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**Report of the individual review of the greenhouse gas inventory of Turkey
submitted in 2006***

* In the symbol for this document, 2006 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2006 greenhouse gas (GHG) inventory submission of Turkey, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 15 to 19 January 2006 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: generalist – Mr. Paul Filliger (Switzerland) and Ms. Inga Konstantinavičiute (Lithuania); energy – Mr. Christo Christov (Bulgaria), Mr. Javier Gonzalez (Spain) and Mr. Francis Yamba (Zambia); industrial processes – Mr. Menouer Boughedaoui (Algeria) and Mr. Hongwei Yang (China); agriculture – Mr. Paul Duffy (Ireland) and Mr. Mahmoud Medany (Egypt); land use, land-use change and forestry (LULUCF) – Mr. Leandro Buendia (Philippines) and Mr. Sandro Federici (Italy); waste – Ms. Tatiana Tugui (Moldova) and Mr. Hiroyuki Ueda (Japan). Ms. Tatiana Tugui and Mr. Paul Duffy were the lead reviewers. The review was coordinated by Mr. Javier Hanna (UNFCCC secretariat).

B. Inventory submission and other sources of information

2. In its 2006 submission, Turkey has submitted a complete set of common reporting format (CRF) tables for the years 1990–2004 and a national inventory report (NIR). Turkey ratified the Convention in 2004 and provided inventory data for the first time in 2006. Turkey did not report the CRF tables in accordance with the reporting requirements specified in decision 13/CP.9 (FCCC/SBSTA/2004/8). Instead it has used the CRF tables included in decision 3/CP.5 (FCCC/CP/1999/7). For the LULUCF sector, Turkey has provided the CRF tables as required by decision 13/CP.9 in separate files. The ERT encourages Turkey to use the CRF Reporter software in future submissions.

C. Emission profiles and trends

3. In 2004, the most important GHG in Turkey was carbon dioxide (CO₂), contributing 81.6 per cent to total¹ national GHG emissions expressed in CO₂ equivalent, followed by methane (CH₄), 15.6 per cent, and nitrous oxide (N₂O), 1.9 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) contributed 1.0 per cent of the overall GHG emissions in the country. The energy sector accounted for 76.7 per cent of total national GHG emissions, followed by waste (9.3 per cent), industrial processes (8.9 per cent) and agriculture (5.1 per cent). The solvent and other product use sector was not estimated. Total national GHG emissions amounted to 296,601.94 Gg CO₂ equivalent and increased by 74.4 per cent between 1990 and 2004. Turkey reports a net sink of 73,244.64 Gg CO₂ from LULUCF in 2004.

D. Key categories

4. Turkey has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2006 submission. The trend assessment is not reported according to 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), as categories are not listed in descending order of magnitude of emissions. Table 7 of the CRF should be used to record the results of the key category analysis. The key category analyses performed by the Party and the

¹ In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO₂ equivalent excluding LULUCF, unless otherwise specified.

secretariat² produced similar results. The small differences between these two analyses arise from the different subsectoral classifications used. Turkey has not included the LULUCF sector in its key category analysis.

E. Main findings

5. The structure of the NIR is not fully consistent with the structure outlined 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” (hereinafter referred to as the UNFCCC reporting guidelines). The CRF tables and the NIR do not include detailed information on choice of methodologies and activity data (AD); however, the emission factors (EFs) used in estimating emissions are described in appendix E to the NIR. The expert review team (ERT) was therefore not able to fully assess rationale for the choices of data, methods and assumptions. The ERT recommends Turkey to follow the requirements of the UNFCCC reporting guidelines (decision 18/CP.8), facilitated by the use of the CRF Reporter, for its future submissions.

6. The Turkish inventory is mainly based on tier 1 methodologies. The ERT encourages Turkey to consider a more extensive use of higher-tier methods for key categories.

F. Cross-cutting topics

1. Completeness

7. Turkey’s inventory is complete for all years and in terms of geographical coverage. Turkey has provided the CRF tables of the LULUCF sector following decision 13/CP.9 in separate files.

