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Report of the review of the initial report of Greece

According to decision 13/CMP.1, each Annex I Party with a commitment inscribed in Annex B to the Kyoto Protocol shall submit to the secretariat, prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later, a report (the 'initial report') to facilitate the calculation of the Party's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, and to demonstrate its capacity to account for emissions and the assigned amount. This report reflects the results of the review of the initial report of Greece conducted by an expert review team in accordance with Article 8 of the Kyoto Protocol.

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I. Introduction and summary

A. Introduction

1. This report covers the in-country review of the initial report of Greece, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The review took place from 23 to 28 April 2007 in Athens, Greece, and was conducted by the following team of nominated experts from the roster of experts: generalist – Mr. Paul Filliger (Switzerland); energy – Mr. Matej Gasperič (Slovenia); industrial processes – Mr. Teemu Oinonen (Finland); agriculture – Mr. Erda Lin (China); land use, land-use change and forestry (LULUCF) – Mr. Héctor D. Ginzo (Argentina); waste – Mr. Jose Ramon T. Villarin (Philippines). Mr. Teemu Oinonen and Mr. Jose Ramon T. Villarin were the lead reviewers. In addition the expert review team (ERT) reviewed the national system, the national registry, and the calculations of Greece's assigned amount and commitment period reserve (CPR), and took note of the LULUCF parameters and the elected Article 3, paragraph 4 activities. The review was coordinated by Ms. Keryn Oude-Egberink and Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1), a draft version of this report was communicated to the Government of Greece, which provided comments that were considered and incorporated in this final version of the report as appropriate. Also, in accordance with these guidelines, the ERT officially notified the Government of Greece of the recommended adjustments to its 2006 greenhouse gas (GHG) inventory in accordance with the guidance for adjustments under Article 5, paragraph 2 of the Kyoto Protocol. The Government of Greece failed to notify the secretariat of its intention to accept or reject the recommended adjustments within the time frame set out in these guidelines. In accordance with these guidelines, this failure was considered as acceptance by Greece of the adjustments, and the ERT applied the calculated adjustments for the purpose of compilation and accounting of the GHG inventory and the assigned amount.

B. Summary

1. Timeliness

3. Decision 13/CMP.1 requests Parties to submit their initial report prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later. The initial report of Greece was submitted on 29 December 2006, which is in compliance with decision 13/CMP.1. In its initial report Greece refers to its 2006 GHG inventory submission of 16 April 2006.

2. Completeness

4. Table 1 below provides information on the mandatory elements that have been included in the initial report. The ERT noted that the initial report generally covered the elements required by decision 13/CMP.1, section I of decision 15/CMP.1, and relevant decisions of the Conference of the Parties and the Conference of the Parties serving as the Meeting of the Parties (CMP). Since the ERT applied the calculated adjustments in the energy sector for energy industries (1.A.1), manufacturing industries and construction (1.A.2), road transportation (1.A.3) and other sectors (1.A.4), the table also reflects the adjusted values as appropriate. Further details on the adjustments are given in section II.C below and annex III to this report.

5. The adjusted estimate of emissions from the energy sector in the base year amounts to 77,695.731 Gg carbon dioxide (CO_2) eq., compared to the 81,762.634 Gg CO_2 eq. originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustments leads to a decrease in

estimated total base year emissions under the Kyoto Protocol by 3.7 per cent (4,066.903 Gg CO_2), from 111,054.072 Gg CO_2 eq. as reported by Greece in the 2006 inventory submission to 106,987.169 Gg CO_2 eq. as calculated by the ERT.

Table 1. Summary of the reporting on mandatory elements in the initial report

Item	Provided	Value/year/comment
Complete GHG inventory from the base year (1990/1995) to the most recent year available (2004)	Yes	Base year: 1990
Base year for HFCs, PFCs and SF_6	Yes	1995
Agreement under Article 4	Yes	125%
LULUCF parameters	Yes	Minimum tree crown cover: 25% Minimum land area: 0.3 ha Minimum tree height: 2 m
Election of and accounting period for Article 3, paragraphs 3 and 4, activities	Yes	Information on election of activities under Article 3, paragraph 4 was not provided in the initial report (see paragraphs 9 and 12). During and after the in-country review, Greece elected forest management under Article 3, paragraph 4 of the Kyoto Protocol, and commitment period accounting
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8	Yes	694 087 947 tonnes CO_2 eq.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, adjusted estimate	–	ERT's calculation of the assigned amount is 668,669,806 tonnes CO_2 eq.
Calculation of the commitment period reserve	Yes	624 679 152 tonnes CO_2 eq.
Calculation of the commitment period reserve, adjusted estimate	–	ERT's calculation of the commitment period reserve is 601,802,826 tonnes CO_2 eq.
Description of national system in accordance with the guidelines for national systems under Article 5, paragraph 1	Partially	The ERT considers that the information provided in the initial report is not complete and sufficient to describe the institutional and procedural arrangements required to maintain Greece's national system, as described in the initial report (see section II.A).
Description of national registry in accordance with the requirements contained in the annex to decision 13/CMP.1, the annex to decision 5/CMP.1 and the technical standards for data exchange between registry systems adopted by the CMP	Yes	

6. In the initial report Greece does not provide information on some of the mandatory elements of the national system (e.g. the institutional and procedural arrangements required to maintain the national system) in line with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1) (hereafter referred to as to the guidelines for national systems under Article 5, paragraph 1) and the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (decision 15/CMP.1) (hereafter referred to as the Article 7 guidelines).

7. The ERT concluded, as a result of the in-country review and the additional information received from Greece during and following the review, that the national system of Greece does not fully meet the guidelines for national systems under Article 5, paragraph 1 and the Article 7 guidelines. The ERT therefore considers the maintenance of the institutional and procedural arrangements; the arrangements for the technical competence of the staff; and the capacity for timely performance of Greece's national system as an unresolved problem, and therefore lists it as a question of implementation. A detailed discussion of the completeness of the national system is provided in section II.A of this report.

8. In addition, the initial report for Greece does not identify its election and accounting of activities under Article 3, paragraph 4 of the Kyoto Protocol. During the review the ERT requested that Greece identify the election and accounting of these activities. Based on the information provided by Greece during and following the review, the ERT concluded that the parameters selected by Greece, including the definitions, elections, and its accounting for LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, are generally prepared in accordance with decision 16/CMP.1. This includes the

election of forest management as an activity under Article 3, paragraph 4 and accounting activities under Article 3, paragraph 3 and paragraph 4 for the entire commitment period. A detailed discussion of the LULUCF parameters and election of activities is provided in section G of this report.

9. In accordance with decision 16/CMP.1, national inventory systems under Article 5, paragraph 1, shall also ensure that areas of land subject to LULUCF activities under Article 3, paragraphs 3 and 4, are identifiable. The initial report does not include information on the capacity of Greece's national system to ensure that such land areas are identifiable.

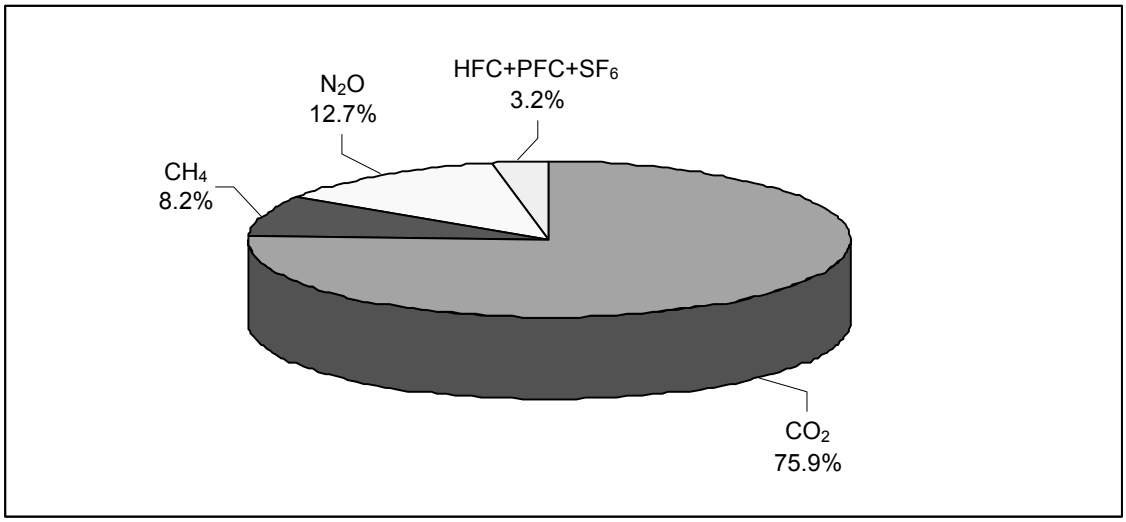
3. Transparency

10. The ERT noted that the information on the mandatory elements in the initial report is generally transparent. However, during the review the ERT identified that the future maintenance of the national system was unclear. A detailed discussion of the transparency of the national system is provided in section II.A of this report. The ERT also raised a number of transparency issues related to the 2006 inventory. A detailed discussion is provided in section II.B.

4. Emission profile in the base year, trends and emission reduction target

11. In the base year under the Kyoto Protocol (1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6), the most important GHG in Greece was CO_2, contributing 75.9 per cent to total[1] national GHG emissions expressed in CO_2 eq.,[2] followed by nitrous oxide (N_2O), 12.7 per cent, and methane (CH_4), 8.2 per cent (see figure 1). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) taken together contributed 3.2 per cent of the overall GHG emissions in the base year. The energy sector accounted for 73.6 per cent of the total GHG emissions in the base year, followed by agriculture (12.2 per cent), industrial processes (10.0 per cent), waste (4.0 per cent) and solvent and other product use (0.2 per cent) (see figure 2). Total national GHG emissions amounted to 111,054.07 Gg CO_2 eq. and increased by 23.9 per cent between the base year and 2004.

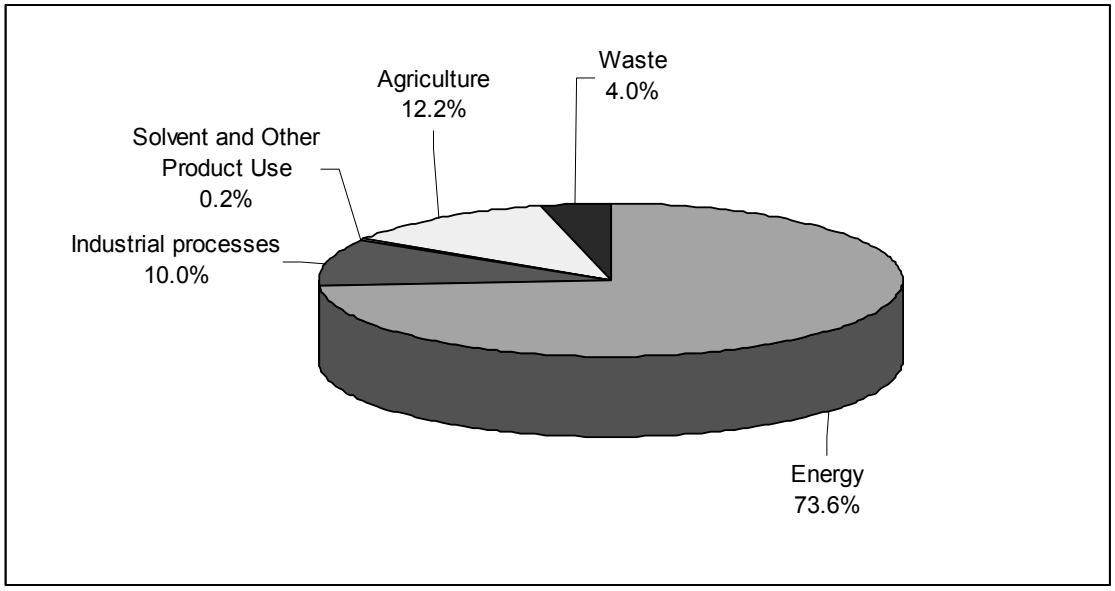
Figure 1. Shares of gases in total GHG emissions, base year



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

[2] The adjusted estimates of the GHG inventory for the base year are not reflected in the values presented in this report, unless otherwise specified. The adjusted estimate of the total national emissions in the base year is 106,987.17 Gg CO_2 eq.

Figure 2. Shares of sectors in total GHG emissions, base year



12. Greece's quantified emission reduction commitment is 92 per cent as included in Annex B to the Kyoto Protocol. As Greece is part of the European Community, whose member States will meet their reduction commitment jointly in accordance with Article 4 of the Kyoto Protocol, Greece's quantified emission limitation commitment is 125 per cent. Greece's assigned amount is calculated based on the Party's Article 4 commitment. Tables 2 and 3 show the greenhouse gas emissions by gas and by sector, respectively.

Table 2. Greenhouse gas emissions by gas, 1990–2004

GHG emissions (without LULUCF)	Gg CO_2 eq.								Change
	Base year[a] (Kyoto Protocol)	1990	1995	2000	2001	2002	2003	2004	BY (Kyoto Protocol) to 2004 (%)
CO_2	84 313.57	84 313.57	87 426.12	103 962.81	106 209.85	105 905.19	109 914.39	110 280.16	30.8
CH_4	9 119.50	9 119.50	9 187.65	8 950.41	8 562.50	8 552.84	8 477.26	8 412.02	–7.8
N_2O	14 113.45	14 113.45	13 073.31	13 408.34	13 217.32	13 168.92	13 251.66	13 155.22	–6.8
HFCs	3 421.01	935.06	3 421.01	5 282.43	5 203.33	5 297.55	5 558.78	5 709.43	66.9
PFCs	82.97	257.62	82.97	148.38	91.38	88.33	77.30	71.71	–13.6
SF_6	3.59	3.07	3.59	3.99	4.06	4.25	4.25	4.47	24.7

Note: BY = Base year; LULUCF = Land use land-use change and forestry.
[a] The adjusted estimates of the base year are not reflected in this table. The adjusted estimate of the total national emissions in the base year is 106,987.17 Gg CO_2 eq.

Table 3. Greenhouse gas emissions by sector, 1990–2004

Sectors	Gg CO_2 eq.								Change
	Base year[a] (Kyoto Protocol)	1990	1995	2000	2001	2002	2003	2004	BY (Kyoto Protocol) to 2004 (%)
Energy	81 762.63	81 762.63	84 570.34	101 508.11	103 791.84	103 726.47	107 820.03	108 135.69	32.3
Industrial processes	11 157.39	8 845.58	11 549.86	13 801.99	13 715.32	13 664.52	13 942.41	14 142.91	26.8
Solvent and other product use	169.71	169.71	154.65	157.33	154.67	155.12	155.50	155.87	–8.2
Agriculture	13 519.23	13 519.23	12 486.24	12 357.76	12 144.28	12 079.00	11 998.61	11 936.71	–11.7
LULUCF	NA	–3 193.27	–4 368.69	–2 958.93	–5 298.43	–5 456.21	–5 528.53	–5 402.32	NA
Waste	4 445.10	4 445.10	4 433.54	3 931.16	3 482.32	3 391.97	3 367.09	3 261.83	–26.6
Other	NO	NO	NO	NO	NO	NO	NO	NO	NA
Total (with LULUCF)	NA	105 548.99	108 825.94	128 797.42	127 990.00	127 560.88	131 755.11	132 230.70	NA
Total (without LULUCF)	111 054.07	108 742.26	113 194.63	131 756.36	133 288.43	133 017.08	137 283.64	137 633.02	23.9

Note: BY = Base year; LULUCF = Land use, land-use change and forestry; NO = Not occurring; NA = Not applicable.
[a] The adjusted estimates of the base year are not reflected in this table. The adjusted estimate of the total national emissions in the base year is 106,987.17 Gg CO_2 eq.

II. Technical assessment of the elements reviewed

A. National system for the estimation of anthropogenic GHG emissions by sources and sinks

13. The national system of Greece is generally prepared in accordance with the guidelines for national systems under Article 5, paragraph 1 (decision 19/CMP.1). The initial report describes the national system as it was until 2006.

14. Table 4 shows which of the specific functions of the national system are included and described in the initial report.

Table 4. Summary of reporting on the elements of the national system

Reporting element	Provided	Comments
Inventory planning		
Designated single national entity*	Yes	See section II.A.1
Defined/allocated specific responsibilities for inventory development process*	Partially	See section II.A.1
Established process for approving the inventory*	Yes	See section II.A.1
Quality assurance/quality control plan*	Yes	See section II.A.2
Ways to improve inventory quality	Yes	See section II.B.3
Inventory preparation		
Key category analysis*	Yes	See section II.B.1
Estimates prepared in line with IPCC guidelines and IPCC good practice guidance*	Yes	See section II.B.2
Sufficient activity data and emission factors collected to support methodology*	No	See section II.B
Quantitative uncertainty analysis*	Yes	See section II.B.2
Recalculations*	Yes	See section II.B.2
General QC (tier 1) procedures implemented*	Yes	See section II.A.2
Source/sink category-specific QC (tier 2) procedures implemented	No	See section II.A.2
Basic review by experts not involved in inventory	No	See section II.A.2
Extensive review for key categories	No	See section II.A.2
Periodic internal review of inventory preparation	Yes	See section II.A.2
Inventory management		
Archive inventory information*	Yes	See section II.A.3
Archive at single location	Yes	See section II.A.3
Provide ERT with access to archived information*	Yes	See section II.A.3
Respond to requests for clarifying inventory information during review process*	Yes	See section II.A.1

* Mandatory elements of the national system.

1. Institutional, legal and procedural arrangements

15. According to the guidelines for national systems under Article 5, paragraph 1 (decision 19/CMP.1) of the Kyoto Protocol, each Party included in Annex 1 shall establish and maintain the institutional, legal and procedural arrangements necessary to perform the functions defined in the guidelines for national systems.

16. During the in-country review the ERT was informed that in Greece, the Ministry for the Environment, Physical Planning and Public Works is the designated single national entity with overall responsibility for the national GHG inventory. The Ministry is responsible for the coordination of all supporting ministries and any relevant public or private organization, relating to the implementation of

the provisions of the Kyoto Protocol, according to Law no. 3017/2002, by which Greece ratified the Kyoto Protocol.

17. Starting in 2007, the Ministry will also have the technical responsibility for the preparation of the inventory. The technical responsibility for inventory preparation was delegated on a contract basis, ending in 2007, to the National Observatory of Athens (NOA). Other organizations (e.g. the Ministry of Development, the Ministry of Rural Development and Food, the Ministry of Transport and Communications, the National Statistical Service of Greece (NSSG), the Civil Aviation Organisation (CAO), the Public Power Corporation (PPC) and individual industrial installations) are also involved in the preparation of the inventory as data providers. In Greece there is an established process for the official consideration and approval of the inventory prior to its submission and for responding to any issues raised by the inventory review. Official consideration of the inventory is overseen by a three-member committee, consisting of representatives of the Ministry for the Environment, Physical Planning and Public Works (Industry Department, Emissions Trading Office, and the Air Pollution Department).

18. During the in-country review, and after being informed by Greece that the contract with the NOA ends in 2007, the ERT requested Greece to provide the required additional information to determine whether the national system has the capacity to fulfil the mandatory functions set out in the guidelines for national systems, under Article 5, paragraph 1, and the Article 7 guidelines. This includes information on the roles and responsibilities of various agencies and entities in relation to the inventory development process, as well as the institutional, legal and procedural arrangements made to prepare the inventory. The ERT also requested that Greece detail the nature of the institutional and procedural arrangements to demonstrate the continuity of the inventory preparation process. The ERT further requested that Greece describe how it will manage the transfer of the knowledge from the NOA to the next organization for the technical preparation of the national inventory. The ERT requested a meeting with the designated personnel to whom the technical responsibility for inventory preparation had been transferred, but no such meeting took place.

19. During the in-country review Greece provided additional documentation on the national system. This information broadly addressed the national system as it was at the time when the 2006 inventory submission was prepared, but did not fully address the questions raised by the ERT, in particular the maintenance of the technical capacity to support the development of the national inventory.

20. Following the in-country review, Greece provided additional information in response to the ERT's identification of potential problems on the national system. It reiterated to the ERT that the Ministry for the Environment, Physical Planning and Public Works has always had the responsibility for the national inventory and the national system, according to Law no. 3017/2002. Greece advised that at the end of the contact with the NOA, the technical responsibility for the inventory preparation process will be transferred to the Division of Atmospheric Pollution Control, within the Ministry for the Environment, Physical Planning and Public Works.

21. While Greece also provided information on the organizational structure in place to support the maintenance of the national system, it did not provide information on the maintenance of the institutional and procedural arrangements, the technical competence of the staff involved in the inventory development process, and its capacity for timely performance associated with the functions of its national system. For example, Greece did not provide information on the technical capacity and the process for the transfer of knowledge between the NOA and the Ministry for the Environment, Physical Planning and Public Works. Greece informed the ERT that it was in a transitional period for the inventory preparation. After this period elapses, the Greek authorities would be able to provide the required information to the UNFCCC secretariat.

