 by Turkey as a QA/QC check in estimating emissions from iron and steel and sinter production. The ERT also recommends that Turkey correct the definition of "E_{CO2}" on page 208 to clarify that it refers to emissions from pellet production.	
I.22	2.C.1 Iron and steel production – CO_2	Turkey provided in the NIR (p.212) a comparison of the total CO_2 emissions calculated using a carbon balance (22,230 kt CO_2) and the sum of the emissions (21,373 kt CO_2) from the integrated plants reported in categories 1.A.1.a, 1.A.1.c, 1.A.2.a and 2.C.1. During the review, the ERT noted the CO_2 emissions gap (857 kt CO_2) in the estimates between these approaches and that some carbon inputs (e.g. iron ore) were missing from the CO_2 emission estimation. The ERT commends the Party for the QA/QC checks undertaken. The ERT recommends that the Party improve the completeness of the CO_2 emission estimation for integrated iron and steel plants by including all the carbon inputs (e.g. iron ore) both in the method consistent with the 2006 IPCC Guidelines used by the Party and in the carbon balance calculated as a QA/QC check, and ensure that the difference in estimated emissions between these two approaches is minimized, and, if it remains, clearly explain why in the NIR.	Yes. Completeness
I.23	2.E.5 Other (electronics industry) – HFCs, PFCs and SF_6	The ERT noted that the AD for perfluoromethane (0.001 t), HFC-23 (0.01 t) and SF_6 (0.002 t) have been constant since the start of the industry in Turkey in 2010. Taking into account that the electronic market is growing, during the review the ERT asked the Party if there are any ongoing or planned projects that would allow it to update the AD. In response Turkey informed the ERT that there are no planned projects for this category, but additional information will be available after the conclusion in May 2020 of the ongoing capacity-building project on F-gases, which started in June 2017. The ERT recommends that Turkey collect the necessary updated AD to reflect national market tendencies and report the corresponding emissions.	Yes. Accuracy
I.24	2.F.3 Fire protection – HFCs	Turkey reported "IE" for HFC-227ea emissions from manufacturing and disposal under this category, while HFC-227ea emissions from stocks are reported (43.17 t in 2016). No further information is provided in CRF table 9 to indicate where emissions from manufacturing and disposal are reported. During the review, the ERT asked the Party to provide more details, including the expected lifetime of fire protection equipment. In response Turkey informed the ERT that, according to information obtained from a discussion with experts working under the Protection of Ozone Layer Division of the Ministry of Environment and Urbanization, HFC-227ea is mostly consumed in fire	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		protection applications in Turkey. No further clarification was provided by the Party, but the ERT assessed that HFC-227ea emissions from manufacturing and disposal of the equipment were reported under operating stocks. The ERT recommends that Turkey 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).	
I.25	2.F.4 Aerosols – HFCs	The ERT noted that HFC emissions from aerosols are not reported by Turkey (blank cells are reported in CRF table2(II)B-Hs2); however, the ERT also noted that metered dose inhalers are widely used in neighbouring countries and by other reporting Parties for medical purposes. During the review, the ERT asked if metered dose inhalers are used in Turkey. In response Turkey informed the ERT that there is a lack of information about this application. The Party had information about the Customs Tariff Statistics Positions code used for inhalers, but this also covers other medicines imported. Taking into account the high probability that metered dose inhalers are used in Turkey, the ERT recommends that the Party estimate and report HFC emissions from metered dose inhalers or provide evidence that these emissions are not occurring in the country.	Yes. Completeness
I.26	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs	It is mentioned in the NIR (p.238) that this category includes emissions from refrigeration and air-conditioning equipment. In the CRF tables, the rows of the table covering category 2.F.1 (refrigeration and air conditioning) were left blank and no notation keys have been reported. The ERT asked the Party to explain why those emissions were not reported in category 2.F.1. In response Turkey informed the ERT that, in line with the national regulation on waste, electric and electronic equipment companies must collect and store the contained gases; however, there are no requirements for them to report this information and emissions are aggregated under category 2.F.6 (other applications). According to the Party, the Department of Waste is working to collect information in order to construct a database and better estimate emissions in accordance with the 2006 IPCC Guidelines. Once the database has been established, the Party intends to provide further information. The ERT recommends that Turkey 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.	Yes. Comparability
I.27	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs	It is mentioned in the NIR (p.238) that the assumed average annual loss of banked refrigerant equipment is 15 per cent, while in CRF table 2(II).B-H for HFC-32 a product life factor of 96.83 per cent is reported. The ERT asked the Party to clarify this inconsistency. In response the Party provided its assumptions for this category, which did not clarify the issue.	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT recommends that the Party verify the product life EF for HFC-32 and revise its estimates, if necessary, as well as 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.	
I.28	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs	It is mentioned in the NIR (p.238) that HFCs have been used since 1999; however, in the CRF tables HFC emissions have been reported only since 2000. The ERT asked the Party to clarify why emissions for 1999 were not included. In response Turkey informed the ERT that there is no available information about the amount of HFCs consumed in 1999 and the missing data will be estimated for the next inventory submission. The ERT recommends that Turkey 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).	Yes. Completeness
I.29	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs	The methodological description in the NIR for this category does not include information on the parameters used for the calculation of emissions. In particular, during the review, the ERT asked the Party to provide more methodological details on the assumed average initial filling and the number of units of equipment on the market. In response Turkey informed the ERT that the methodology used to estimate HFC emissions from other applications was based on the 2006 IPCC Guidelines, using the model provided by the IPCC, which calculates emissions following the tier 1 method. The inventory calculations were based on the raw trade data (import and export) provided for each gas by TurkStat. The ERT recommends that Turkey improve the transparency of the reporting by providing in the NIR a more detailed description of the main assumptions applied and parameters 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.	Yes. Transparency
I.30	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs	It is mentioned in the NIR (p.238) that the average lifetime of refrigeration and air-conditioning equipment that uses HFCs is 15 years and that HFCs have been used since 1999. Taking this into account, first decommissioning of the equipment was expected in 2015 at the latest. In CRF table 2(II)B-H, emissions from disposal of equipment are not reported (emissions from recovery are marked as "NO"). The ERT asked the Party whether disposal emissions had occurred in recent years. Turkey replied that, owing to lack of information, a further explanation could not be provided. Under the national regulation on waste, electric and electronic equipment companies must collect and store the contained gases. Turkey indicated that the Department of Waste is working to collect information in order to make a database to enable estimation of emissions in accordance with the 2006 IPCC Guidelines. Once this database has been established, the Party intends to provide further information. The ERT recommends that Turkey calculate and report HFC disposal emissions from retired refrigeration and air-conditioning equipment, and if applicable, the amount of recovery of these gases.	Yes. Completeness
I.31	2.G.1 Electrical equipment – SF_6	In the NIR (p.241) Turkey reported that SF_6 in electrical equipment is mainly used in circuit breakers. It is mentioned in the NIR (p.243) that it was assumed that all imported SF_6 is released in the year of import (i.e. an EF of 100 per cent) and all emissions are reported from manufacturing. The ERT notes that other Parties use a	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		significantly lower value for this product manufacturing factor (maximum 8.5 per cent) for circuit breakers. The ERT asked the Party to provide a rationale for using such a high EF. Turkey informed the ERT that there is no information available on the number of pieces, and the capacity, of the used, imported or exported equipment and the number of pieces of destroyed equipment. Therefore, the imported gas amount has been assumed as completely emitted in the year of import. The ERT notes that this assumption is not in accordance with the 2006 IPCC Guidelines, whereby emissions should be calculated and reported separately for manufacturing, operation and disposal of equipment. The ERT recommends that Turkey 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.	
Agriculture			
A.14	3. General (agriculture) – CH_4 and N_2O	In the NIR (p.252) Turkey indicated that most of the livestock populations, except non-dairy cattle, merino sheep and poultry, show a decreasing trend between 1990 and 2016 (i.e. goats (–5.3 per cent), swine (–89.2 per cent), dairy cattle (–7.8 per cent), camels (–20.1 per cent), domestic sheep (–27.4 per cent), buffalo (–61.7 per cent), horses (–76.6 per cent) and mules and asses (–84.0 per cent)). However, no information was provided in the NIR on the reason for the observed reduction in livestock populations between 1990 and 2016. During the review, Turkey explained that the livestock population data are from official agricultural statistics published by TurkStat (available at http://www.turkstat.gov.tr/PreTablo.do?alt_id=1002), which are produced within the framework of the Official Statistics Programme in Turkey. In addition, Turkey explained that the decreasing trend in livestock populations is also linked to the country's economy, and provided documents that indicate the share of economic sectors, including the agriculture sector, in the annual gross domestic product from 1998 to 2017 (agriculture, forestry and fishing accounted for 9.9 per cent of gross domestic product in 1998 but 6.3 per cent in 2017). The ERT notes that this overall declining trend in livestock populations is consistent with data reported to the Food and Agriculture Organization of the United Nations (see http://www.fao.org/faostat/en/#data/QA). The ERT recommends that Turkey transparently explain the reduction observed in the populations of most livestock species between 1990 and 2016 in the NIR.	Yes. Transparency
A.15	3.A.1 Cattle – CH_4	Turkey estimated CH_4 emissions from cattle using a tier 2 method (see ID#s A.1 and A.3 in table 3). However, the Party did not provide detailed reference documents for data on the average animal mass, milk productivity and gross energy intake used for the calculation of CH_4 emissions from enteric fermentation for cattle for the whole time series. During the review, Turkey explained that it applied country-specific parameters where available and also default factors whenever necessary, and that the required data for the tier 2 estimation of CH_4 emissions are gathered from the Ministry of Agriculture and Forestry, TurkStat Agricultural Statistics Department, some large private agricultural companies and the Faculty of Agriculture at Ankara University. The ERT agreed with the information provided. The ERT acknowledges the source of the data used for the development of country-specific parameters and recommends that Turkey include in the NIR information on the sources of data and relevant references for the	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		average animal mass, milk productivity and gross energy intake used for the calculation of CH_4 emissions from enteric fermentation for cattle.	