8. Some sources are not included in the inventory, among them CO₂ and N₂O from solvent and other product use; CO₂ from solid waste disposal; CH₄ and N₂O from waste-water handling; CH₄ and N₂O from agricultural soils; N₂O from manure management; CH₄ from metal production; CO₂ from other production; CO₂ from fugitive emissions from fuels; CH₄ from fugitive emissions from oil and natural gas; potential emissions of HFCs; potential and actual emissions of PFCs; changes in carbon stocks in wetlands; and CO₂ emissions from liming. The ERT encourages Turkey to report estimates for these sources in its next submission.

2. Transparency

9. The NIR includes information on emissions, key categories, uncertainty estimates and general quality assurance/quality control (QA/QC). However, the structure of the NIR is not fully consistent with the structure outlined in the UNFCCC reporting guidelines. More information on a quantitative overview of sectors, choice of methods, AD, EFs and assumptions used is needed for transparency. The ERT therefore recommends that Turkey make full use of the structure outlined in the UNFCCC reporting guidelines in its future submissions.

10. In the CRF tables the use of notation keys is limited. “0” is sometimes reported instead of data or where the notation keys should be used. The ERT recommends Turkey not to use “0” but to use the appropriate notation keys instead.

² The secretariat identified, for each Party, those source 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 LULUCF. Key categories according to the tier 1 trend assessment were also identified for those Parties that provided a full set of CRF tables for the year 1990. 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.

11. References to the external sources used for inventory preparation are not provided in the NIR. The NIR does not contain detailed information on the national energy balances and other AD.

3. Recalculations and time-series consistency

12. This is the first inventory submission of Turkey, so that information on recalculations is not provided in the NIR or the CRF. The ERT recommends Turkey, in its future submissions, to provide information on plans for any review of sources that may lead to recalculations. The recommendations of this report identify many areas where Turkey can make improvements in its future submissions.

13. Tier 1 IPCC methodologies have been used for most of the key categories identified. The ERT recommends the use of tier 2 methods for key categories. The same tier 1 methods were applied to the time series 1990–2004, except for civil aviation, where a tier 2 method has been applied to all years. The emissions trend data do not indicate any notable inter-annual fluctuation for the national totals. However, some trends in emissions and activity data for sectors and key categories – stationary combustion (CO₂), road transportation (CO₂) and civil aviation (CO₂), among others – exhibit large inter-annual variations and are not well explained in the NIR. The ERT encourages Turkey to clarify the reasons for the reported emission trends in its next submission.

4. Uncertainties

14. Turkey has provided quantitative uncertainty estimates using the tier 1 method. The NIR states that uncertainty estimates are based on expert judgement and that total inventory uncertainty is 2.5 per cent. The NIR does not, however, give a clear description of how the uncertainty analysis has been carried out. Qualitative uncertainty estimates are provided in CRF table 7 but are not consistent with the quantitative estimates given in the NIR. The ERT recommends that Turkey document the uncertainty analysis better and use this to prioritize further improvements in the inventory.

5. Verification and quality assurance/quality control approaches

15. The NIR gives a general description of Turkey's QA/QC procedures in the introductory chapter. These procedures are not fully described in the sectoral chapters. Turkey has not yet implemented a formal QA/QC plan in accordance with the IPCC good practice guidance and there is no documentation of external peer review or verification procedures. The ERT recommends Turkey to develop and report in its next submission the QA/QC system for the national inventory, including the specification of institutional responsibilities.

G. Areas for further improvement

1. Identified by the Party

16. The NIR does not identify areas for inventory improvement.

2. Identified by the ERT

17. The ERT identifies the following cross-cutting issues for improvement:

- (a) Full use of the NIR structure outlined in the UNFCCC reporting guidelines;
- (b) Greater transparency in the NIR by including information on the characteristics of sectors, choice of methodologies, AD and EFs, as well as assumptions and references;
- (c) Improvement of the completeness of the inventory, particularly providing estimates for the missing sources;

- (d) Development of a QA/QC system for the national inventory;
- (e) Preparation of a QA/QC plan;
- (f) Preparation of a plan for inventory improvements;
- (g) Description of the uncertainty analysis;
- (h) Inclusion of the LULUCF sector in the key category analysis; and
- (i) Following the requirements of the UNFCCC reporting guidelines facilitated by the use of the CRF Reporter.

18. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. Energy

A. Sector overview

19. In 2004, the energy sector accounted for 76.7 per cent of Turkey's total national GHG emissions. Emissions of CO₂ from fuel combustion contributed 74.9 per cent of total national emissions. Between 1990 and 2004, GHG emissions from fuel combustion increased by 73.1 per cent, from 130,698.13 Gg CO₂ equivalent in 1990 to 226,200.42 Gg CO₂ equivalent in 2004, mainly due to increases in emissions from energy industries and manufacturing industries and construction. Emissions from the transport sector increased by 55.5 per cent over the period 1990–2004.

20. The CRF tables for the energy sector cover all the IPCC categories and include all years and gases. Turkey is encouraged to collect disaggregated data and to report separate emissions from the manufacture of solid fuels and other energy industries, pulp and paper, food processing, commercial/institutional and residential categories. Emissions of the indirect GHGs and sulphur dioxide (SO₂) are reported in the CRF. All the CRF tables, including the sectoral background data tables, are provided.

21. The reporting of the energy sector is not completely transparent. The calculation methodologies are not well documented in the NIR and the NIR does not provide sufficient background information to make it possible to follow the calculations.

22. Turkey indicates that it uses an IPCC tier 1 approach for estimating all CO₂ emissions except for road transportation. As no further details are provided in the NIR, the ERT was not able to verify this. The ERT strongly recommends that Turkey use higher-tier methods for all key categories.

23. Notation keys have been used in the CRF tables; however, they are not clearly explained in the relevant CRF tables or the NIR (e.g. the notation key "included elsewhere" ("IE") is used in table 1.A (a) in road transportation for the estimates of CO₂ from diesel oil and gasoline, and for CH₄ and N₂O estimates from diesel oil).

24. The ERT further noted that, while the sources of AD are reported in the NIR, detailed information on the AD and the national energy balance are not provided in the NIR.

B. Reference and sectoral approaches

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

25. CO₂ emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. For the year 2004, there is a difference of 1.97 per cent in the CO₂ emissions estimates between the reference approach and the sectoral approach. There are no explanations provided in the documentation box of CRF table 1.A(c). In addition, the explanations provided in the NIR for the fluctuations in the differences between the two approaches over the years are not adequate and complete. The difference varies from 10.5 per cent in 1990 to -4.4 per cent in 1991.

26. The conversion factor for natural gas reported in CRF table 1.A(b) is 38.1 TJ/Nm³ for the entire time series 1990–2004. This seems high taking into account that the natural gas imported from Russia has a conversion factor of about 33.5 TJ/Mm³. The ERT recommends that Turkey revise this conversion factor on the basis of annual imports and exports of natural gas for all years in its next submission.

27. For the whole time series 1990–2004, about 20 per cent of the emissions in the sectoral approach are reported under other fuels, which results in a high implied emission factor (IEF) for CO₂ emissions from combustion of other fuels. The problem is identified in transport, where CO₂ emissions from road transportation are reported under other fuels but AD are reported under diesel and gasoline use. It is strongly recommended that all fuels and the associated emissions from the different transportation activities be reported in the correct way. The use of notation keys should be explained in CRF table 9.

28. Biomass data and emissions are reported as “0” in CRF table 1.A (b), but they are reported as not applicable (“NA”), not occurring (“NO”) or “IE” in CRF table 1.A (a). The NIR indicates that biomass is counted as solid fuel and that the associated CO₂ emissions are considered in the LULUCF sector. At the same time, the International Energy Agency (IEA) reports 231,563 TJ of biomass used in 2004 for the residential sector. The ERT believes that this significant part of the energy demand of the country should be reported under the appropriate categories and separately from other fuels in the CRF tables. It encourages Turkey to report biomass consumption and emissions under the energy sector in its next submission, checking carefully calorific values and carbon content of biomass fuels.