22. After the in-country review, the ERT concluded that the information contained in the initial report and the additional information received by the ERT were insufficient to confirm that Greece

complies fully with the guidelines for national systems under Article 5, paragraph 1 and the Article 7 guidelines. In particular, the ERT could not confirm the maintenance of the institutional and procedural arrangements, the technical competence of the staff involved in the inventory development process, and its capacity for timely performance associated with the functions of its national system. Also the additional information on the organizational structure provided to the ERT did not provide sufficient detail to adequately address the above issues.

23. The ERT therefore concluded that the national system of Greece is not fully compliant with the guidelines for national systems under Article 5, paragraph 1 of the Kyoto Protocol. The ERT concluded that the maintenance of the institutional and procedural arrangements; the arrangements for the technical competence of the staff; and the capacity for timely performance of Greece's national system is an unresolved problem, and therefore lists it as a question of implementation.

2. Quality assurance/quality control

24. Greece has elaborated a quality assurance/quality control (QA/QC) plan in accordance 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). The QA/QC system of Greece is based on International Organization for Standardization (ISO) Standard 9001:2000. It includes procedures on general quality management, quality control, the archiving of inventory information, quality assurance, the estimation of uncertainties and inventory improvement. Source and sink category-specific procedures (tier 2) for key categories. and for individual categories in which significant methodological and/or data revisions have occurred, have not yet been developed. The implementation of the QA/QC plan is under way but not well advanced. The ERT recommends Greece to focus on the implementation of the QA/QC plan, particularly by sector, as well as the implementation of tier 2 procedures in its next national inventory report (NIR).

25. A periodic internal review (reliability check) was done by technical staff within the NOA during the preparation of the inventory. After a draft of the NIR and the common reporting format (CRF) tables were produced by the NOA, and submitted to the Ministry for the Environment, Physical Planning and Public Works, cross-consultation was undertaken with the relevant ministries. No domestic review however was undertaken by independent experts. The ERT recommends Greece to improve its QA by carrying out a review of the inventory by independent national experts for its next inventory submission.

3. Inventory management

26. Greece has a centralized archiving system. The files are archived by the NOA. The archiving system is mainly based on EXCEL worksheets. For the 2006 inventory, the NOA created two master files containing all relevant information which were handed over to the Ministry for the Environment, Physical Planning and Public Works. The ERT encourages Greece to develop a more sophisticated archiving system, for example, by using a relational database for the central archiving of all data, and provide information on this in its next report under the Kyoto Protocol.

B. Greenhouse gas inventory

27. In conjunction with its initial report submission, Greece submitted a complete set of CRF tables for the years 1990–2004 and an NIR. Where needed the ERT also used previous years' submissions, including the 2003 submission. During the review, Greece provided the ERT with additional information sources. These documents are not part of the initial report submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

1. Key categories

28. Greece has reported a key category tier 1 analysis, both level and trend assessment for 2004, as part of its 2006 inventory submission. It has included the LULUCF sector in its key category analysis. Greece has not provided a key category analysis for 1990.

29. The level assessments of the key category analyses performed for 2004 by Greece and the secretariat[3] (both including the LULUCF sector) produced similar results. The trend assessments of the key category analyses performed by Greece and the secretariat for 2004 produced different results. The differences are explained by the selection of the starting year for the trend analysis. The secretariat selected 1990 as the starting year for the trend analysis for all sources. Greece has selected 1995 as its base year for HFCs, PFCs and SF_6, which is in line with the elections in the initial report, but not completely in line with the IPCC good practice guidance. The key category analysis undertaken by Greece is used to prioritize the development of the inventory. The ERT recommends Greece to include in the next submission a key category analysis for 1990 and if possible to develop a tier 2 key category analysis.

2. Cross-cutting topics

30. The 2006 GHG inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), 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). The ERT identified several cases where the methods, activity data (AD) and emission factors (EFs) used are not fully in line with the guidance indicated above. The ERT identified overestimations in the base year associated with the estimation of emissions from the energy sector. Underestimations were identified in the industrial processes, waste and energy sectors. These cases are discussed in the sectoral sections of the report. The ERT notified Greece on these problems and requested Greece to provide supporting and additional information or revised estimates in line with the ERT's recommendations. Greece responded by providing further information, but did not submit any revised estimates.

31. The ERT reviewed the additional information provided by Greece and concluded that it did not satisfactorily address the ERT's recommendations and therefore calculated and recommended six adjustments to the estimates of GHG emissions for the energy sector. These six adjustment calculations were prepared in consultation with Greece according to the guidance for adjustments under Article 5, paragraph 2 of the Kyoto Protocol (decision 20/CMP.1). The ERT officially notified Greece of these adjustments, in conjunction with the submission of the draft review report (see paragraph 2). In its response Greece failed to notify the secretariat of its intention to accept or reject the recommended adjustments within the time frame set out in the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). Therefore in accordance with these guidelines, this failure was considered as acceptance by Greece of the adjustments, and the ERT applied the calculated adjustments to the emission estimates of the energy sector. A detailed discussion of the adjustments applied by the ERT is provided in section II.C below and in annex III.

[3] 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 Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for the base year or base year period as well as the latest inventory year. Key categories according to the tier 1 trend assessment were also identified. 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.

Completeness

32. Greece submitted a complete set of CRF tables for the years 1990–2004 and an NIR. In the CRF tables, Greece has included data on all relevant gases, sectors and categories. The inventory is complete in terms of geographic coverage. For the period 1990–2004, the coverage of years, sectors, categories and gases is generally complete. However, some categories are missing, for example, in the industrial processes sector, the fluorinated gases (F-gases) (HFCs, PFCs, SF_6) from fire extinguishers, foam blowing and aerosols, and, in the energy sector, CH_4 from other leakages at industrial plants and power stations in the residential and commercial sectors.

33. The CRF tables are completely filled in, but for many categories the notation key "not estimated" ("NE") is used, for example, consumption of halocarbons and SF_6 (2.F) – HFCs, PFCs and SF_6. The ERT recommends that Greece prepare and report estimates for categories that are currently not estimated, and report these in its future inventory submissions. This will help to avoid problems with reviews during the commitment period.

Transparency

34. The CRF tables and the NIR are generally transparent. The NIR is well structured and broadly follows the 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" (hereinafter referred to as the UNFCCC reporting guidelines). However, some additional information could improve the transparency of the NIR. For example, it is recommended that Greece in its next NIR: provide more detailed information about AD, EFs and selected methods for the key categories; improve its documentation of expert judgements by recording them in a standardized form; and improve the references to literature sources. The ERT also recommends Greece to include more information on the key categories in its next NIR. This is of particular importance for those categories where adjustments to the 2006 GHG emission estimates are recommended.

Consistency

35. The ERT concluded that Greece's inventory is broadly in accordance with the UNFCCC reporting guidelines and the IPCC good practice guidance. Although time-series consistency has been improved significantly by using relevant activity data and emission factors, the ERT did find some problems of consistency which are discussed in the sectoral discussion in this report (see e.g. energy – civil aviation, and industrial processes – cement production).

Comparability

36. Greece's inventory is comparable with the inventories of other Annex I Parties. The UNFCCC reporting guidelines have been followed and the allocation of the source and sink categories follows the requirements in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

Accuracy

37. In most of the categories of emissions and removals, Greece's inventory is accurate in that it does not systematically either under- or overestimate emissions or removals. However, during the review, the ERT identified some categories where emissions had been potentially overestimated or underestimated in the base year. The overestimations in the base year were identified by the ERT for the following categories: public electricity and heat production (1.A.1(a)) – CO_2 emissions from the consumption of solid fuels (lignite); energy industries and manufacturing industries and construction (1.A.1 and 1.A.2) – N_2O emissions from the combustion of solid and liquid fuels; chemicals (1.A.2(c)) – CO_2 emissions from the consumption of solid fuels (lignite) for ammonia production; civil aviation (1.A.3(a)) – CO_2, CH_4 and N_2O emissions from fuel combustion; road transportation (1.A.3(b)) – CO_2

emissions from combustion of lubricants; and residential (1.A.4(b)) – CH_4 and N_2O emissions from biomass consumption.

38. Underestimations in the base year were identified by the ERT for the following categories: other sectors (1.A.4) – CO_2, CH_4 and N_2O; chemicals (1.A.2(c)) – CH_4 and N_2O; railways (1.A.3(c)) – CH_4 and N_2O; coal mining and handling – surface mines – mining and post-mining activities (1.B.1(a)ii) – CO_2; natural gas – production/processing (1.B.2(b)ii); – CH_4; natural gas – other leakage (1.B.2(b)v) – CH_4; consumption of halocarbons and SF_6 (2.F) – HFCs, PFCs, SF_6; and solid waste disposal on land (6.A) – CH_4. The ERT also identified some issues of feedstock fuel allocation between the energy and industrial processes sectors.

39. In accordance with the guidelines for inventory review under Article 8 of the Kyoto Protocol (22/CMP.1) the ERT requested Greece to submit to the ERT, through the UNFCCC secretariat, additional supporting information or revised estimates on the above categories (focusing on the base year and 2004) to address the potential problems identified by the ERT. The ERT also requested Greece to prepare the revised calculation of the assigned amount and the commitment period reserve reflecting these revisions.

40. Following the in-country review Greece provided additional information on the potential problems identified by the ERT. However, it did not provide revised estimates for the categories mentioned above and a revised calculation of the assigned amount and the commitment period reserve. The ERT concluded that Greece has not adequately corrected the problems by providing acceptable revised estimates and therefore calculated and applied adjustments for the categories where overestimations in the base year were identified (see paragraph 31). A detailed discussion of the adjustments applied by the ERT is provided in section II.C.

Recalculations

41. Recalculations are performed by Greece as a result of methodological changes or refinements, updates and revision of activity data, changes of allocation to different sectors, and the inclusion of sources that were not addressed previously. Many recalculations are reported in the 2006 inventory submission that relate to practically all sectors. The reasons for the recalculations include: the use of a tier 2 methodology for solid waste disposal on land; the exclusion of CO_2 emissions from biogas flaring from this source; and the inclusion of HFC emissions from commercial refrigeration, which have been estimated for the first time.

42. The recalculations have resulted in improvements to the inventory. The total effect of the recalculations is a decrease in the estimates of emissions of 0.3 per cent in 2003 and of 0.6 per cent in 1990. Information is provided by Greece in the NIR and CRF table 8(b) on the basis for the recalculations.

Uncertainties

43. Greece in its 2006 inventory submission has provided for the first time a tier 1 uncertainty analysis following the IPCC good practice guidance. Uncertainty estimates are available for all categories. Uncertainty values for AD and EFs are taken from the IPCC good practice guidance and from national expert judgement. Uncertainty estimates have been calculated for total emissions with and without LULUCF and for the different gases. However, the rationale provided by Greece for the selection of the uncertainty levels for the different categories is not well explained in the NIR. Greece is using the results of uncertainty analysis to prioritize improvements in the inventory. The ERT recommends Greece to include information on the rationale for the selection of uncertainty values in each sectoral chapter in its NIR and to develop, if possible, a tier 2 uncertainty analysis.

3. Areas for further improvement identified by the Party

44. Greece identifies in the NIR several areas for improvement. It plans to implement improvements to the centralized archiving of information; procedures for the evaluation and the consideration of the verified reports submitted by Greek installations under the European Union (EU) emissions trading scheme; revision of the national energy balance; enhancing the completeness of the inventory; and the use of higher-tier methods for some key categories (e.g. a tier 2 methodology for the estimation of methane emissions from the enteric fermentation of cattle). Greece has also indicated to the ERT that it is working to improve its estimates on land-use areas and areas included in land-use conversions. Here, Greece intends to implement a land measuring system equivalent to a tier 2 approach as described in the IPCC good practice guidance for LULUCF.

4. Areas for further improvement identified by the ERT

45. The ERT identified the following areas for improvement. Greece should:

(a) Address all the issues that led to adjustment calculations during the initial review (see the discussion on the energy sector in section II.B);

(b) Improve the accuracy of the estimates of key categories in the energy sector. For instance, collect information on combustion technologies and implement a tier 2 method for estimating N2O emissions from the combustion of solid and liquid fuels from the categories of energy industries (1.A.1) and manufacturing industries and construction (1.A.2);

(c) Improve the transparency of the estimates by providing more precise and detailed descriptions and documentation of methods, activity data, emission factors, for all the key categories in its NIR;

(d) Ensure that the national system of Greece fully meets the guidelines for national systems under Article 5, paragraph 1 and the Article 7 guidelines with respect to the functions of Greece's national system, including the maintenance of the institutional and procedural arrangements; the arrangements for the technical competence of the staff involved in the inventory development process; and the capacity for timely performance;

(e) Further develop QA/QC system and subsequently implement QA/QC procedures in the inventory preparation, particularly by carrying out a domestic review of the inventory by independent national experts;

(f) Include more information on QC activities in each sectoral chapter of its next NIR;

(g) Use tier 2 methods for key categories in accordance with the IPCC good practice guidance, in particular for key categories under LULUCF, for example, for the estimation of CO2 emissions from forest land remaining forest land (5.A.1) and cropland remaining cropland (5.B.1);

(h) Include information on the rationale for the selection of uncertainty levels in each sectoral chapter of its next NIR;

(i) Prepare and report estimates for categories currently not estimated, for example, subcategories of consumption of halocarbons and SF6. The ERT also recommends Greece to establish a data collection scheme that allows the reporting of potential emissions of F-gases.

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

5. Energy

Sector overview

47. In the base year under the Kyoto Protocol, the energy sector in Greece accounted for 73.6 per cent of total national GHG emissions. Fuel combustion contributed 72.5 per cent to total national emissions in the base year. Emissions from the energy sector increased by 32.3 per cent between 1990 and 2004, and by 0.3 per cent between 2003 and 2004. The most important source categories in the base year in the sector were energy industries and transport, contributing 55.9 and 19.4 per cent, respectively, to total sectoral emissions.

48. The NIR and the CRF tables provide estimates for all gases from 1990 to 2004, and are generally complete.

49. The overall transparency of the NIR is satisfactory. However, the ERT identified a number of transparency issues relating to six adjustments in the energy sector. Greece uses the COPERT III model for estimating GHG emissions from road transportation. Almost all the relevant input parameters are available in the NIR together with very detailed information on the vehicle fleet. Information is not, however, available on the length of trip (ltrip) parameter or on the assumptions made with regard to vehicle fleet and mileage for liquefied petroleum gas (LPG)-fuelled passenger cars. The ERT recommends Greece to document these assumptions in its next NIR. A detailed discussion of the adjustments is provided in section II.C.

50. In addition, information on technology type for stationary sources is not provided in the NIR. However, Greece uses the CORINAIR methodology for the N_2O emission estimates for these categories. There is also no information in the NIR on the allocation of the consumption of lubricants in road transportation (1.A.3(b)) or the assumptions applied to determine the allocation of aviation fuel used for domestic flights. Furthermore, the ERT found in the NIR an inconsistency in the AD for biomass consumption reported for the energy and LULUCF sectors. The ERT recommends that Greece in its next inventory submission further improve its documentation on methodological choices and the rationale for them, its choice of activity data and the sources and references used for estimating emissions.

51. The 2006 GHG inventory submission is complete in terms of geographical coverage. The NIR and the CRF tables contain estimates of emissions for all direct and indirect GHG emissions from fuel combustion. Emissions from fuel combustion from some minor categories are, however, missing, for example, CH_4 and N_2O emissions from gaseous fuel consumption in chemicals (1.A.2(c)) and CH_4 and N_2O emissions from solid fuel use in railways (1.A.3(c)). The ERT recommends that Greece account for the emissions from these minor sources in its future submissions.

52. Greece's key category analysis is consistent with the assessment conducted by the secretariat. Greece identified 10 key categories: CO_2 from stationary combustion from solid, liquid and gaseous fuels (1.A.1), civil aviation (1.A.3(a)), road transportation (1.A.3(b)) and navigation (1.A.3(d)); N_2O emissions from stationary combustion of solid fuels (1.A.1) and from road transportation (1.A.3(b)); and CH_4 emissions from coal mining and handling – surface mines – mining and post-mining activities (1.B.1(a)ii).

53. Time-series consistency has been improved significantly by using relevant activity data and emission factors received from comprehensive industry questionnaires from the EU ETS allocation plan of Greece. The ERT commends Greece for this improvement and encourages Greece to use verified reports from installations under the EU ETS as an additional quality control check for its future submissions to determine country-specific net calorific values (NCVs) and CO_2 EFs for heavy fuel oil and diesel oil.

54. CH_4 fugitive emissions from oil and natural gas have been estimated for the first time using the IPCC tier 1 methodology. This resulted in an increase in the estimates of overall CH_4 fugitive emissions by 4.6 per cent in 1990, and a decrease in the estimates for 2003, by 26.5 per cent. CO_2 and N_2O emissions have been calculated for the first time.

55. During the in-country review, the ERT identified some categories where methods, AD or EFs used were not fully transparent and in accordance with the IPCC good practice guidance and led to possible overestimation of emissions in the base year. The overestimations in the base year concern public electricity and heat production (1.A.1(a)) – the CO_2 emission factor for lignite; energy industries (1.A.1), and manufacturing industries and construction (1.A.2) – the N_2O EF for solid and liquid fuels; chemicals (1.A.2(c)) – CO_2 emissions from ammonia production; civil aviation (1.A.3(a)) – CO_2, CH_4 and N_2O emissions; road transportation (1.A.3(b)) – CO_2 emissions from combustion of lubricants; and residential (1.A.4(b)) – CH_4 and N_2O emissions from biomass consumption.

56. Underestimations in the base year were also identified by the ERT for: other sectors (1.A.4) – CO_2 CH_4 and N_2O; chemicals (1.A.2(c)) – CH_4 and N_2O; railways (1.A.3(c)) – CH_4 and N_2O; coal mining and handling – surface mines – mining and post-mining activities (1.B.1(a)ii) – CO_2; natural gas – production/processing (1.B.2(b)ii) – CH_4; natural gas – other leakage (1.B.2(b)v) – CH_4; consumption of halocarbons and SF_6 (2.F) – HFCs, SF_6; and solid waste disposal on land (6.A) – CH_4.

57. Since Greece did not provide the revised estimates or satisfactory additional information as requested by the ERT, the ERT decided to calculate and apply adjustments to the energy sector to the categories indicated where it had identified overestimations (see paragraph 31). The total adjusted estimate for the energy sector in the base year amounts to 77,695.731 Gg CO_2 eq., compared to the 81,762.634 Gg, CO_2 eq. reported by Greece in its 2006 GHG inventory submission. The total effect of the adjustments was a 3.7 per cent decrease (4,066.903 Gg CO_2 eq.) in estimated total base year emissions. A detailed discussion of the adjustments is provided in section II.C below.

Reference and sectoral approaches

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

58. Greece has applied both the reference approach and the sectoral approach calculations for CO_2 emissions from fuel combustion for the entire time series. For 1990, Greece reports a difference (–0.45 per cent) between the two approaches, mainly due to statistical differences for liquid and gaseous fuels consumption. The ERT is of the opinion that an additional reason for the difference could be the way in which non-energy fuel use (especially natural gas) is treated for the estimations. The ERT therefore recommends that Greece investigate this difference and provide information on it in its future submissions.

International bunker fuels

59. According to the NIR, the allocation of fuel consumption between domestic and international transport is based on data contained in the national energy balance, while the allocation of aircraft landings and take-offs (LTOs) between domestic and international aviation is based on data from the CAO. Greece estimates GHG emissions from international aviation using the IPCC tier 2a methodology and default EFs for CO_2, and tier 2a EFs for N_2O and CH_4 emissions, while for international navigation the CORINAIR methodology and corresponding EFs are used. Inconsistencies between the time series of LTOs and energy consumption are acknowledged by Greece in the NIR.

60. The ERT recommends Greece to obtain information on the structure of the air fleet operating on domestic and international flights, to provide background documentation on how aviation fuel is allocated to international flights in order to explain/justify the discrepancies, and to revise the emissions estimation on this basis. If this cannot be done, the ERT recommends that Greece determine whether the

amount of fuel in 2004 or latest years corresponds to the number of domestic flights, revise the GHG estimates using number of LTOs as a driver, and extrapolate fuel consumption back to 1990. This revision may have implications for the total amount of fuel allocated and the corresponding emissions for the civil aviation category.

Feedstocks and non-energy use of fuels

61. The non-energy use of bitumen, lubricants, naphtha, natural gas, other oil products and petroleum coke is taken into account in both the reference and the sectoral approaches, and the resulting CO_2 emissions in the production of metals and in the chemical industry are estimated and reported by Greece in an aggregated manner for each fuel type, using mostly IPCC default values for the fraction of carbon stored. The non-energy use of lignite in the chemical industry in the period 1990–1991 is also taken into account and reported.