A.16	3.A.1 Cattle – CH_4	In the NIR (p.260) Turkey indicated that a tier 2 methodology was used to estimate CH_4 emissions from enteric fermentation for dairy and non-dairy cattle, but no information was provided in the NIR on how the country-specific EF for dairy and non-dairy cattle was developed. During the review, Turkey explained that the key parameters used to calculate CH_4 emissions from enteric fermentation for cattle are given on page 262 (table 5.8) of the NIR. In addition, Turkey explained that the relevant equations given in the 2006 IPCC Guidelines (volume 4) were used to calculate the country-specific EF. As a follow-up question, the ERT requested the data and references used by the Party for the calculation of net energy for maintenance, animal activity, lactation, work, pregnancy and growth; ratio of energy available in a diet for maintenance to digestible energy consumed; and ratio of net energy available for growth in a diet to digestible energy consumed, which were used to calculate the gross energy intake for dairy and non-dairy cattle. In response, Turkey provided all the necessary data used to calculate the gross energy intake for dairy and non-dairy cattle in an Excel spreadsheet. The ERT welcomed and agreed with the information provided by Turkey, but considered that the data and methodology used to estimate gross energy were not transparently provided in the NIR. The ERT recommends that Turkey summarize in the NIR the methods used to calculate gross energy intake for dairy and non-dairy cattle, including providing the data and references used for the relevant parameters (net energy for maintenance, animal activity, lactation, work, pregnancy and growth; ratio of energy available in a diet for maintenance to digestible energy consumed; and ratio of net energy available for growth in a diet to digestible energy consumed).	Yes. Transparency
A.17	3.A.1 Cattle – CH_4	In the NIR (p.263) Turkey explained that there is a plan to improve the estimation of CH_4 emissions from enteric fermentation for sheep and to apply a tier 2 methodology. However, the Party did not provide a plan for reporting using an enhanced livestock characterization for cattle. During the review, Turkey explained that a tier 2 methodology is used to estimate CH_4 emissions from enteric fermentation for cattle (dairy cattle and non-dairy cattle) since these species contributes a high proportion of total agricultural emissions (around 37.8 per cent in 2016). Thus, the application of a tier 2 method for estimating CH_4 emissions from enteric fermentation from cattle (dairy and non-dairy) was considered a significant step in developing the category estimates in particular and the GHG inventory in general. The ERT welcomes the Party's efforts to improve its estimates. However, because cattle are a significant livestock subcategory, the ERT considers that Turkey needs to include in its plan of improvement the estimation and reporting of CH_4 emissions from enteric fermentation using an enhanced characterization for cattle in accordance with the 2006 IPCC Guidelines. The ERT recommends that the Party report CH_4 emissions from enteric fermentation using an enhanced livestock classification in accordance with the 2006 IPCC Guidelines in its plan of improvement. The ERT encourages Turkey to calculate CH_4 emissions from enteric fermentation for sheep using a tier 2 methodology.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
A.18	3.B Manure management – CH_4 and N_2O	In the NIR (p.425) Turkey indicated that CH_4 and N_2O emissions from manure management are key categories. However, Turkey used a tier 1 method and default EFs from the 2006 IPCC Guidelines for the emission estimates for these categories. During the review, Turkey explained that it is cooperating with relevant stakeholders, including relevant ministries, research institutes, associations and universities, to collect AD and develop country-specific EFs for the future. The ERT commends this effort and recommends that Turkey 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.	Yes. Accuracy
A.19	3.B Manure management – CH_4 and N_2O	In the NIR (p.269) Turkey reported that the default AWMS usage according to the 2006 IPCC Guidelines (volume 4, chapter 10, annex) was used for all livestock. However, in table 5.12 of the NIR, the AWMS usage reported for culture dairy cattle and hybrid dairy cattle is different from the values indicated in the 2006 IPCC Guidelines (table 10A-4) for dairy cattle in Western Europe and Asia (Turkey typically applies the default values for these two regions). In addition, in the same table it is reported that the AWMS usage for camels, horses, goats, mules and asses, chickens, ducks and turkeys is allocated according to the 2006 IPCC Guidelines. During the review, Turkey explained that it will revise the AWMS usage for all livestock according to national circumstances for the next inventory submission. The ERT recommends that Turkey revise the AWMS usage for all livestock species to reflect national circumstances, or apply the default AWMS from the 2006 IPCC Guidelines for the relevant region, and transparently provide the necessary documentation in the NIR.	Yes. Accuracy
A.20	3.B Manure management – N_2O	The ERT noted that the absolute value of Nex per MMS for daily spread for dairy cattle is the highest among reporting Parties. Turkey reported 91,514,402.84 kg nitrogen/year for 2016, while the second-highest value reported by a Party was 16,897,574 kg/nitrogen/year. Similarly high values were reported for liquid systems and digesters. During the review, Turkey explained that this problem is due to the absence of a country-specific MMS distribution for cattle. The ERT recommends that Turkey recalculate the Nex per MMS for daily spread, liquid systems and digesters for dairy cattle to reflect the national MMS distribution for dairy cattle.	Yes. Accuracy
A.21	3.B Manure management – N_2O	In table 5.9 of the NIR (p.266) Turkey reported the Nex rate and TAM for the different livestock categories. However, no information was provided in the NIR on how the values were calculated. During the review, Turkey explained that equation 10.30 and default Nex rates from the 2006 IPCC Guidelines were used to calculate the annual Nex rates. Country-specific TAM values were used for dairy and non-dairy cattle; for all other livestock categories, IPCC default TAM values from tables 10A-4–10A-9 of the 2006 IPCC Guidelines were applied, typically using defaults for developing countries. Given that cattle are a significant livestock category, the ERT finds that the use of default Nex rates is not consistent with the 2006 IPCC Guidelines.	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT recommends that Turkey estimate the Nex rate for dairy and non-dairy cattle using national data, and transparently provide detailed documentation to support the selected values in the NIR. In addition, the ERT encourages the Party to estimate national Nex values and TAM for other livestock.	
A.22	3.B.3 Swine – CH_4 and N_2O	The ERT noted that the population of swine shows large fluctuations in some years of the time series. For instance, there is a relatively large change in population numbers between 2002 (3,600) and 2003 (7,090), a 97.2 per cent increase. The population dropped again between 2004 (4,400) and 2005 (1,930), by 56.0 per cent, and was fairly steady until an increase between 2011 (1,850) and 2012 (2,990). Overall between 1990 (12,000) and 2016 (1,300) the population of swine decreased by 89.2 per cent. During the review, Turkey explained that swine is not a significant livestock category because the population is relatively small compared with other livestock populations. Thus, small changes in the absolute amount lead to high percentage changes overall. In addition, the Party indicated that the swine population figures are from official statistics obtained from TurkStat. The ERT acknowledges the Party's response, but notes that in some cases the population nearly doubled (or halved) within a year, and this was not explained in the NIR.	Yes. Consistency
		The ERT recommends that Turkey check the population of swine used in the calculations and assess and report in the NIR on 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, the ERT recommends that the Party consider whether using a splicing technique from the 2006 IPCC Guidelines would provide more accurate estimates.	
A.23	3.B.3 Swine – CH_4	According to the NIR (p.267) IPCC default CH_4 EFs for Asia have been selected because of the similar body weights of swine in Turkey (volume 4, chapter 10, table 10.14). Applying these default EFs, and considering the climate regions, the ERT noted the significant inter-annual changes in the CH_4 IEF for swine manure management in several years of the time series, particularly in recent years. Between 2014 (3.97 kg CH_4/head/year) and 2015 (3.50 kg CH_4/head/year), the CH_4 IEF decreased by 11.7 per cent. Between 2015 and 2016 (3.99 kg CH_4/head/year), the CH_4 IEF increased by 13.9 per cent. During the review, Turkey explained that swine is not a significant livestock category because the population is relatively small compared with other livestock populations. Thus, small changes in the absolute amount lead to high percentage changes overall. In addition, the Party indicated that the swine population figures are from official statistics obtained from TurkStat. The ERT finds that the Party's response does not adequately address the observed inter-annual fluctuations.	Yes. Consistency
		The ERT recommends that Turkey 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.	
A.24	3.B.5 Indirect N_2O emissions – N_2O	The ERT noted that Turkey reported indirect N_2O emissions from leaching and run-off from manure management as "NE" but no further explanation was provided in the NIR and CRF table 9. During the review, Turkey explained that because of the absence of country-specific information on the fraction of nitrogen loss due to leaching and run-off from MMS, this category can only be estimated using a tier 2 or 3 approach; therefore, indirect N_2O emissions from manure management are not calculated. Turkey also indicated that the relevant explanation will be included in CRF table 9 in its next submission.	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT recommends that Turkey collect relevant data and estimate indirect N_2O emissions from leaching and run-off in accordance with the 2006 IPCC Guidelines.	
A.25	3.C.1 Irrigated – CH_4	The ERT noted that the CH_4 IEF reported by Turkey for rice cultivation under single aeration (7.15 g/m^2 in 2016) is the lowest of all reporting Parties (ranging from 18.97 to 33.23 g/m^2, excluding Turkey). During the review, Turkey explained that a tier 1 method was used for single aeration in accordance with the 2006 IPCC Guidelines using default EFs of 1.30 for the baseline EF for continuously flooded fields without organic amendments, 0.60 for the scaling factor to account for the differences in water regime during the cultivation period and either 0.68, 1.00 or 1.90 (according to the data received from TurkStat's regional offices) for the scaling factor to account for the differences in water regime in the pre-season before the cultivation period. The Party noted that the scaling factor for soil type and rice cultivar is not available and the scaling factor for both type and amount of organic amendment applied is taken as 1 since organic amendments are used in negligible amounts for rice cultivation. The Party further noted that, for single aeration, there is only one default EF for the baseline EF for continuously flooded fields without organic amendments and for the scaling factor to account for the differences in water regime during the cultivation period, so the low IEF is largely driven by the selection of the scaling factor to account for the differences in water regime in the pre-season before the cultivation period. For this scaling factor, the Party indicated that it selected relevant values from table 5.13 of the 2006 IPCC Guidelines (volume 4, chapter 5). The ERT finds that although the NIR reports that disaggregated case scaling factors are applied (p.273), the national conditions leading to the specific disaggregated scaling factors selected have not been reported. The ERT recommends that Turkey include in the NIR the rationale for its selection of the scaling factor to account for the differences in water regime during the cultivation period and the scaling factors to account for the differences in water regime in the pre-season before the cultivation period, along with the assumptions applied in relation to the scaling factor for soil type and rice cultivar and the scaling factor for both type and amount of organic amendment applied.	Yes. Transparency
A.26	3.D.a.2.b Sewage sludge applied to soils – N_2O	In table 5.15 of the NIR (p.277) Turkey reported N_2O emissions from sewage sludge applied to soils; however, the N_2O emissions reported for 1997–2005 (ranging from 0.42 to 1.43 kt N_2O) are much higher than those reported for the remaining years (ranging from 0.15 to 0.27 kt N_2O). During the review, Turkey explained that the decreasing trend in the amount of sludge applied to soils was due to increases in the number of landfills and the amount of sludge sent to those landfills, new legislation that limits the amount of sewage applied to soils, and a change in treatment methods at wastewater treatment plants leading to less production of sludge. The ERT recommends that Turkey include information in the NIR to explain the declining trend in N_2O emissions for this category since 2005, including the drivers affecting this trend (e.g. the increase in the number of landfills, the new legislation that limits the sewage applied to soils, and the change in wastewater treatment methods).	Yes. Transparency
A.27	3.F Field burning of agricultural residues – CH_4 and N_2O	Turkey reports "NO" for the area of maize burned in CRF table 3.F. According to the NIR (p.283) field burning is becoming rare, and, according to consultations with the Ministry of Food, Agriculture and Livestock and other internal research, only burning of wheat, barley and rice takes place in Turkey. The ERT noted that, in the additional information table of CRF table 3.F, complete information is provided on wheat, barley and rice burning. However,	Yes. Completeness

