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Report of the individual review of the inventory submission of Turkey submitted in 2012*

* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the centralized review of the 2012 inventory submission of Turkey, coordinated by the UNFCCC secretariat, in accordance with decision 19/CP.8. The review took place from 24 to 29 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Yuriko Hayabuchi (Japan) and Mr. Leif Hockstad (United States of America); energy – Mr. Liu Qiang (China), Mr. Anand Sookun (Mauritius) and Ms. Kennie Tsui (New Zealand); industrial processes – Ms. Sohyang Lee (Republic of Korea), Mr. Kakhaberi Mdivani (Georgia) and Ms. Kristina Saarinen (Finland); agriculture – Ms. Britta Maria Hoem (Norway) and Mr. Pa Ousman Jarju (Gambia); land use, land-use change and forestry (LULUCF) – Ms. Cristina Garcia-Diaz (Spain), Ms. Rosa Maria Rivas Palma (New Zealand) and Mr. Harry Vreuls (Netherlands); and waste – Mr. Takefumi Oda (Japan) and Ms. Mayra Rocha (Brazil). Ms. Lee and Ms. Saarinen were the lead reviewers. The review was coordinated by Ms. Lisa Hanle and Ms. Astrid Olsson (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention", 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.

3. In 2010, the main greenhouse gas (GHG) in Turkey was carbon dioxide (CO_2), accounting for 81.2 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (14.3 per cent) and nitrous oxide (N_2O) (3.2 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 70.9 per cent of total GHG emissions, followed by the industrial processes sector (13.4 per cent), the waste sector (8.9 per cent) and the agriculture sector (6.7 per cent). Total GHG emissions amounted to 401,924.89 Gg CO_2 eq and increased by 114.9 per cent between 1990 and 2010.

4. Tables 1 and 2 show GHG emissions under the Convention, by gas and by sector, respectively. In table 1, CO_2, CH_4 and N_2O emissions do not include emissions and removals from the LULUCF sector.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding LULUCF, unless otherwise specified.

Table 1
Greenhouse gas emissions by gas, 1990 to 2010

	Gg CO_2 eq							*Change*
Greenhouse gas	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*1990–2010 (%)*
CO_2	141 362.41	173 899.96	225 432.27	259 605.48	297 123.94	299 106.06	326 472.37	131.0
CH_4	33 497.80	46 866.56	53 299.87	52 384.03	54 294.83	54 367.96	57 541.70	71.8
N_2O	11 565.62	16 224.33	16 616.95	14 182.21	11 570.85	12 531.09	13 025.73	12.6
HFCs	NA, NE	NA, NE	818.43	2 379.00	2 669.43	2 839.25	4 009.30	NA
PFCs	603.43	516.43	515.12	487.76	C, NA, NE	C, NA, NE	C, NA, NE	NA
SF_6	NA, NE	NA, NE	322.89	858.73	843.10	803.47	875.78	NA

Abbreviations: C = confidential, NA = not applicable, NE = not estimated.

Table 2
Greenhouse gas emissions by sector, 1990 to 2010

	Gg CO_2 eq							*Change*
Sector	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*1990–2010 (%)*
Energy	132 128.43	160 787.57	212 546.33	241 754.45	277 706.97	278 330.84	285 065.54	115.7
Industrial processes	15 442.26	24 206.65	24 373.81	28 780.76	29 829.90	31 686.98	53 904.79	249.1
Solvent and other product use	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE
Agriculture	29 776.81	28 679.03	27 369.59	25 839.12	25 042.97	25 695.93	27 126.84	–8.9
LULUCF	–56 453.56	–58 950.06	–62 178.98	–58 270.76	–70 350.07	–73 652.10	–78 723.86	39.4
Waste	9 681.77	23 834.04	32 715.80	33 522.87	33 922.31	33 934.08	35 827.72	270.1
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	**130 575.71**	**178 557.23**	**234 826.55**	**271 626.44**	**296 152.08**	**295 995.72**	**323 201.03**	**147.5**
Total (without LULUCF)	**187 029.26**	**237 507.29**	**297 005.53**	**329 897.20**	**366 502.15**	**369 647.82**	**401 924.89**	**114.9**

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable, NE= not estimated.

II. Technical assessment of the inventory submission

A. Overview

1. Inventory submission and other sources of information

5. The 2012 annual inventory submission was submitted on 14 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). The inventory submission was fully submitted 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 inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

6. The expert review team (ERT) also used the previous years' submissions during the review. During the review, Turkey provided the ERT with additional information, which is not part of the inventory submission. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

7. The inventory covers most source and sink categories for the period 1990–2010 and is generally complete in terms of years and geographical coverage. However, the following categories have been reported as not estimated ("NE"):

(a) CH_4, N_2O and CO_2 emissions from most oil and natural gas activities in the energy sector, except for in 2010 (see para. 52 below);

(b) CO_2 emissions and removals and N_2O emissions from a number of categories in the LULUCF sector (see paras. 95, 98, 103, 105, 106, 108 and 109 below);

(c) CH_4 and N_2O emissions from industrial wastewater (see paras. 112 and 118 below) and CO_2, CH_4 and N_2O emissions from waste incineration in the waste sector (see paras. 112 and 120 below).

8. In addition, the ERT notes that Turkey reports several categories as confidential ("C"). However, in response to questions raised by the ERT during the review, Turkey indicated that Turkish regulations prohibit the publication of data determined to be confidential (see para. 58 below) and therefore the emissions are not included in the inventory. Because these estimates are not reported, the ERT concludes that the following categories are also considered "NE": CO_2 emissions from soda ash production, CO_2 emissions from ammonia production, N_2O emissions from nitric acid production, CO_2 emissions from calcium carbide production, CO_2 and CH_4 emissions from other (chemical industry), and actual emissions of HFCs, PFCs and/or SF_6 from a number of categories in the industrial processes sector (e.g. refrigeration and air conditioning (PFCs), aerosols/metered dose inhalers, solvents and semiconductors) (see paras. 70, 73, 74, 76–78 and 80–82 below);

9. Turkey reports process-related CO_2 emissions from ferroalloys production as included elsewhere ("IE"), but there is no indication in CRF table 9(a) or in the NIR regarding in which category the process-related emissions are reported (see para. 79 below).

10. Turkey provides some information on the categories that are not estimated in the inventory submission, and the reasons for their exclusion, in annex 5 of the NIR. Recommendations in previous review reports included that Turkey improve the

completeness of the inventory and the ERT reiterates the recommendation that Turkey provide estimates for these categories in its next inventory submission.

11. In response to recommendations in the previous review reports, Turkey included all the required CRF tables in the inventory submission, which the ERT notes with appreciation. In addition, the ERT commends Turkey for the improvements in the completeness of the LULUCF sector in the 2012 inventory submission, including the reporting of the cropland and grassland categories that were not reported in the previous inventory submission.

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

12. The ERT concluded that the institutional arrangements continued to perform their required functions.

Inventory planning

13. The NIR describes the institutional arrangements for the preparation of the inventory. TurkStat has overall responsibility for the national inventory. Other organizations are also involved in the preparation of the inventory. Emissions from the energy sector are calculated by TurkStat using data from the Ministry of Energy and Natural Resources (MENR). Emissions from electricity generation are calculated by MENR, and the emissions from transportation are calculated by the Ministry of Transport, Maritime Affairs and Communications (MTMAC). Emissions and removals from the LULUCF sector were provided by the Ministry of Food, Agriculture and Livestock and the Ministry of Forest and Water Affairs. Emissions of HFCs, PFCs and SF_6 are estimated by the Ministry of Environment and Urbanization (MEU). TurkStat compiles and submits the inventory.

14. Turkey continues to use mainly lower-tier methods for calculating emissions from key categories in the inventory. The ERT notes with appreciation that Turkey has implemented higher-tier methods for some key categories, such as CO_2 emissions from aviation and road transportation. However, the ERT reiterates the recommendation in the previous review reports that Turkey continue its efforts to use higher-tier methods to estimate emissions from key categories, in line with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance).

15. Turkey does not present an inventory improvement plan in the NIR. The ERT reiterates the recommendations in the previous review reports that, in its next inventory submission, Turkey apply the results of the key category assessment and uncertainty analysis to prepare an improvement plan and include information on actions to address specific recommendations made in review reports and a schedule for the improvements to be made.

16. Although Turkey describes in the NIR the procedure for inventory development, including the responsibility of TurkStat for inventory compilation, it is not clearly discussed in the NIR whether TurkStat or another organization formally approves the inventory prior to submission. The ERT recommends that Turkey provide information on the process for final approval of the inventory submission in its next inventory submission.

Inventory preparation

Key categories

17. Turkey has reported a key category tier 1 analysis, level assessment, as part of its 2012 inventory submission. The key category analysis performed by Turkey and that performed by the secretariat[2] produced different results owing to Turkey including the entire LULUCF sector as a category in its key category analysis. Turkey did not include a trend key category assessment and therefore Turkey's key category analysis was not performed in accordance with the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). This issue had also been raised in recommendations in previous review reports. The ERT reiterates the recommendations in the previous review reports that Turkey improve its key category analyses by including a trend assessment, in line with the IPCC good practice guidance, and include land-use categories separately in the key category analysis, in line with the IPCC good practice guidance for LULUCF.

18. The ERT used the secretariat's key category analysis to determine the key categories and to structure the remainder of this report.

19. Turkey does not explain in the NIR whether the Party uses the results of the key category analysis to prioritize the development and improvement of the inventory. The ERT reiterates the recommendation in the previous review report that, in its next inventory submission, Turkey consider the key category analysis in its methodological choices and prioritization of inventory improvements.

Uncertainties

20. Turkey reported a tier 1 uncertainty analysis, estimating a total uncertainty of 10.3 per cent (including LULUCF) for 2010 emissions. The NIR indicates that the uncertainty analysis is mainly based on expert judgement, although no further references are provided. In response to questions raised by the ERT during the review, Turkey stated that: the uncertainties in the energy sector are estimated by experts from MENR and MTMAC; the uncertainties in the industrial processes sector are estimated from the statistical difference between supply and demand by TurkStat (except for fluorinated gases, which are estimated by experts from MEU); and the uncertainties of agricultural activities are estimated by TurkStat. The ERT recommends that Turkey provide this information in the NIR of its next inventory submission.