62. Greece states in the NIR that activity data on the non-energy consumption of fuels are derived from the national energy balance. The non-energy use of lignite for ammonia production in the national energy balance is included in the non-energy consumption of the chemical industry but the available information does not allow for allocation of individual fuel consumption to individual industrial categories. Thus, CO_2 emissions from ammonia production are included in chemicals (1.A.2(c)) and reported under the energy sector instead of the industrial processes sector. The ERT recommends that Greece thoroughly examine the allocation of the non-energy use of fuels throughout the energy sector, particularly in the chemicals category (liquid and gaseous fuels), and provide more transparent documentation on this allocation in the next inventory submission.

63. According to information provided by Greece during the in-country review, during 1990–1991 domestic lignite was used for ammonia production at production facilities located near the major lignite surface coal mine, and also near thermal power plants. Consumption of lignite as feedstock for ammonia production generally corresponds to the production of ammonia except for the period 1990–1991.

64. The energy balance of Greece reports 579,000 t of lignite for "non-energy use", while the *Statistical Yearbook of Greece 1990–1991* reports 79 ktoe (3,307.57 TJ) of lignite consumption for "non-energy use" in 1990. During the in-country review, using these data the ERT calculated the NCV for lignite, obtaining a value of 5.71 MJ/kg (3,307.57 TJ/579 kt), which corresponds to the NCV used for lignite in the energy industries (1.A.1) category. However, using the 4,862.86 TJ of lignite reported in CRF table 1.A(d) used as feedstock for ammonia production, and the 579,000 t of lignite for "non-energy use (energy balance of Greece), the calculation results in an NCV of 8.399 MJ/kg which is much higher than that used for lignite in the energy industries category (1.A.1). For 1991 the calculation results in an NCV of 8.323 MJ/kg.

65. The ERT identified a lack of transparency in the NCV of lignite used to estimate AD and CO_2 emissions from ammonia production in the base year. The ERT concluded that the NCV of lignite for ammonia production in 1990 and 1991 was much higher than the NCV for lignite used for electricity generation, leading to an overestimation of CO_2, CH_4 and N_2O emissions in the base year. This was therefore identified as a potential problem by the ERT.

66. The ERT recommended that Greece revise the AD by using an NCV of 5.71 MJ/kg for lignite. After the in-country-review Greece did not adequately correct the problem by providing revised estimates or satisfactory additional information. On this basis the ERT decided to apply an adjustment (see paragraph 31). The ERT's adjusted estimate for CO_2 emissions from ammonia production in the base year amounts to 395.453 Gg CO_2 compared to 482.279 Gg CO_2 derived by the ERT from the Party's submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 86.826 Gg CO_2, or 0.08 per cent. Further details on the adjustment are given in section II.C.

67. No data regarding non-energy use in the iron and steel industry are reported in the national energy balance, therefore CO_2 emissions from the use of fuels as reduction agents are reported by Greece under the industrial processes sector. As available information on non-energy use of laterite in the ferroalloys subsector does not allow more detailed disaggregation, CO_2 emissions from ferroalloys production are reported under the energy sector instead of the industrial processes sector. The ERT encourages Greece in its future submissions to use available data on non-energy use of fuels and carbon stored from plants participating in the EU ETS.

Key categories

Stationary combustion: solid fuels – CO_2

68. Stationary combustion of fossil fuels is dominated by lignite consumption in thermal power plants, and the allocation of this energy consumption by technology was made on the basis of data provided by the 1993 study of the Public Power Corporation (PPC), "Estimation of the CO_2 emission factors for the lignite used by the PPC", Athens, 1994 (referred to hereafter as the PPC study). The study examined the estimation of CO_2 emission factors for lignite, based on the installed capacity and the characteristics of electricity production plants. However, exact values from this study were not used for the CO_2 emission estimates (average value of 122 t CO_2/TJ).

69. Emissions from domestic lignite with a relatively low net calorific value (5.71 MJ/kg) account for more than 90 per cent of emissions from the solid fuels used in Greece in the base year. Dry lignite (which has a higher NCV), other bituminous coal and coke oven gas are also combusted for energy purposes.

70. During the in-country review the ERT assessed the calculations for CO_2 emissions from public electricity and heat production and noticed a discrepancy in the CO_2 EF. Greece is not using the derived CO_2 EF of the lignite used for electricity production from the PPC study mentioned above (122 t CO_2/TJ including oxidation factor) but a slightly higher CO_2 implied emission factor (IEF) (122.173 t CO_2/TJ) which, as explained by Greece, is derived from a carbon content of 34 t C/TJ and an IPCC default oxidation factor of 0.98. Although the PPC study is referenced in the NIR, no information is provided in the NIR with regard to the carbon content used for the CO_2 emission estimates.

71. The ERT identified this issue as a potential problem of overestimation of CO_2 emissions in this category. The ERT recommended Greece to revise the CO_2 emission estimates by using the exact EF for lignite as derived in the PPC study. Since Greece did not adequately correct the problems by providing revised estimates or satisfactory additional information to address this potential problem, the ERT decided to calculate and apply an adjustment by using the emission factor (122 t CO_2/TJ) provided in the PPC study (see paragraph 31). After applying the adjustment, CO_2 emissions from lignite consumption in public electricity and heat production (1.A.1(a)) in the base year amount to 34,503.228 Gg CO_2 compared to 35,257.397 Gg CO_2 originally reported in the 2006 GHG inventory. The application of the adjustment leads to a decrease in total estimated base year emissions, by 754.169 Gg CO_2, or 0.68 per cent. Further details on the adjustments are given in section II.C.

Stationary combustion: solid and liquid fuels – N_2O

72. The N_2O IEFs used to estimate N_2O emissions in the base year from the combustion of liquid and solid fuels in the categories energy industries (1.A.1) (15.94 kg N_2O/TJ for solid and 10.90 kg N_2O/TJ for liquid fuels) and manufacturing industries and construction (1.A.2) (10.67 kg N_2O/TJ for solid and 8.43 kg N_2O/TJ for liquid fuels) are several times higher than the IPCC default (1.4 kg N_2O/TJ for solid fuels and 0.6 kg N_2O/TJ for liquid fuels).

73. During the in-country review Greece explained that it uses a mean value of EFs for non-specified sources from CORINAIR 90, as information on the technology was not available. According to the IPCC

good practice guidance decision tree for non-CO_2 emissions from stationary combustion (figure 2.3), Greece should use IPCC default tier 2 EFs if there are no direct measurements of emissions or regional or country-specific EFs. The ERT identified this issue as a potential problem of overestimation of N_2O emissions in the base year from solid fuels and liquid fuels for the categories of energy industries (1.A.1) and manufacturing industries and construction (1.A.2). During the in-country review, the ERT recommended that, for the identified potential problem of overestimation of N_2O emissions from solid fuels, Greece revise its estimates in energy industries (1.A.1) and manufacturing industries and construction (1.A.2) by using the CORINAIR N_2O EF of 0.8 g /GJ or use the default IPCC N_2O EF for solid fuels. The ERT also recommended that Greece demonstrate that the implementation of CORINAIR 90 methodology for liquid fuels is an improvement in comparison with IPCC default method, or use the default IPCC N_2O EF for liquid fuels. Greece in its response confirmed that there are no systematic measurements of N_2O emission factors in the country. Since Greece did not adequately correct the problems by providing revised estimates or satisfactory additional information to address the potential problem, the ERT decided to calculate and apply adjustments (see paragraph 31).

74. The adjusted estimate for N_2O emissions from the combustion of solid fuels from energy industries (1.A.1) in the base year amounts to 0.295 Gg N_2O, compared to 4.600 Gg N_2O as originally reported in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 4.305 Gg N_2O (1,334.609 Gg CO_2 eq.), or 1.202 per cent.

75. The adjusted estimate for N_2O emissions from the combustion of liquid fuels from energy industries (1.A.1) in the base year amounts to 0.046 Gg N_2O, compared to 1.137 Gg N_2O as reported originally in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 1.092 Gg N_2O (338.609 Gg CO_2 eq.), or 0.305 per cent.

76. The adjusted estimate for N_2O emissions from the combustion of solid fuels from manufacturing industries and construction (1.A.2) in the base year amounts to 0.050 Gg N_2O, compared to 0.526 Gg N_2O as reported originally in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 0.475 Gg N_2O (147.338 Gg CO_2 eq.), or 0.133 per cent.

77. The adjusted estimate for N_2O emissions from the combustion of liquid fuels from manufacturing industries and construction (1.A.2) in the base year amounts to 0.038 Gg N_2O compared to 0.727 Gg N_2O originally reported in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 0.689 Gg N_2O (213.563 Gg CO_2 eq.), or 0.192 per cent.

78. The application of these adjustments taken together leads to a decrease in total estimated base year emissions, by 6.562 Gg N_2O (2,034.119 Gg CO_2 eq.), or 1.832 per cent. Detailed information on these adjustment calculations is provided in section II.C of this report.

Stationary combustion: liquid fuels – CO_2

79. The ERT acknowledges the improvements made by Greece in the 2006 submission to increase the transparency of the inventory by disaggregating fuel combustion emissions to the corresponding categiories (chemicals, pulp, paper and print, food processing, beverages and tobacco). The ERT recommends that Greece as a next step exclude the use of liquid fuels as feedstocks currently reported under the subcategory chemicals (1.A.2(c)), and report only the energy consumption of liquid fuels under this subcategory.

80. The ERT also recommends that Greece consider investigating the statistical differences in the energy balance between the supply and demand side for diesel oil and heavy fuel oil, since the differences can be as high as 3.7 per cent of total domestic supply for diesel oil and 6 per cent of total domestic supply for heavy fuel oil for the base year, and report these in its next inventory submission.

Stationary combustion: gaseous fuels – CO_2

81. Greece indicates in the NIR that, while the production of natural gas decreased over the 1990–2004 period, consumption increased due to the introduction of imported natural gas after 1997 (which corresponded to the beginning of the commercial use of natural gas in Greece) and expansion of the gas network. The ERT recommends that Greece improve the transparency of its next NIR by including, information on the NCV of domestic and imported natural gas. The CO_2 IEFs for gaseous fuels in manufacturing industries and construction (40.55–52.87 t/TJ) across the entire time are among the lowest of reporting Parties. During the in-country review Greece explained that the low IEFs are related to the fact that non-energy consumption is included in the AD. It is recommended by the ERT that Greece in its future inventory submissions only report the amount of gaseous fuels used for energy purposes under this category, and include a brief discussion of the use of natural gas in the production of ammonia and the energy and non-energy consumption pattern since 1990 in its next NIR.

Road transportation – CO_2

82. In response to the recommendations of the 2005 review report, Greece has provided in the NIR detailed information on the vehicle fleet, EFs, and other parameters used as input to the COPERT III model, which is used for the estimations, except for an assumption made for LPG passenger cars. Greece has also reported the use of natural gas in road transportation since 1990. The ERT recommends that Greece improve its future submissions by including appropriate, relevant activity data, and more information on the assumptions used concerning the national vehicle fleet (e.g. kilometres driven per vehicle type, average speed, etc.), in its next NIR.

83. CO_2 emissions from energy combustion of lubricants from road transportation (1.A.3(b)) in 1990 are several times higher than the possible calculations based on fleet data and distance travelled. No additional information was provided during the in-country review with regard to the methodology used to determine the part of lubricants that is combusted, nor was a detailed split between different types of lubricants used. During the in-country review the ERT and the Greek inventory team compiled a proxy bottom-up calculation for the amount of lubricants combusted in road transportation. This resulted in CO_2 emission estimates an order of magnitude lower than reported by Greece, comparable with estimates from other Parties. During the in-country review the ERT identified this issue as a potential overestimation in the base year. The ERT recommended that Greece revise its estimates of emissions from energy use of lubricants and provide bottom-up estimates based on vehicle fleet and assumptions, on the annual kilometres travelled used in the COPERT III model, on specific consumption of lubricants and on other relevant drivers in order to ensure a comparable lubricant/fuel consumption ratio in road transportation.

84. Since Greece, after the in-country review, did not adequately correct the problems by providing revised estimates or additional information, the ERT decided to calculate and apply an adjustment (see paragraph 31). The adjusted estimate for CO_2 emissions from energy combustion of lubricants from road transportation (1.A.3(b)) in the base year amounts to 29.811 Gg CO_2 compared to the 142.972 Gg CO_2 originally reported by Greece in the 2006 inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 113.161 Gg CO_2 eq., or 0.102 per cent. Further detail on the adjustment is given in section II.C below and in annex III to this report.

Navigation – CO_2

85. CO_2 emissions are estimated according to the default methodology of CORINAIR. Greece also reports energy use of lubricants in navigation (1.A.3(d)); however, this information is not consistent with the data in the Greek national energy balance. From the NIR it is also not clear how lubricants are allocated to this particular category.

86. During the in-country review the ERT identified CO_2 emissions from combustion of lubricants in navigation (1.A.3(d)) as a potential problem. It recommended that Greece provide bottom-up CO_2 emission estimates based the assumptions concerning specific consumption of lubricants for this category. After the in-country review, Greece did not provide revised estimates or additional information to address the potential problem identified by the ERT. However, the ERT compared the lubricant/fuel ratio for navigation with that of the United Kingdom (UK), which has a navigation profile similar to that of Greece. It concluded that overall the estimates of CO_2 emissions from combustion of lubricants in navigation are conservative, as Greece is using a CO_2 IEF which is 50 per cent lower than the IPCC default (because the correction for carbon stored is introduced in the EF). The ERT therefore reconsidered its intention to recommend an adjustment for the estimate of CO_2 emissions from the combustion of lubricants from this category. The ERT recommends that, in order to improve transparency in its next NIR, Greece clarify the energy use of lubricants in this category and revise the EFs, AD and assumptions as appropriate.

Civil aviation – CO_2

87. CO_2 emissions from civil aviation are estimated to according the IPCC tier 2a method based on aircraft movements, following the Revised 1996 IPCC Guidelines. As suggested by previous in-country reviews, emissions from aviation gasoline and jet kerosene are reported separately and are allocated entirely to domestic flights.

88. CO_2 emissions from jet kerosene are calculated using IPCC default EFs, and a tier 2a EF has been used for calculating N_2O and CH_4 emissions. Consumption of fuels is from the national energy balance, while LTO data are provided by the CAO. In Greece, the number of LTOs from domestic aviation increased by 71.3 per cent over the period 1990–2004; however, over the same period fuel consumption decreased by 15.6 per cent. This issue was identified in previous in-country reviews and acknowledged by Greece as an area for improvement in the NIR.

89. During the in-country review, the ERT informed Greece of the potential problem of an overestimation in the base year for CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)). The ERT requested that Greece provide supporting data and information for the estimation of emissions from domestic air movements over the period 1990–2004 and provide justification for the discrepancy between the data on LTOs and the fuel consumption trends, or revise the emission estimates in the base year in accordance with the trend in LTOs.

90. After the in-country review, Greece provided additional information on domestic LTOs and number of passengers travelling on domestic flights. The number of passengers travelling on domestic flights increased by 40 per cent over the period 1990–2004. Greece did not provide any additional information to the ERT with regard to the methodologies used for estimating fuel consumption on domestic flights as reported in the Greek energy balance. The ERT identified that there is a potential overestimation of CO_2, CH_4 and N_2O emissions from civil aviation in the base year. The ERT recommended that Greece make additional efforts to obtain more disaggregated and detailed data on the structure of the aviation fleet corresponding to the information on LTOs and clarify the discrepancies between the number of passengers travelling on domestic flights, the LTOs and the fuel consumption trends. The ERT also requested Greece to provide the rationale for the allocation of fuel consumption to domestic flights in the energy balance or, if this is not possible, to revise the emission estimates from civil aviation in accordance with the number of LTOs and the trend in domestic flights. Such calculations should take into account national circumstances (composition of fleet and domestic flight distances).

91. Since after the in-country review Greece did not adequately correct the problems by providing revised estimates or additional information, the ERT decided to calculate and apply an adjustment (see paragraph 31). The adjusted estimate for CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)) in

the base year amounts to 593.691 Gg CO_2 eq., compared to the 1,469.238 Gg CO_2 eq. reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 875.547 Gg CO_2 eq., or 0.79 per cent. Further detail on this adjustment is given in section II.C below and in annex III to this report.

Fugitive emissions: coal mining and handling – CH_4

92. CH_4 emissions from surface mining of lignite (1.B.1(a)ii) have been calculated according to the IPCC tier 1 methodology, although this is a key category. The ERT acknowledges the efforts made by Greece in the preparation of future submissions to obtain relevant information in order to apply country-specific EFs, as recommended by the IPCC good practice guidance.

Non-key categories

Stationary combustion: biomass – CH_4 and N_2O

93. Greece reports in the 2006 GHG inventory submission that biomass consumption in the residential category (1.A.4(b)) remains constant over the period 1990–2004 (29,393 TJ). During the in-country review, the ERT identified a discrepancy in the NIR between the activity data reported by Greece on biomass consumption and the AD on fuelwood harvesting as reported under the LULUCF sector. Greece estimates annual carbon loss in living biomass as the sum of losses due to commercial round wood fellings, fuelwood gathering and wildfires. All annual carbon loss in living biomass in 1990 is approximately equivalent to the allocated biomass for combustion, which means that all industrial wood (pulpwood, round and split and other industrial wood) is considered as wood fuel. The ERT considered that this leads to an overestimation of CH_4 and N_2O emissions in the base year, since the carbon content in the biomass used in 1990 in the residential category is approximately equivalent to the overall annual carbon loss in living biomass estimated in the LULUCF sector.

94. The ERT identified biomass consumption (AD) in the residential category as a potential problem of overestimation of CH_4 and N_2O emissions in the base year. The ERT recommended Greece to provide more data for biomass use in the period 1990–2004 to support is estimates, or to revise its figures for biomass consumption in the residential sector, taking into account drivers such as:

- total amount of commercial felling;
- amount of wood used in other sectors or/and for other purposes using relevant drivers;
- heating degree days over the period 1990–2004;
- trends in total area of dwellings;
- trends of other energy use in the residential sector;
- administrative bans on solid biomass use for energy purposes (due to air quality regulations).

95. After the in-country review, Greece informed the ERT that the value used for biomass combustion comes from research done by the Center for Renewable Energy Sources in 1996. This information did not satisfactorily address the potential problem identified by the ERT. Since Greece did not adequately correct the problems by providing revised estimates or additional information, the ERT decided to calculate and apply an adjustment (see paragraph 31). The adjusted estimate, for CH_4 and N_2O emissions from biomass consumption in the residential category (1.A.4(b)) in the base year amounts to 94.670 Gg CO_2 eq., compared to the 297.751 Gg CO_2 eq. originally reported by Greece in the 2006 GHG inventory submission. The application of this adjustment leads to a decrease in total base year

emissions by 203.081 Gg CO_2 eq., or 0.18 per cent. Further details on the adjustments are given in section II.C below and in annex III to this report.

Oil and natural gas – CO_2, CH_4, and N_2O

96. Fugitive emissions from several oil and gas operations such as other leakages at industrial and power plants and in the residential and commercial sector (1.B.2.b(v)) are reported as "NE". The ERT noted that, although emissions from other natural gas fugitive categories are included under production/processing (1.B.2(b)ii), some activities such as natural gas transmission (1.B.2.b(iii)) and distribution (1.B.2(b)iv) are reported as not occurring ("NO"). Greece notes in the NIR that fugitive emissions from oil transport are included under the category of oil venting and flaring. The ERT encourages Greece to further improve the completeness and transparency of its inventory by calculating emissions from categories that are currently not estimated and by using the notation keys appropriately.

6. Industrial processes and solvent and other product use

Sector overview

97. In the base year under the Kyoto Protocol, the industrial processes sector contributed 10.0 per cent (11,157.41 Gg CO_2 eq.) of total national GHG emissions. The majority of the emissions were due to CO_2 from mineral products (6,454.21 Gg). Other sources of emissions were N_2O from chemical industry (712.96 Gg CO_2 eq.), CO_2 and PFCs from metal production (551.27 Gg CO_2 eq.), and HFC-23 from production of halocarbons and SF_6 (3,253.07 Gg CO_2 eq.). Emissions from the industrial processes sector increased by 26.8 per cent between the base year and 2004.

98. The ERT noted that emissions in the base year may be underestimated, in regard to the estimation of F-gases (HFCs, PFCs, SF_6) because Greece has not provided the 1995 estimates for the following categories: refrigeration and air conditioning (2.F.1), the subcategories industrial refrigeration, transport refrigeration; foam blowing (2.F.2); fire extinguishers (2.F.3); aerosols and metered dose inhalers (2.F.4); solvents (2.F.5); and semiconductor manufacturing (2.F.7). The ERT recommends that Greece develop estimates for these categories in its future inventories; as appropriate, set up a system for the gathering of data; and develop a national application of the methods described in the IPCC good practice guidance.