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		only crop production is reported for maize, while other parameters were not reported. During the review, Turkey confirmed that maize is not considered as being subject to field burning, thus the relevant information is given only for crops considered as being subject to field burning. The ERT finds that sufficient documentation has not been provided to demonstrate that field burning of maize does not take place in Turkey. The ERT recommends that Turkey include information in the NIR to justify that maize is not subject to field burning in the country, or collect AD and estimate CH_4 and N_2O emissions from field burning of maize crop residue.	
A.28	3.H Urea application – CO_2	The ERT noted that Turkey reported a significant increase (by 59.8 per cent) in the amount of urea applied between 2015 (1,105,355.00 t) and 2016 (1,766,383.24 t). Overall, between 1990 (627,199.00 t) and 2016, the amount of applied urea increased by 181.6 per cent. During the review, Turkey explained that the data on applied urea are official data from the Ministry for Food and Agriculture (recently renamed the Ministry for Agriculture and Forestry). In addition, Turkey explained that the observed increase in urea application could be due to a reduction in crop yield as a result of climate change in the country. Furthermore, in response to a follow-up request to provide documentation and a reference for the amount of urea application in the country (production, import and use) for the entire time series 1990–2016, the Party provided the required data for 1981–2017 reported by the Ministry for Food and Agriculture (see https://www.tarimorman.gov.tr/Konular/Bitkisel-Uretim/Bitki-Besleme-ve-Tarimsal-Teknolojiler/Bitki-Besleme-Istatistikleri). The ERT noted the Party's response during the review and also noted that this source of data was not included in the NIR. The ERT recommends that Turkey provide the source of urea application data, and explain the reasons for the observed overall increase in the amount of urea applied, particularly in recent years, in the NIR.	Yes. Transparency
LULUCF			
L.21	4. General (LULUCF)	The ERT noted several inconsistencies between the information provided in the NIR and in the CRF tables regarding the LULUCF sector. For example, (1) figures provided in NIR table 6.2 (total emissions and removals in Turkey, 1990–2016) are not consistent with data provided in CRF table 10s6 on emission trends for the period 2007–2016; (2) data in NIR table 6.13 for land converted to forest land in the period 1971–2016 do not match those reported in CRF table 4.A for the period 1990–2016 (for grassland converted to forest land); (3) data in NIR tables 6.15 and 6.16 are not consistent (e.g. for 2016, removals should be reported in table 6.16 as 19,587.3 + 5,100.4 = 2,687.7 t C and emissions as 8,960.6 t C); (4) data in NIR table 6.24 for areas of forest land converted to grassland, for 2004 onward, do not match those in CRF table 4.C; (5) non-CO_2 emissions from drained soils in forest land are reported as "NE" in NIR table 6.3 and as "NO" in CRF table 4(II); and (6) "NA" in NIR table 6.3 is reported for biomass burning for cropland, grassland, wetlands and settlements, whereas "NE", "NO" and "IE" are reported in CRF table 4(V). The ERT recommends that Turkey 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.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