21. In addition, the ERT reiterates the recommendation in the previous review report that Turkey document the rationale for uncertainties for all categories, use the results of the uncertainty analysis in an inventory improvement plan and update uncertainty estimates for categories that are recalculated in its next inventory submission.

22. Furthermore, the ERT reiterates the recommendation in the previous review report that Turkey improve the transparency of the uncertainty analysis by providing information on uncertainties at the category level in the NIR of its next inventory submission. The ERT

[2] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

also recommends that, instead of reporting uncertainties from LULUCF categories as an entire sector, Turkey provide uncertainties by the individual land-use categories in its next inventory submission.

Recalculations and time-series consistency

23. The ERT noted that recalculations reported by the Party of the time series 1990 to 2009 have been undertaken to take into account new activity data (AD) for the LULUCF sector. These recalculations are to correct errors for forest fires and to account for new spatial information for cropland remaining cropland (see paras. 93 and 94 below). The major changes, and the magnitude of the impact, include the following: a decrease in estimated total GHG emissions, including LULUCF, in 1990 of 8.2 per cent and an increase in 2009 of 3.1 per cent of emissions. The rationale for these recalculations is provided in the NIR, but not provided in CRF table 8(b).

24. The ERT reiterates the recommendations in the previous review reports that Turkey further improve the explanations provided for the recalculations undertaken in CRF table 8(b) as well as in a separate chapter of the NIR in its next inventory submission.

Verification and quality assurance/quality control approaches

25. The NIR includes limited information on general quality assurance/quality control (QA/QC) procedures implemented by Turkey. The NIR states that the Party's QA/QC plan is in preparation. In response to a question raised by the ERT during the review, Turkey replied that the official decision for the application of the QA/QC plan will be decided by the Turkish Climate Change Coordination Committee in November 2012, and that this decision will make the plan official and it will then be applied to the inventory. The ERT welcomes this future adoption of the official QA/QC plan, and the impact it will have on the next inventory submission.

26. Despite these planned improvements, the ERT reiterates the recommendation in the previous review reports that Turkey improve QA/QC at all stages of inventory preparation and enhance the documentation of QA/QC procedures implemented. The ERT further reiterates the recommendation made in the previous review reports that sector-specific QA/QC goals be set, which will help to improve the quality of reported data at the sectoral level.

Transparency

27. The information presented in the NIR requires additional effort by the Party to increase transparency. The reporting is mainly at the aggregated level and does not include specific information on the rationale of the choice of methods, description of the methods, assumptions and AD. Furthermore, the NIR does not include references to the external sources used for inventory preparation, information on uncertainties, QA/QC procedures and planned improvements.

28. The following categories are reported as "IE":

(a) CO_2, CH_4 and N_2O emissions in the energy sector from fuel combustion activities in the manufacture of solid fuels and other energy industries, some subcategories in manufacturing industries and construction, and other sectors (commercial/institutional);

(b) CO_2 emissions in the industrial processes sector from limestone and dolomite use and in ferroalloys production (see paras. 65 and 79 below);

(c) CH_4 emissions in the industrial processes sector from the other (chemical industry) category (see paras. 77 and 78 below);

(d) CH_4 emissions from unmanaged waste disposal sites (shallow).

29. The ERT reiterates the recommendation in the previous review reports that Turkey further improve the transparency of its national inventory submission by including detailed methodological information and further explanation of the emission factors (EFs), AD and emission trends for all sectors and key categories, and include all references to the external sources used for inventory preparation. The ERT also recommends that Turkey improve the transparency of the inventory by clearly indicating where categories that are indicated as "IE" are reported, and recommends that the Party report these emissions in their appropriate categories in its next inventory submission.

Inventory management

30. Turkey does not yet have a centralized archiving system, but plans are being developed. The NIR states that TurkStat has been working on the establishment of the Emission Inventory Portal, which will comprise three components: a database, a web-based data collection and a documentation and archiving system. In response to questions raised by the ERT during the review, Turkey replied that the first component of the Emission Inventory Portal is almost complete and, except for LULUCF, includes AD, EFs and calculation sheets. As Turkey prepares to finalize the Emission Inventory Portal, the ERT reiterates the conclusions in the previous review reports and encourages Turkey to complete the development of the third component, the documentation and archiving system, so that the portal includes disaggregated EFs and AD and documentation on such EFs and AD. The ERT further encourages Turkey to finalize the Emission Inventory Portal to include internal documentation on QA/QC procedures, external and internal reviews, documentation on key category analyses, uncertainty analyses and planned inventory improvements. The ERT recommends that Turkey provide an update on the status of development and implementation of all three components in its next inventory submission.

3. Follow-up to previous reviews

31. Following recommendations in the previous review reports, Turkey has implemented some improvements, such as: the estimation of process emissions from iron and steel production separately for the first time in the 2012 inventory submission for 2010 (see para. 66 below); increasing the completeness in the categories reported and transparency in the methodologies and trends in the agriculture sector (see paras. 85–87 below); and increasing the completeness of the LULUCF sector by the reporting of the cropland and grassland categories (see paras. 95 and 104 below).

32. Multiple cross-cutting issues have not yet been addressed by Turkey, including:

(a) The calculation and reporting of emissions currently reported as "NE" and for which methods exist in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and/or the IPCC good practice guidance (see paras. 52, 55, 82, 95, 98, 103, 105, 106, 108, 109 and 112 below) ;

(b) The use of higher-tier methods to estimate emissions from the key categories (see para. 14 above and paras. 45, 59, 67, 68, 89, 114 and 115 below);

(c) The improvement of transparency by structuring the NIR so that it follows more closely the UNFCCC reporting guidelines, specifically by providing: more precise descriptions of the methods, AD, EFs and parameters used; more detailed information on the choice of all methodologies, AD, EFs, parameters and assumptions and on the national circumstances; references to external sources used for inventory preparation; more detailed information on the national energy balance; and further explanation of the EFs, AD and

emission trends for all sectors and key categories, especially in the case of significant fluctuations;

(d) The assessment of time-series consistency, carrying out recalculations where necessary and providing the corresponding rationale in the NIR (see paras. 23 and 24 above);

(e) The creation of a QA/QC plan (see paras. 25 and 26 above);

(f) The development of an inventory improvement plan (see para. 15 above);

(g) The documentation of the rationale for the uncertainty estimates where expert judgement is used (see para. 20 above).

4. Areas for further improvement identified by the expert review team

33. During the review, the ERT identified a number of areas for improvement. These are listed in table 3 below.

34. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 3 below.

35. In response to questions raised by the ERT during the review, Turkey indicated that many issues would be resolved for the 2013 inventory submission. The ERT notes that the improvements Turkey mentioned in response to questions raised by the ERT during the review would result in a greatly improved inventory submission, and the ERT encourages Turkey to implement the planned improvements to achieve this goal in its next inventory submission.

B. Energy

1. Sector overview

36. The energy sector is the main sector in the GHG inventory of Turkey. In 2010, emissions from the energy sector amounted to 285,065.54 Gg CO_2 eq, or 70.9 per cent of total GHG emissions. Since 1990, emissions have increased by 115.7 per cent. The key driver for the rise in emissions is an increase in energy consumption occurring in energy industries, manufacturing industries and construction, transport and other sectors. Within the sector, 39.6 per cent of the emissions were from energy industries, followed by 23.6 per cent from other sectors, 20.0 per cent from manufacturing industries and construction and 15.8 per cent from transport. The remaining 0.9 per cent were from fugitive emissions from solid fuels.

37. For some subcategories in the energy sector (e.g. civil aviation) there is a designated section about recalculations, while for some other categories (e.g. iron and steel production) there is none. The ERT encourages Turkey to include a separate section at the subcategory level for recalculations in the NIR of its next inventory submission. The ERT also encourages Turkey to include a section on planned improvements for each of the categories in the energy sector of the NIR and to make efforts to improve the structure of the reporting in order to facilitate transparency in its next inventory submission.

38. The previous review report recommended that Turkey improve transparency by correctly allocating the emissions from military use of fuels under other (fuel combustion) or by ensuring the proper use of the notation keys (e.g. using the notation key “IE” for the category other (fuel combustion) with relevant explanations in CRF table 9(a). In response to questions raised by the ERT during the review, Turkey replied that military use of fuels could not be separated from the energy balance tables and that there is no underestimation

when this category is included in transport as opposed to other (fuel combustion). The ERT reiterates the recommendation in the previous review reports that Turkey make efforts to disaggregate the data when compiling the energy balance in order to improve the transparency of its reporting in its next inventory submission. If disaggregation is not possible, the ERT recommends that Turkey use the notation key "IE" for the category other (fuel combustion) and provide information in CRF table 9(a) to indicate in which category these emissions and fuels have been aggregated.

39. Consistent with recommendations in the previous review report, the ERT observed that notation keys are not always properly used or adequately explained. For example, the ERT notes that "IE" is reported for the following subcategories: manufacturing of solid fuels and other energy industries; pulp and paper industries; food processing, beverages and tobacco; and commercial/institutional. Although the NIR indicates where these emissions are reported, this is not documented in CRF table 9(a). The ERT recommends that Turkey use appropriate notation keys, along with the proper documentation in CRF table 9(a) in its next inventory submission.

2. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

40. CO_2 emissions were calculated using the reference approach and the sectoral approach. In 2010, CO_2 emissions estimated using the reference approach were 4.8 per cent higher than the sectoral approach. In the NIR and the CRF tables, Turkey states that the differences can be attributed to the fact that the reference approach uses the average calorific values and carbon content of crude oil, lignite and hard coal, whereas the sectoral approach uses the individual calorific values and carbon content in each category, or plant-specific net calorific values.