29. The total apparent energy consumption reported to the UNFCCC corresponds to that reported to the IEA, with differences within 5 per cent for most years. Several products are reported in the CRF tables but not to the IEA. The stocks for all products largely disagree for all years. The ERT recommends Turkey to reconcile the energy data it reports to the IEA and those it reports to the UNFCCC.

2. International bunker fuels

30. International bunker fuels consumption and emissions are not reported in the CRF tables, and it is not clear if the data on navigation and civil aviation in the sectoral approach exclude international bunker fuels. The ERT recommends Turkey to report emissions from international bunkers separately from those from domestic navigation and aviation.

3. Feedstocks and non-energy use of fuels

31. There is no natural gas reported as feedstock, although Turkey has a large chemical industry, including the production of ammonia. Only gas/diesel oil is reported as feedstock. The ERT recommends Turkey to provide data on natural gas used as feedstock in its next submission.

C. Key categories

1. Road transportation – CO₂

32. In the NIR, Turkey reports using tier 2/3 methods for road transportation (consumption of fuels are reported as estimated using tier 1 approach), which is a key category for CO₂, while in the CRF tier 2 is reported. However, no further information is provided on the method used. The CO₂ IEFs and emissions from liquid fuels in road transportation are reported as “IE” for the period 1990–2004 resulting in the lowest CO₂ IEFs of all reporting Parties in the transport sector (between 3.94 and 10.11 t CO₂/TJ, compared to an average value of above 72 t CO₂/TJ). Turkey is encouraged to explain the method, AD and EFs used for the estimations in this category, and is recommended to estimate emissions on the basis of the size and characteristics of its vehicle fleet and annual mileage, and to report disaggregated CO₂ emissions from gasoline and diesel oil used in road transportation (AD are reported in the CRF tables and used for estimating CH₄ and N₂O emissions).

33. The trend in fuel consumption and CO₂ emissions for road transportation fluctuate. The 2004 value is 25.9 per cent higher than the 1990 value, while CO₂ emissions from this category increased by 41.8 per cent over the same period. The NIR gives no specific information to explain the observed fluctuations or links them to national economic conditions. The ERT recommends Turkey to explain the trends in fuel consumption and CO₂ emissions for this category in its next NIR.

2. Stationary combustion: all fuels – CO₂

34. For all fuels the time series of fuel consumption are not consistent and show significant inter-annual changes. The ERT was not able to understand the high increases and decreases in parameters such as emission totals and IEFs because of the lack of transparency in the NIR. As unchanged EFs are used for all years of the time series, Turkey should explain the fluctuations of AD, IEFs and emissions. Turkey is encouraged to apply higher-tier approaches to these key categories.

3. Civil aviation – CO₂

35. The trend in fuel consumption for civil aviation fluctuates and the following inter-annual changes are unusual: 1992–1993 (33.4 per cent), 1994–1995 (66.2 per cent), 2001–2002 (–67.7 per cent), 2002–2003 (149.6 per cent) and 2003–2004 (79.5 per cent). The 2004 value is 422.5 per cent higher than the 1990 value.

36. The 1990, 1992–1994, 1998 and 2002–2003 values of the CO₂ IEF for jet kerosene (ranging from 68.1 t/TJ to 245.4 t/TJ) are different from most of those reported by other Parties, as identified in previous review stages. All IEFs for 1990–2004 are higher or lower than the IPCC default value (72.8 t/TJ). Turkey is not following the recommendations of the IPCC good practice guidance that domestic CO₂ emissions should be separated from emissions from international aviation. The ERT recommends Turkey to provide an explanation for these IEF fluctuations and, if necessary, to revise the time series in its next submission.