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L.22	4. General (LULUCF)	Turkey provided in the NIR (p.317) an estimate of the uncertainty associated with the AD for forest land (23.5 per cent) and for the EFs (48.9 per cent), resulting in an uncertainty estimate for forest land of 54.2 per cent, applying the 2006 IPCC Guidelines equations. Annex 2 to the NIR also provides information about the uncertainty of the AD and EFs for all LULUCF categories. The ERT noted that in that annex the values assigned for forest land, grassland, cropland, wetlands and harvested wood products for CO_2 emissions are all the same (23.5 and 4.5 per cent for AD and EFs, respectively) and that the uncertainty value for the EF for forest land (48.9 per cent) reported in the NIR is not reflected in annex 2. The ERT finds that it is unlikely that the same uncertainty values apply to the AD and EFs for all categories. The ERT recommends that Turkey explain in the NIR the rationale for reporting the same uncertainty values for AD and EFs for different categories (forest land, grassland, cropland, wetlands and harvested wood products) for CO_2 emissions or update the uncertainty analysis to better reflect national circumstances.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.23	Land representation	The ERT noted that Turkey has not reproduced the final areas reported in CRF table 4.1 for 2015 as initial areas for 2016 in CRF table 4.1, particularly for forest land (final area in 2015 = 22,342.94 kha and initial area in 2016 = 20,692.35 kha); grassland (final area in 2015 = 14,852.59 kha and initial area in 2016 = 16,738.06 kha); other land (final area in 2015 = 10,959.90 kha and initial area in 2016 = 10,727.47 kha). The ERT notes that the area at the end of one inventory year should be the same as the initial area in the subsequent year. The ERT recommends that Turkey 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.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.24	Land representation	In the definition of wetlands in the NIR (p.294), Turkey indicated that only artificial water bodies (dams, irrigation dams and reservoirs) are included. The ERT noted that, to ensure consistency with the land representation in the 2006 IPCC Guidelines, the total area of the country needs to be represented. It is not clear where the areas of natural rivers and lakes are reported. The ERT noted that natural rivers and lakes can be classified as unmanaged wetlands, but in this case the definition provided by Turkey needs to be changed (see, for instance, the definition of wetlands in the 2006 IPCC Guidelines (volume 4, chapter 3, p. 3.6)). During the review, Turkey indicated that natural rivers and lakes will be added in the next inventory submission. The ERT recommends that Turkey provide an explanation of where the areas of natural rivers and lakes are included in the NIR, and, if not included, revise its definition of wetlands to ensure adherence to the 2006 IPCC Guidelines and recalculate emissions for the entire time series to reflect the revised definition. The ERT also recommends that Turkey provide information on where other managed wetland areas (e.g. peatlands) are included.	Yes. Completeness
L.25	Land representation	Turkey presented in table 6.18 of the NIR detailed information about the areas of land-use changes (except forest land) for 1990–2000, 2000–2006 and 2006–2012. The ERT notes, however, that it is not clear if and how Turkey makes use of this information considering, in particular, that the aggregate data reported in CRF table 4.1 are different from the data reported in table 6.18.	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT recommends that Turkey include in the NIR information on the relation of the very informative data presented in table 6.18 of the NIR to the data provided in the CRF tables, in particular CRF table 4.1. If the Party is currently not using the data in NIR table 6.18 in the inventory calculations, but as a means of assuring the quality of the areas of land-use changes used in the emission calculations, the ERT recommends that this exercise be described in the NIR.	
L.26	4.A.1 Forest land remaining forest land – CO_2	In the calculation of the annual carbon loss in wood removals using equation 2.12 of the 2006 IPCC Guidelines (volume 4, chapter 2, p.2.12), Turkey defined the annual wood removals as whole harvested woods, including planned harvests. During the review, Turkey explained that the annual inventory covers the actual emissions from wood removals, including those in standing sales. The ERT notes that the annual inventory should report actual emissions from wood removals, not for the planned wood removals, and finds that Turkey's reporting on this issue in the NIR is not transparent. The ERT recommends that Turkey apply the definition of annual wood removals presented in the 2006 IPCC Guidelines (annual wood removals, roundwood, $m^3\ yr^{-1}$), or, if not applicable, provide a justification for including more than the actual wood annually removed in the calculations for this category.	Yes. Transparency
L.27	4.A.2.2 Grassland converted to forest land – CO_2	The ERT noted that the NIR and CRF table 4.A do not provide individual areas and background information (in the case of the NIR) for the types of conversion from grassland to forest land (e.g. from pasture, natural grassland or green areas to deciduous or coniferous species) that could justify the observed changes in the implied carbon stock change factor for grassland converted to forest land, particularly in the most recent years (e.g. between 2015 and 2016 the net carbon stock change per area in living biomass decreased from 0.32 to 0.28 t C/ha). The ERT recommends that Turkey provide in CRF table 4.A and the NIR detailed information about the areas converted for each subcategory under grassland to facilitate understanding of the changes from one year to another in the implied carbon stock change factors for grassland converted to forest land.	Yes. Transparency
L.28	4.B Cropland – CO_2	Turkey used 0.75 t C/ha as the carbon stock of biomass per area for annual crops converted to any other land-use category. The ERT recognizes that this value is country specific and based on the preliminary results of a project to develop climate change ecosystem services software to support sustainable land planning works. The ERT notes that the default carbon stock of biomass provided in table 8.4 of section 8.3 (land converted to settlements) of the 2006 IPCC Guidelines for cropland containing annual crops is 4.7 t C/ha (also consistent with chapter 6, section 6.3.1.2). The ERT also notes that no further information is provided in the NIR regarding the methodological approach adopted in the above-mentioned project to estimate the value of 0.75 t C/ha. The ERT recommends that Turkey either assess and document in the NIR the methodological approach used to generate the country-specific carbon stock of biomass per area for annual crops, or, if this is not possible, use the default value from table 8.4 of the 2006 IPCC Guidelines (4.7 t C/ha).	Yes. Accuracy
L.29	4.B Cropland – CO_2	The ERT noted that the trend in CO_2 emissions for cropland presents inter-annual variations that were not explained or explicitly addressed in the NIR. The reported net CO_2 eq emissions for this category for 1990–1999 ranged from –37.15 kt (in 1990) to 19.86 kt (in 1999). In 2000, cropland was a net sink of –502.18 kt, with a reduced area of	Yes. Consistency