99. Greece has recalculated the emissions (HFC-134a) of the category refrigeration and air conditioning (2.F.1) and included estimates for the subcategory commercial refrigeration, thus improving the completeness of the inventory for this particular category. However, the appropriateness of the recalculated level of emissions is not clear, since estimates of potential emissions are not provided. The effect of the recalculations on the estimates of total national emissions on the base year (1995) arising from recalculation of actual emissions of HFCs is 0.05 per cent. The ERT therefore recommends that Greece implement the IPCC good practice guidance by developing a data-gathering system to enable the reporting of potential emissions. The recommendation has a twofold function. First, this will assist Greece fulfil the reporting requirements of the UNFCCC reporting guidelines. Second, it provides a tier 2 quality control check for the level and trend of emissions from refrigeration and air conditioning equipment, since potential emissions for a category may be viewed as an upper limit for emissions.

Key categories

Cement production – CO_2

100. Greece uses a tier 2 methodology and a national EF (0.5428 t CO_2/t clinker production) to estimate emissions from cement production. The ERT analysed Greece's clinker production data using a statistical smoother. Analysis of the AD by the ERT revealed an unexplained shift in the production level between 1994 and 1995, amounting to 1 million tonnes of clinker produced. During the in-country visit, the ERT had access to plant-specific clinker production data, and verified that the shift was due to

an increase of production in one particular installation plant. Greek experts explained that the shift was due to a change of ownership, which had resulted in increased use of already existing production capacity. The ERT recommends that Greece include this explanation in the NIR of its future submissions.

101. The ERT encourages Greece to further improve the transparency of its reporting by including an explanation in the NIR of how the calcium oxide (CaO) and magnesium oxide (MgO) contents are arrived at each year.

Nitric acid production – N_2O

102. Greece has used for this category an average of the IPCC default emission factors from the Revised 1996 IPCC Guidelines, which is not in line with the IPCC good practice guidance. The good practice guidance states that if the subcategory nitric acid production is a key category, then plant-level emissions and destruction data should be collected. This condition applies to Greece. Greece has already collected plant-specific data on destruction technologies as recommended in the previous (2005) review. The ERT therefore recommends that Greece in its future submissions follow the IPCC good practice guidance and continue to collect plant-specific emissions data. The ERT also recommends that this development be appropriately documented in the NIR. In particular, it recommends that Greece in its future submissions follow the IPCC good practice guidance by implementing tier 2 quality control checks when undertaking recalculations.

Non-key categories

Lime production – CO_2

103. Greece reports in its NIR that emissions from hydraulic lime production are not included in the estimate of CO_2 emissions from lime production. The Greek experts calculated during the review that the level of emissions for all years would be about 3 per cent higher if emissions from hydraulic lime were included. While this is a small quantity, the ERT recommends Greece to include CO_2 emissions from hydraulic lime production in its future inventories. The ERT also recommends that Greece carry out a check of data quality for this category. The recalculations should be based on the results of this check.

7. Agriculture

Sector overview

104. In the base year under the Kyoto Protocol, the agriculture sector was the largest anthropogenic source of N_2O emissions in Greece. The 2006 inventory submission is complete in terms of the coverage of GHG gases, sources and years, including reporting of trends for each gas in the different categories in the sector.

105. In the base year, emissions from agriculture are estimated at 13,519.23 Gg CO_2 eq., accounting for 12.2 per cent of total national GHG emissions. Between 1990 and 2004, emissions from the sector decreased by 11.7 per cent, mainly due to the reduction of N_2O emissions from agricultural soils (4.D) due to a decrease in the use of synthetic nitrogen fertilizers.

106. Greece has made improvements in the agriculture sector following the 2005 in-country review, correcting some of the problems identified, and has provided a more comprehensive NIR, for example, by adopting a three-year average for animal population numbers. Planned improvements for estimating emissions from enteric fermentation are reported in the NIR, such as updating activity data as soon as they become available.

107. Recalculations have been undertaken for all years. The results show that there are still some uncertainties caused by the estimation of activity data for animal populations, in particular sheep. The ERT recommends that Greece improve its system for collecting AD (animal population statistics) and reporting them in the next NIR.

108. No detailed QA/QC information is provided in the agriculture sector. The ERT recommends that in its next NIR Greece provide more information on the QA/QC procedures specific to the sector and their implementation, sectoral archiving and documentation procedures.

Key categories

Enteric fermentation – CH_4

109. In Greece, enteric fermentation is a key category, mainly due to the large population of sheep. CH_4 emissions from enteric fermentation in sheep are estimated according to the IPCC tier 2 methodology and country-specific EFs. CH_4 emissions from enteric fermentation have been recalculated for the complete time series because of the use of a three-year average for the sheep population, resulting in a higher estimate of base year emissions in the 2006 submission compared with the 2005 inventory submission. This approach needs to be maintained in future because of the large fluctuations in the activity data (animal population). In the interest of greater transparency and comparability with the annual international statistics, the ERT recommends that Greece report in its future NIRs sheep population data for every year, including the three-year average for 1990, so that the trend is more transparent.

110. In Greece, CH_4 emissions from enteric fermentation from the other animals are estimated according to the IPCC tier 1 methodology, using IPCC default EFs. The application of this methodology requires livestock population data and EFs per animal species. The selection of the EFs for dairy cattle and non-dairy cattle corresponds to the characteristics of Eastern Europe and was based on data from the NSSG on milk production per animal. However, data on milk production per animal for the years 2001–2004 are derived from the Food and Agriculture Organization of the United Nations (FAO) data, and they fluctuate, from 3,400 kg in 2001 to 3,800 kg in 2004. This introduced inconsistencies in the time series on milk production. Because of a larger fluctuation in milk production, the ERT recommends Greece to change the EF using country-specific data rather than the EF for Eastern Europe for its next submission.

Agricultural soils – N_2O

111. Direct N_2O emissions, indirect N_2O emissions and N_2O emissions from pasture, range and paddock manure were key sources in 1990 according to the level assessment by both Greece and the secretariat.

112. N_2O emissions from agricultural soils (4.D) are estimated according to the tier 1 IPCC methodology. Some methodological details are not transparently reported in the NIR. In order to improve transparency the ERT recommends that in its future submissions Greece provide more information on N_2O emissions from pasture, range and paddock manure (i.e. animal production), such as the amount of nitrogen (N) excreted from animal manure, and information on N volatilization from animal manure. As there is a four-year delay in obtaining final activity data on synthetic fertilizers for a certain year from national sources, extrapolation is necessary to get provisional statistical data, in particular for the most recent years. An appropriate method of extrapolation is therefore needed. The ERT recommends that Greece extrapolate the annual quantities of synthetic fertilizers consumed in the country during the period 2003–2004 based on the trends observed for the years 1990–2000 and 1998–2002, and then compare the extrapolated results with the updated data coming from the FAO or national sources. Greece should then determine the most appropriate trend as the basis for extrapolation of the AD. When the final AD are received from the NSSG, the provisional data should be updated.

The ERT recommends Greece to provide in its next NIR information on this procedure and the difficulties in obtaining final AD on synthetic fertilizers.

Non-key categories

Manure management – N_2O

113. N_2O emissions from manure management are estimated by using the emission factors for N excretion described in the Revised 1996 IPCC Guidelines. For N excretion Greece uses the values provided for Mediterranean countries. Activity data are not based on observation but are proposed by experts of the Ministry of Rural Development and Food (MRDF). Different types of manure management systems have been identified but the MRDF does not provide data on all systems. The ERT recommends Greece to collect more complete data on animal waste management systems (AWMS) existing in the country and to report detailed background information on this in its next NIR (e.g. more detail on the share of each animal type and the treatment of manure). The ERT also recommends that Greece establish a process for collecting field data to improve the estimates for this category in its future inventories.

8. Land use, land-use change and forestry

Sector overview

114. In Greece the LULUCF sector was a net sink from 1990 to 2004. Net removals of CO_2 increased by 66.7 per cent over the period, from –3,248.20 Gg CO_2 eq. to –5,414.52 eq. in 2004. The inter-annual fluctuations in net removals were mostly due to carbon biomass losses from forest fires, which increased in 1997 and 1999. Annual harvesting of wood showed a decreasing trend over the whole period 1990–2004, which contributed to the increasing trend in net CO_2 removals.

115. Greece has not reported a key category analysis for 1990. The secretariat identified CO_2 emissions from forest land remaining forest land (5.A.1) and cropland remaining cropland (5.B.1) as key categories in 1990. The ERT recommends Greece to perform a key category analysis including LULUCF following the IPCC good practice guidance and the IPCC good practice guidance for LULUCF for 1990.

116. In the 2006 submission the LULUCF sector is generally complete, and it is transparent with respect to the description of methodologies and sources of activity data. Greece has estimated emissions and removals of CO_2, and emissions of CH_4 and N_2O from the LULUCF sector using either the tier 1 or the tier 2 method according to the IPCC good practice guidance for LULUCF. The AD used are country-specific and the EFs used are either IPCC default or country-specific. However, emissions and CO_2 removals from some land-use conversions in 1990 have not been estimated. For example, grassland converted to forest land (5.A.2.2), land converted to wetlands (5.D.2) and land converted to settlements (5.E.2) are reported as "NE". Also, net CO_2 emissions from the changes in soil carbon stocks arising from cropland converted to forest land (5.A.2.1) and cropland converted to grassland (5.C.2.2) are reported under cropland remaining cropland (5.B.1). The ERT encourages Greece to report in its next submission CO_2 emissions or removals that are not estimated, even if they are minor, and to allocate CO_2 emissions and removals to the appropriate categories.

117. For the year 1990, uncertainties have not been calculated either for the LULUCF sector as a whole or for the LULUCF categories. The ERT recommends that Greece estimate the uncertainties for the whole LULUCF sector including its key categories. Greece has not implemented QA/QC procedures for 1990 for the LULUCF sector. The ERT recommends that sectoral QA/QC for the LULUCF sector be implemented as part of the national system in the preparation of Greece's next submission.

Key categories

Forest land remaining forest land – CO_2

118. In 1990 forest land remaining forest land (5.A.1) accounted for 62.9 per cent of net CO_2 removals from the LULUCF sector. Net CO_2 removals from this category increased by 85.2 per cent between 1990 and 2004.

119. The methodology used for estimating the changes in the carbon stocks in living biomass uses a tier 2 approach using both country-specific EFs and IPCC default EFs from the IPCC good practice guidance for LULUCF. The ERT recommends Greece to replace the default EF values with country-specific EFs in its future submissions.

120. The estimation of the changes in living biomass carbon stocks assumes an annual rate of above-ground biomass increase which is based on the average of all major tree species. This annual rate was assumed to be constant over the period 1990–2004. However, this assumption requires supporting field data, given that the NIR indicates that Greece went through several dry seasons in the period 1990–2004. The frequency of forest fires is an indicator of dry periods. In this regard, the ERT recommends Greece to plan and implement a procedural system for periodically estimating biomass growth rates.

121. The methodology used for estimating changes in carbon stocks in dead organic matter is a combination of a tier 1 approach (for unburnt areas) and a tier 2 approach (for burnt areas), according to the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The methodology combines country-specific activity data and IPCC default EFs. Changes in forest soil carbon stocks are assumed to be zero for the complete time series and reported as "NO" (tier 1). The ERT encourages Greece to measure changes in soil organic matter carbon stocks in the future, because frequent forest wildfires can impact significantly on soil organic matter, and because this pool is part of a key category the ERT also recommends Greece to use a tier 2 approach in its future submissions.

Cropland remaining cropland – CO_2

122. Net CO_2 removals from cropland remaining cropland (5.B.1) accounted for 37.1 per cent of net CO_2 removals from the LULUCF sector in 1990.

123. Net CO_2 removals from cropland remaining cropland (5.B.1) are the result of mostly changes in living biomass stocks. In estimating net CO_2 removals from cropland remaining cropland Greece uses a combination of default EF (tier 1) and country-specific activity data (tier 2) approaches which are in accordance with the IPCC good practice guidance for LULUCF. As this is a key category, the ERT recommends Greece to upgrade the methodology to a tier 2 methodology, preferably by estimating the changes in soil carbon stocks using country-specific EFs.

124. On the estimation of CO_2 emissions from changes in soil carbon stocks, the ERT concludes that the reporting of emissions from this category is not entirely transparent as CO_2 emissions from changes in soil organic carbon due to the conversion of cropland to forest land (5.A.2.1) and cropland to grassland (5.C.2.2) are included under the category cropland remaining cropland (5.B.1). As Greece does not have a comprehensive land use and land-use change area matrix for 1990, the ERT recommends it to establish a system for the identification of land use and measurement of the areas of land-use change similar to any of the various methods included in the methodological approach 2 in the IPCC good practice guidance for LULUCF.

9. Waste

Sector overview

125. In the base year under the Kyoto Protocol, the waste sector in Greece accounted for 4.0 per cent of total national emissions. A substantial portion of the emissions in this sector (59.5 per cent) arose from wastewater handling. From 1990 to 2004, wastewater handling emissions decreased, contributing to a reduction in the total emissions of the waste sector (by 26.6 per cent). This decrease is attributed largely to a reduction in CH_4 emissions associated with the aerobic treatment of domestic wastewater.

126. In the 2006 inventory submission, Greece has performed recalculations of the emissions of the waste sector for the period 1990–2003. The recalculations are due mainly to the application of a tier 2 (first order decay (FOD)) method for estimating CH_4 emissions from solid waste disposal on land; the exclusion of biogenic CO_2 emissions from biogas flaring; the separation of municipal sludge from wastewater; and the use of updated data on industrial wastewater. For 1990 the recalculations result in a 20.5 per cent reduction in the estimate of GHG emissions from the waste sector, from 5,357.37 Gg CO_2 eq. (in the 2005 submission) to 4,445.10 Gg CO_2 eq. (in the 2006 submission).

127. The ERT reiterates the recommendation from the 2005 review report that Greece should include in its NIR a description of the QA/QC procedures that have been undertaken in the waste sector. The ERT also recommends that Greece include in the waste chapter of the NIR explanations to support the uncertainty analyses associated with the estimation of GHG emissions from the waste sector.

Key categories

Solid waste disposal on land – CH_4

128. The ERT commends Greece for using a tier 2 (FOD) method for estimating CH_4 emissions from solid waste disposal on land. This has led to a decrease in 1990 emissions in this category by 32.6 per cent, and of 2003 emissions by 42.9 per cent, since the 2005 submission. The assumed CH_4 recovery rate for three out of the four waste disposal sites in Greece is 60 per cent. The recovery rate at the Athens recovery facility is about 30 per cent, which is constant for the time series.

129. During the review the ERT noted a possible overestimate of the rate of CH_4 recovery from solid waste disposal sites, leading to an underestimation of CH_4 emissions for the period 1990–2004. The ERT recommends Greece to adopt a more accurate value for CH_4 recovery in three of the four sites and to revise the estimates of CH_4 emissions from solid waste disposal on land in its next inventory submission.

130. Annual growth rates in solid waste disposed on land suddenly increased from about 1 per cent to about 5 per cent from 1992 onwards. This inconsistency is due to an abrupt rise in the inter-annual change of the per capita waste generation rate (from 0.007 kg/person/day/year to 0.028 kg/person/day/year). The ERT recommends that Greece reconcile these two inter-annual rate changes in per capita waste generation rate in order to maintain time-series consistency.

Wastewater handling – CH_4

131. The key driver for the overall downward trend in total GHG emissions from waste is the reduction in CH_4 emissions from wastewater handling. As this is a key category, the ERT encourages Greece to make greater effort to ensure accuracy in estimating these emissions, particularly in the determination of the aerobic treatment of domestic/commercial wastewater and the emissions associated with the treatment of industrial wastewater.

132. For greater transparency, Greece is encouraged to provide the sectoral background information on wastewater in both the CRF tables and the NIR, and also to describe the distribution and function of the different wastewater handling systems in Greece in its next NIR.

Non-key categories

Waste incineration – CO_2

133. In CRF table 6.C, the notation key "NE" is used for CO_2 emissions from other – (non-biogenic) – other non-specified (6.C(b)). The use of the notation key "NE" for this source suggests that the CO_2 estimates from waste incineration may be incomplete. The ERT recommends that, if CO_2 emissions from this category (6.C(b)) do not occur in Greece, then the notation key "NE" should be changed to "NO".

C. Adjustments

134. The ERT identified and recommended six adjustments in the energy sector for the base year. In accordance with the guidance for adjustments under Article 5, paragraph 2 of the Kyoto Protocol (decision 20/CMP.1), the adjustments to the energy sector were prepared by the ERT in consultation with Greece. Also, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1), the ERT officially notified Greece of the calculated adjustments. Greece failed to notify the secretariat of its intention to accept or reject the calculated adjustments within the time frame set out in these guidelines. In accordance with these guidelines, this failure was considered as acceptance by Greece of the adjustments, and the ERT applied the calculated adjustments to the emission estimates of the energy sector.

135. The overestimations leading to adjustments in the energy sector in the base year include: CO_2 emissions from the consumption of solid fuels (lignite) – public electricity and heat production – (1.A.1(a)); N_2O emissions from the consumption of solid and liquid fuels – energy industries (1.A.1) and manufacturing industries and construction (1.A.2); CO_2 emissions from the combustion of solid fuels (lignite) for ammonia production – chemicals (1.A.2(c)); CO_2, CH_4, N_2O emissions – civil aviation (1.A.3(a)); CO_2 emissions from combustion of lubricants – road transportation (1.A.3(b)); and CH_4 and N_2O emissions from biomass consumption – the residential category (1.A.4(b)).

136. The adjusted estimate for GHG emissions from the energy sector in the base year amounts to 77,695.731 Gg CO_2 eq., compared to the 81,762.634 Gg CO_2 eq. originally reported by Greece in its 2006 GHG inventory submission. The application of the adjustments leads to a decrease in estimated total base year emissions under the Kyoto Protocol by 3.7 per cent (4,066.903 Gg CO_2 eq.), from 111,054.072 Gg CO_2 eq. as reported by Greece to 106,987.169 Gg CO_2 eq. as calculated by the ERT.

1. Public electricity and heat production (1.A.1(a)) – CO_2 emissions from the consumption of solid fuels (lignite)

The original estimate

137. In its 2006 inventory submission accompanying the initial report, Greece provides the following estimate for CO_2 emissions from consumption of solid fuels in public electricity and heat production (1.A.1(a)) in 1990: 35,257.397 Gg CO_2 (see CRF table 1.A(a)).

The underlying problem

138. During the in-country review the ERT informed Greece that there was a potential problem of overestimation in the base year in the estimate of CO_2 emissions from lignite consumption in public electricity and heat production (1.A.1(a)) due to the lack of transparency in the EF used to calculate CO_2 emissions from this source.

139. In the 2006 submission, according to Greece, the carbon (C) content (CO_2 emission factor) of the lignite used for electricity production is based on the PPC study to determine the aggregated CO_2 country-specific EF based on chemical analysis of lignite samples coming from different mines. The CO_2 EF for lignite identified in the study is 122 t CO_2/TJ, which is the result of a weighted average of the

carbon content in lignites from different basins in Greece. This EF accounts for the oxidation factor of lignite for combustion in energy industries in Greece.

140. However, in the 2006 GHG inventory submission Greece has used 122.173 t CO_2/TJ as the CO_2 emission factor for lignite in 1990, which is higher than the CO_2 EF provided in the PPC study.

The rationale for the adjustment

141. Greece refers to the PPC study in the NIR. In estimating CO_2 emissions from lignite consumption in 1990, however, Greece does not use the CO_2 EF from that study (122 t CO_2/TJ) but a slightly higher CO_2 EF (122.173 t CO_2/TJ).

142. During the in-country review process the ERT was able to determine that the higher CO_2 EF (122.173 tCO_2/TJ) in the base year results from converting the CO_2 EF based on the PPC study (122 t CO_2/TJ) to C content, then rounding it to 34 t C/TJ, and then converting it back to the CO_2 EF again (multiplying by 44/12) and further multiplying it by the IPCC default oxidation factor (0.98). The result of these calculations is a higher CO_2 EF (122.173 t CO_2/TJ) in the base year. The ERT during the in-country review recommended Greece to address the potential problem of overestimation in the base year by providing revised estimates for CO_2 emissions from lignite consumption in public electricity and heat production using the emission factor (122 t CO_2/TJ) provided in the PPC study.

143. Greece responded to the notification on potential problems on 8 June 2007, within the six-week period established by the guidelines for review under Article 8 of the Kyoto Protocol, as follows:

"The Inventory team used the value of 122,17 t CO_2/TJ for the compilation of National Inventories. This was the value used for the compilation of the 1st National Plan for Emissions Reductions of Greenhouse Gases in 1994 and on the Inventory that had been compiled then. The value had been derived from specific measurements made by PPC SA (including rounding and the oxidation factor). The value suggested by ERT does not include rounding and for this reason it is slightly higher (122,109 t CO_2/TJ."