4. Fugitive emissions: coal mining and handling – CH₄

37. Fugitive emissions are a key category by level assessment. The tier 1 method has been used to estimate emissions using IPCC default values. Of the two subcategories (underground and surface mining), CH₄ emissions from surface mining contributed more than those from underground mining. They are 11.6 per cent higher in 1990 and 56.6 per cent in 2004. The CH₄ emissions from this category fell by 14.1 per cent due to a shift away from the use of coal to natural gas in the residential sector. To reduce the uncertainty associated with the use of default figures, and following the recommendations of the IPCC good practice guidance, Turkey is encouraged to use a tier 2 method for estimating CH₄

emissions which use country-specific emission factors that reflect the average methane content of coal actually mined.

38. There are no emissions reported for post-mining activities, either for surface or for underground mining. Since coal mining and handling is a key category, Turkey is encouraged to estimate CH₄ emissions from post-mining activities.

D. Non-key categories

1. Road transportation – N₂O

39. N₂O emissions from road transportation is very likely to be a key category. Turkey is encouraged to revise its estimates and include separately N₂O emissions from diesel oil for the whole time series, and to pay special attention in its key category analysis. The gasoline N₂O IEFs reported by Turkey (from 6.59 kg/TJ in 1990 to 14.36 kg/TJ in 2004) are among the highest of reporting Parties, and these should be assessed and revised taking into account the gradual introduction of abatement technologies in the vehicle fleet during the period 1990–2004. The ERT encourages Turkey to introduce the necessary changes in its next submission.

II. Industrial processes and solvent and other product use

A. Sector overview

40. In 2004, total emissions from this sector were 26,448.25 Gg CO₂ equivalent, or 8.9 per cent of total national GHG national emissions. Emissions of CO₂ from cement production represented 63.2 per cent of the total GHG emissions of the sector in 2004. Total GHG emissions from this sector increased by 102.4 per cent between 1990 and 2004, mainly due to an increase in CO₂ emissions from cement production – by 61.9 per cent over the same period.

41. The ERT recognizes Turkey's efforts in preparing its first inventory for the industrial processes sector. However, it believes that the inventory of this sector can be improved, especially by applying the guidance of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance, rather than only the Revised 1996 IPCC Guidelines. The Party should follow the UNFCCC reporting guidelines and provide information on the process technologies used in the plants, the methodologies used for the estimates and references in order to ensure transparency and completeness.

42. Turkey estimates emissions from this sector using AD from the national statistical office, TURKSTAT, and data provided by the Customs Department for estimating emissions of the fluorinated gases. Turkey does not provide any information in its NIR regarding QA/QC and verification procedures. The ERT encourages Turkey to use plant-specific data and data from industrial associations to improve quality, and to use QA/QC procedures for the future improvement of the inventory.

43. Because the notation keys are not appropriately used in the CRF tables and the list of categories provided in the NIR (page 15) is not clearly described, the ERT was not able to determine clearly which sources are present in Turkey's industrial processes. For example, the notation key "IE" is used for nitrogen oxide (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs), while N₂O is reported as "0" in CRF table 2(I) for adipic acid production. Moreover, the notation key "confidential" ("C") is not used in the CRF, although the NIR does mention issues of data confidentiality. The ERT recommends Turkey to use the notation keys appropriately in the CRF rather than leave cells blank or report "0" for many categories.

44. The secretariat's key category analysis shows two key categories in this sector – CO₂ emissions from cement production and N₂O emissions from nitric acid production – while Turkey's key category analysis identifies CO₂ from lime production as a third key category.

B. Key categories

1. Cement production – CO₂

45. The methodology used is tier 2, based on statistical clinker production data and the IPCC default EF (0.51 t/t). However, the cement kiln dust (CKD) correction factor has not been applied. Since CO₂ emissions from this category are the single largest source of emissions in the sector, accounting for more than 80 per cent of total CO₂ emissions for all the reporting years, the ERT encourages Turkey to apply the tier 2 method appropriately by including a CKD correction in the estimates.

2. Nitric acid production – N₂O

46. The methodology used follows IPCC tier 1 and is based on statistical production data and the IPCC default EF (19.0 kg/t), which is the highest among reporting Parties. Since this is the upper limit value for the process, Turkey is recommended to justify the use of this EF by documenting the process in its next submission. As this is a key category, the ERT recommends Turkey to apply the IPCC tier 2 method based on the abatement technology employed.

