



**UNITED
NATIONS**



**Framework Convention
on Climate Change**

Distr.
GENERAL

FCCC/ARR/2009/ESP
5 March 2010

ENGLISH ONLY

**Report of the individual review of the annual submission of Spain
submitted in 2009***

* In the symbol for this document, 2009 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Spain, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 14 to 19 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Domenico Gaudio (Italy) and Mr. Dennis Rudov (Belarus); energy – Mr. Leif Hockstad (United States of America) and Mr. Ole-Kenneth Nielsen (Denmark); industrial processes – Mr. Donald Kamdonyo (Malawi) and Mr. Stanford Mwakasonda (South Africa) and Mr. Dušan Vácha (Czech Republic); agriculture – Mr. Chang Liang (Canada); land use, land-use change and forestry (LULUCF) – Ms. Oksana Butrim (Ukraine), Mr. Walter Oyhantçabal (Uruguay) and Mr. Richard Volz (Switzerland); and waste – Ms. Violeta Hristova (Bulgaria) and Mr. Jose Ramon Villarin (Philippines). Mr. Hockstad and Mr. Mwakasonda were the lead reviewers. The review was coordinated by Mr. Sabin Guendehou and Ms. Astrid Olsson (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 Spain, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in Spain was carbon dioxide (CO₂), accounting for 82.8 per cent of total GHG emissions¹ expressed in CO₂ equivalent (eq), followed by methane (CH₄) (8.8 per cent) and nitrous oxide (N₂O), (6.9 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 1.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 78.1 per cent of the total GHG emissions, followed by agriculture (10.5 per cent), industrial processes (7.9 per cent), waste (3.2 per cent) and solvent and other product use (0.4 per cent). Total GHG emissions amounted to 442,321.56 Gg CO₂ eq and increased by 52.3 per cent between the base year² and 2007.

4. Tables 1 and 2 show total GHG emissions by gas and by sector, respectively. Table 1 shows emissions from the sectors/categories listed in Annex A to the Kyoto Protocol and excludes emissions and removals from the LULUCF sector.

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

² “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions includes emissions from Annex A sources only.

Table 1. Total greenhouse gas emissions by gas, 1990–2007^a

Greenhouse gas	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^b	1990	1995	2000	2005	2006	2007	
CO ₂	228 446.83	228 446.83	255 255.70	307 692.26	367 996.87	358 418.06	366 366.37	60.4
CH ₄	28 587.41	28 587.41	31 819.76	36 657.87	37 944.16	38 510.51	39 058.70	36.6
N ₂ O	27 747.40	27 747.40	26 504.20	32 631.30	29 687.34	30 020.30	30 470.38	9.8
HFCs	4 645.44	2 403.18	4 645.44	8 170.02	5 006.09	5 549.63	5 837.02	25.7
PFCs	832.51	882.92	832.51	411.71	244.41	247.63	249.12	–70.1
SF ₆	108.34	66.92	108.34	204.60	271.63	323.62	339.97	213.8

^a “Total GHG emissions” includes emissions from the sectors/categories listed in Annex A to the Kyoto Protocol and excludes emissions/removals from the LULUCF sector).

^b “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^a	1990	1995	2000	2005	2006	2007	
Energy	212 465.02	212 465.02	240 705.53	289 419.14	347 308.80	337 170.02	345 391.32	62.6
Industrial processes	28 547.56	26 314.29	27 411.17	34 684.62	34 321.67	35 007.86	34 852.48	22.1
Solvent and other product use	1 387.85	1 387.85	1 343.58	1 675.58	1 481.74	1 517.27	1 674.20	20.6
Agriculture	40 330.18	40 330.18	39 877.02	47 755.72	44 878.13	45 817.68	46 425.65	15.1
LULUCF	NA	–21 290.92	–22 456.81	–26 253.09	–27 415.09	–27 344.98	–27 996.96	NA
Waste	7 637.31	7 637.31	9 828.64	12 232.69	13 160.16	13 556.93	13 977.90	83.0
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	290 367.93	266 843.74	296 709.13	359 514.67	413 735.40	405 724.77	414 324.60	42.7
Total (without LULUCF)	290 367.93	288 134.66	319 165.94	385 767.75	441 150.50	433 069.76	442 321.56	52.3

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

^a “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The base year emissions include emissions from Annex A sources only.

C. Annual submission and other sources of information

5. The 2009 annual inventory submission was submitted on 14 April 2009; it contains a complete set of common reporting format (CRF) tables for the period 1990–2007, and a national inventory report (NIR). Spain also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including accounting of Kyoto Protocol units and information on changes in the national system and in the national registry. The standard electronic format (SEF) tables were submitted on 27 April 2009. The annual submission was submitted in accordance with decision 15/CMP.1. The Party indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol.

6. In addition, the expert review team (ERT) used the Standard Independent Assessment Report (SIAR), Parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.³

7. During the review, Spain provided the ERT with additional information. The documents concerned are not part of the annual 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.

D. Completeness of inventory

8. The inventory is in general complete in terms of years and geographical coverage. Spain has provided all CRF tables for the years 1990–2007 except for CRF table 8(b) on explanations for recalculations. The ERT found that the completeness of the annual submission could be improved with respect to the Party's reporting of not estimated ("NE") for a number of categories, namely: CO₂, CH₄ and N₂O emissions from gaseous fuels in road transportation, CH₄ emissions from exploration of oil, CO₂ and CH₄ emissions from exploration of natural gas, CO₂ emissions from production/processing of natural gas, CH₄ emissions from other leakage of natural gas, N₂O emissions from oil flaring, CO₂, CH₄ and N₂O emissions from flaring combined, emissions from fuel use in military operations, potential fluorinated gases (F-gases) emissions, CO₂ emissions from cropland remaining cropland (all carbon pools), CO₂ emissions from cropland converted to grassland (all carbon pools), CO₂ emissions from cropland converted to settlements (all carbon pools), CO₂, CH₄ and N₂O emissions from biomass burning (wildfires) in cropland.

9. The ERT recommends that Spain improve the completeness of its next annual submission, especially for those categories that are known to occur within the Party and for which methodologies are available in the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) to estimate emissions. The ERT encourages the Party to explore approaches available in the scientific literature, to estimate emissions for categories that do not have methodologies prescribed in the Revised 1996 IPCC guidelines nor the IPCC good practice guidance, with a view to enhance further, to the extent possible, the completeness and accuracy of its inventory. The ERT also recommends that the Party, when reporting emissions data for the first time for a given category, ensure that emissions data are provided for the entire inventory time-series, and that the choice of methods and emission factors (EFs) are clearly explained in the NIR.

³ The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry. The SIAR is not publicly available.