41. For the year 2010, there is a difference in apparent consumption of approximately 2.5 per cent between the reference approach and the International Energy Agency (IEA) data. Apparent consumption reported to the secretariat is within about 5.0 per cent of that reported to the IEA for the period 1990 to 2004 except for 1991 (+10 per cent). The differences increase to up to 10.0 per cent for the last five years. The 1990–2010 growth rate of the total apparent consumption is 125.0 per cent (CRF tables) compared with 117.0 per cent (IEA). In the NIR, Turkey indicates that the data reported to the secretariat are the latest available data with some revisions, as compared with data submitted earlier to the IEA, and hence are more accurate. The ERT reiterates the recommendations in the previous review reports that Turkey investigate other possible factors for these differences, such as statistical differences in the energy balance, missing information or double counting in the reference or sectoral approaches, cross-check net calorific values with default values, correct any identified errors and report on its findings in its next inventory submission.

International bunker fuels

42. Turkey reported emissions from international bunkers starting with its 2010 inventory submission and including emissions from 2008 onwards (although the NIR indicates that data are available from 2007 onwards). In response to questions raised by the ERT during the review, Turkey indicated that it will include a complete time series in its next inventory submission. The ERT reiterates the recommendation in the previous review report that Turkey provide an entire time series for this category, along with information relating to the methods and assumptions used in its next inventory submission.

43. Emissions from international bunkers are reported in CRF table 1.C for gas/diesel oil, jet kerosene and residual oil, but are not included in the reference approach. The ERT reiterates recommendations in the previous review report that Turkey report consistently

international bunker fuel use in CRF table 1.A(b) and table 1.C in its next inventory submission.

Feedstocks and non-energy use of fuels

44. In the 2012 inventory submission, Turkey has reported only the feedstocks and non-energy use of gas/diesel oil in CRF table 1.A(d). Use of all other fuels is reported as "NA" (not applicable). Recommendations in the previous review reports included that Turkey explore the possibility of collecting more disaggregated data on the amount of feedstocks and non-energy use of fuels. In response to questions raised by the ERT during the review on progress in implementation of this recommendation, Turkey stated that it does not know the quantity of fuels used for non-energy purposes or as feedstock either in the energy or the industrial processes sector and it therefore assumes that all fuels are combusted. The ERT recommends that Turkey continue to identify opportunities to collect more AD on feedstocks and non-energy use of fuels. If such disaggregation continues to be impractical, the ERT recommends that Turkey revise its use of notation keys (e.g. "IE" in CRF table 1.A(d) for fuel types that are known to be used as a feedstock, but for which it is not possible to disaggregate the respective AD), and that it make use of the additional information fields in CRF table 1.A(d) to improve the transparency of its reporting. The ERT also recommends that the Party clearly explain in the NIR the allocation of fuels used as feedstocks and for non-energy purposes between the energy and industrial processes sectors, if any, as appropriate, in its next inventory submission.

3. Key categories

Stationary combustion: solid, liquid and gaseous fuels – CO_2

45. Turkey states that emissions from the energy sector, except for transport and public electricity and heat production, were estimated by an IPCC tier 1 approach. For the other categories, a tier 2 methodology was used. The ERT reiterates recommendations in the previous review reports that Turkey enhance efforts to use tier 2 methods for all key categories in its next inventory submission.

46. The ERT welcomes the Party's efforts to provide the EFs in the NIR in response to the recommendations in the previous review reports. However, the application of the tier 2 methodology as per the IPCC good practice guidance with use of country-specific values is still not clearly explained in the NIR. Data sources are often cited as being from the energy balance and sometimes from individual plants. The EFs are not clearly elaborated to be comparable with the default ones. The ERT reiterates the recommendation in the previous review report that Turkey include further information on the data sources and methodologies used for calculating the EFs at the plant level and compare these to the IPCC default EFs in its next inventory submission.

47. The ERT noted significant fluctuations in the implied emission factor (IEF) values for gas, liquid and solid fuels in fuel combustion for energy industries. For example, for liquid fuels used in public electricity and heat production, the CO_2 IEF between 1990 (66.29 t/TJ) and 2010 (73.40 t/TJ) is among the lowest of all reporting Parties (ranging from 23.39 t/TJ to 254.39 t/TJ), except in 2005, 2009 and 2010. The 2010 value was 10.7 per cent higher than the 1990 value. In response to questions raised by the ERT during the review, Turkey indicated that stock change differences from year to year may lead to these observed fluctuations. Moreover, for solid fuels used in public electricity and heat production there are large inter-annual changes in the CO_2 IEF between 1990 (76.52 t/TJ) and 2010 (98.72 t/TJ); and between 1990 and 2004 the CO_2 IEF is the lowest of all reporting Parties (ranging from 76.52 t/TJ to 144.44 t/TJ) and generally below the IPCC default range of 94.6–106.7 t/TJ. The 2010 value is 29.0 per cent higher than the 1990

value. In response to questions raised by the ERT during the review, Turkey indicated that the shift from hard coal to gas and liquid fuels may have led to these fluctuations. In addition, Turkey explained that the calorific values and the carbon content of the indigenous solid fuels (which include hard coal, lignite, asphaltite and coke) are comparably low and variable. This situation creates significant differences between years. In order to improve transparency the ERT recommends that Turkey include documentation about the fuel quality in its next inventory submission.

48. Recommendations in the previous review reports for the past several years[3] have identified large inter-annual changes in subcategories of manufacturing industries and construction (e.g. iron and steel, non-ferrous metals and chemicals) and have recommended that Turkey review the AD, EFs and calculations performed, and, if appropriate, recalculate emission estimates to correct time-series inconsistencies. Turkey did not carry out any recalculations in the energy sector in the 2012 inventory submission and no additional information has been provided in the NIR to explain the trends.

49. The current ERT also noted significant fluctuations in the emission trend values from combustion of gas, liquid and solid fuels. For example, the trend in total CO_2 emissions from fuel combustion between 1990 (126,701.07 Gg CO_2 eq) and 2010 (277,315.57 Gg CO_2 eq) increased by 118.9 per cent. For iron and steel (gas, liquid and solid fuels), a large inter-annual change in total CO_2 emissions was observed between 2009 (12,663.30 Gg CO_2 eq) and 2010 (6,860.89 Gg CO_2 eq). The 2010 value was 45.8 per cent lower than the 2009 value. In response to questions raised by the ERT during the review, Turkey indicated that technology used, yield and burning processes may have caused the decrease in emissions observed in 2010. For non-ferrous metals (solid, liquid and gaseous fuels), total CO_2 emissions in 2010 (1,413.81 Gg CO_2 eq) were 23.5 per cent greater than in 2009 (1,144.63 Gg CO_2 eq). In addition, for non-ferrous metals, there are large inter-annual changes in emissions in several years of the time series, including most recently: 2005/2006 (15.1 per cent), 2006/2007 (265.0 per cent), 2007/2008 (–97.3 per cent) and 2008/2009 (331.6 per cent). In response to questions raised by the ERT during the review, Turkey responded that in the energy sector the type of fuel consumed has changed over the years and the shift from hard coal to gas and liquid fuels may have led to those fluctuations. The ERT recommends that Turkey further investigate the reasons for these changes and provide clear explanations for these and any future fluctuations in its next inventory submission.

Road transportation: solid, liquid and gaseous fuels – CO_2

50. Turkey states in the NIR that the model for road transportation is based on COPERT with certain modifications according to country specifications. Recommendations in the previous review report included that Turkey provide the model version and elaborate the modifications made to the model. Further, recommendations in the previous review report requested that Turkey improve the documentation of the methods applied and provide all EFs, assumptions and AD used in developing the country-specific model and calculating emissions. As no additional information was provided in the 2012 inventory submission the ERT reiterates the recommendations in the previous review reports that, in order to improve transparency, Turkey provide the description of the role of data providers, particularly for liquid fuels, including biodiesel, for the transport categories in its next inventory submission.

[3] FCCC/ARR/2009/TUR, paragraphs 45–47, FCCC/ARR/2010/TUR, paragraphs 32, and FCCC/ARR/2011/TUR, paragraph 35.

4. Non-key categories

Stationary combustion: biomass – CH_4 and N_2O

51. Biomass consumption was reported in the CRF tables of the 2011 inventory submission under the road transportation and other sectors (residential). In the 2012 inventory submission, biomass is also included in energy industries and the category other (stationary), where the biomass combusted is the CH_4 captured from solid waste disposal sites. In response to questions raised by the ERT during the review regarding the types of biomass combusted in the energy sector, Turkey stated that in CRF table 1.A(a), the biomass included in other sectors (residential) is from wood and, to a lesser extent, animal waste. The ERT strongly recommends that Turkey improve the transparency of its reporting by providing information in the NIR on the types of biomass used in the energy sector in its next inventory submission.

Oil and natural gas – CO_2, CH_4 and N_2O

52. Fugitive emissions from oil and natural gas are reported as "NE" for the entire time series, except for the year 2010 in the CRF tables, with an explanation that the methodology for emission estimation is not clear. Previous review reports recommended that Turkey improve the completeness of the inventory by including the fugitive emission estimates using the default EFs provided by the IPCC good practice guidance. In response to questions raised by the ERT during the review, Turkey replied that emissions from the activities were calculated for the first time for the year 2010 and work is under way to complete the time series. The ERT therefore recommends that Turkey complete the time series for the category oil and natural gas and include proper documentation in the NIR, including information on data sources for the AD and EFs, in its next inventory submission.

C. Industrial processes and solvent and other product use

1. Sector overview

53. In 2010, emissions from the industrial processes sector amounted to 53,904.79 Gg CO_2 eq, or 13.4 per cent of total GHG emissions. Since 1990, emissions have increased by 249.1 per cent in the industrial processes sector. The key driver for the rise in emissions in the industrial processes sector was cement production. Within the industrial processes sector, 58.9 per cent of the emissions were from mineral products, followed by 32.1 per cent from metal production and 9.1 per cent from consumption of halocarbons and SF_6. Turkey does not report emissions from the chemical industry, stating they are "C". Turkey reports other production and production of halocarbons and SF_6 as "NA". Turkey reports the CO_2 and N_2O emissions from the solvent and other product use sector as "NA" or "NE".

54. The Party has made no recalculations for the industrial processes sector between the 2011 and 2012 inventory submissions.