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		cropland remaining cropland (from 32,069.42 to 28,136.97 kha) and land converted to cropland (from 245.60 to 186.09 kha) between 1999 and 2000. These areas were constant until 2006, with cropland being a net sink in that year of –530.27 kt CO_2 eq. In 2007, the area of cropland remaining cropland dropped slightly to 28,080.39 kha and the area of land converted to cropland dropped from 186.09 to 2.00 kha. These areas were constant until 2016. The net sink of –530.27 kt CO_2 in 2006 became a net source of CO_2 emissions from 2007 (190.56 kt CO_2) until 2015 (213.14 kt CO_2) and, despite no changes in the areas under cropland, the category became a net sink of –44.16 kt CO_2 in 2016. The reasons for these trends was not provided in the NIR. The ERT recommends that Turkey review the underlying methods and areas used to estimate CO_2 emissions and removals for cropland, and, as appropriate, revise the estimated CO_2 emissions and removals for cropland and explain in the NIR the reasons for any remaining significant variations in the emission trend from 1990 to 2016 and subsequent years.	
L.30	4.B Cropland – CO_2	In 2015, cropland was a net source (213.14 kt CO_2) and in 2016 it became a net sink (–44.16 kt CO_2), despite the same area of cropland being reported since 2007 (28,082.39 kha). The ERT noticed that the reporting of the net change in carbon stock in the DOM pool was not consistent with previous reporting (e.g. in 2007, DOM was reported as 1.04 kt C with an implied carbon stock change factor constant at 0.000037 t C/ha, while in 2016 DOM was reported at 73.31 kt C with an implied carbon stock change factor of 0.0026 t C/ha). The ERT recommends that Turkey revisit the calculations and parameters used to estimate DOM in cropland and either recalculate or revise the emissions from cropland using revised parameters for 2016 or explain in the NIR the reasons for such a significant change in the carbon stock for the DOM pool between 2007–2015 and 2016.	Yes. Consistency
L.31	4.B Cropland – CO_2	Turkey assumed the carbon stock in above-ground biomass of perennial crops to be 10 t C/ha. The ERT noted, however, that table 5.1 of the 2006 IPCC Guidelines provides a value of 63 t C/ha for a temperate climate region, for cropping systems with perennial species, assuming a harvest cycle of 30 years. The ERT also noted that the use of 10 t C/ha could lead to an underestimation of the losses of carbon stock in biomass for cropland converted to other types of land use. During the review, Turkey informed the ERT that it used the country-specific value for living biomass used by Italy, since the two countries have similar climatic conditions. The ERT agrees that using factors from countries with similar conditions is in accordance with the 2006 IPCC Guidelines. The ERT recommends that Turkey provide in the NIR a clear explanation of the carbon stock value for above-ground biomass used in the calculations for perennial crops and its applicability to Turkish circumstances and indicate whether the ongoing capacity-building projects in the country (e.g. the above-mentioned EU-funded project) will generate carbon stock factors for perennial crops specific to Turkey.	Yes. Transparency
L.32	4.B Cropland – CO_2	In its definition of cropland, Turkey included poplar plantations in or near the agriculture area. The ERT noted that, according to Coaloa and Nervo (2010), Turkey is considered to have a major area planted with poplar (125,000 ha), mainly for wood production (3,500,000 m^3, of which 1,925,000 m^3 is for industry). The article also mentions that 50 per cent of the poplars in Turkey are established along water canals and streams and around irrigable fields. During the review, the ERT was concerned about a possible misclassification of poplar plantations in the CORINE land-	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		cover maps, and these plantations being excluded from cropland. However, Turkey indicated that this is not possible because the total geographical area of the country is represented in the six broad land-use categories. Given the importance of poplar plantations in the country, the ERT recommends that Turkey further assess whether all poplar plantations are accurately included in the inventory calculations. The ERT encourages Turkey to create a specific subcategory under perennial crops and provide estimates of the net changes in carbon stock for these plantations.	
L.33	4.B.2 Land converted to cropland – CO_2	In CRF table 4.B Turkey reported as"NO" all pools for forest land converted to cropland, which implies that this type of conversion does not occur in the country. However, the ERT noted that Ozalp et al. (2016) indicates that Turkey's forests have been "continuously facing conversion into both agriculture and pasture lands". During the review, Turkey responded that there is no spatial assessment and it is only an expert judgment when referring to the use of the notation key "NO". The ERT noted that the 2006 IPCC Guidelines state that the subjective nature of expert judgment increases the need for QA/QC procedures and inventory compilers are encouraged to review expert judgments (volume 1, chapter 2, p.2.21). The ERT recommends that, if reporting "NO" for all pools for forest land converted to cropland is based on expert judgment, Turkey provide in the NIR detailed information on how the expert judgment was elicited and documented (in line with 2006 IPCC Guidelines, volume 1, annex 2A.1). If Turkey cannot justify the reporting of "NO", the ERT recommends that the Party report corresponding CO_2 emissions.	Yes. Transparency
L.34	4.C Grassland – CO_2	Turkey reported in table 6.19 of the NIR the carbon stocks associated with all carbon pools for pasture but did not discriminate between the subcategories of pasture, natural grassland and green areas reported elsewhere in the NIR (table 6.18) to estimate the changes in carbon stock from conversion of grassland. For instance, Turkey assumed a carbon stock of living biomass in pasture of 1.86 t C/ha (0.49 t C/ha for above-ground and 1.37 t C/ha for below-ground biomass) in table 6.19. These values have been applied to grassland conversions (to and from) without differentiating between pasture, natural grassland and green areas. The ERT recommends that Turkey provide in the NIR the areas of grassland under each subcategory (pasture, natural grassland and green areas), as well as the differentiated carbon stocks per unit of area, to increase the transparency of the reporting. The ERT also recommends that Turkey indicate in the NIR the assumptions regarding the carbon stock change from conversion of land to grassland (e.g. for tier 1) in accordance with the 2006 IPCC Guidelines (p.6.25), it is assumed that grassland achieves steady-state biomass during the first year following conversion.	Yes. Transparency
L.35	4.C Grassland – CO_2	Turkey indicated in the NIR (p.327) that for grassland above-ground biomass carbon stock has been assumed to be 0.735 Mg C/ha and below-ground biomass carbon stock to be 2.94 Mg C/ha. In response to a question from the ERT during the review regarding the use of the same carbon stocks for the different subcategories of grassland (natural grassland, pasture or green areas), Turkey stated that it had not used the value 0.735 t C/ha for above-ground biomass carbon stocks, indicating the use of the value 0.49 t C/ha provided in table 6.19 of the NIR associated with pasture. The ERT noted that on several occasions (e.g. table 6.19 and table 6.21 for soil carbon	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		stocks, which provide the average values of 100.56 t C/ha for pasture and 29.3 t C/ha for grassland, respectively) Turkey provided in the NIR different values for the same parameter, giving rise to confusion. Turkey further explained that the values in table 6.19 come from the Scientific and Technical Research Council of Turkey and those in table 6.21 are generated from a large-scale study, but only the values in table 6.21 for soil carbon stocks were used. The ERT recommends that Turkey provide in a single table for each subcategory of grassland (natural grassland, pasture and green areas) all the carbon stock values applied to estimate the changes in carbon stocks, and avoid making references to other values that are not used in the calculations. The ERT commends Turkey for carrying out several parallel studies, for which the ERT encourages the Party to present the results separately in the NIR (e.g. in an annex).	