3. Lime production – CO₂

47. Turkey has used the IPCC default EF (0.91 t/t), which assumes that the lime produced is 100 per cent pure. This will result in an overestimation of emissions if the lime is in fact not of such a high purity. The ERT encourages the Party to develop country-specific EFs based on calcium oxide (CaO) and magnesium oxide (MgO) contents to achieve better estimates.

C. Non-key categories

1. Aluminium production – PFCs

48. There is one aluminium plant in Turkey with an annual production of around 60 kt. However, potential and actual emissions of PFCs from aluminium production are not reported and the notation keys are not used in the CRF tables. The ERT recommends Turkey to estimate these emissions by using at least the tier 1 method in order to be in line with the IPCC good practice guidance.

III. Agriculture

A. Sector overview

49. In 2004, estimated emissions from agriculture in Turkey accounted for 5.1 per cent of total national GHG emissions, or 15,177.82 Gg of CO₂ equivalent. CH₄ emissions from the sector amounted to 15,027.78 Gg of CO₂ equivalent, or 32.5 per cent of total national CH₄ emissions. N₂O emissions amounted to 150.04 Gg of CO₂ equivalent, or 2.7 per cent of total national N₂O emissions. Over the period 1990–2004 emissions from the sector decreased by 17.8 per cent, mainly due to large reductions in populations of cattle and sheep. In 2004, CH₄ emissions accounted for 99.0 per cent of the emissions from the agriculture sector, and N₂O the remaining 1.0 per cent.

50. The ERT noted that this is the first submission by Turkey and welcomes the estimates made for this sector. However, due to the size of the livestock populations in Turkey, some potential key categories are incomplete, in particular N₂O emissions from manure management and agricultural soils. The ERT encourages Turkey to provide estimates from these categories in its next submission, applying

the appropriate default emission factors in tables 4–20 and 4–21 of Volume 3 of the Revised 1996 IPCC Guidelines if no country-specific data are available.

B. Key categories

1. Enteric fermentation – CH₄

51. Turkey estimates CH₄ emissions from this key category using the IPCC tier 1 method and default emission factors for Asia and developing countries. The ERT encourages Turkey to develop a tier 2 method with country-specific data, especially for cattle and sheep populations. For non-key populations such as buffalo, goats, horses and swine, Turkey may continue with the tier 1 approach but should consider whether East European or Asian default EFs are the more appropriate.

C. Non-key categories

1. Manure management – CH₄

52. Turkey provides emission estimates for this non-key category. The ERT recommends that Turkey improve the documentation in its NIR on its selection of emission factors and specify in its next submission whether or not it uses different factors for each climatic region.

2. Field burning of agricultural residues – CH₄ and N₂O

53. Turkey provides emission estimates for this non-key category for both CH₄ and N₂O. The ERT recommends that Turkey check whether or not it has overestimated these emissions by a factor of 1,000. The CRF tables require crop production data in tonnes, while quantities of biomass dry matter to be reported in gigagrams. The ERT recommends that Turkey revise these estimates for its next submission.

IV. Land use, land-use change and forestry

A. Sector overview

54. For LULUCF, Turkey has provided two sets of CRF tables covering the period 1990–2004: one set uses the land-use change and forestry (LUCF) categories of the Revised 1996 IPCC Guidelines and the other uses the categories of the *IPCC Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The latter set was submitted a few days before the centralized review started and was considered by the ERT, even though an updated NIR has not been submitted.

55. In 2004, the LULUCF sector in Turkey represented a net sink of –73,244.6 Gg CO₂ which offsets 30.3 per cent of total CO₂ emissions. Comparing net CO₂ removals by the LULUCF sector in 2004 with those for 2003, the removals show an increase of 11.4 per cent. The time series shows that since 1990 the LULUCF sector has been a net sink throughout the period, increasing by 66.1 per cent from the 1990 value of –44,087.46 Gg CO₂.