55. Reporting for the industrial processes sector in the inventory is not complete due to emission estimates from many categories not being reported. Turkey uses the notation key "NE" for all gases and subcategories under consumption of halocarbons and SF_6, except for HFCs from refrigeration and SF_6 from electrical equipment.

56. In addition, Turkey reports the notation key "C" for several categories (see paras. 70, 73, 74, 76–78 and 80–82 below). In response to questions raised by the ERT during the review, the ERT concluded that Turkey does not allocate the emissions reported as "C" under any other category in the inventory. The notation key "C" is used for all of the following categories:

(a) CO_2 emissions from soda ash production and use;

(b) CO_2 emissions from ammonia production;

(c) N_2O emissions from nitric acid production;

(d) CO_2 emissions from calcium carbide production;

(e) CH_4 emissions from other chemical processes such as carbon black, ethylene, dichloroethylene, styrene and methanol production;

(f) CO_2 and PFC emissions from aluminium production;

(g) SF_6 used in aluminium and magnesium foundries (according to the NIR these emissions are confidential, but according to CRF table 2(II).C, SF_6 emissions from aluminium foundries are reported as "NE" while emissions from magnesium foundries are reported as "NA").

57. The ERT also finds that it is not transparent from the NIR or the CRF tables that process-related CO_2 emissions from ferroalloys are included in the inventory (see para. 79 below).

58. The reason given in the NIR for use of the notation key "C" is that although AD are available, these data and the emissions cannot be published due to concerns regarding confidentiality. In response to questions raised by the ERT during the review, Turkey indicated that if the production data for a category are confidential according to Turkish Statistical Law No. 5429 and it is not possible to report the emissions at a higher, more aggregated level, emissions are noted as confidential and not included in the national total. The ERT notes, however, that the previous review report identified the possibility of improving completeness in the light of additional item 25/11/2008-5813/2 in Turkish Statistical Law No. 5429, which stipulates that confidential data can be published only when combined with other data so as not to allow any direct or indirect identification. Considering this potential flexibility, the ERT strongly recommends that Turkey consider whether the regulation would allow aggregation of these categories at a higher level. The ERT notes that given the number of categories currently reported as "C", if all of these emissions were allocated at a higher level (perhaps even at the sector or national level, if necessary) then this could result in a sufficient number of affected plants/facilities to sufficiently address confidentiality concerns. If this is possible, the ERT recommends that Turkey establish data collection methods for those categories currently missing from the inventory, estimate emissions from these categories and report them in the next inventory submission. If this is not possible, the ERT strongly recommends that Turkey correct the notation key for these categories to "NE" in its next inventory submission.

59. Annex 7 of the NIR explains that the uncertainties of emissions from the industrial processes sector are calculated using the statistical differences between supply and demand and a tier 1 uncertainty analysis. Given that there are so few plants in some industrial processes categories, the ERT encourages Turkey to explore the possibility of further improving the uncertainty analysis for the industrial processes sector and move to a higher-tier uncertainty assessment, by using, where possible, uncertainties of plant-level data.

2. Key categories

Cement production – CO_2

60. Cement production contributed 53.7 per cent of emissions from those industrial processes emissions that are included in the current reporting and is thus the main key category for the industrial processes sector.

61. Emissions from cement production are calculated from aggregated country-specific clinker production data from the Turkish Cement Manufacturers' Association and IPCC tier 2 default values, which, according to the NIR, correspond well with country-specific data for calcium oxide content in clinker (weight fraction of 65.0 per cent) and a correction factor of 1.02 for cement kiln dust. The ERT reiterates the recommendation in the previous review report that Turkey provide a more detailed description of the verification of these EFs with country-specific data in its next inventory submission.

62. Turkey applies the same EF (0.52 t/t) for all years in the time series. The ERT recommends that Turkey evaluate the possibility of developing a country-specific EF to better reflect technological development in this category and thus better reflect the actual emissions between 1990 and 2010. The ERT also recommends that Turkey evaluate the possibility of using plant-specific data in the estimation of emissions, as confidentiality will not hinder this approach due to the large number of plants in the category.

63. In the NIR, Turkey provides information that waste (e.g. waste plastics, used tyres, waste oils, industrial sludge, tank bottom sludge and biomass) is incinerated in cement kilns. According to the NIR, these emissions are accounted for in the energy sector. However, in reviewing the CRF tables, the ERT concluded that it is not transparent that these emissions from waste incineration are taken into account in the energy, waste or industrial processes sectors. Although cement production is included in the category manufacturing industries and construction (other), biomass and other fuels are reported as "NO" (not occurring). The ERT strongly recommends that Turkey transparently document where emissions from incineration of waste fuels in cement kilns are reported, and if they are not reported, use the appropriate notation key (e.g. "NE") in its next inventory submission.

Lime production – CO_2

64. Turkey calculates emissions from lime production data obtained from the Turkish Lime Association using a tier 1 method and the IPCC default value of 0.75 t CO_2/t lime produced. The ERT reiterates the recommendation in the previous review report that Turkey correct the units of the EF from kg CO_2/t lime produced to t CO_2/t lime produced in annex 2 of the NIR in its next inventory submission.

65. Due to confidentiality concerns associated with calculating emissions from limestone and dolomite use, Turkey reports the emissions from limestone and dolomite use under lime production. As described in the previous review report, the addition of emissions from limestone and dolomite use to lime production after 2001 has led to large fluctuations in the IEF over the time series. Turkey has not implemented the recommendation in the previous review report to explain this fluctuation in the NIR. The ERT reiterates the recommendation in the previous review report that Turkey elaborate on the reason for the fluctuation of the IEFs and include an explanation of how time-series consistency is ensured in the NIR of its next inventory submission.

Iron and steel production – CO_2

66. Turkey has estimated process emissions from iron and steel production separately for the first time in the 2012 inventory submission, but for 2010 only. The ERT commends Turkey for this improvement and recommends that Turkey recalculate the time series for iron and steel process emissions for the years 1990–2009 in its next inventory submission.

Consumption of halocarbons and SF_6 – HFCs and SF_6

67. Turkey estimates HFC and SF_6 emissions using a tier 1 approach based on import statistics and the IPCC good practice guidance. HFC-134a emissions from refrigeration and air-conditioning equipment is a key category, and therefore the ERT recommends that

Turkey use a higher-tier method for estimating these emissions in its next inventory submission.

68. If Turkey does not have the data to implement a higher-tier method, the ERT reiterates the recommendation in the previous review report that Turkey improve the transparency of its reporting in its next inventory submission by including information on the AD (whether they include only the import of raw gas or gas in products) and by providing more information about the methods used to calculate emissions for this category, for example by explaining whether the bottom-up or top-down approach was used.

69. In response to questions raised by the ERT during the review, Turkey indicated that there are two proposals for European Union projects that would assist in completing the category consumption of halocarbons and SF_6. The ERT welcomes this development and encourages Turkey to provide information on the status of these projects in its next inventory submission.

3. Non-key categories

Soda ash production and use – CO_2

70. Turkey reports emissions from this category as "C" and does not include them in any other category. Reiterating the recommendations in the previous review reports, the ERT recommends that Turkey estimate the emissions and report them aggregated under another category (e.g. other) in its next inventory submission. The ERT also recommends that Turkey study the possibility of reporting these emissions separately. At a minimum, if no other changes can be made, the ERT strongly recommends that Turkey correct the notation key from "C" to "NE" in its next inventory submission.

Other (mineral products) – CO_2

71. The ERT notes that Turkey reports nitrogen oxides (NO_x) emissions from glass production, but reports AD and CO_2 emissions as "NA". The ERT recognizes that reporting of CO_2 emissions from glass production is not required under the Revised 1996 IPCC Guidelines or the IPCC good practice guidance; however, given that NO_x emissions are reported, the ERT encourages Turkey to consider replacing the current notation key "NA" for CO_2 emissions with "NE" in its next inventory submission.

Ammonia production – CO_2

72. Turkey reports CO_2 emissions from ammonia production for the years 1990–2006. Emissions are reported as "C" in 2007, 2008 and 2010 and "NO" in 2009. The ERT noted that in response to recommendations in previous review reports, Turkey changed the notation key for this category from "NA" in 2009 to "NO", reflecting the fact that, in that year, Turkey relied on imports of ammonia to meet domestic needs and no production occurred in the country. The ERT welcomes this improvement.

73. Where the notation key "C" is used, the ERT recommends that Turkey justify the use of the notation key "C" in the NIR, as well as provide documentation on where these emissions are aggregated, in its next inventory submission. If emissions are not estimated, the ERT strongly recommends that the Party use the notation key "NE" in its next inventory submission.

Nitric acid production – N_2O

74. Turkey reports these emissions as "C" since 2006 and does not aggregate them under any other category. The ERT reiterates the recommendations from previous review reports that Turkey report the confidential emissions aggregated under other (chemical industry) in its next inventory submission.

Adipic acid production – N_2O

75. Previous NIRs submitted by Turkey have indicated that emissions from this category are small and adipic acid production is not a key category.[4] In the CRF tables for those submissions, AD were reported as "IE" and N_2O emissions were reported as "NA". In the 2012 inventory submission, it is reported that there is no adipic acid plant in Turkey and the Party reports "NO" in the CRF tables for the full time series. The ERT recommends that Turkey provide clear information in the NIR of its next inventory submission on whether or not adipic acid production has occurred in Turkey during the period 1990–2011.

Carbide production – CO_2

76. From the NIR it is not clear whether emissions from carbide production are estimated or included in the inventory. The ERT recommends that Turkey transparently describe whether this category exists in Turkey, and, if so, describe the data sources and methods for estimating emissions in its next inventory submission.

Other (chemical industry) – CO_2 and CH_4

77. According to the NIR, emissions from the following processes are reported under other (chemical industry): carbon black, ethylene, dichloroethylene, styrene and methanol production. According to the NIR, emissions from these processes are estimated using industrial production data from TurkStat and tier 1 methodologies. However, CRF table 2(I) reports only the notation keys "C", "NA" and "IE".