E. Main findings

10. The inventory is generally in line with 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). However, the ERT identified, in particular, the need for Spain to improve the inventory in LULUCF in line with the IPCC good practice guidance for LULUCF (see chapter V). The inventory covers the period 1990–2007 and is complete in terms of years, sectors and geographical coverage. Spain has submitted a complete set of CRF tables (except for CRF table 8(b)) for the years 1990–2007 and an NIR. The ERT found that the completeness of the annual submission could be improved with respect to the Party's reporting of “NE” for a number of non-LULUCF categories, especially those categories that are included in either the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance, and for which methods are prescribed therein.
11. By supplying the additional information requested by the ERT, Spain has demonstrated sufficient capacity to comply with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines) and the IPCC good practice guidance.
12. Spain has submitted, in part, on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with Part I of the annex to decision 15/CMP.1. The Party did not submit, on a voluntary basis, information on reporting of activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.
13. Spain has reported information on its accounting of Kyoto Protocol units in accordance with section I.E of the annex to decision 15/CMP.1, and used the SEF tables as required by decision 14/CMP.1.
14. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. However, no reference is included in the description of the national system on arrangements in place to ensure reporting on land areas for activities under Article 3, paragraph 3, and for elected activities under Article 3, paragraph 4, of the Kyoto Protocol.
15. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).
16. The ERT encourages Spain to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website.⁴
17. In the course of the review, the ERT formulated a number of recommendations relating to the completeness of the annual submission (see paras. 8 and 9 above), its transparency (see para. 30 below), key categories analysis (see paras. 23 and 25 below), uncertainty estimation (see para. 26 below), recalculations (see para. 28 below) and quality assurance/quality control (QA/QC) procedures (see para. 29 below).

⁴ <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotated_nir_outline.pdf>.

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

1. Overview

18. The ERT concluded that the national system continued to perform its required functions.

19. The NIR and additional information submitted by Spain during the review described the national system and institutional arrangements for the preparation of the inventory. The Directorate-General for Environmental Quality and Assessment at the Ministry of the Environment has overall responsibility for the national inventory. It performs the functions of the single national entity, in accordance with the order of the Ministry of the Environment MAM/1444/2006, dated 9 May 2006. To perform these functions, the Directorate-General for Environmental Quality and Assessment relies on the technical assistance of AED-NDS-TWOBE (Análisis Estadístico de Datos).

20. Other organizations are also involved in the preparation of the inventory, among them: the Industrial Engineering Technical School of the Polytechnic University in Madrid (ETSII-UPM) for inventory projections system, the Systems and Technology of Animal Production of the Valencia Polytechnic University (STEPA-UPV) for the agriculture sector and the Research Centre for Energy, Environment and Technology (CIEMAT) for quality control procedures, especially in the energy sector. Furthermore, in the various thematic contexts, working groups have been set up with different bodies. A group including representatives from the Ministry of Environment and Rural and Marine Affairs, with the cooperation of experts in the field, addresses specific aspects of agriculture; a group including representatives of the Ministry of Environment and Rural and Marine Affairs and the Ministry of Public Works, with the cooperation of experts in the field, works on the improvement of emission estimates in LULUCF; a group of representatives from the Autonomous Regions addresses technical aspects regarding methodology and basic information for the preparation of the national inventory and its disaggregation into regional levels.

2. Inventory planning

21. The Directorate-General for Environmental Quality and Assessment at the Ministry of the Environment is responsible for inventory planning; agreements are in place with other ministries, institutes, research institutions and universities (see paras. 19 and 20 above) to ensure annual provision of activity data (AD) and EFs. A QA/QC plan has been implemented, which includes highly formalized procedures for the request, receipt and archiving of data and QC checks built into the inventory database. An agreement with regional administration reached in 2008 is expected to allow a check of the bottom-up information incorporated into the national inventory with the corresponding data from the regional governments. It will also allow additional QC checks in bottom-up/top-down analyses to be performed with data sources at national and regional level.

22. Concerning arrangements for QA, the NIR does not provide enough information about involving external personnel to perform QA activities. Peer review has been carried out on 2007 and 2008 submissions only through a contract with CIEMAT, which covered only the energy sector. Since QA activities are an integral part of the national system, the ERT recommends that Spain provide, in its next annual submission, more detailed information on existing arrangements between the single national entity and external institutions with regard to performing QA activities. The ERT also recommends that Spain report in its next annual submission on how it intends to extend QA activities to other sectors and ensure the continuation during the commitment period. Furthermore, the description of the national system does not include any information on the arrangements in place to report on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. The ERT recommends that Spain report this information in its next annual submission.

3. Inventory preparation

Key categories

23. Spain has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2009 submission. The key category analysis performed by the Party and that performed by the secretariat⁵ produced different results owing to different levels of disaggregation used by the Party. Spain has included the LULUCF sector in its key category analysis. The ERT identified that the LULUCF categories reported by Spain as key categories do not correspond to IPCC categories and that it is not clear how they have been identified as key categories. The ERT recommends that Spain implement the key category analysis including the LULUCF sector in line with the IPCC good practice guidance for LULUCF in its next annual submission. Qualitative criteria have also been used to identify key categories. Spain should report in its next annual submission the results of the key category analysis with and without LULUCF, together with key categories identified by qualitative criteria in the NIR and CRF table 7.

24. Spain uses its key category analysis to plan future improvements in the inventory, for example regarding the selection of the estimation method and allocation of resources.

25. The ERT encourages Spain to implement a tier 2 key category analysis, as already planned according to previous NIRs.

Uncertainties

26. Spain has provided an uncertainty analysis for each category and for the inventory as a whole based on the tier 1 method and in accordance with the IPCC good practice guidance. However, the ERT noted that Spain has not implemented the recommendations from the previous review to include the LULUCF sector in its uncertainty analysis and to update its uncertainty analysis on an annual basis. Spain has explained that it is unable to implement the recommendation to update its uncertainty analysis on an annual basis because the estimates for the last reported year are based on provisional information, which is likely to be revised. The ERT reiterates the recommendations from the previous review that Spain includes the LULUCF sector in its uncertainty analysis and update its uncertainty analysis on an annual basis. The ERT encourages Spain to apply the tier 2 uncertainty analysis starting, as foreseen in the planned improvements, with the agriculture sector.

Recalculations and time-series consistency

27. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Spain for the time series 1990–2006 have been undertaken to take into account several factors, including: reallocation of fuels between the energy and industrial processes sectors; in the energy sector: availability of new and more precise information about fuel consumption and EFs, revision of natural gas consumption in 2004–2006; in the industrial processes sector: revision of AD for the decarbonation processes in fine ceramic (for 1990–2006) and for clinker production (for 2006), inclusion of CH₄ emissions from calcium carbide production, revision of data on domestic use of solvents and pharmaceutical products; in the agriculture sector: revision of AD on swine and poultry, updated information on milk production statistics, revision of parameters for burnt fraction of agricultural residues; in the LULUCF sector: new information on carbon stock change in living biomass

⁵ The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

in cropland converted to forest land; and in the waste sector: updated information on the amount of waste landfilled. For further information on recalculations, refer to the appropriate chapters of this report (see paras. 42, 56, 64, 75 and 82 below).