56. The ERT noted that the CRF tables contain a great number of blank cells, without the appropriate notation keys, and in some instances the notation keys have not been correctly used. For instance, in CRF table 5, under grassland converted to other land-use categories, the appropriate value of emissions/removals that results from the sum of any grassland converted to other land uses should be reported instead of the notation key “NA”, taking into account that Turkey has reported estimates for carbon stock change under the category grassland converted to forest land (table 5.A).

57. In the NIR, for every land-use category, the reporting of the values (e.g. biomass expansion factors (BEFs) and conversion factors) and methodologies (e.g. stock-change method or gain–loss

method) applied for estimating carbon stock changes is neither clear nor comprehensive, and this made it difficult for the ERT to check the estimates of changes in carbon stocks.

58. Turkey has provided a complete time series only for carbon stock changes, excluding soils, in the categories forest land remaining forest land and land converted to forest land, and for non-CO₂ emissions from biomass burning under forest land. Moreover, the time series for carbon stock changes in the following categories are incomplete: cropland remaining cropland (reported for 1991–2004); grassland remaining grassland and land converted to grassland (reported for 2000–2004); wetlands remaining wetlands (reported for 1992–2002); and settlements remaining settlements (reported for 1991–2000). For non-CO₂ emissions (i.e. CH₄, N₂O, NO_x and CO), Turkey has only provided a complete time series for the forest land remaining forest land category. Non-CO₂ emissions from other land-use categories have not been estimated. The ERT recommends Turkey to estimate and report a complete inventory of the six land-use categories outlined in the IPCC good practice guidance for LULUCF.

59. The ERT noted that for the categories cropland remaining cropland, grassland remaining grassland, wetlands remaining wetlands and settlements remaining settlements, activity data (area) for carbon stock change estimates have not been reported. The ERT encourages Turkey to provide all AD for these categories in its next submission to improve the transparency of its reporting.

60. The ERT recommends that, for the sake of the completeness of the inventory in its future submissions, Turkey provide estimates or an explanation (if they are not estimated) for the following categories: direct N₂O emissions from nitrogen fertilization (CRF table 5(I)); N₂O emissions from drainage of soils (CRF table 5(II)); N₂O emissions from disturbance associated with land-use conversion to cropland (CRF table 5(III)); and CO₂ emissions from lime application (CRF table 5(V)).

B. Key categories

1. Forest land – CO₂

61. Turkey's key category analysis does not include the LULUCF categories. However, in the ERT's opinion, net CO₂ removals from forest land are likely to be a key category. The ERT recommends that Turkey perform a key category analysis including LULUCF, using the methods recommended in the IPCC good practice guidance for LULUCF, and report the results in its future submissions.

62. The ERT noted that the area reported under land converted to forest land in CRF table 5.A for 2004 is lower than the area reported in the NIR (table 7.2.A) for the same variable. According to table 7.2A of the NIR, the correct value should be 41.2 kha (618 kha/15 years) instead of 30.92 kha, as reported in the CRF table 5.A (the 30.92 kha value corresponds to the annual expansion of forest plantation in Turkey according to the Food and Agriculture Organization of the United Nations (FAO) Forest Resources Assessment 2005, table 5.5, page 83). The ERT requests Turkey to reflect the appropriate value in its next submission.

C. Non-key categories

1. Biomass burning – CH₄, NO₂

63. No explanations of the methodology and emission factors used for estimating emissions from biomass burning in the category forest land have been reported. The ERT noted that the values reported in the NIR for N₂O (0.01308 Gg) and CH₄ (0.0013 Gg) emissions are different from the values reported in the CRF for 2004, which are 0.00055 Gg for N₂O and 0.00095 Gg for CH₄. Moreover, AD have not been reported in the CRF tables. The ERT encourages the Party to provide all AD in its next submission to improve transparency.

V. Waste

A. Sector overview

64. In 2004, total emissions from the waste sector contributed 9.3 per cent to total national emissions, compared with 3.8 per cent in 1990. The emission estimates in this sector include emissions from solid waste disposal on land. Emissions from waste-water handling and waste incineration are not estimated.