144. Greece did not adequately correct the problems by providing revised estimates as requested by the ERT. In line with the process for calculating adjustments (decisions 22/CMP.1 and 20/CMP.1), Greece provided further information on 23 July 2007 by forwarding a full copy of the PPC study (which had already been provided to the ERT during the review).

145. The ERT, having reviewed Greece's response, concluded that its recommendations had not been followed and additionally that Greece had not transparently justified the use of the EF. The rationale for the adjustment is a lack of transparency in the use of the CO_2 EF for lignite in the public electricity and heat production category.

The assumptions, data and methodology used to calculate the adjustment

146. During the in-country review the ERT attempted to reproduce the calculations of the CO_2 for lignite on the basis of the information given in the PPC study. The outcome was a CO_2 IEF of 122.109 t CO_2/TJ. During the in-country visit and again on 23 July 2007 Greece provided to the ERT a full copy of the PPC study. The study concludes that the CO_2 IEF for lignite consumption in Greece is 122 t CO_2/TJ (including the oxidation factor). The ERT considers this value adequate. In calculating the adjustment the ERT applied the IPCC default approach using the CO_2 IEF from the PPC study, and the amount of lignite combusted in the category public electricity and heat production reported by Greece in the 2006 GHG inventory submission.

The adjusted estimate

147. Table 5 presents the results of the ERT's calculation, including the original estimate as reported by Greece for 1990, the adjusted estimate as calculated by the ERT, and the impact of the adjustment on total GHG emissions in the base year. It shows that the adjusted estimate for CO_2 emissions from lignite consumption in public electricity and heat production (1.A.1(a)) in the base year amounts to 34,503.228 Gg CO_2 compared to the 35,257.397 Gg CO_2 originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 754.169 Gg CO_2, or 0.680 per cent.

Conservativeness of the ERT's calculation of the adjustment

148. The ERT applied the conservativeness factor 0.98 (table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1) for estimating total CO_2 emissions from lignite consumption in public electricity and heat production (1.A.1(a)). The ERT therefore considers that the resulting adjusted value is conservative.

Calculation of the adjustment

Table 5. Public electricity and heat production (1.A.1(a)) – CO_2 emissions from the consumption of solid fuels (lignite): the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.1(a), public electricity and heat production			
Greece's estimate of CO_2 emissions from solid fuels* consumption (in 1.A.1(a), public electricity and heat production)	35 257.397	Gg CO_2	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)
Party's AD for solid fuels* (lignite) consumption in category 1.A.1(a)	288 585.042	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)
Party's EF for CO_2 from lignite consumption in category 1.A.1(a)	122 173.333	t CO_2/TJ	Greece's 2006 inventory submission – NIR, page 52, table 3.6 (C content =34tC/TJ, oxidation factor is =0.98)
Applied CO_2 EF in the adjustment	122	t CO_2/TJ	CO_2 emission factor for the lignite used for electricity production study conducted by the Public Power Corporation (PPC, 1993) including oxidation factor (page 31)
Adjusted CO_2 emissions from lignite consumption in 1.A.1.a public electricity and heat production (before applying conservativeness factor)	35 207.375	Gg CO_2	ERT's calculation
Conservativeness factor	0.98		Table 1 of appendix III of the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative estimate for CO_2 emissions in 1.A.1(a), public electricity and heat production	34 503.228	Gg CO_2	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	GgCO_2 eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 299.903	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	754.169	Gg CO_2 eq.	ERT's calculation
	0.680	%	ERT's calculation

**Note*: According to the NIR, annex II, pages 215–222, only lignite was used as solid fuel for public electricity and heat production.

2. Energy industries (1.A.1) and manufacturing industries and construction (1.A.2) – N_2O emissions from the combustion of solid and liquid fuels

The original estimate

149. In its 2006 inventory submission accompanying the initial report, Greece provides the following estimates for N_2O emissions from the combustion of solid and liquid fuels from energy industries (1.A.1) and manufacturing industries and construction (1.A.2):

Solid fuels

- N_2O emissions from the combustion of solid fuels from energy industries – public electricity and heat production (1.A.1(a)) in the base year amounted to 1,426.039 Gg CO_2 eq. (4.6 Gg N_2O);
- N_2O emissions from the combustion of solid fuels from manufacturing industries and construction (non-ferrous metals (1.A.2(b)), food processing, beverages and tobacco (1.A.2(e)), chemicals (1.A.2(c)), and other (1.A.2(f)) in the base year amounted to 162.945 Gg CO_2 eq. (0.525 Gg N_2O).

Liquid fuels

- N_2O emissions from the combustion of liquid fuels from energy industries (public electricity and heat production (1.A.1(a)) and petroleum refining (1.A.1(b)) in the base year amounted to 352.767 Gg CO_2 eq. (1.137 Gg N_2O);
- N_2O emissions from the combustion of liquid fuels from manufacturing industries and construction (iron and steel (1.A.2(a)), non-ferrous metals (1.A.2(b)), food processing, beverages and tobacco (1.A.2(e)), chemicals (1.A.2(c)), pulp, paper and print (1.A.2(d)) and other (1.A.2(f))) in the base year amounted to 252.262 Gg CO_2 eq. (0.727 Gg N_2O).

The underlying problem

150. During the in-country review the ERT identified a potential problem of overestimation of N_2O emissions from the combustion of solid and liquid fuels from energy industries (1.A.1) and manufacturing industries and construction (1.A.2) in the base year.

151. The N_2O EFs used to estimate N_2O emissions for 1990 from the combustion of liquid and solid fuels in the categories of energy industries (1.A.1) (15.94 kg N_2O/TJ for solid and 10.90 kg N_2O/TJ for liquid fuels) and manufacturing industries and construction (1.A.2) (10.67 kg N_2O/TJ for solid and 8.43 kg N_2O/TJ for liquid fuels) are several times higher than the IPCC default (1.4 kg N_2O/TJ for solid fuels and 0.6 kg N_2O/TJ for liquid fuels).

The rationale for the adjustment

152. In estimating N_2O emissions from solid fuels, Greece uses as the emission factor a mean value from the CORINAIR 90 range for non-specified sources (as the type of technology is unknown). According to the IPCC good practice guidance (estimation of non-CO_2 emissions from stationary combustion), if there are no direct measurements of emissions, non-CO_2 emissions should be calculated using the IPCC default tier 2 EF or regional or country-specific EFs.

153. During the in-country review the ERT recommended that Greece address this potential overestimation of N_2O emissions from solid fuels in the base year by using the CORINAIR N_2O EF of 0.8 g N_2O/GJ for energy industries (1.A.1) and manufacturing industries and construction (1.A.2), or else using the IPCC default EF for N_2O for solid fuel combustion.

154. For estimating N_2O emissions from liquid fuels, during the in-country review the ERT recommended Greece to justify the use of the CORINAIR methodology rather than the IPCC default method, or to use the IPCC default method for estimating N_2O emissions from liquid fuels.

155. In response to this notification on this potential problem, Greece responded to the ERT, within the six-week period, 8 June 2007, as follows:

"The N_2O emission factor for liquid and solid fuels in the energy industry is highly uncertain because it depends on the specific combustion conditions. In Greece there are no available systematic measurements of that emission factor. For this reason the inventory team chose to use the value proposed by CORINAIR for non specified uses."

156. Greece did not adequately correct the problems by providing the recommended revised estimates as requested by the ERT.

157. The ERT, having reviewed the additional information provided, concluded that its recommendations had not been followed appropriately. The rationale for the adjustment is the lack of transparency in the estimation of N_2O emissions, particularly in the election of EFs, from solid and liquid fuel combustion for energy industries (1.A.1) and manufacturing industries and construction (1.A.2). These estimates are not in line with the IPCC good practice guidance.

The assumptions, data and methodology used to calculate the adjustment

158. Activity data are available in the 2006 GHG inventory submission for the estimation of N_2O emissions from solid and liquid fuels from energy industries – public electricity and heat production (1.A.1) and manufacturing industries and construction (1.A.2). On this basis the ERT applied the IPCC default tier 1 approach for the adjustment, using the default N_2O EF (1.4 kg N_2O/TJ) for the combustion of solid fuels and the default N_2O EF (0.6 kg N_2O/TJ) for the combustion of liquid fuels from the Revised 1996 IPCC Guidelines – Reference Manual, table 1-8, page 1.36 for the combustion of liquid fuels in energy industries (1.A.1) and for manufacturing industries and construction (1.A.2).

The adjusted estimate

159. Tables 6, 7, 8 and 9 present the results of the ERT's calculation, including the original estimate as reported by Greece, the adjusted estimate as calculated by the ERT, and the impact of the adjustment on total GHG emissions in the base year for energy industries (1.A.1) (solid and liquid fuels) and for manufacturing industries and construction (1.A.2) (solid and liquid fuels). Details on the impact of the adjustments on the estimates of total base year emissions originally reported by Greece are provided below.

160. The application of the adjustment to N_2O emissions from the combustion of solid and liquid fuels from energy industries (1.A.1) and manufacturing industries and construction (1.A.2) leads to a decrease in total estimated base year emissions of N_2O, by 6.562 Gg (2,034.119 Gg CO_2 eq.), or 1.832 per cent. Table 10 presents the total difference between the original and the adjusted total estimated GHG emissions for this particular adjustment case.

Energy industries: solid and liquid fuels

161. The adjusted estimate for N_2O emissions from the combustion of solid fuels from energy industries (1.A.1) in the base year amounts to 0.295 Gg N_2O, compared to the 4.600 Gg N_2O originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions of N_2O, by 4.305 Gg (1,334.609 Gg CO_2 eq.), or 1.202 per cent.

162. The adjusted estimate for N_2O emissions from the combustion of liquid fuels from energy industries (1.A.1) in the base year amounts to 0.046 Gg N_2O, compared to the 1.137 Gg N_2O originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions of N_2O, by 1.092 Gg (338.609 Gg CO_2 eq.), or 0.305 per cent.

Manufacturing industries and construction – solid and liquid fuels

163. The adjusted estimate for N_2O emissions from the combustion of solid fuels from manufacturing industries and construction (1.A.2) in the base year amounts to 0.050 Gg N_2O, compared to the 0.526 Gg N_2O originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions of N_2O, by 0.475 Gg (147.338 Gg CO_2 eq.), or 0.133 per cent.

164. The adjusted estimate for N_2O emissions from the combustion of liquid fuels from manufacturing industries and construction (1.A.2) in the base year amounts to 0.038 Gg N_2O compared to the 0.727 Gg N_2O originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions of N_2O, by 0.689 Gg (213.563 Gg CO_2 eq.), or 0.192 per cent.

Conservativeness of the ERT's calculation of the adjustment

165. The ERT applied the conservativeness factor 0.73 (from table 1 of appendix III to the Technical Guidance for Adjustments, attached to decision 20/CMP.1) for estimating total N_2O emissions from the combustion of solid and liquid fuels from energy industries (1.A.1) and manufacturing industries and construction (1.A.2). The ERT therefore considers that the resulting adjusted value is conservative.

Table 6. Energy industries (1.A.1) – N_2O emissions from the combustion of solid fuels: the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.1 energy industries			
Greece's estimate of N_2O emissions from 1.A.1 energy industries – solid fuels	4.60012467	Gg N_2O	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s1
Greece's estimate of N_2O emissions from 1.A.1 energy industries – solid fuels	1 426.039	Gg CO_2 eq.	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s1
Greece's activity data 1.A.1 energy industries – solid fuels	288 585.04	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s1
Greece's N_2O IEF for 1.A.1 energy industries – solid fuels	15.940274	kg N_2O/TJ	Greece's 2006 submission for 1990, CRF table 1.A(a)s1
N_2O EF for 1.A.1 energy industries – solid fuels (before applying conservativeness factor)	1.4	kg N_2O/TJ	IPCC EF for N_2O emissions for solid fuels (Reference Manual, page 1.36, table 1-8)
Estimate of N_2O emissions from 1.A.1 energy industries – solid fuels	0.404019	Gg N_2O	ERT's calculation
Conservativeness factor	0.73		Table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative N_2O emissions from 1.A.1 energy industries – solid fuels	0.294935	Gg N_2O	ERT's calculation
Adjusted conservative N_2O emissions from 1.A.1 energy industries – solid fuels	91.430	Gg CO_2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	GgCO_2 eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	109 719.463	Gg CO2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	1 334.609	Gg CO_2 eq.	ERT's calculation
	1.202	%	ERT's calculation

Table 7. Energy industries (1.A.1) – N_2O emissions from the combustion of liquid fuels: the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.1 energy industries			
Party's estimate of N_2O emissions from 1.A.1 energy industries – liquid fuels	1.13709590	Gg N_2O	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s1
Party's estimate of N_2O emissions from 1.A.1 energy industries – liquid fuels	352.767	Gg CO_2 eq.	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s1
Greece's activity data 1.A.1 energy industries – liquid fuels	104 274.55	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s1
Greece's N_2O IEF for 1.A.1 energy industries – liquid fuels	10.9048268	kg N_2O/TJ	Greece's 2006 submission for 1990, CRF table 1.A(a)s1
N_2O EF for 1.A.1 energy industries – liquid fuels (before applying conservativeness factor)	0.6	kg N_2O/TJ	IPCC default EF for N_2O emissions for liquid fuels (Reference Manual, page 1.36, table 1-8)
Estimate of N_2O emissions from 1.A.1 energy industries – liquid fuels	0.062565	Gg N_2O	ERT's calculation
Conservativeness factor	0.73		Table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative N_2O emissions from 1.A.1 energy industries – liquid fuels	0.045672	Gg N_2O	ERT's calculation
Adjusted conservative N_2O emissions from 1.A.1 energy industries – liquid fuels	14.158	Gg CO_2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	Gg CO_2 eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 715.463	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	338.609	Gg CO_2 eq.	ERT's calculation
	0.305	%	ERT's calculation

Table 8. Manufacturing industries and construction (1.A.2) – N_2O emissions from the combustion of solid fuels: the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.2 manufacturing industries and construction			
Greece's estimate of N_2O emissions from 1.A.2 manufacturing industries and construction – solid fuels	0.52562855	Gg N_2O	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
Party's estimate of N_2O emissions from 1.A.2 manufacturing industries and construction – solid fuels	162.945	Gg CO_2 eq.	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
Greece' s activity data 1.A.2 manufacturing industries and construction – solid fuels	49 260.490	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
Greece' s N_2O IEF for 1.A.2 manufacturing industries and construction – solid fuels	10.6703879	kg N_2O/TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
N_2O EF for 1.A.2 manufacturing industries and construction – solid fuels (before applying conservativeness factor)	1.4	kg N_2O/TJ	IPCC EF for N_2O emissions for solid fuels (Reference Manual, page 1.36, table 1-8)
Estimate of N_2O emissions from 1.A.2 manufacturing industries and construction – solid fuels	0.068966	Gg N_2O	ERT's calculation
Conservativeness factor	0.73		Table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative N_2O emissions from 1.A.2 manufacturing industries and construction – solid fuels	0.050345	Gg N_2O	ERT's calculation
Adjusted conservative N_2O emissions from 1.A.2 manufacturing industries and construction – solid fuels	15 607	Gg CO_2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	Gg CO_2 eq.	Greece' s initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 906.734	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	147.338	Gg CO_2 eq.	ERT's calculation
	0.133	%	ERT's calculation

Table 9. Manufacturing industries and construction (1.A.2) – N_2O emissions from the combustion of liquid fuels: the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.2 manufacturing industries and construction			
Greece's estimate of N_2O emissions from 1.A.2 manufacturing industries and construction – liquid fuels	0.72665028	Gg N_2O	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
Greece's estimate of N_2O emissions from 1.A.2 manufacturing industries and construction – liquid fuels	225.262	Gg CO_2 eq.	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
Greece's activity data 1.A.2 manufacturing industries and construction – liquid fuels	86 164.41	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
Greece's N_2O IEF for 1.A.2 manufacturing industries and construction – liquid fuels	8.43329960	kg N_2O/TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s2
N_2O EF for 1.A.2 manufacturing industries and construction – liquid fuels (before applying conservativeness factor)	0.6	kg N_2O/TJ	IPCC EF for N_2O emissions for liquid fuels (Reference Manual, page 1.36, table 1-8)
Estimate of N_2O emissions from 1.A.2 manufacturing industries and construction – liquid fuels	0.051699	Gg N_2O	ERT's calculation
Conservativeness factor	0.73		Table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative N_2O emissions from 1.A.2 manufacturing industries and construction – liquid fuels	0.037740	Gg N_2O	ERT's calculation
Adjusted conservative N_2O emissions from 1.A.2 manufacturing industries and construction – liquid fuels	11.699	Gg CO_2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	Gg CO_2 eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 840.509	Gg CO_2 eq.	ERT
Difference between original and adjusted total aggregated GHG emissions	213.563	Gg CO_2 eq.	ERT's calculation
	0.192	%	ERT's calculation

Table 10. – N_2O emissions from the combustion of solid and liquid fuels (1.A.1 and 1.A.2) Description of the adjustment calculation – summary table

Parameter/estimate	Value	Unit	Source
Category: 1.A.1 energy industries and 1.A.2 manufacturing industries and construction			
Adjusted conservative N_2O emissions from 1.A.1 energy industries and 1.A.2 manufacturing industries and construction – solid and liquid fuels	0.428726	Gg N_2O	ERT's calculation
Adjusted conservative N_2O emissions from 1.A.1 energy industries and 1.A.2 manufacturing industries and construction – solid and liquid fuels	132.905	Gg CO_2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	Gg CO_2 eq.	Greece's initial report (2006 GHG inventory submission) (base year 1990 and 1995 for F-gases)
Total aggregated GHG in the base year after application of the adjustment	109 019.953	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	1 334.609	*Gg CO_2 eq.*	*Table 6 N_2O emissions from 1.A.1 energy industries – solid fuels*
	338.609	*Gg CO_2 eq.*	*Table 7 N_2O emissions from 1.A.1 energy industries – liquid fuels*
	147.338	*Gg CO_2 eq.*	*Table 8 N_2O emissions from 1.A.2 manufacturing industries and construction – solid fuels*
	213.563	*Gg CO_2 eq.*	*Table 9 N_2O emissions from 1.A.2 manufacturing industries and construction – liquid fuels*
	2 034.119	Gg CO_2 eq.	TOTAL (1.A.1 + 1.A.2)
	1.832	%	ERT's calculation

3. Chemicals (1.A.2(c)) – CO_2 emissions from the combustion of solid fuels (lignite) for ammonia production

The original estimate

166. In its 2006 inventory submission, Greece estimated CO_2 emissions from 6,534.2 TJ of solid fuels combusted in chemicals (1.A.2(c)) in the base year at 648.04 Gg CO_2. According to the information provided by Greece during the in-country visit, this amount also includes CO_2 emissions from ammonia production under the industrial processes sector. The amount of lignite used as feedstock for ammonia production is 4,862.86 TJ as reported in CRF table 1.A(d) – feedstocks and non-energy use of fuels (with zero fraction of carbon stored since all carbon in the ammonia production process is released). If these reported AD (4,862.86 TJ) and the reported EF for lignite for ammonia production in the NIR (99.176 t/TJ) are used, the resulting emissions amount to 482.279 Gg CO_2.

The underlying problem

167. During the in-country review, the ERT informed Greece of a potential problem of overestimation in the base year in the estimation of CO_2 emissions from ammonia production, included in the chemicals (1.A.2(c)) category and reported under the energy sector.

168. According to the Greek energy balance, Greece used 579,000 t of lignite for "non-energy use" in 1990. During the in-country review, Greece explained to the ERT that this amount of lignite corresponds to the amount used for the production of ammonia. According to the *Statistical Yearbook of Greece 1990–1991* (page 348), consumption for "non-energy use" in 1990 is 79 ktoe (i.e. lignite for ammonia production), which corresponds to 3,307.57 TJ (1 ktoe = 41.868 TJ). This amount of lignite used is much lower than the amount of lignite used as a feedstock reported in CRF table 1.A(d). The result is therefore an overestimation of CO_2 emissions from ammonia production in the base year.

The rationale for the adjustment

169. The energy balance of Greece reports 579,000 t of lignite for "non-energy use", while the *Statistical Yearbook of Greece 1990–1991* reports 79 ktoe (3,307.57 TJ) of lignite consumption for "non-energy use" in 1990. During the in-country review, using these data the ERT calculated the NCV for lignite, obtaining a value of 5.71 MJ/kg (3,307.57 TJ/579 kt), which corresponds to the NCV used for lignite in the energy industries (1.A.1) category. However, using the 4,862.86 TJ of lignite reported in CRF table 1.A(d) and the 579,000 t of lignite for "non-energy use" reported in the energy balance of Greece, the calculation results in an NCV of 8.399 MJ/kg, which is much higher than the NCV used for lignite in the energy industries (1.A.1) category.