78. Further, according to CRF table 2(I), emissions from chemical industry processes (other non-specified) are reported as "C". However, the NIR does not specify which chemical processes might be included under this subcategory, how emissions are estimated or where the emissions are aggregated. A cell comment indicates that all emissions are reported under the subcategory other non-specified. The ERT recommends that Turkey report emissions from other chemical processes in its next inventory submission, studying the possibility of reporting emissions separately under the relevant chemical industry subcategory. In addition, the ERT recommends that Turkey transparently describe the calculations and reporting in the NIR of its next inventory submission.

Ferroalloys production – CO_2

79. Turkey reports process-related CO_2 emissions from ferroalloys production in CRF table 2(I) as "IE" but there is no indication in CRF table 9(a) or in the NIR regarding in which category the process-related emissions are reported. Instead, the NIR only states that "the emissions from fuel consumption are reported under CRF category 1.A.2." In response to questions raised by the ERT during the review, Turkey indicated that emissions have been reported under the energy sector in order to avoid double counting. The ERT recommends that Turkey transparently document in the NIR of its next inventory submission where both combustion and process-related emissions are reported.

Aluminium production – CO_2 and PFCs

80. The NIR states that CO_2 emissions from this category are considered small. Turkey uses the notation key "C" in CRF tables 2(I).A-G and 2(II) for both CO_2 and PFC emissions. However, there is no information regarding whether the emissions are

[4] For example, see "Turkey Greenhouse Gas Inventory, 1990-2009", page 47, available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php> and the "Turkey Greenhouse Gas Inventory, 1990-2008", page 41, available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5270.php>.

aggregated elsewhere, and if so where, nor is there information in the NIR on the methods used to calculate emissions.

81. The ERT strongly recommends that Turkey estimate these emissions and report them, aggregated if necessary, or separately, if possible. At a minimum, if no other changes can be made, the ERT strongly recommends that Turkey correct the notation key from "C" to "NE" in its next inventory submission.

SF_6 used in aluminium and magnesium foundries – SF_6

82. According to the NIR, SF_6 emissions from aluminium and magnesium foundries are "C" and are not included in the inventory. However, in the CRF tables, SF_6 emissions from aluminium foundries are reported as "NE" and SF_6 emissions from magnesium foundries are reported as "NA". The ERT strongly recommends that Turkey estimate these emissions and report them, aggregated if necessary, or separately, if possible. At a minimum, if no other changes can be made, the ERT strongly recommends that Turkey correct the notation key for SF_6 used in magnesium foundries from "NA" to "NE" in its next inventory submission.

D. Agriculture

1. Sector overview

83. In 2010, emissions from the agriculture sector amounted to 27,126.84 Gg CO_2 eq, or 6.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 8.9 per cent. The key driver for the fall in emissions is a decrease in the number of livestock. However, emissions from agricultural soils and rice cultivation have increased by 10.7 per cent and 86.8 per cent, respectively. Within the sector, 58.4 per cent of the emissions were from enteric fermentation, followed by 26.7 per cent from agricultural soils, 13.3 per cent from manure management, 0.9 per cent from field burning of agricultural residues and 0.8 per cent from rice cultivation.

84. Turkey made no recalculations in the agriculture sector between the 2011 and 2012 submissions.

85. The ERT commends Turkey for providing emission estimates for the first time in the 2012 inventory submission for pasture, range and paddock and indirect emissions from agricultural soils. As these values were only provided for 2010, the ERT recommends that Turkey provide emission estimates for the full time series in its next inventory submission.

86. The ERT commends Turkey for its efforts in explaining the emission trends in its 2012 inventory submission. However, the ERT recommends that Turkey further elaborate on the contribution of gases and subcategories within the agriculture sector to total sector emissions, as well as document the percentage contribution from the gases and subcategories to total national emissions. The ERT reiterates the recommendation in the previous review reports that Turkey provide detailed documentation on the selection of methods, EFs and AD used in its next inventory submission.

87. The ERT commends Turkey for implementing the recommendations in the previous review report to enhance the transparency of its livestock characterization by providing in the NIR a description of the livestock subgroups and how they are distributed across the climate regions "cool" and "temperate".

88. Turkey describes generally how the Party calculates uncertainties, ensures time-series consistency and carries out QA/QC procedures in the inventory (NIR annexes 3 and 7). The ERT recommends that Turkey provide the information more transparently, including data on sources of uncertainties, any issues affecting time-series consistency, and

category-specific QA/QC and verification procedures for all categories in the agriculture sector in its next inventory submission. In addition, the ERT recommends that Turkey provide information on category-specific planned improvements in its next inventory submission.

2. Key categories

Enteric fermentation – CH_4

89. Turkey continues to use a tier 1 method to estimate emissions from livestock categories using the default EFs for Asia and Eastern Europe from the Revised 1996 IPCC Guidelines in consideration of different climatic regions in Turkey. However, because CH_4 emissions from enteric fermentation is a key category, the ERT reiterates the recommendation in the previous review reports that Turkey estimate the emissions from significant livestock categories using a tier 2 method in accordance with chapter 4.1 of the IPCC good practice guidance.

90. Previous review reports recommended, among other things, that Turkey present national data on the milk productivity of dairy cattle in the NIR to verify the selection of relevant default EFs from the Revised 1996 IPCC Guidelines. Turkey did not provide any additional information in the 2012 inventory submission. In response to questions raised by the ERT during the review, Turkey responded that milk production is obtained by calculating the number of milked animals and the milk yields determined in the 2001 agricultural census. The ERT recommends that Turkey provide the relevant data in the NIR of its next inventory submission.

Manure management – N_2O

91. N_2O emissions have been reported per animal waste management system (AWMS). However, only notation keys ("NO", "NA" and "NE") are included for N_2O excretion per AWMS and for the IEFs. The NIR does not include documentation of the country-specific N_2O emissions per manure management system, or information about the distribution of manure management systems used for the different animal groups. In response to questions raised by the ERT during previous reviews, Turkey explained that it uses EFs based on expert judgement, because there were no other available data. The ERT recommends that Turkey use default values for AWMS distribution and default EFs or provide transparent documentation of the country-specific values. In addition, the ERT reiterates the recommendation in the previous review report that Turkey improve the completeness and transparency of its reporting by including the relevant information and documentation both in the CRF tables and in the NIR of its next inventory submission.

E. Land use, land-use change and forestry

1. Sector overview

92. In 2010, net removals from the LULUCF sector amounted to 78,723.86 Gg CO_2 eq. Since 1990, net removals have increased by 39.4 per cent. The key drivers for the rise in removals are the increase of removals in the grassland category (which are reported from 2000 onwards), in cropland (increase of 70.5 per cent) and in forest land (31.1 per cent). Within the sector, in 2010, net removals from forest land were 58,832.75 Gg CO_2 eq, followed by 19,748.85 Gg CO_2 eq from cropland and 142.25 Gg CO_2 eq from grassland. Wetlands, settlements and other land categories were not reported for the time series 1990–2010. Apart from carbon stock changes, the only other category reported for the sector is a small amount of CH_4 and N_2O emissions from wildfires on forest land remaining forest land.

93. Turkey has made recalculations in the reporting of some years and some land-use categories between the 2011 and 2012 inventory submissions, but has not included any information in the NIR regarding the reasons for the recalculations and the impacts on the reported emissions and removals, nor has Turkey provided explanations on the recalculations in CRF table 8(b). The ERT also notes that a recalculation for forest fires undertaken as a result of recommendations in a previous review report has been repeatedly included as a new recalculation in the last three inventory submissions, when it was only recalculated in the 2009 inventory submission. The ERT reiterates the recommendation in the previous review reports that, in its next inventory submission, Turkey improve the transparency of its documentation for recalculations made and provide an analysis of the impact of the recalculations on emissions/removals from the LULUCF sector. The ERT recommends that any new recalculations should also be reflected in the CRF tables of its next inventory submission.

94. The ERT recognizes the improvements in Turkey's reporting of the representation of land areas for the LULUCF sector compared with the 2011 inventory submission. Turkey has included in the 2012 inventory submission estimates for cropland and grassland categories that were not estimated last year. The ERT also notes the planned improvements for future inventory submissions explained in the 2012 NIR to improve the national land use and land-use change information. In response to questions raised by the ERT during the review, Turkey explained that work on the improvements is already under way and will be included in its next inventory submission. The ERT welcomes these planned improvements and recommends that Turkey provide more information on the progress to date to improve the system for the complete representation of land areas in its next inventory submission. In addition, the ERT recommends that Turkey provide further information on all land-use categories in the NIR of its next inventory submission, including a summary table with all the national areas under the different land uses and land-use changes as part of the section on QA/QC. Finally, the ERT recommends that Turkey improve the transparency of its documentation on how the emissions and removals for relevant land areas are derived and provide information on the AD, EFs, other parameters and underlying assumptions in separate sections in the NIR in the next inventory submission, following the outline of the NIR as laid out in the UNFCCC reporting guidelines.

95. The ERT notes that several CRF tables that were not filled in with estimates or notation keys, or only partially completed in the 2011 inventory submission and identified through recommendations in the previous review reports (e.g. tables 5.D, 5.E, 5.F, 5(III), and parts of tables 5(II), 5(IV) and 5(V)), are now complete. The ERT welcomes these improvements. The ERT also notes that, although the time series for cropland remaining cropland is now complete with estimates, the time series for grassland remaining grassland is still incomplete (1990–1999). Turkey provides a table in the NIR on page 10 which includes reasons for not reporting some categories (e.g. CO_2 emissions from forest land soils, N_2O emissions from disturbance associated with land-use conversion to cropland). In some cases, the activities are not occurring (e.g. drainage does not occur in the forests) or AD are not available (e.g. data are not available on carbon stocks in the soil organic matter). The ERT recommends that Turkey provide the relevant explanations for the use of the notation keys in all of the CRF tables and in the NIR in its next inventory submission.

96. Recommendations in the previous review reports included that Turkey improve the transparency and consistency of its reporting with respect to the IPCC good practice guidance for LULUCF. Although there have been some improvements compared with the 2011 inventory submission, many recommendations have not yet been addressed (see paras. 97, 100 and 101 below).