28. The major impact of the recalculations includes an increase of 0.2 per cent in total estimated GHG emissions in the base year and a decrease of 0.1 per cent in 2006). The rationale for these recalculations is provided in the NIR, but not in the CRF table 8(b). The ERT recommends that Spain report the explanations of the recalculations in the CRF table 8(b).

Verification and quality assurance/quality control approaches

29. According to the information presented in the NIR, both tier 1 and tier 2 QA/QC procedures have been implemented. However, from the QA/QC plan presented, it is not clear which QC procedures are implemented and for which categories tier 2 QA/QC procedures are applied. Furthermore, QA procedures are not carried out on an annual basis and for all sectors, but have been performed only for the 2007 and 2008 submissions for energy. In order to increase transparency, the ERT reiterates the recommendation from the previous review that Spain provide a sample of the completed tier 1 QC tables in its next annual submission. The ERT invites Spain to provide in its next NIR a list of the key categories to which tier 2 QA/QC procedures are applied. The ERT also recommends Spain to report in its next submission on past and planned QA activities and to ensure that all sectors are considered.

Transparency

30. The inventory submission is in general transparent, as regards both the NIR and the CRF tables. However, the use of notation keys is not always consistent. The definition of "NE" reported by Spain implies that this notation key is used where there are no emissions and in cases where estimates have not been provided. In addition, a detailed description of the analysis of trends in AD (for e.g. fuel consumption) and resulting emission estimates have not been provided and the current inventory for the non-energy use of fuels is not transparent (see para. 46 below). The ERT recommends that the Party use the notation keys in line with the IPCC good practice guidance and provide more information on AD and emission trends. Furthermore, explanations or references to the NIR have not been provided in some documentation boxes of the CRF tables, which makes the tables difficult to understand (e.g. it is not clear where some figures come from in the LULUCF sector). The ERT encourages the Party to improve the use of these boxes, providing relevant information on assumptions and methodology in order to improve transparency.

4. Inventory management

31. Spain has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. For practical reasons, the inventory database, together with the most important data, is duplicated at the Directorate-General for Environmental Quality and Evaluation of the Ministry of the Environment and at AED-NDS-TWOBE, which is the company in charge of technical support in the execution of tasks and the general development of the inventory.

G. Follow-up to previous reviews

32. Although a number of recalculations and improvements have been implemented by Spain in past annual submissions, changes identified by the ERT in the 2009 submission are limited to:

- (a) Revision in the waste sector to take into account previously missing information on the amount of waste deposited in controlled landfills;

- (b) Update of information on fuel for various sectors and reallocation of a significant amount of fuel from energy use to non-energy use in the chemical industry;
 - (c) Deduction of emissions from renewable fuels from overall emissions from road transportation.
33. The ERT identified that several recommendations from previous reviews have not been implemented. These recommendations include:
- (a) Improve completeness by estimating categories reported as “NE” using IPCC tier 1 methods, default EFs and/or AD, where applicable;
 - (b) Improve information on parameters that result in significant changes in implied emission factors (IEFs), particularly in the energy sector, and explain large inter-annual variations regarding the carbon content of fuels in most categories, in order to reduce the uncertainty of the estimates for this sector;
 - (c) Further improve institutional cooperation on the reporting of AD for the energy sector in order to resolve the apparent problem of inconsistency between the data sources from the different providers (ministries, departments and agencies) so as to reduce the uncertainty of AD and country-specific EFs;
 - (d) Obtain plant-specific data reported under the European Union emissions trading scheme (EU ETS) for the industrial processes and energy sectors in order to be able to compare this data with the data from statistical questionnaires as part of QA/QC checks and the verification process to reduce uncertainty;
 - (e) Increase transparency of the implemented QA/QC procedures by providing a sample of the completed tier 1 QC tables in an annex to the inventory submission as well as a list of the key categories for which tier 2 QA/QC procedures have been applied.

H. Areas for further improvement

1. Identified by the Party

34. The 2009 NIR identifies several areas for improvement. Spain indicated that it is working to:
- (a) Improve the development of the institutional arrangements, particularly regarding cooperation between ministries and autonomous communities;
 - (b) Identify key categories by using a tier 2 approach and including the LULUCF sector;
 - (c) Introduce a tier 2 approach to estimate uncertainty in specific sectors, such as agriculture;
 - (d) Improve the development and documentation of QC procedures to identify atypical values and replace anomalous/absent values. A number of specific improvements are also planned in all sectors.

2. Identified by the expert review team

35. The ERT identifies the following cross-cutting issues for improvement:
- (a) Improve completeness by providing in the next annual submission estimates for categories currently reported as “NE” for which methods exist in the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance;
 - (b) Improve transparency by clarifying the use of the notation keys;

- (c) Provide more detailed information on AD and emissions trends;
- (d) Include the LULUCF sector in the uncertainty analysis and update the uncertainty analysis on an annual basis;
- (e) Include in the NIR more detailed information on arrangements in the national system to perform QA activities for all sectors;
- (f) Include in the NIR information on arrangements in place in the national system to ensure reporting on land areas for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol;
- (g) Further improve the measures put in place in the registry to minimize operator errors, in accordance with paragraph 115 (e) of the annex to decision 22/CMP.1;
- (h) Put in place measures as soon as possible to mitigate and reduce the internal fragmentation of unit blocks and report on progress made in implementing these measures in the next annual submission, including any relevant implementation plan, test plans and test reports following the changes applied to the registry.

36. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

II. Energy

A. Sector overview

37. The energy sector is the main sector in the GHG inventory of Spain. In 2007, emissions from the energy sector amounted to 345,391.32 Gg CO₂ eq, or 78.1 per cent of total GHG emissions. Since 1990, emissions have increased by 62.6 per cent. The key driver for the rise in emissions was the substantial increase in emissions from transport (95.3 per cent), energy industries (58.4 per cent) and manufacturing industries and construction (46.4 per cent) between 1990 and 2007. Spain attributes this trend to a high economic growth rate. Within the sector, 35.6 per cent of the emissions were from energy industries, followed by 32.5 per cent from transport, 19.8 per cent from manufacturing industries and construction and 10.9 per cent from other sectors. Fugitive emissions from fuels accounted for 1.2 per cent of energy-related GHG emissions, of which 0.3 per cent were from solid fuels and 0.9 per cent from oil and natural gas.