170. In addition, emissions from ammonia production can be calculated using the IPCC alternative method based on the reported amount of ammonia produced (313,028 t) in CRF table 2(I).A-G and the IPCC emission factor (1.5 t CO_2/t of ammonia produced). A comparison of the current approach used by Greece using fuel consumption (482.279 Gg CO_2) with the approach based on the amount of ammonia produced (469.542 Gg CO_2) also shows a discrepancy between the two approaches.

171. During the in-country review the ERT identified the overestimation of CO_2 emissions from ammonia production included in chemicals (1.A.2(c)) and reported under the energy sector as a potential problem, and recommended that Greece address the problem by revising the activity data using the lignite NCV of 5.71 MJ/kg for lignite as derived from the energy balance of Greece and the *Statistical Yearbook of Greece 1990–1991* in order to estimate GHG emissions (CO_2, CH_4, N_2O) from ammonia production.

172. In response to the notification on the potential problem, Greece responded to the ERT within the six-week period, on 8 June 2007, as follows:

"For the inventory compilation the use of original data (ie kt) were used as provided by the Ministry of Development, that is the authority responsible for such a purpose. The data provided by the statistical service have obviously resulted from these original data using some kind of conversion. The Inventory team considered accurate to use for the conversion the NCV used for industrial processes, since industrial production of ammonia and fertilizers are concerned."

173. Greece did not adequately correct the problems by providing revised estimates as the ERT recommended. The ERT, having reviewed Greece's response, concluded that its recommendations to Greece had not been followed. The rationale for the adjustment is a lack of transparency and supporting documentation for the NCV of lignite used to estimate AD and CO_2 emissions from ammonia production in the base year.

The assumptions, data and methodology used to calculate the adjustment

174. As indicated above, the ERT calculated the NCV for lignite, obtaining a value of 5.711 MJ/kg (3,307.57 TJ/579 kt) for 1990, based on the data contained in the energy balance of Greece (579,000 t of lignite for "non-energy use") and the *Statistical Yearbook of Greece 1990–1991* (79 ktoe or 3,307.57 TJ of lignite for "non-energy use"). Consequently the NCV for estimating the adjusted AD (3,307.57 TJ) for CO_2 emissions from ammonia production included in chemicals (1.A.2(c)) and reported under the energy sector used by the ERT is 5.71 MJ/kg, which corresponds to the NCV used for energy use in energy industries (1.A.1). On this basis the ERT applied the IPCC default approach for the adjustment, using the CO_2 EF for lignite from the PPC study (122 t/TJ, including oxidation factor) and the obtained AD (3,307.57 TJ).

The adjusted estimate

175. Table 11 presents the results of the ERT's calculation, including the original estimate for CO_2 emissions from ammonia production as reported by Greece, the adjusted estimate as calculated by the ERT, and the impact of the adjustment on total estimated GHG emissions in the base year.

176. As table 11 shows, the adjusted derived estimate for CO_2 emissions from ammonia production in the base year amounts to 395.453 Gg CO_2 compared to 482.279 Gg CO_2 derived by the ERT from Greece's submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 86.826 Gg CO_2, or 0.078 per cent.

Conservativeness of the ERT's calculation of the adjustment

177. The ERT applied the conservativeness factor 0.98 (table 1 of appendix III to the Technical Guidance for Adjustments, attached to decision 20/CMP.1) for estimating CO_2 emissions from ammonia production included in chemicals (1.A.2(c)) and reported under the energy sector. The ERT therefore considers that the resulting adjusted value is conservative.

Table 11. Chemicals (1.A.2(c)) – CO_2 emissions from the combustion of solid fuels (lignite) for ammonia production: the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.2(c), chemicals			
Greece's AD for ammonia production	579 000	ton	Greece's 2006 inventory submission, NIR annex II, page 215, table II.2
Greece's *AD of lignite used as feedstock (described to the ERT as lignite for ammonia production)*	4 862.86	TJ	Party's 2006 submission for 1990, CRF table 1.a(d)
CO_2 EF of lignite for ammonia production	99.176	t CO_2/TJ	Greece's 2006 inventory submission, NIR annex III, page 233, table III.1 (lignite – other sectors (c content 27.6t C/TJ (101.2tCO2/TJ), oxidation factor 0.98))
Party's estimate for *CO_2 emissions from ammonia production*	482.279	Gg CO_2	Derived from Greece's 2006 inventory submission
Applied AD for ammonia production	79 (3 307.57 TJ)	ktoe	*Statistical Yearbook of Greece 1990–1991*, page 348
Conservativeness factor	0.98		Table 1 of appendix III of the Technical Guidance for Adjustments attached to decision 20/CMP.1.
Adjusted conservative AD for ammonia production	3 241.42	TJ	ERT's calculation
Applied CO_2 EF of lignite for ammonia production	122	t CO_2/TJ	CO_2 emission factor for the lignite used for electricity production study conducted by Public Power Corporation (PPC, 1993) including oxidation factor
Adjusted conservative estimate for *CO_2 emissions from amonia production*	395.453	Gg CO_2	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	Gg CO_2 eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 967.246	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	86.826	Gg CO_2 eq.	ERT's calculation
	0.078	%	ERT's calculation

4. Civil aviation (1.A.3(a)) – CO_2, CH_4, and N_2O emissions from the combustion of fuel (jet kerosene and aviation gasoline)

The original estimate

178. In its 2006 inventory submission, Greece estimated CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)): 1,469.238 Gg CO_2 eq. For this estimation Greece used an IPCC tier 2a methodology, which is based on a combination of energy consumption data and air traffic data (LTOs) and default emission factors.

The underlying problem

179. During the in-country review, the ERT informed Greece of the potential problem of an overestimation in the base year for CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)).

180. Both Greece in its NIR and the ERT acknowledged the apparent discrepancies and lack of transparency between the data on LTOs and energy consumption from the energy balance. The number of LTOs from domestic aviation increased by 71.3 per cent over the period 1990–2004, but fuel consumption decreased by 15.6 per cent in the same period. The issue was identified by the ERT during the 2004 and 2005 reviews and was acknowledged by Greece as an area for improvement in its future NIRs.

181. After the review process Greece provided additional information on domestic LTOs and the number of passengers travelling on domestic flights for the complete time series 1990–2004. The number of passengers travelling on domestic flights increased by 40 per cent over the period 1990–2004. Greece did not provide any additional information with regard to the methodologies used for estimating fuel consumption on domestic flights as reported in the energy balance as "domestic air".

The rationale for the adjustment

182. During the in-country review the ERT recommended that Greece address the potential overestimation of emissions from civil aviation in the base year. The ERT requested that Greece provide supporting data and information for the estimation of emissions from domestic air movements over the period 1990–2004 and provide justification for the discrepancy between the data on LTOs and the fuel consumption trends, or revise the emission estimates in the base year in accordance with the trend in LTOs.

183. Greece responded to the notification on potential problems on 8 June 2007, within the six-week period established by the guidelines for review under Article 8 of the Kyoto Protocol, as follows:

"The inventory team used official data taken from the corresponding competent authorities i.e. LTOs from the Civil Aviation Organisation and fuel consumption from the official Energy Balance – Ministry for Development, including data for the distribution of fuels between domestic and international flights."

184. Greece did not adequately correct the problems by providing the recommended revised CO_2, N_2O and CH_4 emission estimates.

185. Based on Greece's response and the additional information provided by Greece, the ERT concluded that its recommendations had not been followed. The rationale for the adjustment is the discrepancy between the LTOs and fuel consumption as, based on the official statistics of LTOs reported, the fuel consumption is far higher than would be expected for the base year. In addition, the ERT considered that there was a lack of transparency in the allocation of fuel to domestic flights and therefore a lack of transparency in the estimation of CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)).

186. The ERT consulted Greece on the calculation of the adjustment (according to decision 22/CMP.1). In its response, on 23 July 2007, Greece provided to the ERT information on flight statistics (domestic arrivals and departures, and number of passengers travelling). According to this information LTOs in Greece from domestic aviation increased by 71.3 per cent between 1990 and 2004, and the number of passengers on domestic flights increased by 40 per cent over the period 1990–2004, but fuel consumption decreased by 15.6 per cent over the same period. This remaining inconsistency between the statistics on LTOs (from the CAO) and fuel consumption (from the Greek energy balance) indicates an overestimation of CO_2, CH_4 and N_2O emissions in 1990.

The assumptions, data and methodology used to calculate the adjustment

187. Before the ERT proceeded with the adjustment, it tested several assumptions – for example, examining the share of LTO CO_2 emissions compared to total CO_2 emissions from domestic flights; comparing the fuel consumption/number of domestic flights with corresponding data from a cluster of countries of comparable size and domestic flight distances; and examining whether the average domestic flight distance and fleet would match reported domestic fuel consumption in 1990. The results of this exercise showed again that there was an overestimation of CO_2, CH_4 and N_2O emissions from civil aviation in the base year. Also, the ERT concluded that the number of LTOs in 2004 reported by Greece is correct.

188. Since Greece has detailed LTO statistics, and since domestic flights are not possible without an LTO cycle, the ERT applied the number of LTOs in 2004 as a driver for the extrapolation of GHG

emissions back to 1990. A detailed description of the assumptions, data and methodology used is provided in annex III.

The adjusted estimate

189. Table 12 presents the results of the ERT's calculation, including the original estimate as reported by Greece in its 2006 GHG inventory submission, the adjusted estimate as calculated by the ERT, in accordance with appendix III to the Technical Guidance for Adjustments (attached to decision 20/CMP.1) and the impact of the adjustment on total estimated GHG emissions in the base year.

190. As table 12 shows, the adjusted estimate for CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)) in the base year amounts to 593.691 Gg CO_2 eq., compared to the 1,469.238 Gg CO_2 eq. originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 875.547 Gg CO_2 eq., or 0.788 per cent.

Conservativeness of the ERT's calculation of the adjustment

191. The ERT applied the conservativeness factor 0.82 for transport (aviation and shipping) activity data (table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1) for the AD (consumption of jet kerosene and aviation gasoline) used in calculating CO_2, CH_4 and N_2O emissions from civil aviation (1.A.3(a)). The ERT therefore considers that the resulting adjusted value is conservative.

Table 12. Civil aviation (1.A.3(a)) – CO_2, CH_4, and N_2O emissions from the combustion of fuel (jet kerosene and aviation gasoline): the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.3(a) civil aviation			
Estimate of CO_2 emissions from 1.A.3(a) civil aviation	1 454.689	Gg CO_2	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Estimate of CH_4 emissions from 1.A.3(a) civil aviation	0.0120345	Gg CH_4	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Greece's estimate of N_2O emissions from 1.A.3(a) civil aviation	0.0461168	Gg N_2O	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Greece'sestimate of GHG emissions from 1.A.3(a) civil aviation	1 469.238	Gg CO_2 eq.	ERT's calculation from Party's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Greece's AD for fuel combustion in 1.A.3(a) civil aviation in 1990	20 602.26	TJ	Greece's 2006 inventory submission for 2004, CRF table 1.A(a)s3
- of which jet kerosene	20 243.86	TJ	Greece's 2006 inventory submission for 2004, CRF table 1.A(a)s3
- of which aviation Gasoline	358.40	TJ	Greece's 2006 submission for 2004, CRF table 1.A(a)s3
Greece's number of domestic LTOs in 1990	118.55	thousand LTOs	Greece's 2006 inventory submission, NIR, page 75, table 3.21,
Greece's AD for fuel combustion in 1.A.3(a) civil aviation in 2004	17 394.30	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
- of which jet kerosene	16 498.30	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
- of which aviation gasoline	896.00	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Greece's number of domestic LTOs in 2004	203.11	thousand LTOs	Greece's 2006 inventory submission NIR, page 75, table 3.21
Driver for extrapolation	0.08	TJ/LTO	ERT's calculation
Adjusted AD for 1.A.3(a) civil aviation	10 152.42	TJ	ERT's calculation: extrapolation from 2004 to 1990 using number of LTOs as a driver
- of which jet kerosene	9 976.04	TJ	ERT's calculation based on share of Jet kerosene in Party's 2006 submission for 1990, CRF table1.A(a)s3
- of which aviation gasoline	176.38	TJ	ERT's calculation based on share of aviation gasoline in Greece's 2006 submission for 1990, CRF table1.A(a)s3
Conservativeness factor (activity data- aviation)	0.82		Table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted AD for 1.A.3(a) civil aviation	8 324.98	TJ	ERT's calculation
- of which jet kerosene	8 180.35	TJ	ERT's calculation
- of which aviation gasoline	144.63	TJ	ERT's calculation
IEF CO_2 – aviation gasoline	68.6070	t CO_2/TJ	Party's 2006 submission for 1990, CRF table 1.A(a)s3
IEF CO_2 – jet kerosene	70.6436	t CO_2/TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
IEF CH_4 – aviation gasoline	0.5	kg CH_4/TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
IEF CH_4 – jet kerosene	0.5856	kg CH_4/TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
IEF N_2O – aviation gasoline	2	kg N_2O/TJ	Greece's 2006 submission for 1990, CRF table 1.A(a)s3
IEF N_2O – jet kerosene	2.2426	kg N_2O/TJ	Greece's 2006 submission for 1990, CRF table 1.A(a)s3
Adjusted CO_2 emissions 1.A.3(a) civil aviation	587.812	Gg CO_2	ERT's calculation
Adjusted CH_4 emissions 1.A.3(a) civil aviation	0.0048627	Gg CH_4	ERT's calculation
Adjusted N_2O emissions 1.A.3(a) civil aviation	0.0186345	Gg N_2O	ERT's calculation
Adjusted GHG emissions 1.A.3(a) civil aviation	593.691	Gg CO_2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Grece	111 054.072	GgCO_2 eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases

Total aggregated GHG in the base year after application of the adjustment	110 178.525	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	875.547	Gg CO_2 eq.	ERT's calculation
	0.788	%	ERT's calculation

5. Road transportation (1.A.3(b)) – CO_2 emissions from combustion of lubricants

The original estimate

192. In its 2006 inventory submission, for the base year, Greece provides the following estimate for CO_2 emissions from combustion of lubricants in road transportation (1.A.3(b)): 142.972 Gg CO_2.

The underlying problem

193. During the in-country review the ERT identified a potential problem of overestimation of CO_2 emissions from combustion of lubricants in road transportation (1.A.3(b)).

194. The lubricant consumption per fuel consumption ratio in 1990, based on Greece's activity data allocation, is 0.0236 (3.938,62 TJ/166.745,16 TJ), which is nine times higher than the average of other countries that report CO_2 emissions from combustion of lubricants.

The rationale for the adjustment

195. During the in-country review the ERT, with the assistance of the Greek inventory team, made a proxy bottom-up calculation (using fleet structure, and kilometres driven used by Greece for estimating emissions from fuel combustion for road transportation, 1.A.3(b)). The ERT's calculation resulted in an estimate of CO_2 emissions, which is an order of magnitude lower than the CO_2 emission estimates provided by Greece in CRF table 1.A(a) for the year. This estimate by the ERT is comparable with the estimates of CO_2 emissions from other countries (United Kingdom, Germany, and Romania) from the combustion of lubricants in road transportation in 1990.

196. During the review the ERT recommended Greece to provide revised CO_2 emission estimates based on the number of vehicles in the fleet, assumptions on annual kilometres travelled and the specific consumption of lubricants. In response to the notification on this potential problem, Greece responded to the ERT within the six-week period, on 8 June 2007, as follows:

"The amount of lubricants (in kt) used was taken from the official Energy Balance of Greece, provided by the Ministry for Development and notified to IEA and EUROSTAT."

197. Greece did not adequately correct the problems by providing revised estimates, as recommended by the ERT, nor did it provide any additional information on the methodology used for determining the portion of lubricants combusted, nor was a detailed split into different types of lubricant provided. The ERT, having reviewed the response from Greece, concluded that its recommendations had not been followed. The rationale for the adjustment is lack of transparency since Greece was unable to provide the methodology used for calculating the combusted portion of lubricants (AD), or to provide revised estimates as recommended by the ERT.

The assumptions, data and methodology used to calculate the adjustment

198. The ERT concluded that the most appropriate methodology for the adjustment in accordance with the Technical Guidance for Adjustments (attached to decision 20/CMP.1) would be the use of an appropriate driver (lubricant consumption/fuel consumption) from a cluster of countries which estimate CO_2 emissions from the combustion of lubricants. However, only three countries do so (United Kingdom, Germany and Romania). Before the ERT proceeded with the adjustment, it also tested whether a higher proportion of two-stroke mopeds in the Greek vehicle fleet can significantly affect the

estimate of CO_2 emissions from consumption of lubricants, and concluded that the effect cannot justify the much higher Greek CO_2 emission estimates from combustion of lubricants in road transport.

199. A detailed description of the assumptions, data and methodology used is provided in annex III to this report.

The adjusted estimate

200. Table 13 presents the results of the ERT's calculation, including the original estimate as reported by Greece, the adjusted estimate as calculated by the ERT, and the impact of the adjustment on total GHG emissions in the base year.

201. As table 13 shows, the adjusted estimate, for CO_2 emissions from energy combustion of lubricants from road transportation (1.A.3(b)) in the base year amounts to 29.811 Gg CO_2 compared 142.972 Gg CO_2 originally reported by Greece in the 2006 inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 113.161 Gg CO_2, or 0.102 per cent.

Conservativeness of the ERT's calculation of the adjustment

202. The ERT applied the conservativeness factor 0.94 (transport (road and other), table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1) for estimating CO2 emissions from the combustion of lubricants from road transportation (1.A.3(b)). The ERT therefore considers that the resulting adjusted value is conservative.

Table 13. Road transportation (1.A.3(b)) – CO_2 emissions from combustion of lubricants: description of the adjustment calculation

Parameter/estimate	Value	Unit	Source
Category: 1.A.3(b) road transportation			
Greece's estimate of CO_2 emissions for lubricants in 1.A.3(b) road transportation	142.972	Gg CO_2	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Greece's lubricants consumption in 1.A.3(b) road transportation	3 938.62	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3
Greece's fuel consumption in 1.A.3(b) road transportation	166 745.16	TJ	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s3 (gasoline+diesel+LPG)
Lubricant/fuel ratio in 1.A.3(b) road transportation	0.00261983	t lub / t fuel	Lubricant/fuel ratio derived from cluster of countries (see annex III)
Lubricants consumption in 1.A.3(b) road transportation using ratio and fuel used , as reported by Greece (before applying conservativeness factor)	436.84	TJ	ERT's calculation
Conservativeness factor	0.94		Transport (road and other) - table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative lubricants consumption in 1.A.3(b) road transportation	410.63	TJ	ERT's calculation
EF CO_2 – lubricants	20	tC/TJ	IPCC Default CO_2 EF, Revised 1996 IPCC Guidelines, Reference manual, table 1.1, page 1.13
Oxidation factor	0.99		Revised 1996 IPCC Guidelines, Workbook, table 1-4, page 1.8
Adjusted conservative CO_2 emissions from lubricants combustion in 1.A.3(b) road transportation	29.811	Gg CO_2	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece	111 054.072	$GgCO_2$ eq.	Greece's initial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 940.911	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	113.161	Gg CO_2 eq.	ERT's calculation
	0.102	%	ERT's calculation

6. Residential (1.A.4(b)) – CH_4 and N_2O emissions from biomass consumption

The original estimate

203. In its 2006 inventory submission accompanying the initial report, Greece provides the following estimate for biomass consumption, in the residential category (1.A.4(b)): 29,393 TJ; and, for CH_4 and N_2O emissions from biomass consumption, 9.41 Gg CH_4 and 0.32 Gg N_2O (297.751 Gg CO_2 eq., taking CH_4 and N_2O emissions together).

The underlying problem

204. Biomass consumption in the residential category is reported as constant over the period 1990–2004 (29,393 TJ). During the in-country review the ERT considered that this constant value used over the whole time series has led to an overestimation of CH_4 and N_2O emissions in 1990. It informed Greece of a potential problem of overestimation in the base year of biomass consumption in the residential category, leading to an overestimation of CH_4 and N_2O emissions.

The rationale for the adjustment

205. During the in-country review the ERT noted that the AD for biomass consumption reported for the residential category (1.A.4(b)) in the base year are similar to the data on total carbon loss in living biomass reported in the LULUCF sector (forest land remaining forest land). If all annual carbon loss in living biomass in 1990 would be allocated as biomass used for combustion purposes, this would mean that all industrial wood (pulpwood, round and split and other industrial wood) is also considered as fuelwood. The ERT considered that these assumptions may lead to an overestimation of CH_4 and N_2O emissions in the residential category (1.A.4(b)) in the base year. The rationale for identifying this as a potential problem is the lack of transparency in the assumptions made and the data sources for biomass consumption in the residential category (1.A.4(b)).