97. The Party still does not implement any category-specific QA/QC procedures within the LULUCF sector, as noted in recommendations in the previous two review reports. In

response to questions raised by the ERT during the review, Turkey explained that it has begun to design a QA/QC system for the entire inventory which was to be approved in November 2012 (see para. 25 above). The ERT welcomes the development of this process and recommends that Turkey implement and transparently describe the QA/QC system for the LULUCF sector in its next inventory submission in order to improve the verification of the inventory estimates. The ERT also reiterates the recommendation in the previous review reports that Turkey consider how the estimates for the LULUCF categories might be independently verified, as described in the IPCC good practice guidance for LULUCF. Furthermore, the ERT notes that the planned improvements section in the 2012 inventory submission is the same as in the 2011 inventory submission. The ERT therefore recommends that the Party implement these improvements as soon as practicable and communicate the progress of implementation in its next inventory submission. The ERT welcomes the planned establishment of a permanent working team.

2. Key categories

Forest land remaining forest land – CO_2

98. In the NIR, Turkey defines forest land as woody areas greater than 3 ha that have any crown cover greater than 0 per cent, because the forest area definition includes degraded forests. The total forest area reported is 21,537.09 kha in 2010, with 10,334.25 kha being degraded forests. Turkey notes that the forest area differs from Turkey's forest area reported to the United Nations Food and Agriculture Organization (FAO). This is because forests reported to FAO include woody areas with greater than 40.0 per cent crown closure only, whereas the forest definition used for reporting in the inventory disregards crown closure. The NIR shows an increase in forest area of 3.8 per cent since 1990. Turkey does not report any forest land converted to other land use (i.e. deforestation). The notation key "NA" is used for all the forest land converted to other land use categories, except for forest land converted to wetlands and forest land converted to settlements, where the notation key "NE" is used. Based on questions raised by the ERT during the review, Turkey explained that, according to the national forest resources inventory data based on forest management plans, the national forest area is increasing. Turkey provided information on the ENVANIS system, a forest resources inventory based on forest management plans, which provides yearly data for estimating forest carbon stock changes, and explained that future improvements on land-use estimates will not include the forest land category. Given the differences in forest area reported by Turkey for the Convention and to FAO, and the inclusion of degraded forest within the forest land area, the ERT recommends that Turkey improve its monitoring of land-use changes to and from forest land and include more complete information on forest data collection and the ENVANIS system in its next inventory submission. The ERT also recommends that Turkey improve the transparency of areas reported under forest land remaining forest land and report all land-use changes from and to forest land or use the correct notation key in the CRF tables in its next inventory submission.

99. In the NIR, Turkey describes the forest areas in different climatic zones and reports stock changes for different pools under managed and unmanaged forest, and mentions that approximately 48.0 per cent of the land that Turkey includes as forest land is degraded. In the CRF tables, however, there is no disaggregation of the forest land remaining forest land category into any of these forest management types. Based on questions raised by the ERT during the review, Turkey explained that the data used for the inventory (ENVANIS) have all of the different forest types categorized according to the management classes (i.e. high forests, coppices, normal or degraded forests). The ERT recommends that Turkey use those same subcategories in both the NIR and the CRF tables, in order to improve the transparency and consistency of its reporting in its next inventory submission. Further, the

ERT recommends that Turkey explain the methods and factors for the estimation of carbon stock changes in degraded forests in its next inventory submission.

100. Turkey uses a stock change approach (tier 2 method) with country-specific EFs for the calculation of the biomass gains. However, the NIR refers to the gain–loss (default) method to estimate biomass losses. Based on questions raised by the ERT during the review, Turkey explained that the annual change in carbon stocks in living biomass is calculated using equation 3.2.3 of the IPCC good practice guidance for LULUCF, which estimates annual change in carbon stocks in living biomass (stock change method, tier 2 method using country-specific factors), equation 3.2.5, which estimates the average annual increment in biomass (default method), and equation 3.2.6, which estimates the annual decrease in carbon stocks due to biomass loss (default method). Recommendations in the previous review reports also raised this issue, because there seems to be a combination of methods that results in double counting of biomass losses. This is because the stock change method already estimates annual carbon stock changes (gains and losses). The ERT concludes that it is therefore not clear how the default method is applied and that Turkey has not addressed recommendations in previous review reports on this issue. The ERT reiterates the recommendation in the previous review reports that Turkey provide clear and transparent documentation on the estimation of carbon stock changes in forest biomass, including use of country-specific factors and expert judgement. The ERT further recommends that, where recalculations are implemented, Turkey apply these consistently for the entire time series for all forest types and document this in the CRF tables and the NIR of its next inventory submission.

101. Recommendations in previous review reports included that Turkey provide complete and transparent documentation on how the input parameter for average annual transfer into dead wood is calculated and applied, because there were concerns that there was a possible overestimation of carbon accumulation in dead wood. This concern arises from the unusual trend in Turkey in carbon stock change in the pool (e.g. doubling between 2007 and 2008). Turkey did not provide any explanation in the current inventory submission. The ERT reiterates the recommendation in the previous review report that the Party provide complete and transparent documentation in its next inventory submission.

102. Turkey's 2012 NIR states there were insufficient data to calculate the carbon stock changes in litter. Therefore, this pool was assumed to be zero, in line with the IPCC good practice guidance for LULUCF tier 1 method. However, the IPCC good practice guidance for LULUCF encourages the reporting of carbon stock changes in litter to reflect national circumstances and where management could influence these carbon stock changes. The ERT notes that it is good practice to report carbon stock changes for litter pools, particularly because Turkey does report on AD which could be used to calculate carbon stock changes for the litter pool (e.g. forest areas and a climatic map). The ERT encourages Turkey, in its next inventory submission, to use a tier 2 approach for the estimation of emissions and reductions in the litter pools (i.e. using equation 3.2.13 and default litter data in table 3.2.1 of the IPCC good practice guidance for LULUCF).

103. Turkey's 2012 inventory submission does not include estimates for carbon stock changes in soils. Instead, the Party uses the notation keys "NE" for mineral soils and "NO" for organic soils. In the NIR, Turkey documents that carbon stock changes in forest soils were not estimated because of the lack of suitable documentation and the inadequacy of default values provided in the IPCC good practice guidance for LULUCF in reflecting Turkey's national circumstances. The ERT encourages Turkey to include carbon stock changes in soils as part of the planned inventory improvements and include these estimates in its next inventory submission.

Cropland remaining cropland – CO_2

104. Turkey reported on cropland remaining cropland in the 2012 inventory submission, which is an improvement compared with the previous year's inventory submission. The ERT welcomes these improvements. Turkey states that this land category includes annual and perennial crops. However, the NIR did not include any description of the crops and management of this land category as background. NIR tables 7.19–7.22 include information on the cropland and grassland area in four different years (1980, 2000, 2006 and 2010). The NIR does not provide details of the tier 1 and tier 2 methodologies applied to estimate the increase of biomass in perennial cropland. The ERT recognizes the improvement in the reporting for this category compared with the 2011 inventory submission, but recommends that Turkey include more detail on the resources and the methodologies used in its next inventory submission in order to improve the transparency of its reporting.

105. A combination of tier 1 and tier 2 methods has been applied to estimate emissions and removals, in line with the IPCC good practice guidance for LULUCF. The ERT notes that there are still some cells in the CRF tables where notation keys ("NE" and "NA") have been used. The ERT recommends that Turkey continue to improve the completeness of its reporting for cropland.

106. Carbon stock changes in mineral soils for this land category were included in the 2011 inventory submission, but they were not included in the 2012 inventory submission. The notation keys "NA" and "NE" were used instead. In response to questions raised by the ERT during the review, Turkey stated that since the submission in April 2012 there has been progress on the reporting of carbon stock changes, and that improvements, including the separation between organic and mineral soils, will be included in the 2013 inventory submission. The ERT welcomes these improvements and recommends that Turkey include these estimates in its next inventory submission.

3. Non-key categories

Land converted to forest land – CO_2

107. The 2012 NIR reports an increase in forest areas. This has been estimated by an interpolation resulting in an increase of 54.18 kha per year between 1990 and 2004. In the 2011 NIR, the increase was assumed to be equivalent to 30.92 kha, and this last figure is the value used in the CRF tables for calculations instead of the value provided in the 2012 NIR. In response to questions raised by the ERT during the review, Turkey provided inconsistent responses. The ERT recommends that Turkey review the estimates and improve the transparency of the methodology and data sources for the estimates in its next inventory submission.

108. Turkey reports carbon stock changes in dead organic matter for this category between 2008 and 2010. Prior to 2008, Turkey used the notation key "NE" for cropland converted to forest land and grassland converted to forest land, and "NO" for the remaining land categories converted to forest land. In addition, Turkey does not include estimates for any carbon stock changes in soils for this category, and uses the notation key "NO", except for grassland converted to forest land, where the notation key "NE" is used. The ERT recommends that Turkey include the missing estimates, along with transparent information on how these estimates are calculated, in its next inventory submission.

Grassland remaining grassland – CO_2

109. Turkey did not include a section on this land category in the NIR. However, in CRF table 5.C Turkey reports net CO_2 emissions and removals from 2000 to 2010, and uses the notation key "NE" for the period 1990–1999. The ERT has identified large inter-annual

changes in CO_2 emissions in this category in most years of the reported period, with inter-annual variations ranging from –708.1 per cent to 45.5 per cent. In response to questions raised by the ERT during the review, Turkey stated that the emissions and removals from grassland remaining grassland are calculated based on data obtained from grassland rehabilitation projects which are only available after 2000. Turkey assumes that carbon stocks in this category remain unchanged unless rehabilitation applies, and that the aerial coverage of grassland rehabilitation projects may vary significantly among years. The ERT recommends that Turkey increase the transparency of the information on areas, methods, factors and parameters used for the emission calculations related to grassland in its next inventory submission. The ERT also recommends that Turkey complete the time series for the category grassland remaining grassland in its next inventory submission.