L.36	4.C.2 Land converted to grassland – CO_2	Turkey provides in the NIR (p.314) carbon stock values for soil organic carbon for coniferous and deciduous forests from Tolunay and Çömez (2008), which are very similar to those provided by Tolunay (2011). However, the ERT notes that, when estimating the changes in carbon stock for forest land converted to grassland, there is no information in the NIR or in CRF table 4.C regarding the type of forest subject to conversion, that is from productive forest land to grassland or from degraded forest land to grassland. The values of the DOM and soil pools provided in section 6.4 of the NIR include only one value for DOM and soil organic carbon for each coniferous and deciduous forest without differentiating between productive and degraded forests. Tolunay (2011) shows that there are significant differences in the carbon stocks of all pools for productive and degraded forests. Considering that the information provided in table 6.5 of the NIR shows that there is a high percentage of degraded forests in the country (42.1 per cent, or 9,494,000 ha, in 2016), it is likely that the conversion to grassland would affect both types. In addition, the ERT noted that there is no specification of which type of grassland the forest land has been converted to (pasture, natural grassland or green areas). The ERT recommends that Turkey review, and as appropriate revise, the values of carbon stocks applied so far in the calculation of carbon stock changes for the conversion of forest land to grassland, on the basis of available literature in the country (e.g. Tolunay (2011)) or appropriate IPCC default values. The ERT also recommends that Turkey provide in section 6.4 of the NIR detailed information regarding the carbon stock values used for the calculations for conversion of forest land to grassland for all pools, and include in CRF table 4.C information on grassland converted to forest land by subcategory (e.g. degraded coniferous forest land converted to natural grassland; degraded coniferous forest land converted to pasture; degraded coniferous forest land converted to green areas; productive coniferous forest land converted to natural grassland; productive coniferous forest land converted to pasture; productive coniferous forest land converted to green areas; degraded deciduous forest land converted to natural grassland; degraded deciduous forest land converted to pasture; degraded deciduous forest land converted to green areas; productive deciduous forest land converted to natural grassland; productive deciduous forest land converted to pasture; and productive deciduous forest land converted to green areas).	Yes. Accuracy
L.37	4.C.2.1 Forest land converted to	Turkey provides in table 6.24 of the NIR the areas of forest land converted to grassland from 1971 to 2016. The ERT notes that the values in the table refer to the increase in the annual area of grassland converted to forest land	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
	grassland – CO_2	and that from 2004 to 2016 the values provided do not correspond to the annual differences in the areas reported for these years in CRF table 4.C. For instance, for 2004, the value reported in table 6.24 of the NIR (20.1 kha) should be 17.5 kha and the value reported for 2016 (7.8 kha) should be 5.2 kha. In response to a question from the ERT during the review, Turkey indicated that these differences reflect the default transition period of 20 years for land to remain in a transition condition, after which it is transferred to permanent status. The ERT noted, however, that these land transitions within a category need to be equally reflected in the CRF tables, since the estimation of changes in carbon stock for grassland remaining grassland is substantially different from those for forest land converted to grassland. The forest land converted to grassland steadily increased from 1990 to 2016, except for in 2009–2010 and 2010–2011, when the forest land converted reduced by 0.37 kha and 2.63 kha, respectively. Although the areas decreased in those years, the area of grassland remaining grassland was constant (14,617.0 kha). The ERT recommends that Turkey 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.	
L.38	4.D.2 Land converted to wetlands – CO_2	Turkey has reported emissions from conversion of cropland and grassland to wetlands (flooded lands) from 1990 to 2011 covering the living biomass, DOM and mineral soils pools. For 2012 onward, the Party did not provide any estimate for this category, including the area of wetlands remaining wetlands, reported as "NE" and "NO", thus inconsistently with the reporting in CRF table 4.1, for which an area of 1,251.63 kha is reported for 2016. Although no estimates are provided for land converted to wetlands, Turkey indicated in section 6.5 of the NIR (wetlands) that all perennial and annual cropland and grassland converted to wetlands have been reported using the gain–loss method and provided the equations for estimating the changes in carbon stock in above- and below-ground biomass, litter and mineral soils for both land uses (cropland and grassland). During the review, Turkey explained that the AD for flooded land reveal that there has been no new dam construction since 2011 and that is why the emissions have been reported as "NO" since then. The ERT recommends that the Party 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. The ERT encourages Turkey not to include in the wetlands section of the NIR information (e.g. equations) that is not used in the estimation of the data provided in CRF table 4.D.	Yes. Transparency
L.39	4.E.2 Land converted to settlements – CO_2	For land converted to settlements, Turkey provided in the NIR the equations used to estimate the changes in carbon stock for biomass, litter and soils, but did not refer to the use of the equations in the 2006 IPCC Guidelines (equations 2.15 and 2.16 in volume 4, chapter 2). Turkey provided an estimate of the increase in carbon stocks in above-ground biomass on land converted to settlements of 8.50 t C/ha and indicated that this is the first time it has reported settlements at a tier 3 level. The ERT noted that the methodology used to generate the country-specific value of carbon stock in above-ground biomass on land converted to settlements has not been provided in the NIR, and therefore could not be assessed further, and that although Turkey indicated in the NIR (p.344) that no	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		recalculation for settlements was performed, the net CO_2 values for years prior to 2016 have been changed (see ID# L.40 below). The ERT recommends that Turkey provide information in the NIR regarding the equations it 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, to ensure the transparency of the reporting.	
L.40	4.E.2.2 Cropland converted to settlements – CO_2	For cropland converted to settlements, Turkey reported gains of carbon stock in biomass (2.69 kt C in 2016). The ERT noted that the implied carbon stock change factor for 1990–2006, when the area converted remains constant and equal to 32.41 kha, is 3.40 t C/ha, and for the period 2007–2016, when the area converted remains constant at 0.28 kha, the IEF is 9.61 t C/ha. Turkey stated in response to a question from the ERT that the AD changed for 2012 onward owing to the use of CORINE data and that the area of conversion from perennial crops to settlements is larger than the area of annual crops converted. Turkey mentioned that clarification of the implied carbon stock change values will be provided in the next inventory submission. Turkey informed in the NIR that no recalculation was performed for cropland converted to settlements. However, the ERT noted that the values reported in CRF table 4.E for net CO_2 eq emissions were different in the 2017 and 2018 inventory submissions. For instance, the emissions reported in the 2018 inventory submission in CRF table 4.E for 2007–2015 are all the same (44.56 kt CO_2 eq) but they do not correspond to the values reported in CRF table 4.E in the 2017 inventory submission (e.g. for 2015, net CO_2 emissions were 64.29 kt). The ERT recommends that Turkey create the subcategories for which carbon stock change factors are available (e.g. annual and perennial crops) in the CRF tables, provide rationale and explanations in the NIR for changes performed since the previous inventory submission and ensure that if no recalculation is performed the values provided in the previous inventory submission are maintained. The ERT also recommends that Turkey apply the same data set over time (e.g. do not apply new CORINE data only for the years available), or, where this is not possible, apply the methodological approaches (splicing techniques) provided in the 2006 IPCC Guidelines (volume 1, chapter 5) to estimate the non-observed values and ensure a consistent data set.	Yes. Accuracy
L.41	4(III) Direct N_2O emissions from nitrogen mineralization/immobilization – N_2O	In CRF table 9 Turkey indicated that "NE" was reported in CRF table 4(III) for other land since it is assumed on the basis of expert judgment that other land in the country has a very low nitrogen content and the amount of mineralization is negligible. The ERT noted that information on the expert judgment on the insignificance of emissions for this category and a demonstration that they are below the threshold of significance in accordance with the UNFCCC Annex I inventory reporting guidelines have not been provided in the NIR. The ERT recommends that Turkey 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.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