38. The ERT identified a number of categories that are reported as “NE” by the Party. In response to a question from the ERT on this issue, the Party indicated that it would address in its next annual submission the completeness of the energy inventory by reporting the following categories, which are currently reported as “NE”: all emissions from gaseous fuels in road transportation; CO₂ emissions from coal mining and handling (underground and surface mines); CH₄ emissions from oil exploration; N₂O emissions from oil refining and storage; CH₄ and CO₂ emissions from natural gas exploration and natural gas other leakage (in residential and commercial sectors); CO₂ emissions from natural gas production/processing; N₂O from oil flaring; and all emissions from combined flaring. The ERT recommends that the Party ensure, to the extent possible, the inclusion in its next annual submission emissions for categories currently reported as “NE” and for which methods exist in the Revised 1996 IPCC guidelines and/or the IPCC good practice guidance, and if emissions for a given category cannot be estimated then the Party is to provide sufficient explanation in the NIR as to why it cannot be estimated.

39. In response to the recommendations from the previous review, Spain has provided explanations for the use of “NE” in table 9(a) of the CRF tables. Through contact with the relevant industries, Spain has been able to verify that some of the emissions previously reported as “NE” are in fact not occurring

(“NO”) and the notation keys in the CRF table have been changed to reflect this. The ERT commends Spain for this effort.

40. The ERT identified a lack of transparency as AD used to estimate emissions from the following categories: commercial/institutional, residential and agriculture/forestry/fisheries are aggregated while emissions are disaggregated. This was also been the case in the 2008 submission. In response to questions raised by the ERT during the review, Spain provided a table showing AD disaggregated by category and fuel type. The ERT reiterates the recommendation from the previous review that Spain include this table in its next submission in order to improve transparency and clarify how changing fuel mixes affects the IEFs over time.

41. The description and analysis of trends in fuel consumption and resulting emission estimates in the NIR lack details and explanations of the underlying drivers. This is particularly the case for manufacturing industries and construction, for which a trend analysis has been provided at the category level only. This issue has been noted in the last two review reports. During the review Spain indicated that there were plans to include information on trend drivers, including a detailed discussion of the trend of the fuel consumption at category level in the 2010 submission. The ERT welcomes this plan and recommends that Spain include this information in its next annual submission.

42. Spain has provided clear explanations of its recalculations as well as an effective graphical representation of the impact of these recalculations on emissions in the time-series, as part of its discussion of categories in the NIR. The ERT commends Spain for this approach. In the 2009 submission, recalculations of the emissions from the energy sector for 1990 resulted in an overall decrease in the reported emissions of 97.63 Gg CO₂ eq, or 0.05 per cent. The largest changes to emission estimates were made in the categories of oil and natural gas (0.7 per cent), manufacturing industries and construction (–0.2 per cent) and transport (–0.1 per cent). The recalculations for 2006 resulted in an overall decrease in reported emissions of 1,111.25 Gg CO₂ eq, or 0.3 per cent. The main category responsible for this decrease is manufacturing industries and construction where numerous recalculations have been made, all of which are thoroughly described in the NIR. The recalculations mainly result from updated information on AD. The recalculations performed are in line with the IPCC good practice guidance. The ERT noted that explanations of recalculations have not been reported in CRF table 8(b); this issue has also been raised in previous reviews. The ERT recommends that Spain report in detail on its recalculations in CRF table 8(b) in its next annual submission.

B. Reference and sectoral approaches

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

43. CO₂ emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. For 2007, there is a difference of 1.25 per cent between the emission estimates calculated using the reference approach and those calculated using the sectoral approach. In general, the difference between the estimates calculated using the two approaches is less than 2 per cent, with the exception of 1996, 1997 and 1998, for which there are differences of up to 2.67 per cent. Spain has provided an extensive discussion of the reasons for these differences in annex 4 to its NIR. The main structural differences between the two approaches are different coverage of fuels and source activities.

44. As noted by the previous ERT, one planned improvement reported by Spain is the review of its liquid fuels balance in cooperation with the Ministry of Industry, Tourism and Trade (MITYC) in order to quantify a sectoral breakdown of liquid fuel consumption and non-energy fuel use to address apparent inconsistencies between International Energy Agency data and the data used in the emission inventory. The ERT reiterates the recommendation that Spain proceed with the implementation of this plan and report on progress and outcomes in its next annual submission.

2. International bunker fuels

45. Large inter-annual changes in the CO₂ emissions from aviation bunkers are evident for the periods 1990–1991, 1991–1992 and 1993–1994 (increases of 19.1 per cent, 18.5 per cent and 14.6 per cent, respectively). The 2007 value for these emissions is 202.8 per cent higher than the 1990 value. There were also large inter-annual changes in CO₂ emissions from marine bunkers for the periods 1995–1996 and 1996–1997 (increases of 46.0 per cent and 23.3 per cent, respectively). The 2007 value for these emissions is 132.9 per cent higher than the 1990 value. The NIR contains only a very brief description of bunker fuels which does not explain these inter-annual changes. The ERT reiterates the recommendation from the previous review that Spain includes a discussion of bunker AD and emissions, and provide an analysis of the trends and drivers, in the 2010 annual submission.

3. Feedstocks and non-energy use of fuels

46. In the previous review report it was recommended that Spain carry out a study in order to prepare a balance of liquid fuels (including non-energy fuel use) in cooperation with the MITYC and report the results and/or progress of this in its next NIR, with the aim of explaining the inventory compilation processes for the non-energy use of fuels and documenting data sources. In the 2009 submission the study remains a planned improvement. The current inventory for the non-energy use of fuels is not transparent – undertaking the planned project would greatly increase transparency in this part of the inventory. The ERT reiterates the recommendation from the previous review and urges Spain to include information on this study in the 2010 annual submission.

C. Key categories

1. Stationary combustion: all fuels – CO₂

47. Spain has not used data reported under the EU ETS for verification or any other purpose. The detailed data reported under the EU ETS could provide useful information on carbon content of fuels, calorific values, etc., to the inventory compilers. This would be a valuable instrument in the QA/QC work of the inventory. In line with previous reviews the ERT recommends Spain to ensure that inventory compilers have access to the detailed data reported under EU ETS.

48. The NIR indicates that natural gas was the only gaseous fuel combusted in public electricity and heat production in 1990 and 1995. However, the IEFs differ significantly from the standard EF which ranges between 55–56kg/GJ, for example from 60.3 in 1992 to 50.5 in 1993 to. In response to a question raised by the ERT during the review, Spain stated that for the years 1990–1993, the emission estimates are provided by OFICO (Electric Energy Compensations Office) on absolute CO₂ emissions data for all fuels in each power plant. Spain indicated that the total emission estimate is considered robust, but changes between fuel categories could occur. For 1995 Spain reported that an input error has been detected concerning the CO₂ EF for a single power plant, lowering the CO₂ IEF for gaseous fuels in public electricity and heat production. The ERT recommends that Spain correct the identified error, and provide further information in the NIR regarding the split between fuel categories for the years 1990–1993.

2. Civil aviation – CO₂

49. Spain has reported all emissions from civil aviation, including emissions from aviation gasoline, under jet kerosene. This reduces the transparency of the inventory. In response to a question raised during the review Spain indicated that it is possible to report emissions separately. The ERT recommends that Spain increase transparency by reporting emissions from aviation gasoline and jet kerosene separately in the next annual submission.