206. The ERT recommended Greece to provide more transparent data on biomass use in the period 1990–2004 or to revise biomass consumption in the residential category, taking into account drivers such as:

- total amount of commercial felling;
- amount of wood used in other sectors or/and for other purposes;
- heating degree/days over the period 1990–2004;
- trends in total area of dwellings;
- trends of other energy use in residential sector;
- administrative bans on solid biomass use for energy purposes (due to air quality issues).

207. Greece responded to the notification on potential problems on 8 June 2007, within the six-week period established by the guidelines for review under Article 8 of the Kyoto Protocol, as follows:

"The amount of biomass use in the residential sector used by the inventory team (29.393 TJ or 702 ktoe) is taken from the national energy balance sheet and it remains constant until today. The aforementioned value comes from research contacted by the Center for Renewable Energy Sources in 1996."

"Such an adjustment would result in discrepancies between the inventories and the official energy balance when there are no data in support of such an adjustment."

208. Greece did not adequately correct the problems by providing revised CH_4 and N_2O emission estimates as requested by the ERT.

209. The ERT, having reviewed Greece's response, concluded that its recommendations had not been followed. The rationale for the adjustment is the lack of transparency on the assumptions and data sources used in the estimates, and the discrepancy in the assumptions, data and methodology used.

210. Before the ERT proceeded with the calculation of the adjustment, it compared the activity data on annual carbon loss in living biomass estimated in the 2006 Greece's submission for 1990 (table 5.A) and FAO statistics and noted a close match. Further disaggregation of the FAO data shows that 35.6 per cent of wood "produced" in Greece is fuelwood. According to the FAO statistics, in 1990 Greece "produced" 1,346,000 m^3 of fuelwood, which corresponds to 759,800 t dry wood. In practice this means that Greece used an energy content of biomass of 39 MJ/kg of dry wood (the value is close to the NCV of fuel oil), which is almost 2.6 times higher than the IPCC default value of 15 MJ/kg for fuelwood.

The assumptions, data and methodology used to calculate the adjustment

211. According to the NIR over the period 1990–2004 there was a considerable reduction in total wood harvest (NIR, page 153, paragraph 4), and a sharper reduction in the production of fuelwood (substitution of wood as a heating source by liquid fuels and electricity).

212. The ERT noted that the FAO on fuelwood statistics for Greece[4] for the period 1990–2005 identified a decrease in fuelwood consumption of 25.3 per cent, which is consistent with the information in the NIR. On this basis the ERT used the amount of fuelwood reported by the FAO for the total amount of biomass used in the residential sector (1.A.4(b)) for 1990.

213. For converting the FAO data provided in mass units (m^3) the ERT used wood densities taken from the IPCC good practice guidance for LULUCF (table 3A.1.9-1), including the IPCC default value of 0.5 for carbon content in dry wood, and used the IPCC default value of 15 MJ/kg for fuelwood as NCV. The AD obtained using these parameters and the EFs for CH_4 and N_2O emissions from biomass reported by Greece for the residential category (1.A.4(b)) in the base year were subsequently used in the calculation of the adjusted estimates.

214. A detailed description of the assumptions, data and methodology used for the calculations is provided in annex III to this report.

The adjusted estimate

215. Table 14 presents the results of the ERT's calculation, including the original estimate as reported by Greece, the adjusted estimate as calculated by the ERT, and the impact of the adjustment on total estimated GHG emissions in the base year. As table 14 shows, the adjusted estimate, for CH_4 and N_2O emissions from biomass consumption, residential category (1.A.4(b)) in the base year amounts to 94.670 Gg CO_2 eq., compared to the 297.751 Gg CO_2 eq. originally reported by Greece in the 2006 GHG inventory submission. The application of the adjustment leads to a decrease in total estimated base year emissions, by 203.081 Gg CO_2 eq., or 0.183 per cent.

Conservativeness of the ERT's calculation of the adjustment

216. The ERT applied the conservativeness factor 0.82 (table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1) for estimating total CH_4 and N_2O emissions from biomass consumption, residential category (1.A.4(b)). The ERT therefore considers that the resulting adjusted value is conservative.

[4] FAO FaoStat: <http/faostat.fao.org/site/381/default.aspx>.

Table 14. Residential (1.A.4(b)) – CH_4 and N_2O emissions from biomass consumption: the adjustment calculation

Parameter/Estimate	Value	Unit	Source
Category: 1.A.4(b) residential			
Greece's estimate of CH_4 emissions from biomass consumption in 1.A.4(b) residential	9.40576	Gg CH_4	Greece's 2006 inventory submission for 1990, CRF table 1.A(a)s4
Greece's estimate of N_2O emissions from biomass consumption in 1.A.4(b) residential	0.323323	Gg N_2O	Greece' inventory 2006 submission for 1990, CRF table 1.A(a)s4
Greece'sestimate of CH_4 and N_2O emissions from biomass consumption in 1.A.4(b) residential	297.751	Gg CO_2 eq.	ERT's calculation based on Party's 2006 submission for 1990, CRF table1.A(a)s4
Greece's AD for biomass consumption in 1.A.4(b) residential	29,393	TJ	Greece's inventory 2006 submission for 1990, CRF table 1.A(a)s4
Biomass consumption for adjustment calculation – conifers	116 000	m^3	FAO FaoStat – Wood fuel (conifers)*
Biomass consumption for adjustment calculation – non-conifers	1 230 000	m^3	FAO FaoStat – Wood fuel (non-conifers)*
Applied wood density (tdm/m^3) – *conifers*	0.4	ton dm/m^3	IPCC good practice guidance for LULUCF (table 3A.1.9-1)
Applied Wood density (tdm/m^3) – *non-conifers*	0.58	ton dm/m^3	IPCC good practice guidance for LULUCF (table 3A.1.9-1)
Applied total amount of dry fuelwood	759 800	ton dm	ERT's calculation
Net calorific value of fuelwood	15	MJ/kg	Revised 1996 IPCC Guidelines for national GHG Inventories (table 1–13, page 1.45)
Adjusted biomass consumption in 1.A.4.b residental	11 397.00	TJ	ERT's calculation
Conservativeness factor	0.82		Table 1 of appendix III to the Technical Guidance for Adjustments attached to decision 20/CMP.1
Adjusted conservative biomass consumption in 1.A.4(b) residental	9 345.54	TJ	ERT's calculation
EF CH_4 – biomass	320	kg CH_4/TJ	IEF from Greece's 2006 submission, CRF table 1.A(a)s3 – 1990
EF N_2O – biomass	11	kg N_2O/TJ	IEF from Greece's 2006 submission table 1.A(a)s3 – 1990
Adjusted conservative biomass CH_4 emissions 1.A.4(b) residential	2.99057	Gg CH_4	ERT's calculation
Adjusted conservative biomass N_2O emissions 1.A.4(b) residential	0.102801	Gg N_2O	ERT's calculation
Adjusted conservative estimate of CH_4 and N_2O emissions from biomass consumption in 1.A.4(b) residential	94.670	Gg CO2 eq.	ERT's calculation
Total aggregated GHG emissions in the base year as reported by Greece's	111 054.072	Gg CO_2 eq.	Greece'sinitial report (2006 GHG inventory submission), base year 1990 and 1995 for F-gases
Total aggregated GHG in the base year after application of the adjustment	110 850.991	Gg CO_2 eq.	ERT's calculation
Difference between original and adjusted total aggregated GHG emissions	203.081	Gg CO_2 eq.	ERT's calculation
	0.183	%	ERT's calculation

* FAO FaoStat: <http/faostat.fao.org/site/381/default.aspx>.

D. Calculation of the assigned amount

217. The assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated by Greece in accordance with the annex to decision 13/CMP.1.

218. Greece's base year is 1990 and it has chosen 1995 as the base year for HFCs, PFCs and SF_6. Greece's quantified emission reduction commitment is 92 per cent as included in Annex B to the Kyoto Protocol. As Greece is part of the European Community, whose member States will meet their reduction commitment jointly in accordance with Article 4 of the Kyoto Protocol, Greece's quantified emission limitation commitment is 125 per cent. The assigned amount is calculated based on Greece's Article 4 commitment.

219. Based on Greece's base year emissions under the Kyoto Protocol – 111,054.072 Gg CO_2 eq. – and its quantified emission limitation commitment in accordance with Article 4 of the Kyoto Protocol (125 per cent of base year emissions), Greece calculated its assigned amount to be 694,087,947 tonnes CO_2 eq. The ERT disagrees with this figure.

220. The ERT applied six adjustments (see section C) to the base year emission estimates, which cover seven categories. Based on Greece's base year emissions, its quantified emission limitation commitment in accordance with Article 4 of the Kyoto Protocol and applying the adjustments (4,066.903 Gg CO_2 eq.), to the base year emissions, the ERT's calculation of the assigned amount is 668,669,806 tonnes CO_2 eq., which is 3.7 per cent lower than the original assigned amount calculated and reported by Greece in its initial report.

E. Calculation of the commitment period reserve

221. Greece's calculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1. Based on its originally calculated assigned amount – 694,087,947 tonnes CO_2 eq. – Greece calculated and reported in its initial report its commitment period reserve to be 624,679,152 tonnes CO_2 eq. The ERT disagrees with this figure.

222. Based on the ERT's calculation of the assigned amount, which includes the applied adjustments to the base year emissions, the ERT calculates the commitment period reserve to be 601,802,826 tonnes CO_2 eq.

F. National registry

223. Greece has provided practically all the information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1) in its initial report. The information provided is transparent and in accordance with the requirements of these guidelines. Table 15 summarizes the information on the mandatory reporting elements on the national registry system, as stipulated by decision 15/CMP.1, which describes how its national registry performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1.

Table 15. Summary of information on the national registry system

Reporting element	Provided in the initial report or during the in-country visit	Comments
Registry administrator		
Name and contact information	Yes	National Center for the Environment and Sustainable Development (NCESD) Address: KIFISIAS & GR. LAMBRAKI 1
Cooperation with other Parties in a consolidated system		
Names of other Parties with which Greece cooperates, or clarification that no such cooperation exists	Yes	No such cooperation exists
Database structure and capacity of the national registry		
Description of the database structure	Yes	Covered in the independent assessment report (IAR)[a]
Description of the capacity of the national registry	Yes	
Conformity with data exchange standards (DES)		
Description of how the national registry conforms to the technical DES between registry systems	No	Covered in the IAR
Procedures for minimizing and handling of discrepancies		
Description of the procedures employed in the national registry to minimize discrepancies in the transaction of Kyoto Protocol units	Yes	A supplementary approach to minimization of discrepancies is made possible by transactions also being undertaken through the CITL.
Description of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transaction	Yes	
Prevention of unauthorized manipulations and operator error		
An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error	Yes	Covered in the IAR
An overview of how these measures are kept up to date	Yes	
User interface of the national registry		
A list of the information publicly accessible by means of the user interface to the national registry	Yes	Covered in the IAR
The Internet address of the interface to Greece's national registry	Yes	<https://registry.ekpaa.gr/crwebekpaa/startApp.do>
Integrity of data storage and recovery		
A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster	Yes	Covered in the IAR
Test results		
The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems.	No	Covered in the IAR

[a] Pursuant to decision 16/CP.10, once registry systems become operational, the administrator of the international transaction log (ITL) is requested to facilitate an interactive exercise, including with experts from Parties to the Kyoto Protocol not included in Annex I to the Convention, demonstrating the functioning of the ITL with other registry systems. The results of this exercise will be included in an independent assessment report (IAR). They will be also included in its annual report to the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol.

224. The registry of Greece was not yet operational at the time of the in-country review (April 2007). During the in-country review, the ERT was provided with additional and updated information on the national registry, including the structure, role and responsibilities of the registry administrator, which is the National Center for the Environment and Sustainable Development, the arrangements between Greece and the software and hardware providers, and the timetable for initialization and other activities of the registry.

225. During the in-country review, the ERT was informed that the national registry has been operational since May 2006 for transactions within the EU (non-Kyoto units). The initialization process with the ITL under the Kyoto Protocol was expected to be completed by 27 September 2007, by which date the registry was expected to be fully operational. Information on the registry is publicly available at <http://www.ekpaa.gr>. Further information on the registry was obtained by the ERT through direct interaction with the registry service administrators, the software contractor (Mr. Gerhard Schwarz, representative of Smart Technologies GmbH) and a document entitled "Greek GHG Registry: Supporting Documents and Procedures for the ERT, UNFCCC", dated 25 April 2007.

226. The ERT was also informed on the procedures and security measures in place to minimize discrepancies, terminate transactions and correct problems, and minimize operator error. These procedures and security measures included internal consistency checks and routines, automatic termination of inconsistent transactions, reconciliation procedures with the international transaction log (ITL) in the event of termination failure, training and help-desk programs for operators and registry staff, hierarchical access rights depending on the user (registry administrator or operator), authentication protocols such as "audit trailing", client information provider (IP) logging, and analysis tools, backup units, and security buffers between the data servers and the Internet.

227. The ERT recommends that Greece provide in its next annual report under the Kyoto Protocol a description of the registry's database structure to accompany the schematic diagram shown in the initial report, as well as a description of the user training and help-desk programs for operators and staff of the registry. It is also recommended that the following information be included: the success and failure of measures and checks designed to prevent discrepancies, errors and security leaks, and added registry procedures in the upgraded software version (e.g. checks on the handling of temporary certified emission reductions (tCERs) and long-term certified emission reductions (lCERs), net source and non-compliance cancellations after ITL notification, etc.).

228. The ERT acknowledges the effort made by Greece to put in place these adequate procedures and security measures through the contractual arrangement it has with Smart Technologies to handle the registry servers system in Vienna, Austria. The ERT gained the overall impression that Greece attaches adequate importance, and allocates sufficient resources, including human resources, to the development, operation and maintenance of the registry.

229. The ERT took note of the results of the technical assessment of the national registry, including the results of standardized testing, as reported in the independent assessment report (IAR), that was forwarded to the ERT by the administrator of the international transaction log, pursuant to decision 16/CP.10 on 27 September 2007.

230. The ERT reiterated the main findings of this report, including that the registry has fulfilled all of its obligations regarding conformity with the data exchange standards. These obligations include having adequate transaction procedures; adequate security measures to prevent and resolve unauthorized manipulations; and adequate measures for data storage and registry recovery.

231. Based on the results of the in-country review and the technical assessment, as reported in the IAR, the ERT concluded that Greece's national registry is fully compliant with the registry requirements defined in decisions 13/CMP.1 and 5/CMP.1, noting that registries do not have obligations regarding operational performance or public availability of information prior to the operational phase.

G. Land use, land-use change and forestry parameters and election of activities

232. Table 16 shows Greece's choice of parameters for forest definition as well as its elections for Article 3, paragraphs 3 and 4, activities in accordance with decision 16/CMP.1.

Table 16. Selection of LULUCF parameters

Parameters for forest definition		
Minimum tree cover	25%	
Minimum land area	0.3 ha	
Minimum tree height	2 m	
Elections for Article 3, paragraphs 3 and 4, activities		
Article 3, paragraph 3, activities	**Election**	**Accounting period**
Afforestation and reforestation	Mandatory	Commitment period
Deforestation	Mandatory	Commitment period
Article 3, paragraph 4, activities		
Forest land management	Elected	Commitment period
Cropland management	Not elected	Not applicable
Grazing land management	Not elected	Not applicable
Revegetation	Not elected	Not applicable

[a] Information of election of Article 3, paragraph 4, activities and accounting period was provided by Greece during and after the in-country review

233. The elected forest parameter values are within the ranges prescribed in paragraph 1(a) of the annex to decision 16/CMP.1.

234. The initial report for Greece does not identify its election and the accounting period for activities under Article 3, paragraph 4 of the Kyoto Protocol. In response to the ERT's questions, during and after the review the Ministry for the Environment, Physical Planning and Public Works provided information on the election and accounting of these activities. Greece intends to elect forest management, and to account for this Article 3, paragraph 4 activity over the entire commitment period. In addition Greece in its initial report states that it will account for activities under Article 3 paragraph 3 for the entire commitment period.

235. In accordance with decision 16/CMP.1, national systems under Article 5, paragraph 1 of the Kyoto Protocol shall ensure that areas of land subject to LULUCF activities under Article 3, paragraphs 3 and 4, are identifiable. Information on the capacity of Greece's national system to ensure that such land areas are identifiable is not included in the initial report. Also Greece does not have a comprehensive land use and land-use change area matrix. The ERT recommends Greece to establish a system for the identification and measurement of land use and areas of land-use change using at least a tier 2 methodology, described by the IPCC good practice guidance for LULUCF.

III. Conclusions and recommendations

A. Conclusions

236. The ERT concluded that the initial report of Greece generally covers the elements required by paragraphs 5, 6, 7 and 8 of the annex to decision 13/CMP.1, section I of the annex to decision 15/CMP.1, and relevant decisions of the CMP; that the assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated in accordance with the annex to decision 13/CMP.1; that the calculation of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1; and that the parameters for forest definitions are within the agreed range specified by decision 16/CMP.1.

237. The national system of Greece for the estimation of greenhouse gas emissions and removals is not fully prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1) and reported in accordance with the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (decision 15/CMP.1). In particular, Greece has not provided in the initial report some of the mandatory elements of the national system, such as institutional and procedural arrangements required to maintain the system as required by decision 19/CMP.1. The ERT found that the initial report describes the national system of Greece as it was at the date of its submission. At the time of the in-country review, due to the transfer of the technical responsibility for inventory preparation to the Ministry for the Environment during 2007, there was not sufficient evidence to demonstrate to the ERT, that Greece could maintain the institutional and procedural arrangements to perform fully the functions of the national system, that it has in place the necessary arrangements for technical competence of the staff involved in the inventory development process, and that the national system has the capacity for timely performance (see section III.C above).

238. Greece's 2006 greenhouse gas inventory submitted in conjunction with the initial report is largely complete; it includes a complete set of CRF tables for the years 1990–2004 and the NIR; it is complete in terms of geographical coverage, years and sectors; and it is fairly complete in terms of categories and gases. The inventory is also generally accurate and transparent as defined in the UNFCCC reporting guidelines, and broadly consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. However, the ERT identified a number of categories, in particular in the energy sector, where methods, AD or EFs used were not fully in accordance with these guidelines. This includes a number of categories in the energy sector with an overestimation of emissions in the base year, for which the ERT requested Greece to submit revised estimates. Greece provided further information on these categories, but did not submit any revised estimates. As a result, the ERT calculated and recommended six adjustments (covering seven categories) in the energy sector where overestimations of emissions were identified in the base year (see section III.C). In accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1), the ERT officially notified Greece of the calculated adjustments. However, Greece failed to notify the secretariat of its intention to accept or reject the calculated adjustments within the time frame set out in these guidelines. In accordance with these guidelines, this failure was considered as acceptance by Greece of the adjustments, and the ERT applied the six adjustments calculated to the emission estimates of seven categories in the energy sector.

239. The assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated by Greece in accordance with the annex to decision 13/CMP.1. Based on the reported base year emissions under the Kyoto Protocol of 111,054.07 Gg CO_2 eq. and the limitation commitment in accordance with Article 4 of the Kyoto Protocol of 125 per cent, Greece calculated the assigned amount to be 694,087,947 tonnes CO_2 eq. The required level of the commitment period reserve was calculated by Greece, in accordance with paragraph 6 of the annex to decision 11/CMP.1, to be 624,679,152 tonnes CO_2 eq. The ERT did not agree with these numbers and applied adjustments in the energy sector, calculating the assigned amount and the commitment period reserve accordingly (see section III.C).

240. The parameters selected by Greece on forest definitions for LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are in accordance with decision 16/CMP.1. This includes 25 per cent of minimum tree cover, 0.3 ha of minimum land area, and 2 metres as minimum tree height. LULUCF activities under Article 3, paragraph 3, will be accounted for the entire commitment period. During and following the in-country review, it informed the ERT that it intends to elect forest management as an activity under Article 3, paragraph 4 and to account for activities under Article 3, paragraph 4 for the entire commitment period. Greece has not, however, provided information as required under decision 16/CMP.1 on the capacity of its national system to ensure that land areas under Article 3, paragraphs 3 and 4, are identifiable.

241. Greece in its initial report has provided most of the information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1).

242. Based on the results of the in-country review and the technical assessment, as reported in the independent assessment report, the ERT concluded that Greece's national registry is fully compliant with the registry requirements defined in decisions 13/CMP.1 and 5/CMP.1.