Waste

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
W.4	5.A.1 Managed waste disposal sites – CH_4	The ERT reviewed the MSW composition provided in table 7.25 of the NIR and detected significant fluctuations in different periods of the time series (1990–2001, 2002–2013 and 2014–2016) for most of the MSW components. For example, food waste was assumed to compose 64.0 per cent of MSW in 1990–2001, 34.0 per cent between 2002 and 2013 and 48.7 per cent between 2014 and 2016. Garden and park waste went from 0.0 per cent to 19.0 per cent and back down to 6.8 per cent over these same three periods. The compositions assumed for the three periods are explained in the NIR, but the fluctuations observed between periods are not justified and they follow unexpected trends. During the review, Turkey explained how the statistics are produced and described the QA/QC procedures established and how they are applied when new statistics are generated. Furthermore, Turkey clarified during the review that the waste composition data used in the calculations for the three periods are all official data. However, although the information provided is all official data, it is the view of the ERT that there is no information to justify the unexpected trend in the waste composition data between the three periods. The ERT recommends that Turkey investigate the completeness and accuracy of the different data sources and, as appropriate, update the time series of MSW composition, by component, by applying a relevant splicing technique from the 2006 IPCC Guidelines to ensure a consistent time series. If data used correspond to 1993, 2006 and 2014, the ERT recommends that the Party apply a splicing technique from the 2006 IPCC Guidelines (e.g. interpolation combined with extrapolation) for the remaining years, and not use the data for 1993 for the whole period 1990–2001, data for 2006 for the whole period 2002–2013 or data for 2014 for the whole period 2014–2016.	Yes. Accuracy
W.5	5.A.1 Managed waste disposal sites – CH_4	Turkey reported in the NIR (section 7.2), and confirmed during the review, that, according to the clinical waste management practices and regulations in Turkey, clinical waste collected separately from health institutions is disposed of in solid waste disposal sites or incinerated, and almost all is sterilized prior to disposal in solid waste disposal sites. CH_4 emissions from clinical waste have not been estimated because they were determined to be insignificant; however, the ERT noted that there is no technical justification for this in the NIR in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. During the review the ERT requested Turkey to assess the level of emissions from clinical waste disposed to landfill to check that the emissions can be considered negligible. Turkey sent a file with the AD and parameters considered, and the CH_4 emission estimates. The ERT confirmed that the emissions estimated are under the significance threshold in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, so emissions can be considered negligible. However, in its assessment Turkey considered only data for 2008–2016, and applied a methodology from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* to estimate emissions. The ERT recommends that Turkey improve the transparency of the inventory by adding information in the NIR to justify that emissions from clinical waste disposed to landfill can be considered negligible in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. Additionally, the ERT encourages Turkey to improve the data and methodology used for determining the significance of CH_4 emissions from clinical waste disposed to landfill by completing the gaps in the AD for 1990–2007 using any IPCC gap-filling technique, and using the first-order decay methodology proposed in the 2006 IPCC Guidelines.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
W.6	5.B.1 Composting – CH_4 and N_2O	According to the information reported in table 7.20 and figure 7.3 of the NIR, there are large inter-annual fluctuations in the amount of waste treated by composting plants between 2001 and 2013. For example, the amount treated in 2006 (104.81 kt dry matter) presents a significant decrease (36.6 per cent) with respect to 2005 (165.35 kt dry matter) and is also lower (46.2 per cent) than in 2007 (194.75 kt dry matter). The ERT noted that there is no information in the NIR to explain this trend, and that the number of composting plants reported in table 7.19 of the NIR fluctuates throughout the inventory period (from one in 1995 to seven in 2016). However, the ERT also noted that this fluctuation does not reflect the fluctuation observed for waste treated by composting plants reported in table 7.20 (for example, table 7.19 indicates that there were four composting plants in 2005, 2006, 2008 and 2014). During the review, Turkey clarified that the reason for this range in the amount of waste composted could be each plant's different capacity. There is one dominant facility (representing 99.9 per cent of the composted waste in 2015 and 93.0 per cent of the composted waste in 2016), and the others are very small facilities established in different regions within the scope of projects. Regarding the number of composting plants, Turkey explained that table 7.19 indicates the number of facilities with installed capacity in that year, and not the number of facilities operating. The ERT recommends that Turkey provide a more detailed explanation of the AD trend, specifically focusing on describing the reasons for the fluctuations in AD observed between 2001 and 2013. The ERT also recommends that the Party change the type of data reported in table 7.19 by replacing the current information reported (number of facilities with installed capacity) with the number of facilities operating each year and separately indicating the capacity of each plant.	Yes. Transparency
W.7	5.C.2 Open burning of waste – CO_2, CH_4 and N_2O	According to table 7.25 of the NIR Turkey considers the origin of garden and park waste as non-biogenic, when it should be considered as biogenic. During the review, Turkey clarified that garden and park waste have been mistakenly considered as non-biogenic, and emissions from garden and park waste have also been considered as non-biogenic for the calculation of GHG emissions from open burning of waste. Turkey also confirmed that it will correct this misclassification and consider garden and park waste as biogenic in the next inventory submission. The ERT recommends that Turkey change the classification of garden and park MSW to biogenic in its emission calculations and in NIR table 7.25. The ERT also recommends that Turkey recalculate GHG emissions for the entire time series accordingly and describe the recalculation in the NIR.	Yes. Accuracy
W.8	5.D Wastewater treatment and discharge – CH_4	The ERT noted that in CRF table 5.D Turkey reported the AD related to sludge removal from industrial wastewater (category 5.D.2) as "NE". The ERT also noted that no information regarding sludge emissions for categories 5.A, 5.B and 5.C was available in the NIR. Further, the ERT noted that the reporting of "NE" in CRF table 5.D was not consistent with data reported under the agriculture sector for agricultural soils (table 5.15 of the NIR), where sewage sludge is estimated to be applied to soils. These aspects were identified by the ERT as potential issues related to consistency and completeness, so the ERT requested that Turkey provide a complete sludge balance. During the review, Turkey informed the ERT that the data source for the emission estimations related to sewage sludge applied to soils in the agriculture sector is TurkStat (municipal wastewater statistics survey). The results of the survey used for the agriculture sector estimates have not yet been included in the calculations for the waste sector. For the category domestic wastewater, Turkey indicated that the total organics in wastewater is calculated using a country-	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		specific biochemical oxygen demand (53 g/person/day) for wastewater collected by sewers. The source of this value is a study on derivation of factors for pollution loads discharged to receiving bodies by municipalities, which includes a country-specific biochemical oxygen demand for receiving bodies (25 g/person/day). In addition, the study reports a country-specific biochemical oxygen demand for sludge (28 g/person/day). Because different data sources have been used to estimate the total amount of sludge removed from wastewater for the purposes of calculating emissions from the agriculture and waste sectors, the ERT identified an inconsistency. Turkey informed the ERT that a certain amount of domestic sewage sludge is incinerated with energy recovery and reported under the energy sector. Some industrial sludge, tank bottom sludge and sewage sludge is incinerated and reported under categories 1.A.1.a, 1.A.2.c and 1.A.2.f. Further, Turkey indicated that a study is ongoing to determine the amount of sewage sludge disposed in solid waste disposal sites from the results of the municipal wastewater statistics survey for the whole time series. This survey is conducted every two years and so data are not available for all years. So far, the main reason for not using these statistics for the waste sector estimates is that the data on sewage sludge were edited and published for the first time last year by the data provider. This has been identified by the ERT as an issue related to completeness since emissions from sludge removal for domestic wastewater in landfills (category 5.A) have not been estimated. The ERT recommends that Turkey improve the consistency of the data reported between the waste (category 5.D) and agriculture (category 3.D) sectors with respect to the amount of sludge produced from wastewater and the amount used on agricultural soils. The ERT also recommends that Turkey improve the completeness of the GHG inventory by including the emissions from sludge landfilled. In addition, the ERT recommends that Turkey improve the transparency of the NIR by reporting a complete sludge balance, including the total amount produced (from domestic and industrial wastewater), the amount sent to each of the different treatments (landfill, incineration, agriculture, composting, etc.) and, if possible, their specific characteristics (carbon and nitrogen content).	
W.9	5.D.1 Domestic wastewater – CH_4	The ERT noted that Turkey used country-specific values for the degrees of treatment utilization by population class in table 7.30 of the NIR, which are based on data from different surveys conducted in 2012 (municipal wastewater statistics, and sectoral water and wastewater statistics). However, it also noted that the same values have been used for the whole time series. During the review, Turkey clarified that these parameters have been used for the whole time series, assuming that the technology and the fractional usage do not change over time. However, the Party noted that a study is ongoing to determine specific values for the available years (every two years after 2008) to improve the estimates in the GHG inventory. The ERT is of the view that, as the technologies used and the degrees of utilization have likely evolved over time, assuming constant treatment pathways for the entire time series results in an accuracy issue. The ERT recommends that Turkey 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). The ERT also recommends that the Party 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, the ERT recommends that the Party improve the	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		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.	
W.10	5.D.1 Domestic wastewater – N_2O	According to the information reported in the NIR (p.410) Turkey used a country-specific value for Tplant of 9.6 per cent. However, there is no information regarding the data sources or how the value has been estimated. The ERT noted that the same value has been used for the whole time series. During the review Turkey informed the ERT that the Tplant value had been estimated using available data based on the municipal wastewater statistics and the sectoral water and wastewater statistics (from 2012) and the following equation: Tplant = A/B*100, where A = total amount of wastewater treated from advanced centralized wastewater treatment plants with nitrogen removal processes, and B = total amount of wastewater discharged to receiving bodies. Turkey clarified that this parameter has been used for the whole time series, assuming that the technology and the degree of utilization do not change over time. However, a study is ongoing to determine specific values for the available years (every two years after 2008) to improve the estimates in the GHG inventory. The ERT is of the view that, as the technologies used and the degrees of utilization have likely evolved over time, assuming constant treatment pathways for the entire time series results in an accuracy issue. The ERT recommends that Turkey improve the accuracy of the Tplant parameter for the whole time series by applying the results achieved from the ongoing study, which is being carried out to determine specific values for this parameter (every two years after 2008). The ERT also recommends that the Party recalculate the AD and corresponding N_2O emissions for the whole time series accordingly. If the study is not available for the next inventory submission, the ERT recommends that the Party improve the transparency of the NIR by including the data source for this parameter, explaining how it has been estimated, and mentioning in the planned improvement section the ongoing study being carried out to improve this factor, including a brief description of the scope, progress achieved and the date that the results are expected to be available.	Yes. Accuracy
W.11	5.D.2 Industrial wastewater – CH_4	According to table 7.37 of the NIR Turkey used a country-specific value for the fractional usage parameter for different types of waste treatment and discharge pathways. However, there is no information regarding the data sources or how the fractional usages have been estimated. The ERT noted that the same values have been used for the whole time series. During the review Turkey informed the ERT that the data on fractional usage of different wastewater treatment types were obtained from the municipal wastewater statistics and the sectoral water and wastewater statistics (for 2012). Turkey clarified that these parameters have been used for the whole time series, assuming that the technology and the fractional usage do not change over time. However, the Party noted that a study is ongoing to determine specific values for the available years (every two years after 2008) to improve the inventory. The ERT recommends that Turkey 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, which is being carried out to determine specific values for these parameters (every two years after 2008). The ERT also recommends that the Party recalculate the AD and corresponding CH_4 emission for the whole time series accordingly. If the study is not available for the next inventory submission, the ERT recommends that	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		the Party 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 study, including a brief description of the scope, progress achieved and the date that the results are expected to be available.	