3. Coal mining and handling – CH₄

50. In the previous review report, it was recommended that Spain undertake a study to determine the extent of degasification activities and CH₄ recovery and flaring, and to assess the possible impacts of these activities on GHG emissions in the fugitive and stationary combustion categories. The occurrence of CH₄ recovery or flaring would affect the emissions estimates of this category and the relevant categories of energy production based on the CH₄ recovery and flaring data. The ERT reiterates this recommendation and recommends that Spain report on the progress or results of this study in its next annual submission.

4. Oil and natural gas – CO₂

51. The previous review identified large fluctuations in CO₂ emissions from flaring. Even though this is common the ERT recommended Spain to provide a trend analysis in the NIR. This information was not provided in the 2009 annual submission. During the review and in response to a question raised by the ERT, Spain provided an explanation for these fluctuations. The ERT recommends that Spain include this information in the next annual submission.

D. Non-key categories

1. Road transportation: Biomass – CO₂

52. The CO₂ IEF for biomass is 18.12 t/TJ, which is very low compared with other Parties (62.32-84.80 t/TJ). During the review Spain explained that this was an error and provided the ERT with the correct information and indicated that it would be corrected in the next submission. In addition, Spain provided a table showing the share of bioethanol and biodiesel, in order to explain the changes over the years in IEFs. The ERT recommends that Spain correct the CO₂ emissions from biomass in road transportation and include the table with time-series data on consumption of bioethanol and biodiesel in its next annual submission.

2. Other: All fuels – CO₂

53. Regarding military use of fuels, Spain states in the NIR that the energy statistics do not contain specific information on this issue. It has been reported as “NO”, which cannot be correct. The ERT recommends that Spain establish whether fuel consumption for military purposes is included in the energy statistics, and ensure that all military domestic fuel consumption is accounted for in the inventory in the next annual submission.

III. Industrial processes and solvent and other product use

A. Sector overview

54. In 2007, emissions from the industrial processes sector amounted to 34,852.48 Gg CO₂ eq, or 7.9 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1,674.20 Gg CO₂ eq, or 0.4 per cent of total GHG emissions. Since the base year (which is 1990 for CO₂, CH₄ and N₂O and 1995 for HFCs, PFCs and SF₆), emissions have increased by 22.1 per cent in the industrial processes sector, and increased by 20.6 per cent in the solvent and other product use sector. The key driver for the rise in emissions in the industrial processes sector is CO₂ emissions from cement production, in particular a clinker production increase between 1990 and 2007 of 38.1 per cent. Within the industrial processes sector, 64.1 per cent of the emissions were from mineral products, followed by 16.1 per cent from consumption of halocarbons and SF₆, 11.6 per cent from metal production and 6.2 per cent from chemical industry. Production of halocarbons and SF₆ accounted for 2.0 per cent.

55. Spain's inventory for this sector is in general complete. However, potential emissions of HFCs, PFCs and SF₆ are reported as "NE". The ERT recommends that Spain provide, in its next annual submission, estimates for potential emissions of HFCs, PFCs and SF₆ for the consumption of halocarbons and SF₆ category.

56. Spain has reported recalculations due to the revision of AD for the decarbonation processes in the ceramic industry (for 1990–2006) and for clinker production (for 2006), the inclusion of CH₄ emissions from calcium carbide production, and the revision of data on domestic use of solvents and pharmaceutical products. The effect of the recalculations on emission estimates is an increase of 0.004 per cent for the base year and a decrease 0.2 per cent for 2006. The rationale for the recalculations is provided in the NIR but not in CRF table 8(a). The ERT recommends that Spain provide the rationale for the recalculation in the CRF table 8(a) in its next annual submission.

57. QA/QC could be improved in this sector by comparing the basic information collected for the inventory with that collected and reported within the framework of the European Community directives (e.g. on the EU ETS), at least for the most important categories such as cement production.

B. Key categories

1. Nitric acid production – N₂O

58. In the previous two review reports, it was recommended that Spain establish direct contact with the production plants in order to verify the country-specific average EF of 7 kg N₂O/t production, which is out of date owing to rapid development and the application of abatement technology in this category. The applied EF and methodology do not follow the IPCC good practice guidance. The ERT recommends that Spain use a higher-tier method and collect AD and EFs from all plants as recommended by the IPCC good practice guidance for key categories. Spain is recommended to collect such information and provide information about relevant recalculations in its next annual submission.

2. Iron and steel production – CO₂

59. Estimates of emissions from this category are calculated using the carbon mass balance approach for the incoming and outgoing materials for each of the processes established within steel, pig iron and sinter production, with a distinction made between the technologies used in steel production. The information needed to determine the carbon balance has been provided by the individual operators of plants where these processes have occurred since 2000. As the information for the years 1990–1999 period are not available, the average EFs for the period 2000–2002 were used. This approach provides the most accurate CO₂ emissions estimates for recent years but may not reflect earlier years correctly. Spain is encouraged to continue its efforts to improve emission estimates from this category and to provide more information about emission estimates and allocation between the energy and industrial processes sectors (the description of emissions split between these sectors is missing) in its next annual submission in order to improve transparency. Moreover, the ERT recommends that Spain discuss, in its next annual inventory submission, time-series consistency, explain trend changes (where time-series show rapid increase and/or decrease) and justify the use of the average EFs for emission estimates before the year 2000.

C. Non-key categories

Ammonia production – CO₂

60. The ERT identified, in this category, a lack of transparency in many aspects. To increase transparency, the ERT encourages Spain to provide a more precise description of national circumstances for this category (e.g. the amount of CO₂ used for urea production), emissions calculation, trends analysis, QA/QC process and EFs used in individual plants, in its next annual submission.

IV. Agriculture

A. Sector overview

61. In 2007, emissions from the agriculture sector amounted to 46,425.65 Gg CO₂ eq, or 10.5 per cent of total GHG emissions. Emissions increased by 15.1 per cent between 1990 and 2007. The key driver for this rise in emissions was the increase in emissions from enteric fermentation and manure management, which was, to a great extent, due to a large increase in the size of the populations of beef cattle and swine. Within the agriculture sector, 42.5 per cent of emissions were from agricultural soils, followed by 29.2 per cent from enteric fermentation and 26.8 per cent from manure management. The remaining 1.5 per cent was from rice cultivation (0.6 per cent) and field burning of agricultural residues (0.9 per cent).

62. The submission is complete with regard to the agriculture sector, covering all categories and gases. Savannah burning does not occur in Spain.

63. There are some errors in various parts of the NIR relating to agricultural soils methodologies and CRF tables (e.g. a database error in converting N₂O-N into N₂O, misreporting the amount of leaching and runoff nitrogen). The ERT recommends that Spain correct these problems in its next annual submission.