B. Recommendations

243. In the course of the review, the ERT formulated a number of recommendations relating to the accuracy, transparency and completeness of Greece's information presented in the initial report, and the 2006 GHG inventory submission. The key recommendations are that Greece:

- Demonstrate and report in its next submission under the Kyoto Protocol that as part of its national system it can maintain the institutional and procedural arrangements necessary to perform the functions of this system, including the arrangements for sufficient capacity and arrangements for technical competence of the staff to timely perform the functions defined in the guidelines for national systems (decision 19/CMP.1);

- Further develop its QA/QC system and consequently implement QA/QC procedures in the inventory preparation, particularly by carrying out a domestic review of the inventory by independent national experts. Include more information on QC activities in each sectoral chapter of its next NIR;

- Address all the methodological issues that led to adjustments during the initial review and use, where appropriate, tier 2 methods for key categories in accordance with the IPCC good practice guidance, for example, for the estimation of CO_2 emissions from forest land remaining forest land (5.A.1) and cropland remaining cropland (5.B.1);

- Improve the completeness of the inventory by preparing and reporting estimates for categories that are currently not estimated, including estimates for subcategories of consumption of halocarbons and SF_6, and estimates of potential emissions of fluorinated gases that could be obtained by establishing a relevant data-gathering system;

- Improve the accuracy of the estimation of GHG emissions of key categories in the energy sector, including by collecting information on combustion technologies and implementing a tier 2 method for estimating N_2O emissions from solid fuels and liquid fuels for the categories energy industries (1.A.1) and manufacturing industries and construction (1.A.2);

- Improve the transparency of the estimates by providing more precise descriptions and documentation of the methods used and more detailed information about AD and EFs for all key categories in its next NIR;

- Include information on the rationale for the selection of uncertainty values in each sectoral chapter of its next NIR;

- Demonstrate and report in its next submission under the Kyoto Protocol the capacity of Greece's national system to ensure that land areas under Article 3, paragraphs 3 and 4, are identifiable;

- Adopt and implement at least a tier 2 methodology for the identification and measurement of land uses and changes in land use, as described in the IPCC good practice guidance for LULUCF.

C. Adjustments/question of implementation

244. The ERT concludes from the information contained in the initial report and the additional information received during and after the in-country review that the national system of Greece does not fully comply with the guidelines for national systems under Article 5, paragraph 1 of the Kyoto Protocol (decision 19/CMP.1) and the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (decision 15/CMP.1). In particular, the ERT concludes that the maintenance of the institutional and procedural arrangements; the arrangements for the technical competence of the staff; and the capacity for timely performance of Greece's national system is an unresolved problem, and therefore lists it as a question of implementation.

245. The ERT concludes, based on the review of the 2006 inventory submitted in conjunction with the initial report, that there are several categories where the methods, AD and EFs used are not fully in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance as required by Article 5, paragraph 2 of the Kyoto Protocol. This includes a number of categories in the energy sector for which base year emissions have been overestimated. The ERT, following the review of the additional information provided by Greece during and after the in-country review, concluded that it did not satisfactorily correct the problem through submission of acceptable revised estimates and decided to calculate and recommend six adjustments in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1). Greece in its communication of 13 November 2007 failed to notify the secretariat of its intention to accept or reject the calculated adjustments to the GHG emission estimates of the energy sector. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol, this failure was considered as acceptance by Greece of the adjustments, and the ERT applied the six adjustments calculated to the emission estimates of seven categories in the energy sector. The application of adjustments by the ERT resulted in a change in the estimate of the base year emissions from the energy sector – from 81,762.634 Gg CO_2 eq., as originally reported by Greece, to 77,695.731 Gg CO_2 eq. This in turn resulted in a change in the estimated total base year emissions of Greece – from 111,054.072 Gg CO_2 eq., as originally reported by Greece, to 106,987.169 Gg CO_2 eq.

246. Accordingly, the ERT has calculated the assigned amount based on the adjusted value of the base year emissions of Greece to be 668,669,806 tonnes CO_2 eq. This is 3.7 per cent lower than the original assigned amount calculated and reported by Greece in its initial report. The ERT has also recalculated the commitment period reserve to be 601,802,826 tonnes CO_2 eq.

Annex I

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/>.

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UNFCCC secretariat. Greece: Independent assessment report of the national registry of Greece. Reg_AIR_GR_2007_1. Will be available at: <http://unfccc.int>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Paris Zikos, Ms. Elpida Politi, (Ministry for the Environment, Physical Planning and Public Works), Mr. Dimitrios Lalas, Mr. Giannis Sarafidis, Ms. Elena Georgopoulou, Ms. Dimitra Koutentaki, Mr. Sebastian Mirasgentis, Ms. Katerina Papagiannaki and Mr. Babis Petsikos (National Observatory of Athens), Mr. Eleftherios Papavasilopoulos, and Mr. Ioannis Pappas (National Center for the Environment and Sustainable Development).

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General Secretariat of National Statistical Service of Greece. *Statistical Yearbook of Greece 1990–1991*.

Greek GHG Registry. Supporting documents and procedures for the ERT, UNFCCC, 25 April 2007.

Head of the Division of Atmospheric Pollution Control (P. Zikos). Answers to the questions raised by ERT on 24 April 2007. Athens, Greece, 28 April 2007.

Hellenic Republic, Ministry for the Environment, Physical Planning and Public Works Division of Air Pollution and Noise Control. Initial Report of Greece under the Kyoto Protocol. Letter to UNFCCC secretariat concerning Art. 3, paragraph 3 and paragraph 4. Athens, Greece, 18 May 2007.

Hellenic Republic, Ministry for the Environment, Physical Planning and Public Works Division of Air Pollution and Noise Control. Additional information provided by Greece to the potential problems and further questions from the ERT formulated in the course of the in-country review of Greece initial report under the Kyoto Protocol and 2006 inventory submission. Covering letter to UNFCCC secretariat, with 13-page annex. Athens, Greece, 8 June 2007.

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Annex II

Acronyms and abbreviations

AD	activity data
CaO	lime
CAO	Civil Aviation Organisation
CH_4	methane
CMP	Conference of the Parties and the Conference of the Parties serving as the Meeting of the Parties
CO_2	carbon dioxide
CO_2 eq.	carbon dioxide eq.
CRF	common reporting format
EC	European Community
EF	emission factor
EIT	economy in transition
ERT	expert review team
ETS	emissions trading scheme
EU	European Union
F-gas	fluorinated gas
FAO	Food and Agriculture Organization of the United Nations
FOD	first order decay
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
GJ	gigajoule (1 GJ = 10^9 joule)
GWP	global warming potential
HFCs	hydrofluorocarbons
IAR	independent assessment report
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1 thousand grams)
kgoe	kilograms of oil eq.
LPG	liquefied petroleum gas
LTO	landing and take-off
LULUCF	land use, land-use change and forestry
m^3	cubic metre
Mg	megagram (1 Mg = 1 tonne)
Mt	million tonnes
Mtoe	millions of tonnes of oil eq.
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NIR	national inventory report
nm	nautical miles
NO	not occurring
NOA	National Observatory of Athens
NSSG	National Statistical Service of Greece
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
PPC	Public Power Corporation
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
SO_2	sulphur dioxide
Tg	teragram (1 Tg = 1 million tonnes)
TJ	terajoule (1 TJ = 10^{12} joule
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change

Annex III

Additional details on selected adjustment cases

A. Road transportation (1.A.3(b)) – CO_2 emissions from combustion of lubricants

Adjustment method

1. In line with the Technical Guidance for Adjustments attached to decision 20/CMP.1, the ERT elected to apply a basic adjustment method using the lubricant/fuel ratio from a cluster of countries. Apart from Greece, three countries estimate emissions from the consumption of lubricants in road transportation. Table III.1 identifies the lubricant/fuel ratios of these three countries.

Table III.1. Lubricant/fuel ratio for a cluster of countries

Road transport	Lubricants use (TJ)	Fuel consumption in road transportation (TJ)	Ratio lubricant/fuel
UK (1990)	3 613.29	1 536,368.08	0.00235184
Romania (1993)	460.74	93 541.69	0.00492550
Germany (1990)	1 203.00	2 066 537.00	0.00058213
Average			0.00261983

2. The lubricant/fuel ratio in 1990, based on Greece's reported AD, would be 0.0236 (3.938,62TJ/166.745,16TJ) which is nine times higher than the average of the selected cluster of countries. Greece has a 50 per cent lower CO_2 IEF (because the correction of carbon stored introduced in the EF), but CO_2 emissions are still more than 4.5 times above the average. Table III.2 shows the adjusted AD derived by applying the basic adjustment method using the average lubricant/fuel ratio from a cluster of countries (0.00261983 TJ/TJ).

Table III.2. Adjustment calculation

Year	Combustion of lubricants used in 1.A.3(a) road transportation AD (TJ)		Comments
	Reported by Greece	Adjusted by the ERT	
1990	3 938.62	410.63	Activity data estimates based on average lubricant/fuel ratio derived from a cluster of countries.

3. Since Greece has a relatively large fleet of two-stroke mopeds which use lubricants in the fuel mixture, the ERT also considered the impact of this national driver on Greece's estimates of its CO_2 emissions. It concluded that the relatively large fleet of two-stroke mopeds does not significantly affect the CO_2 emission estimates or justify an order of magnitude difference between Greece and other countries, in the estimation of CO_2 emissions from combustion of lubricants in road transportation (1.A.3(b)).

Table III.3. CO_2 emissions from combustion of lubricants in road transportation – two-stroke mopeds

Parameter/estimate	Value	Unit	Source
Fuel consumption of two-stroke mopeds	77 351	t (gasoline)	COPERT III data for 1990 used for estimation of GHG emissions in road transportation – two-stroke mopeds
Lubricants mixture used for 1.A.3(b) road transportation (two-stroke mopeds)	1:50 (2%)	Ratio	2006 IPCC Guidelines
Lubricants combusted in 1.A.3(b) road transportation (two-stroke mopeds)	1 547	t (lubricants)	ERT's calculation
NCV of lubricants	40.19	MJ/kg	Greece's 2006 submission for 1990 – CRF table 1.A(b)
C content of lubricants	20	t C/TJ	Greece's 2006 submission for 1990 – CRF table 1.A(b)
CO_2 emissions from lubricants combustion in 1.A.3(b) road transportation – two-stroke mopeds	4.514	Gg CO_2	ERT's calculation

B. Civil aviation (1.A.3(a)) – CO_2, CH_4, and N_2O emissions from the combustion of fuel (jet kerosene and aviation gasoline)

Adjustment method

4. According to the Technical Guidance for Adjustments accompanying decision 20/CMP.1, adjustments should be applied at the level at which the problem was identified. For this particular case, the adjustment is focused to the AD on fuel consumption.

5. During the process for calculating adjustments, the ERT requested Greece to provide background information on LTOs and fuel allocated to domestic aviation. The ERT received further information from Greece on LTOs. The information received confirmed the number of LTOs as reported in the NIR, including information on numbers of passengers travelling on domestic flights. This additional information showed an increase in the number of passengers travelling on domestic flights by 40 per cent over the period 1990–2004, and provided additional support that the trend in fuel consumption should also be increasing.

6. To determine whether fuel consumption and consequently emissions of CO_2, CH_4 and N_2O were overestimated in 1990 or underestimated in 2004, the ERT estimated fuel consumption for 2004 based on number of LTOs, and the average share (10–20 per cent) of LTO emissions in relation to total emissions from domestic flights (as provided in the Revised 1996 IPCC Guidelines). This approach depends mainly on the length of the domestic flight, which depends on the size of the country. As almost all domestic flights from Athens are in the range of 100–500 km, and flights from Greece to the Greek islands are relatively short, the share of LTOs in total flight fuel consumption would be expected to be closer to the upper part of the range or even higher than the range indicated in the Revised 1996 IPCC Guidelines.

7. For example, the share of LTOs in total fuel consumption for domestic flights reported by Italy (with larger distances between major domestic hubs) was 25.4 per cent in 1990 and 25.0 per cent in 2004.

8. Applying the upper part of the IPCC range (20 per cent) to reported fuel consumption in 2004 for Greece resulted in 383 kg of fuel per LTO. The ERT considered that this would be the expected amount of fuel consumption for Greece for fleets operating domestic routes. Furthermore the ERT compared Greece's ratio, "fuel consumption/domestic flight" (0.08 TJ/flight), in 2004 with data from a cluster of comparable countries and concluded that Greece's data were closely aligned with the cluster of countries selected (United Kingdom 0.08 TJ/flight, Italy 0.12 TJ/flight, Norway 0.05 TJ/flight).

9. The ERT agreed that fuel consumption in 2004 as reported in the NIR is a solid starting point for extrapolation back to 1990. As a driver for extrapolation back to 1990 the ERT selected a ratio of reported fuel consumption divided by the number of LTOs provided in the NIR (0.08 TJ/LTO). The ERT assumed that one domestic flight consists of 1 LTO + 1 cruise; thus the number of LTO cycles corresponds to the number of flights.

10. Table III.4 shows adjusted fuel consumption to 1990 using the basic adjustment method of extrapolation.

Table III.4. Adjusted fuel consumption using extrapolation

	LTOs		Fuel consumption (TJ)	
Year	Provided by Greece	% of increase (year/1990)	Proposed by Greece	Adjusted by the ERT
1990	118 550	1	20 602	10 152
1991	102 660	–13.40	20 300	8 792
1992	112 370	–5.21	21 450	9 623
1993	123 240	3.96	22 570	10 554
1994	127 580	7.62	19 800	10 926
1995	135 260	14.10	17 170	11 583
1996	145 120	22.41	18 060	12 428
1997	164 880	39.08	17 350	14 120
1998	167 700	41.46	16 230	14 362
1999	200 530	69.15	15 430	17 173
2000	220 070	85.63	22 160	18 846
2001	202 870	71.13	18 870	17 373
2002	174 000	46.77	17 260	14 901
2003	195 950	65.29	16 500	16 781
2004	203 110	71.33	17 394	17 394

11. Adjusted fuel consumption using extrapolation back to 1990 corresponds with a 25 per cent share of LTO in fuel consumption (comparable with Italy's), 400 kg/LTO (jet and turboprop in the fleet operating on domestic flights) and average cruise distance of 400 km, which is a reasonable distance for Greece's national circumstances.

12. To provide further support on whether fuel consumption (and consequently emissions of CO_2, CH_4 and N_2O) are overestimated for 1990, the ERT during the review also tested a number of the assumptions made by Greece on fuel allocation. For example, the ERT tested the allocation of fuel for domestic aviation reported by Greece for the year 1990 against the number of LTOs provided by the CAO. The ERT concluded as follows.

13. If LTO/cruise consumption in 1990 was 10/90 (the range mentioned in the Revised 1996 IPCC Guidelines is 10–20 per cent), then:

- Average LTO consumption would be 400 kg/LTO, which corresponds to a fleet where every type of aircraft has two smaller turboprop aircraft (Boeing 737); average flight distance would then further increase over the maximum flight distance for turboprop aircraft (1200 km).

14. If LTO/cruise consumption in 1990 was 20/80 then:

- The average LTO consumption would be 800 kg/LTO, which means that all aircraft operating on domestic routes (100–500 km) would be Boeing 737/A320 aircraft, with an occupancy rate of only 44 per cent;

- The average cruise (fuel use minus LTO) per flight would be 3,188 kg, which corresponds to 578 nm (1,053 km is the distance from Athens to Beirut, Tunis, Rome, Budapest and Cairo) using Boeing 737-400 aircraft (5.51kg fuel/nm from the IPCC good practice guidance, page 2.65, table 2.9);
- The indicator of fuel consumption per domestic flight would be 0.017 TJ/flight, which is almost three times more than that in the UK (0.006 TJ/flight).

15. The ERT also tested the ratio that would result in a flight distance which is still theoretically plausible in Greece (average flight of 400 km) using the amount of fuel allocated to domestic flights. Based on a ratio calculated by the ERT of 60/40, the average LTO consumption per flight would be approximately 2,790 kg/LTO, which is close to the consumption of a Boeing 747 LTO. The ERT concluded from this analysis that the amount of aviation fuel allocated by Greece to domestic aviation in 1990 was higher than would be expected.

C. Residential (1.A.4(b)) – CH_4 and N_2O emissions from biomass

Adjustment method

16. In its 2006 inventory GHG submission, Greece reports 29,393 TJ of biomass burned in the residential category (1.A.4(b)). According to the FAO statistics, in 1990 Greece "produced" 1,346,000 m^3 of fuelwood, which corresponds to 759,800 tons dry wood, which equates to an energy content of biomass of 39 MJ/kg of dry wood (this value is close to the NCV of fuel oil). This is almost 2.6 times higher than the IPCC default value of 15 MJ/kg for fuelwood. The ERT also assumed that the industry sector does not use commercial fuelwood for energy purposes.

17. In determining the amount of fuelwood used in 1990, the ERT used the FAO data for 1990 on wood production. The FAO data for Greece and the information provided in the Greek NIR under the LULUCF sector were found to be consistent. Over the period 1990–2004 there was a considerable reduction in total wood harvest that corresponded to a similar reduction in the amount of CO_2 released to the atmosphere (NIR, page 153, paragraph 4). As a result of this reduction, there was a sharper reduction in the production of fuelwood compared to that from commercial felling; this was due mainly to the substitution of wood as a heating source by liquid fuels and electricity.

18. The ERT noted that the FAO data on fuelwood statistics for Greece for the period 1990–2005 identified a decrease in fuelwood consumption of 25.3 per cent. The ERT noted that the information provided by Greece in the NIR is consistent with the FAO information. On this basis the ERT used the amount of fuelwood reported by the FAO for the total amount of biomass used in the residential category (1.A.4(b)) for 1990.

Table III.5. FAO FaoStat statistics for Greece

Country	Subject	Commodity	Unit	1990
Greece	Production quantity	Other Indust Roundwd(C)	CUM	62 000
Greece	Production quantity	Other Indust Roundwd(NC)	CUM	138 000
Greece	Production quantity	Pulpwood,Round&Split Trd	CUM	
Greece	Production quantity	Pulpwood,Round&Split(C)	CUM	
Greece	Production quantity	Pulpwood,Round&Split(NC)	CUM	
Greece	Production quantity	Pulpwood+Particles(C)	CUM	140 000
Greece	Production quantity	Pulpwood+Particles(NC)	CUM	260 000
Greece	Production quantity	Sawlogs+Veneer Logs (C)	CUM	302 000
Greece	Production quantity	Sawlogs+Veneer Logs (NC)	CUM	244 000
Greece	Production quantity	Pulpwood,Round&Split Trd	CUM	
Greece	Production quantity	Pulpwood,Round&Split(C)	CUM	
Greece	Production quantity	Pulpwood,Round&Split(NC)	CUM	
Greece	Production quantity	Pulpwood+Particles(C)	CUM	140 000
Greece	Production quantity	Pulpwood+Particles(NC)	CUM	260 000
Greece	Production quantity	Sawlogs+Veneer Logs (C)	CUM	302 000
Greece	Production quantity	Sawlogs+Veneer Logs (NC)	CUM	244 000
Greece	Production quantity	Wood Fuel(C)	CUM	116 000
Greece	Production quantity	Wood Fuel(NC)	CUM	1 230 000
Greece	Production quantity	TOTAL Wood fuel	CUM	1 346 000
Greece	Production quantity	TOTAL Industrial wood	CUM	2 092 000
Greece	Production quantity	TOTAL	CUM	3 438 000

19. The total production quantity of harvested wood in 1990 according to the FAO is 3,438,000 m^3, which includes industrial wood and fuelwood, of which 1,062,000 m^3 were conifers and 2,376,000 m^3 were non-conifers. The most abundant conifers as assessed by the ERT were fir (Abies spp.) and pine (Pinus spp.), and the most abundant non-conifers were oak (Quercus spp.) and beech (Fagus spp.).

20. Wood densities of conifers (0.4 ton dm/m^3) and non-conifers (0.58 ton dm/m^3) were taken from of the IPCC good practice guidance for LULUCF (table 3A.1.9-1) including the IPCC default value of 0.5 for carbon content in dry wood. The ERT used the IPCC default value of 15 MJ/kg for fuelwood as the NCV. The AD obtained using the above parameters and the EFs for CH_4 and N_2O emissions from biomass reported by Greece for the residential category (1.A.4(b)) in the base year were subsequently used in the calculation of the adjusted estimates.

Table III.6. Comparison of annual carbon loss in living biomass estimated in Greece's submission for 1990 and the FAO FaoStat statistics

	Production quantity (m^3)	Wood density (tdm/m^3)	Dry wood (tons dry matter)	Carbon content (Gg C)
Conifers (FAO)	1 062 000	0.4	424 800	
Non-conifers (FAO)	2 376 000	0.58	1 378 080	
TOTAL (FAO)	3 438 000		1 802 880	901 440
Wood fires*				150 000
Total annual carbon loss in living biomass (FAO)				1 051 440
Total annual carbon loss in living biomass (Greece 2006 submission for 1990, CRF table 5.A)				1 127 560
Difference				**6.7%**

* *Note*: The amount is estimated from figure 7.5 presented in Greece's 2006 NIR (*c.* 550 kt CO_2).

21. Comparison of the FAO data with data submitted by Greece for the LULUCF sector shows a close match (a 6.7 per cent difference). The ERT therefore concluded that the FAO data can be used for the adjustment.

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