F. Waste

1. Sector overview

110. In 2010, emissions from the waste sector amounted to 35,827.72 Gg CO_2 eq, or 8.9 per cent of total GHG emissions. Since 1990, emissions have increased by 270.1 per cent. The key driver for the rise in emissions is the increase of generated and disposed solid waste, resulting in higher CH_4 emissions from solid waste disposal on land. Within the sector, 89.3 per cent of the emissions were from solid waste disposal on land, followed by 10.7 per cent from wastewater handling. Waste incineration and other (waste) are reported as "NA".

111. There were no recalculations performed for the waste sector between the 2011 and 2012 submissions and recommendations from the previous review reports are still pending. The ERT strongly recommends that Turkey implement recommendations in previous review reports regarding the estimation of emissions from solid waste disposal on land (see paras. 115 and 116 below), wastewater handling (see paras. 118 and 119 below) and waste incineration (see para. 120 below) in its next inventory submission.

112. As noted in previous review reports, Turkey does not estimate CH_4 and N_2O emissions from domestic (sludge) and industrial wastewater (reported as "NE") and does not estimate CO_2, N_2O and CH_4 emissions from waste incineration (reported as "NA"). Turkey explains in the NIR that, although there are waste incineration plants in Turkey, emissions are not included due to a lack of AD. The ERT recommends that Turkey strive to improve the completeness of its inventory in this sector in its next inventory submission.

113. Consistent with recommendations in the previous review reports, the ERT noted that the NIR does not provide sufficient information on, and justification for, the choice of methodologies, AD, EFs and parameters for the categories solid waste disposal on land and wastewater treatment, and therefore reiterates the recommendation in previous review reports that Turkey provide detailed methodological information and explanation of trends in its next inventory submission.

114. Turkey reported emissions from solid waste disposal on land and domestic wastewater handling using the tier 1 method and IPCC default values. Both categories are key categories; therefore, the ERT reiterates the recommendation in the previous review report that Turkey improve its efforts to develop country-specific specific EFs and use higher-tier approaches for emission estimates in its next inventory submission.

2. Key categories

Solid waste disposal on land – CH_4

115. The CH_4 emissions from solid waste disposal on land were calculated using an IPCC tier 1 methodology applying default values from the Revised 1996 IPCC Guidelines. The ERT noted that Turkey also provided estimates using the tier 2 approach, applying the first-order decay (FOD) model in order to compare the emission estimates reached with tier 1. However, the NIR does not provide detailed information on the calculation and justification of parameters used for the estimates using the FOD model. In response to questions raised by the ERT during the review, Turkey provided information on the parameters applied in the FOD model. The ERT reiterates the recommendation in previous review reports that, in its next inventory submission, Turkey use the FOD model to estimate and report emissions rather than the tier 1 method, because solid waste disposal on land is a key category.

116. The CH_4 emissions from solid waste disposal on land were estimated using data for waste composition based on default values from the Revised 1996 IPCC Guidelines. The ERT recommends that Turkey improve the effort to develop country-specific data for waste composition. Turkey has used 0.15 as the degradable organic carbon (DOC) value for the entire time series, which is the lowest value of the range suggested by the Revised 1996 IPCC Guidelines (0.15–0.40). However, there is no explanation in the NIR to justify the use of this value for the country's circumstances. The ERT reiterates the recommendation in the previous review report that Turkey use appropriate DOC values and justify the choice made in its next inventory submission.

117. In the NIR, Turkey stated that CH_4 has been recovered in the country since 2002, but recovery data are only included beginning in the year 2010. In response to questions raised by the ERT during the review, Turkey explained that there are four CH_4 recovery plants operating in Istanbul and Ankara provinces and that the relevant data are still being collected. The ERT recommends that Turkey include information on CH_4 recovery for the remaining years in its next inventory submission.

Wastewater handling – CH_4 and N_2O

118. The Party calculated CH_4 emissions from domestic wastewater handling using the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) tier 1 methodology and applying IPCC default values from the 2006 IPCC Guidelines due to lack of country-specific data. The ERT noted that Turkey continues to report emissions from industrial wastewater as "NE". The ERT reiterates the recommendation in previous review reports that Turkey include emissions from industrial wastewater in its next inventory submission. If AD are not available, the ERT recommends that the Party use wastewater flow data and default values of chemical oxygen demand of key industries, in accordance with the IPCC good practice guidance.

119. Turkey estimates N_2O emissions from domestic wastewater. However, unlike in previous inventory submissions, the N_2O emissions values are reported at an aggregated level, with N_2O emissions from wastewater and sludge independently reported as "NA". Turkey has not completed the additional information in CRF table 6.B. The N_2O emissions were calculated using the IPCC good practice guidance basic approach based on population and protein intake per capita. Turkey has used AD based on population statistics from TurkStat and FAO protein consumption data. The ERT reiterates the recommendation in the previous review report that Turkey correct the use of notation keys in the CRF tables and provide the additional information in CRF table 6.B in its next inventory submission.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

120. The ERT noted that Turkey continues to report emissions from waste incineration as "NA". The ERT reiterates the recommendation in the previous review reports that Turkey include emission estimates from waste incineration in the inventory, because incineration plants are reported to exist in the country. If no AD are available by waste type, the ERT recommends the use of statistical data for waste incinerated and default EFs in accordance with the IPCC good practice guidance.

III. Conclusions and recommendations

A. Conclusions

121. Turkey made its inventory submission on 14 April 2012. The inventory submission contains the GHG inventory (comprising CRF tables and an NIR). This is in line with the UNFCCC reporting guidelines.

122. The inventory submission is complete and Turkey has submitted a complete set of CRF tables for the years 1990–2010 and an NIR; these are generally complete in terms of geographical coverage, years and sectors, but not complete in terms of categories and gases. Many of the categories, particularly in the industrial processes and LULUCF sectors were reported as "NE" or "C", as were: fugitive CO_2, CH_4 and N_2O emissions from oil, natural gas in the energy sector; and CH_4 and N_2O emissions from domestic (sludge) and industrial wastewater and CO_2, CH_4 and N_2O emissions from waste incineration in the waste sector. The ERT recommends that Turkey provide estimates for these categories in its next inventory submission, in order to improve completeness.

123. Turkey's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, Turkey does not provide emission estimates for all categories existing in the country, or for all years. Tier 1 methods are used for many key categories instead of higher-tier methods, and the inventory is not fully transparent or consistent.

124. Turkey has made recalculations for the inventory between the 2011 and 2012 submissions following changes in AD and in order to rectify identified errors in the LULUCF sector only. The impact of these recalculations on the national totals is an increase in emissions of 3.1 per cent (including LULUCF) for 2009. Recalculations took place in the following categories:

(a) Forest fires;

(b) Cropland remaining cropland.

125. The institutional arrangements implemented by Turkey for the preparation of the inventory continue to perform their required functions; however, the ERT identified some issues that need to be addressed in the next inventory submission, including the development of an inventory improvement plan, which includes an approach for improving the transparency and accuracy in the reporting of confidential emissions in the industrial processes sector, and, more broadly, a timeline for the implementation of the recommendations in the previous review reports.

B. Recommendations

126. The ERT identifies issues for improvement as listed in table 3 below. Recommendations are for the next inventory submission unless otherwise specified.

Table 3
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
General	Completeness of inventory	Provide estimates for all categories currently not estimated	10
	Inventory planning	Continue efforts to use higher-tier methods to estimate emissions from key categories, in line with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (IPCC good practice guidance)	14
		Apply the results of the key category assessment and uncertainty analysis to prepare an improvement plan, including actions to address specific recommendations in review reports and a schedule for implementation	15
		Provide information on the process for final approval of the inventory submission	16
	Inventory preparation	Improve key category analyses by including a trend assessment, in line with the IPCC good practice guidance, and including land-use categories separately in the key category analysis, in line with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (IPCC good practice guidance for LULUCF)	17
		Use the key category analysis in methodological choices and for prioritizing inventory improvements	19
		Provide information on the source of uncertainty data in the NIR	20
		Document the rationale for uncertainties for all categories, use the results of the uncertainty analysis in the inventory improvement plan, and update uncertainty estimates for categories that are recalculated	21
		Improve the transparency of the uncertainty analysis by providing information on uncertainties at the category level in the NIR	22
		Provide uncertainties by the individual land-use categories instead of reporting uncertainties from LULUCF categories as an entire sector	22
		Further improve the explanations provided for the recalculations undertaken and include numerical information on the magnitude and impact in a separate chapter of the NIR	24
		Improve QA/QC at all stages of inventory preparation and enhance the documentation of the QA/QC procedures implemented	26

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Set sector-specific QA/QC goals, which will help to improve the quality of reported data at the sectoral level	26
		Improve the transparency of the national inventory submission by including detailed methodological information and further explanation of the EFs, AD and emission trends for all sectors and key categories, and all references to the external sources used for inventory preparation	29
		Improve the transparency of the inventory by clearly indicating where sources reported as "IE" are reported and make efforts to report these emissions in their appropriate categories	29
	Inventory management	Provide an update on the status of development and implementation of all three components of the Emission Inventory Portal	30
Energy	Sector overview	Make efforts to disaggregate the data for the category other (fuel combustion) when compiling the energy balance so as to improve the transparency of reporting or, if disaggregation is not possible, use the notation key "IE" for the category other (fuel combustion) and provide information in CRF table 9(a) to indicate in which category these emissions and fuels have been aggregated	38
		Use appropriate notation keys, along with the proper documentation in CRF table 9(a)	39
	Reference and sectoral approaches	Investigate other possible factors for the differences in reporting to the secretariat and IEA, such as statistical differences in the energy balance, missing information or double counting in the reference or sectoral approaches, cross-check net calorific values with default values, correct any identified errors and report on the findings	41
	International bunker fuels	Provide an entire time series for this category, along with information relating to the methods and assumptions used	42
		Report consistently international bunker fuel use in CRF table 1.A(b) and table 1.C	43
	Feedstocks and non-energy use of fuels	Continue to identify opportunities to collect more AD on feedstocks and non-energy use of fuels. If such disaggregation continues to be impractical, revise use of notation keys and make use of the additional information fields in CRF table 1.A(d)	44
		Clearly explain in the NIR the allocation of fuels used as feedstocks and for non-energy uses between the energy and industrial processes sectors, if any, as appropriate	44
	Stationary combustion: solid, liquid and gaseous fuels – CO_2	Enhance efforts to use tier 2 methods for all key categories	45
		Include further information on the data sources and methodologies used for calculating the EFs at the plant level and compare these to the IPCC default EFs	46