64. Several improvements were made to the inventory estimates, including updates of the data for poultry and swine populations, crop areas and production, agricultural use of fertilizers and compost and revision of crop residue burning parameters, which led to specific recalculations in the 2009 submission. In general, the recalculations for 2006 resulted in a decrease of 0.8 per cent in the estimated emissions compared with the previously reported values.

B. Key categories

1. Enteric fermentation – CH₄

65. A tier 2 approach was used for cattle and sheep while a tier 1 approach using IPCC default EFs was applied for other animals, in line with the IPCC good practice guidance. The ERT noted that Spain keeps the body weight for beef cattle constant over the entire time series. This affects the EF for beef cattle. In response to a question raised by the ERT during the review, Spain indicated that it will undertake work to update the body weight for beef cattle annually to be able to derive more accurate EFs for enteric fermentation in its next annual submission. The ERT welcomes this initiative and recommends that Spain revise its EFs for enteric fermentation for beef cattle and update emission estimates in its next annual submission.

2. Manure management – CH₄

66. Keeping a constant body weight for beef cattle from 1990 to 2007 would affect the accuracy of EFs used to estimate CH₄ from manure management. In implementing the recommendation formulated in paragraph 65 above, Spain should also update the EFs used to estimate CH₄ emissions from manure management in line with the IPCC good practice guidance.

3. Manure management – N₂O

67. The lack of changes in average body weight for beef cattle for the entire time series (see para. 65 above) may also affect manure nitrogen excretion rates (N_{ex}), and in turn emissions of N₂O, for a number of emission sources. In response to a question raised by the ERT during the review, Spain stated that N_{ex} is more closely linked to animal diet composition; the Party indicated that it will undertake work to develop a time-series for N_{ex} for beef cattle using diet composition and, among other parameters, average body weight/carcass weight. The ERT welcomes this work and recommends that Spain derive a

time-series for N_{ex} for beef cattle in line with the IPCC good practice guidance in its next annual submission.

4. Agricultural soils – N_2O

68. The ERT noted that Spain estimates emissions of N_2O from animal manure deposited on pasture, range and paddock and from leaching and runoff of nitrogen using the IPCC tier 1 approach, but the IEFs deviate significantly (by an order of magnitude of two to three) from the IPCC default EFs. In response to a question raised during the review, Spain discovered an error in the database whereby 44/48 instead of 44/28 was being used when converting N_2O-N into N_2O . The lower IEF for leaching and runoff is due to the use in the calculation of amount of leaching and runoff nitrogen instead of the amount of nitrogen that is subject to leaching and runoff. The ERT recommends that Spain correct its database error and report correct amounts of leaching and runoff nitrogen in its next annual submission.

69. Spain estimates and reports direct soil N_2O emissions from domestic wastewater sludge and municipal waste compost applied to soils under other (agricultural soils (4.D.4)). To be consistent with other Parties included in Annex I to the Convention and in line with the Revised 1996 IPCC Guidelines, the ERT recommends that Spain report the N_2O emissions from domestic wastewater sludge and municipal waste compost applied to soils under the category other direct soil emissions (4.D.1.6).

C. Non-key categories

Field burning of agricultural residues – N_2O and CH_4

70. The ERT noted that Spain reports emissions of N_2O from burning of other non-specified cereal crops, but no emissions of CH_4 , in CRF table 4.F from 1990 to 2003. Spain uses the default tier 1 method for the emission estimates and the reason for the omission of CH_4 emissions is unclear. The ERT recommends that Spain explain the omission of CH_4 emissions for the years 1990–2003 or provide these emission estimates in its next annual submission.

V. Land use, land-use change and forestry

A. Sector overview

71. In 2007, net removals from the LULUCF sector amounted to 27,996.96 Gg CO_2 eq. Since 1990, net removals have increased by 31.5 per cent. The sector offset is equivalent to 6.3 per cent of the total GHG emissions of Spain. The key driver for the rise in removals is the increase in removals of CO_2 in forest land, which grew 30.1 per cent since 1990. Within the sector, 99.7 per cent of the reported removals were from forest land, followed by 0.3 per cent from grassland. Forest land remaining forest land is responsible for the majority (76.7 per cent) of the removals in the sector. At the same time the increase in removals in the sector is mainly attributed to carbon stock changes in cropland converted to forest land, as the carbon stocks are considered constant in forest land remaining forest land.

72. The ERT identified a number of categories that are reported as “NE” by the Party. In response to an ERT question on this issue, the Party indicated that it would address in its next annual submission the completeness of the LULUCF inventory by reporting the following categories, which are currently reported as “NE”: CO_2 emissions from cropland remaining cropland, CO_2 emissions from cropland converted to grassland, CO_2 emissions from cropland converted to settlements, and CO_2 , CH_4 and N_2O emissions from biomass burning (wildfires) in cropland. The ERT recommends that Spain report, in its next annual submission, all categories currently reported as “NE”.

73. Spain has not included the LULUCF sector in its uncertainty estimates. The ERT strongly recommends Spain to resolve this issue in its next annual submission.

74. Spain reported CO₂ removals from carbon fixing in forest systems and CH₄ and N₂O emissions from fires in forest systems as key categories. However, the ERT identified that these categories do not correspond to IPCC categories in the LULUCF sector and that it is not clear how they have been identified as key categories. The ERT recommends that Spain use the appropriate LULUCF categories in its key category analysis including the LULUCF sector in line with the IPCC good practice guidance for LULUCF in its next annual submission.

75. The time-series has been recalculated, as new information was available on carbon stock changes in living biomass in cropland converted to forest land. The recalculations resulted in a reduction in net removals of 20.8 per cent in 1990 and 16.9 per cent in 2006.

76. Spain reports land-use changes using approach 2 of the IPCC good practice guidance for LULUCF, and uses CORINE land cover cartography for 1990 and 2000 as the basis to set the areas for the different land-use categories except forest land, where Spain used its Forestry Map. Data for all other years were obtained through interpolation (years between 1990–2000) and extrapolation (years between 2000–2007). Applying interpolation/extrapolation techniques from only two data points in time and on longer periods (10 years) is not in line with the IPCC good practice guidance for LULUCF. The ERT recommends that Spain generate consistent new data and revise the estimates of land areas and associated emissions/removals in its next annual submission. Furthermore, these interpolation/extrapolation techniques are not in line with the requirements for land areas representation for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for which more geographically explicit data, using either grids or polygons at a finer resolution, for every category is required. The ERT recommends that Spain give serious consideration to this issue of representation of land area in order to improve the inventory in LULUCF and to be able to report on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

B. Key categories

Forest land remaining forest land – CO₂

77. Spain used the stock change method of the IPCC good practice guidance for LULUCF with data obtained from the second and third national forest inventory (NFI2 and NFI3, conducted in 1986–1995 and 1997–2007, respectively). In general the stock change method provides good results for relatively large increases or decreases of biomass, or where very accurate forest inventories are carried out. Spain applied a constant annual increment value (0.43 Mg C/ha) for forest for the whole time-series, calculated from the difference between the two data sets from the NFI2 and the NFI3. Spain assumed that the area of forest land remaining forest land remained unchanged since 1990 (13,523 kha). Thus, removals under forest land remaining forest land have been reported using the same value for the entire period 1990–2007.