65. The information contained in CRF table 6.A is not complete in terms of additional information. The ERT encourages Turkey to continue working to improve the completeness and transparency of its reporting and to provide the background data used for estimating emissions (e.g. the composition of landfilled waste, the waste generation rate, etc.).

66. Information on the methodologies and parameters used for estimating emissions from the waste sector is provided very briefly in the NIR. The ERT recommends Turkey to provide more detailed information in its next submission in order to facilitate the review and enhance transparency.

67. Some of the activity data on municipal solid waste disposal at landfills were produced by TURKSTAT based on surveys, and other data were estimated by regression analysis. The ERT recommends Turkey to clarify the approaches that support the use of a regression model for data estimation and to improve the information on the waste management practices in the country for its next submission.

68. Notation keys are not used in CRF tables 6.A, 6.B and 6.C. Turkey should complete blank cells with the correct notation keys and explain the reasons for their use in its next submission.

B. Key categories

1. Solid waste disposal on land – CH₄

69. CH₄ emissions from solid waste disposal on land are a key category in both the level and the trend assessments and amounted to 27,546.11 Gg CO₂ equivalent in 2004. Between 1990 and 2004, emissions from this sector increased by 331.3 per cent. The emission trend and its causes are not explained or documented in the NIR. The ERT encourages Turkey to clarify the reasons for the trend reported.

70. The IPCC tier 1 method and default emission factors have been used to estimate emissions of CH₄ from solid waste disposal on land. Both controlled and uncontrolled landfills are considered in the estimation. Since CH₄ emissions from solid waste disposal on land are a key category, the tier 2 method should be used in accordance with the IPCC good practice guidance. The ERT encourages Turkey to obtain or estimate activity data on current and historical waste disposal that will facilitate the application of the IPCC tier 2 method (first order decay) in the next inventory submission, and to provide information on the composition of landfilled waste.

71. CH₄ emissions from landfilled industrial waste and sludge are not mentioned. The ERT encourages Turkey to look at the possibility of providing this information in its future submissions.

72. The recovery of CH₄ and its subsequent utilization are not considered due to lack of data and are reported as “0” in the CRF tables. The ERT recommends the use of either the notation key “NO” if CH₄ recovery is not occurring in the country or “NE” if recovery is not estimated.

73. In CRF table 6.A, an incorrect value is reported for degradable organic carbon (DOC) degraded. The ERT recommends that Turkey report the quantity of DOC degraded, which can be estimated by the product of the fraction of DOC (%) and activity data, instead of reporting its fraction.

C. Non-key categories

1. Waste-water handling – CH₄ and N₂O

74. CH₄ and N₂O emissions from waste-water handling are not estimated due to lack of data. The ERT recommends that for its next submission Turkey estimate CH₄ emissions by using the IPCC default parameters and N₂O emissions by using the FAOSTAT data on protein consumption.

2. Waste incineration – CO₂

75. CO₂ emissions from waste incineration are not reported since the methodology for waste incineration has not yet been finalized. Turkey is encouraged to use the IPCC default methodology and parameters and to report these emissions in its next submission.

Annex

Documents and information used during the review

A. Reference documents

IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gp/english/>>.

IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>>.

IPCC/OECD/IEA. Revised 1996 IPCC Guidelines for national greenhouse gas inventories, volumes 1–3, 1997. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>>.

UNFCCC. Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories. FCCC/SBSTA/2004/8. Available at <<http://unfccc.int/resource/docs/2004/sbsta/08.pdf>>.

UNFCCC. Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention. FCCC/CP/2002/8. Available at <<http://unfccc.int/resource/docs/cop8/08.pdf>>.

UNFCCC secretariat. Status report for Turkey. 2006. Available at <<http://unfccc.int/resource/docs/2006/asr/tur.pdf>>.

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006 (in preparation).

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Mustafa Sahin (Ministry of Environment and Forestry) including additional material on the methodology and assumptions used.