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Include documentation about fuel quality	47
		Further investigate the reasons for fluctuations in CO_2 emissions and provide clear explanations for these and any future fluctuations	49
		Provide a description of the role of data providers, particularly for liquid fuels, including biodiesel, for the transport categories	50
	Stationary combustion: biomass – CH_4 and N_2O	Provide information in the NIR on the types of biomass used in the energy sector	51
	Oil and natural gas – CO_2, CH_4 and N_2O	Complete the time series for this category and include proper documentation in the NIR, including information on data sources for the AD and EFs	52
Industrial processes and solvent and other product use	Sector overview	Consider whether domestic regulation would allow reporting of categories labelled as confidential at a higher level of aggregation. If this is possible, establish data collection methods for those categories currently missing from the inventory, estimate the emissions, and report them. If this is not possible, correct the notation key for these sources to "NE"	58
	Cement production – CO_2	Provide a more detailed description of the verification of EFs with country-specific data	61
		Evaluate the possibility of developing a country-specific EF to better reflect technological development in this category and thus better reflect the actual emissions between 1990 and 2010	62
		Evaluate the possibility of using plant-specific data in the estimation of emissions	62
		Transparently document where emissions from incineration of waste fuels in cement kilns are reported, and, if they are not reported, use the appropriate notation key, "NE"	63
	Lime production – CO_2	Correct the unit of the EF from kg CO_2/t lime produced to t CO_2/t lime produced in annex 2 of the NIR	64
		Explain in the NIR the large fluctuations in the IEF over the time series for this category	65
	Iron and steel production – CO_2	Recalculate the time series for iron and steel process emissions for the years 1990–2009	66
	Consumption of halocarbons and SF_6 – HFCs and SF_6	Use a higher-tier method for estimating these emissions	67
		Improve the transparency of the reporting by including information on the AD (whether they include only the import of raw gas or gas in products) and by providing more information about the methods used to calculate emissions, for example by explaining whether the bottom-up or top-down approach was used	68
	Soda ash production	Estimate these emissions and report them aggregated under	70

Sector	*Category*	*Recommendation*	*Paragraph reference*
	and use – CO_2	another category (e.g. other) and study the possibility of reporting these emissions separately or, at a minimum, if no other changes can be made, correct the notation key from "C" to "NE"	
	Ammonia production – CO_2	Justify the use of the notation key "C" in the NIR, in addition to providing documentation on where these emissions are aggregated; and, if emissions are not estimated, use the notation key "NE"	73
	Nitric acid production – N_2O	Report the confidential emissions aggregated under other (chemical industry)	74
	Adipic acid production – N_2O	Provide clear information in the NIR on whether or not adipic acid production has occurred in Turkey during the period 1990–2011	75
	Carbide production – CO_2	Transparently describe whether this category exists in Turkey, and, if so, describe the data sources and methods for estimating emissions	76
	Other chemical processes – CO_2 and CH_4	Report emissions from other chemical processes, studying the possibility of reporting emissions separately under the relevant chemical industry subcategory	78
		Transparently describe the calculations and reporting in the NIR	78
	Ferroalloys production – CO_2	Transparently document in the NIR where both combustion and process-related emissions are reported	79
	Aluminium production – CO_2 and PFCs	Estimate these emissions and report them aggregated, if necessary, or separately, if possible or, at a minimum, if no other changes can be made, correct the notation key from "C" to "NE"	81
	SF_6 used in aluminium and magnesium foundries – SF_6	Estimate these emissions and report them aggregated, if necessary, or separately, if possible or, at a minimum, if no other changes can be made correct the notation key to "NE" for SF_6 used in magnesium foundries	82
Agriculture	Sector overview	Provide emission estimates for pasture, range and paddock and indirect emissions from agricultural soils for the full time series	85
		Further elaborate on the contribution of gases and subcategories within the agriculture sector to total sector emissions, and document the percentage contribution from the gases and subcategories to total national emissions	86
		Provide detailed documentation on the selection of methods, EFs and AD used in this sector	86
		More transparently provide information, including data, on sources of uncertainties, any issues affecting time-series consistency, and category-specific QA/QC and verification procedures for all categories in the agriculture sector	88
		Provide information on category-specific planned improvements	88
	Enteric fermentation – CH_4	Estimate the emissions from significant livestock categories using a tier 2 method in accordance with chapter 4.1 of the IPCC good practice guidance	89

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Provide in the NIR the relevant national data on the milk productivity of dairy cattle	90
	Manure management – N_2O	Use default values for AWMS distribution and default EFs or provide transparent documentation of the country-specific values; and improve the completeness and transparency of the reporting by including the relevant information and documentation in both the CRF tables and the NIR	91
LULUCF	Sector overview	Improve the transparency of the documentation for recalculations made and provide an analysis of the impact of the recalculations on emissions/removals from the LULUCF sector, and reflect these new recalculations in the CRF tables	93
		Provide more information on the progress to date to improve the system for the complete representation of land areas	94
		Provide further information on all land-use categories, including a summary table with all the national areas under the different land uses and land-use changes as part of the section on QA/QC	94
		Improve the transparency of the documentation on how the emissions and removals for relevant land areas are derived and provide information on the AD, EFs, other parameters and underlying assumptions in separate sections in the NIR, following the outline of the NIR as laid out in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories"	94
		Provide the relevant explanations for the use of the notation keys in all of the CRF tables and in the NIR	95
		Implement the QA/QC system and transparently describe this for the LULUCF sector, in order to improve the verification of the inventory estimates	97
		Consider how the estimates for the LULUCF categories might be independently verified, as described in the IPCC good practice guidance for LULUCF	97
		Implement the planned improvements as soon as practicable and communicate the progress of implementation	97
	Forest land remaining forest land – CO_2	Improve the monitoring of land-use changes to and from forest land and include more complete information on forest data collection and how the ENVANIS system works	98
		Improve the transparency of land areas reported and report all land-use changes from and to forest land or use the correct notation key in the CRF tables	98
		Use the same subcategories (management classes) in both the NIR and the CRF tables, in order to improve the transparency and consistency of the reporting	99
		Explain the methods and factors for the estimation of carbon stock changes in degraded forests	99

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Provide clear and transparent documentation on the estimation of carbon stock changes in forest biomass including use of country-specific factors and expert judgement	100
		Where recalculations are implemented, apply these consistently for the entire time series for all forest types and document this in the CRF tables and the NIR	100
		Provide complete and transparent documentation on how the input parameter for average annual transfer into dead wood is calculated and applied	101
	Cropland remaining cropland – CO_2	Include more detail on the resources and methodologies used in order to improve transparency	104
		Continue to improve the completeness of the reporting	105
		Include estimates for carbon stock changes in mineral soils	106
	Land converted to forest land – CO_2	Review the estimates and improve the transparency of the methodology and data sources for the estimates	107
		Include the missing estimates for this category, along with transparent information on how these estimates are calculated	108
	Grassland remaining grassland – CO_2	Increase the transparency of the information on areas, methods, factors and parameters used for the emissions calculations related to grasslands	109
		Complete the time series for this category.	109
Waste	Sector overview	Implement the recommendation from the previous review report by performing recalculations for this sector	111
		Improve the completeness of the inventory for this sector by estimating CH_4 and N_2O emissions from domestic (sludge) and industrial wastewater (currently reported as "NE"), and for CO_2, N_2O and CH_4 emissions from waste incineration (currently reported as "NA")	112
		Provide detailed methodological information and explanation of trends	113
		Improve efforts to develop country-specific specific EFs and use higher-tier approaches for emission estimates	114
	Solid waste disposal on land – CH_4	Use the FOD model to estimate and report emissions rather than the tier 1 method, as solid waste disposal on land is a key category	115
		Improve the effort to develop country-specific data for waste composition	116
		Use appropriate DOC values and justify the choice made	116
		Include information on CH_4 recovery for the unreported years	117
	Wastewater handling –CH_4 and N_2O	Include emissions from industrial wastewater or, if AD are not available, use the wastewater flow data and default values of chemical oxygen demand of key industries in accordance with	118

Sector	*Category*	*Recommendation*	*Paragraph reference*
		the IPCC good practice guidance	
		Correct the use of notation keys in the CRF tables and provide the additional information in CRF table 6.B	119
	Waste incineration–CO_2, CH_4 and N_2O	Include emission estimates from waste incineration in the inventory; if no AD are available by waste type, use the statistical data for waste incinerated and the IPCC default EFs in accordance with the IPCC good practice guidance	120

Abbreviations: AD = activity data, AWMS = animal waste management system, C = confidential, CO_2 = carbon dioxide, CRF = common reporting format, DOC = degradable organic carbon, EF = emission factor, FOD = first-order decay, IE = included elsewhere, IEA = International Energy Agency, IPCC = Intergovernmental Panel on Climate Change, kg = kilogram, LULUCF = land use, land-use change and forestry, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control, SF_6 = sulphur hexafluoride, t = tonne.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

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FCCC/ARR/2011/TUR. Report of the individual review of the greenhouse gas inventory of Turkey submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/tur.pdf.>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Ali Can (State Institute of Statistics), including additional material on the methodology and assumptions used.

Annex II

Acronyms and abbreviations

AD	activity data
ARR	annual review report
AWMS	animal waste management system
C	confidential
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
FOD	first-order decay model
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
LULUCF	land use, land-use change and forestry
MENR	Ministry of Energy and Natural Resources
MEU	Ministry of Environment and Urbanization
MTMAC	Ministry of Transport, Maritime Affairs and Communications
Mg	megagram (1 Mg = 1 tonne)
Mt	million tonnes
NA	not applicable
NE	not estimated
N_2O	nitrous oxide
NO	not occurring
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change