78. The ERT found that assuming a constant land area for such a long period would lead to an inaccurate estimation of emissions and removals for forest land remaining forest land and other land use categories. The ERT reiterates the recommendation that Spain generate consistent new data and revise the estimates of land areas and associated emissions/removals in its next annual submission (see para. 76 above). The ERT recommends that Spain either improve the method used to construct the time-series on biomass increment by taking into account the trends in the data relating to forests, such as harvesting volume and age class distribution of forest – or switch to the gains and losses method if a third stock data set is not expected to be obtained in the near future. In order to improve transparency, the ERT invites Spain to provide in its next annual submission the data it possesses on harvested volumes from forest.

C. Non-key categories

1. Biomass burning – CO₂

79. Spain has reported CO₂ emissions from forest fires as included elsewhere and provided an explanation and the CO₂ emission estimates in the form of additional information in appendix 3 to the NIR. This is because carbon losses owing to natural disturbances are already covered by the stock change method used for forest land remaining forest land. In the previous review report it was pointed out that the methods applied by Spain do not capture removals by regrowth after natural disturbances, meaning that Spain has not reported CO₂ emissions associated with natural disturbance events in line with the IPCC good practice guidance for LULUCF. The ERT reiterates the recommendation from the previous ERT that Spain report CO₂ emissions associated with natural disturbance events in line with the IPCC good practice guidance for LULUCF in its next annual submission.

2. Grassland remaining grassland – CO₂

80. As much as 20 per cent of the total land area of Spain is reported under other land. Emissions/removals in this category are reported as “NO”. Spain allocates grazed pasture lands (‘dehesas’) with some woody vegetation with tree crown cover below the threshold of its national definition of forest (10 per cent crown cover) to other land. The ERT found that the definition of other land used by Spain is not in line with the IPCC good practice guidance for LULUCF and that some of the land area corresponds to the definition of grassland. The ERT recommends Spain to revise its land-use classification and allocate the relevant land area currently reported under other land to grassland and report thereon, including recalculations, in its next annual submission.

VI. Waste

A. Sector overview

81. In 2007, emissions from the waste sector amounted to 13,977.90 Gg CO₂ eq, or 3.2 per cent of total GHG emissions. Since the base year, emissions have increased by 83.0 per cent. The key drivers for the rise in emissions include an increase in solid waste generation and an increase in wastewater treatment coverage. Within the sector, 69.8 per cent of the emissions were from solid waste disposal on land, followed by 25.3 per cent from wastewater handling and 0.1 per cent from waste incineration. The remaining 4.8 per cent were from other sources (i.e. sludge spreading).

82. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. These were done to take into account new and updated information on landfill sites, the inclusion of data from the Garraf landfill site (Barcelona), protein consumption and corpse incineration. The changes include an increase in total estimated GHG emissions in the base year of 0.2 per cent (or 543.79 Gg CO₂ eq) and an increase in 2006 of 0.3 per cent (or 1,288.06 Gg CO₂ eq). The rationale for these recalculations is provided in the NIR, but not in CRF table 8(b). The ERT recommends that Spain include the rationale for the recalculations in CRF table 8(b) in the next annual submission.

83. Spain reports that as part of its QC programme it has performed internal data consistency and verification checks (on landfill data and wastewater handling) that are generally in line with the IPCC good practice guidance. The ERT recommends that Spain also report on what it has done as far as QA activities are concerned, in order to ensure greater confidence in its estimates.

B. Key categories

1. Solid waste disposal on land – CH₄

84. In estimating CH₄ emissions from managed solid waste disposal on land, Spain used the first-order decay model in accordance with the IPCC good practice guidance. Solid waste AD were

obtained using landfill site specific surveys. For some landfill sites, extrapolation backwards in time of the amount of waste deposited was performed; however, it is not clearly reported how this extrapolation was carried out. In landfill sites where parameters such as the CH₄ generation constant, methane correction factor, and oxidation factor were not submitted in these surveys, Spain used values from the IPCC good practice guidance. To improve transparency, the ERT recommends that Spain indicate clearly how extrapolation of municipal solid waste (MSW) data was done and for which years.

85. In estimating CH₄ emissions from unmanaged landfill sites, Spain made assumptions related to the depth of these sites and the amount of waste that is burned. The ERT recommends that Spain improve its determination of the depth of these unmanaged sites, and that it report on the amount of waste burned and how related coefficients have evolved over time.

86. As noted in the previous review, the degradable organic carbon (DOC) values are estimated by extrapolation (pre-1984) or are kept constant (1997–2007). It was recommended then that Spain use appropriate methods from the IPCC good practice guidance to improve time-series consistency in these DOC values. In response to questions raised by the ERT during the review, Spain stated that site-specific MSW composition data are collected and that gap-filling procedures are applied for short time spans in the data. The ERT recommends therefore that in its next annual submission, Spain revise data on MSW composition (table 8.2.3 of the NIR) accordingly, especially the last row covering the years 1997–2007, in which the MSW component fractions and the DOC values have remained constant for 10 years.

87. The recalculation of landfill emissions due to improved information obtained from questionnaires to landfill sites and the inclusion of data from the Garraf landfill site resulted in an increase in estimated emissions of 6 to 16 per cent for the years 1990 to 2006 compared with the previous submission. The ERT commends Spain for improving its data collection and ensuring the completeness of the emission estimates in this key category.

88. Spain has reported fossil CO₂, non-CO₂ (CH₄ and N₂O) emissions and other pollutants from waste burned on landfill sites under solid waste disposal on land. However, these emissions should not be reported under this category. The ERT recommends that Spain report these emissions under open burning of waste in its next annual submission.

2. Wastewater handling – CH₄

89. In estimating CH₄ emissions from this category, Spain used AD from both industrial and domestic/commercial sources. Industrial AD were collected from point and area sources, while domestic/commercial AD were determined from the data on the population served by wastewater treatment plants. Time-series for industrial AD were reconstructed from data for certain key years (e.g. 1994 for the agriculture and food sector, and 1996 for the chemical industry sector) using industrial production indices. EFs for point sources were taken from the EMEP/CORINAIR guidebook, while the rest were calculated using methodologies from the IPCC good practice guidance.

90. It was noted in the previous review that Spain's reporting of wastewater emissions in the NIR is limited and lacks transparency. The previous review recommended that more information be given on the method of interpolation and extrapolation of population data. The ERT reiterates this recommendation with a view to improving transparency. In particular, the ERT recommends that Spain's reporting on point sources of industrial wastewater treatment should include more information (e.g. type, GHG emission process). The ERT recommends that Spain use the CRF table documentation boxes, with clear references to more thorough explanatory text in the NIR.