[a] Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines. Encouragements are made to the Party to address all findings not related to such issues.

Annex I

Overview of greenhouse gas emissions and removals for Turkey for submission year 2018, as submitted by Turkey in its 2018 inventory submission

1. Table 6 shows total GHG emissions, including and excluding LULUCF and, for Parties that have decided to report indirect CO_2 emissions, with and without indirect CO_2. Tables 7 and 8 show GHG emissions reported under the Convention by Turkey by gas and by sector, respectively.

Table 6
Total greenhouse gas emissions for Turkey, 1990–2016
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions*[a]	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*
1990	181 792.04	210 714.73	NA	NA
1995	213 287.87	242 194.62	NA	NA
2000	258 754.41	293 494.15	NA	NA
2010	356 607.05	402 563.69	NA	NA
2011	383 314.54	431 407.02	NA	NA
2012	396 328.31	445 631.48	NA	NA
2013	381 823.64	438 981.70	NA	NA
2014	393 656.59	451 808.67	NA	NA
2015	406 261.50	469 930.44	NA	NA
2016	427 989.15	496 067.36	NA	NA

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

Table 7
Greenhouse gas emissions by gas for Turkey, excluding land use, land-use change and forestry, 1990–2016
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	146 507.20	42 183.50	21 398.73	NO	625.30	NO	NO	NO
1995	178 310.25	42 372.39	20 900.54	NO	611.44	NO	NO	NO

	CO_2[a]	CH_4	N_2O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF_6	NF_3
2000	226 029.84	43 484.24	22 596.29	115.66	601.00	NO	667.13	NO
2010	319 528.40	52 461.56	25 889.96	3 054.28	461.74	NO	1 167.75	NO
2011	344 745.50	54 709.60	26 775.82	3 432.64	480.36	NO	1 263.10	NO
2012	354 134.76	57 965.47	27 592.36	4 256.83	359.06	NO	1 322.98	NO
2013	346 780.97	56 771.52	29 344.19	4 470.24	270.60	NO	1 344.17	NO
2014	357 559.96	58 130.48	29 297.59	4 927.55	255.42	NO	1 637.67	NO
2015	380 858.10	52 392.72	29 769.97	4 805.04	119.72	NO	1 984.90	NO
2016	402 820.78	54 717.60	31 960.68	4 719.62	24.58	NO	1 824.09	NO
Per cent change 1990–2016	**174.9**	**29.7**	**49.4**	**NA**	**–96.1**	**NA**	**NA**	**NA**

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

Table 8
Greenhouse gas emissions by sector for Turkey, 1990–2016
(kt CO_2 eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	134 327.90	22 893.94	42 402.30	–28 922.68	11 090.59	NO
1995	162 696.10	26 128.67	40 987.45	–28 906.75	12 382.41	NO
2000	212 330.42	26 643.60	40 032.91	–34 739.75	14 487.23	NO
2010	292 323.66	49 215.31	42 826.37	–45 956.63	18 198.35	NO
2011	313 375.15	54 413.15	45 125.81	–48 092.48	18 492.92	NO
2012	320 114.01	56 780.54	50 610.34	–49 303.17	18 126.59	NO
2013	308 771.37	59 809.23	53 627.96	–57 158.06	16 773.13	NO
2014	321 255.33	60 204.41	53 742.13	–58 152.08	16 606.80	NO
2015	339721.86	59 574.33	53 650.01	–63 668.94	16 984.25	NO
2016	360978.43	62 422.04	56 485.70	–68 078.21	16 181.19	NO
Per cent change 1990–2016	**168.7**	**172.7**	**33.2**	**135.4**	**45.9**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions. (2) Turkey 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 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 reporting in the Party's inventory are the following:

(a) SF_6 and PFC emissions from other product use (category 2.G.2) (see ID# I.1 in table 3);

(b) CO_2 emissions from captive lime production at sugar facilities (category 2.A.2 lime production) (see ID#s I.2 and I.3 in table 3);

(c) HFC and SF_6 emissions from product uses as substitutes for ozone-depleting substances (category 2.F) (see ID# I.18 in table 3);

(d) N_2O emissions from use for medical applications (category 2.G other product manufacture and use) (see ID# I.20 in table 3);

(e) CO_2 emissions from all carbon inputs (e.g. iron ore) in iron and steel production (category 2.C.1) (see ID# I.22 in table 5);

(f) HFC emissions from metered dose inhalers (category 2.F.4) (see ID# I.25 in table 3);

(g) HFC emissions under category 2.F.6 other applications for 1999 (see ID# I.28 in table 5);

(h) HFC emissions from disposal of retired equipment (category 2.F.6) (see ID# I.30 in table 5);

(i) Indirect N_2O emissions from leaching and run-off from MMS (category 3.B.5) (see ID# A.24 in table 5);

(j) CH_4 and N_2O emissions from field burning of maize (category 3.F) (see ID# A.27 in table 5);

(k) Carbon stock changes in mineral soils for grassland (category 4.C.2) (see ID# L.1(b) in table 3);

(l) Carbon stock changes for wetlands converted to grassland (biomass and mineral soils pools) (category 4.C.2) (see ID# L.1(d) in table 3);

(m) CO_2 emissions and removals from forest land converted to grassland (all pools) (category 4.C.2) (see ID# L.1(c) in table 3);

(n) CO_2 emissions and removals from natural rivers and lakes under wetlands (see ID# L.24 in table 5);

(o) CH_4 emissions from sludge in landfills (category 5.A) (see ID# W.8 in table 5).

Annex III

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change reports

IPCC. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. JL Houghton, LG Meira Filho, B Lim, et al. (eds.). Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency. Available at https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

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

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 http://www.ipcc-nggip.iges.or.jp/public/wetlands/.

Annual review reports

Reports on the individual reviews of the 2011, 2012, 2013, 2014, 2015 and 2016 inventory submissions of Turkey, contained in documents FCCC/ARR/2011/TUR, FCCC/ARR/2012/TUR, FCCC/ARR/2013/TUR, FCCC/ARR/2014/TUR, FCCC/ARR/2015/TUR and FCCC/ARR/2016/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/sites/default/files/resource/AGI%20report_2018.pdf.

Annual status report for Turkey for 2018. Available at https://unfccc.int/sites/default/files/resource/asr2018_TUR.pdf.

Coaloa D and Nervo G. 2011. Poplar wood production in Europe on account of market criticalities and agricultural, forestry and energy policy. *In*: *Proceedings on the Tercer Congreso Internacional de Salicáceas en Argentina, Patagonia, Argentina, 14-19 March 2011*.

Ozalp M, Erdogan Yuksel E and Yuksek T. 2016. Soil property changes after conversion from forest to pasture in Mount Sacinka, Artvin, Turkey: soil property changes after the conversion from forest. *Land Degradation & Development*. 27(4): pp.1007–1017. Available at http://doi.wiley.com/10.1002/ldr.2353.

Tolunay D. 2011. Total carbon stock and carbon accumulation in living tree biomass in forest ecosystems of Turkey. *Turkish Journal of Agriculture and Forestry*. 35: pp.265–279.

Tolunay D and Çömez A. 2008. Türkiye ormanlarinda toprak ve ölü örtüde depolanmiş organik karbon miktarlari [Amounts of organic carbon stored in forest floor and soil in Turkey]. *In: Proceedings of the National Symposium on Air Pollution and Air Pollution Control of Atmospheric Pollution, Hatay, Turkey, 22-25 October 2008*.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Sebahattin Sari and Ms. Fatma Betül Demirok (Turkish Statistical Institute), including additional material on the methodology and assumptions used.

The following documents[1] were also provided by Turkey:

Ministry of Treasury and Finance. 2016. Tender name: Technical Assistance for Increased Capacity for Transposition and Capacity Building on F-gases. Available at http://www.cfcu.gov.tr/tender/64574.

Turkish Statistical Institute. 2017. *National Inventory System. Quality Assurance and Quality Control Plan.* Ancara, 10 October 2017.
Available at https://biruni.tuik.gov.tr/yayin/views/visitorPages/english/index.zul
('Environment and Energy' to be chosen as search subject).

[1] Reproduced as received from the Party.