C. Non-key categories

Waste incineration – CO₂

91. Spain reports that the incineration of corpses or cremation is the principal activity in this category that contributes to CO₂ emissions. Other sources include the incineration of hospital waste and sludge from both industrial and domestic/commercial wastewater. The ERT recommends that Spain indicate in the NIR that the CO₂ EF used in the estimation is not from biogenic carbon of the human body but from the combustion of the support fuel and other non-biogenic materials in the cremation process.

92. In the incineration of sludge, Spain uses a CO₂ EF that is zero, assuming that the sludge is renewable organic waste. This is true of urban or MSW sludge, but this EF may vary according to the nature of industrial sludge (i.e. CO₂ emissions from the pulp/paper industry may be negligible, but those from the oil refining industry are not). Spain acknowledged this during the review and stated that it will aim to differentiate between types of industrial sludge incineration in its next annual submission.

93. Spain notes in the NIR that emissions from industrial solid waste incineration have not yet been estimated, even though some of these activity centres have already been identified. In fact, according to Spain's response during the review, there is only one industrial waste incineration plant in the country. The ERT commends Spain for identifying this additional source and recommends that Spain include these emissions in the next annual submission.

VII. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

A. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

94. Spain has reported information on its accounting of Kyoto Protocol units in the required SEF tables, in accordance with decisions 14/CMP.1 and 15/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and their comparison report.⁶ The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

95. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with section I.E of the annex to decision 15/CMP.1, and reported using the SEF tables, in accordance with decision 14/CMP.1. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry, and meets the requirements set out in paragraphs 88 (a) to (j) of the annex to decision 22/CMP.1. The transactions of the Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred.

2. National registry

96. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its findings that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with

⁶ The SEF tables comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

97. The ERT took note of the SIAR and its findings that Spain should enhance the user interface of its registry by making publicly available all the information referred to in paragraph 46 of the annex to decision 13/CMP.1, and report, in its next annual submission, on any changes to that information. In response to the draft report, Spain clarified that the required information has already been made available. Spain should further improve the measures put in place in its registry to minimize operator errors, in accordance with paragraph 115(e) of the annex to decision 22/CMP.1. It should also put in place as soon as possible measures to mitigate and reduce the internal fragmentation of unit blocks and report in its next annual submission on progress made in implementing these measures, including any relevant implementation plan, test plans and test reports following the changes to its registry.

3. Calculation of commitment period reserve

98. In its 2009 annual submission, Spain has reported that its commitment period reserve has not changed since the initial report review (1,499,576,336 t CO₂ eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

B. Changes to the national system

99. Spain has reported no change in its national system since the previous annual submission. No change in the national system was identified by the ERT during the review. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

C. Changes to the national registry

100. Spain has reported some changes in its national registry since the previous annual submission. These included changes to contact information, database server capacity and integrity of data storage; all changes were noted in the SIAR report. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

VIII. Conclusions and recommendations

101. Spain made its annual submission on 14 April 2009. The Party indicated that the 2009 annual submission is a voluntary submission under the Kyoto Protocol. It contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on Kyoto Protocol units, changes to the national system and the national registry). This is in line with decision 15/CMP.1.

102. The ERT concludes that the inventory submission of Spain has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is in general complete and the Party has submitted a complete set of CRF tables for the years 1990–2007 (except for CRF table 8(b)) and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. The following categories were reported as “NE”, even though methodologies for their estimation are available in the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance: CO₂, CH₄ and N₂O emissions from gaseous fuels in road transportation; CH₄ emissions from exploration of oil; CO₂ and CH₄ emissions from exploration of natural gas; CO₂ emissions from production/processing of natural gas; CH₄ emissions from other leakage of natural gas; N₂O emissions from oil flaring; CO₂, CH₄ and N₂O emissions from flaring combined; emissions from fuel use in military operations; potential F-gases emissions; CO₂ emissions from cropland remaining cropland;

CO₂ emissions from cropland converted to grassland; CO₂ emissions from cropland converted to settlements; and CO₂, CH₄ and N₂O emissions from biomass burning (wildfires) in cropland.

103. The submission on a voluntary basis of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. Spain did not report on a voluntary basis information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and information on minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

104. The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. In order to bring its reporting more in line with these guidelines, Spain should improve the completeness of the next annual submission, its transparency, its uncertainty estimation and its key category analysis, and implement QA activities for all sectors.

105. The information on Kyoto Protocol units has been reported in accordance with section I.E of the annex to decision 15/CMP.1 and used the required reporting format tables as required by decision 14/CMP.1.

106. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

107. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

108. In the course of the review, the ERT formulated a number of recommendations⁷ relating to the completeness of the annual submission, transparency, uncertainty estimation, key category analysis and QA/QC procedures of Spain's information presented in its annual submission. The key recommendations are that Spain:

- (a) Include in its next annual submission, emissions for categories currently reported as "NE" and for which methods exist in the Revised 1996 IPCC guidelines and/or the IPCC good practice guidance, and if emissions for a given category cannot be estimated then the Party is to provide sufficient explanation in the NIR as to why it cannot be estimated;
- (b) Improve transparency by clarifying the use of the notation keys;
- (c) Provide more detailed information on AD and emissions trends;
- (d) Improve the key category analysis including the LULUCF sector in line with the IPCC good practice guidance for LULUCF;
- (e) Include the LULUCF sector in the uncertainty analysis and update the uncertainty analysis on an annual basis;
- (f) Include in the NIR more detailed information on arrangements in the national system to perform QA activities for all sectors;
- (g) Include in the NIR information on arrangements in place in the national system to ensure reporting on land areas for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol;

⁷ For a complete list of recommendations, the relevant chapters of this report should be consulted.

- (h) Further improve the measures put in place in its registry to minimize operator errors, in accordance with paragraph 115(e) of the annex to decision 22/CMP.1;
- (i) Put in place as soon as possible measures to mitigate and reduce the internal fragmentation of unit blocks and report on progress made in implementing these measures in its next annual submission, including any relevant implementation plan, test plans and test reports following the changes applied to its registry.

IX. Questions of implementation

109. No questions of implementation were identified by the ERT during the review.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html>>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gp/english/>>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gp/lulucf/gp/lulucf.html>>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”. FCCC/SBSTA/2006/9. Available at <<http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>>.

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

“Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol”. Decision 19/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>>.

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Decision 15/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>>.

“Guidelines for review under Article 8 of the Kyoto Protocol”. Decision 22/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>>.

Status report for Spain 2009. Available at <<http://unfccc.int/resource/docs/2009/asr/esp.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <<http://unfccc.int/resource/webdocs/sai/2009.pdf>>.

FCCC/ARR/2008/ESP. Report of the individual review of the greenhouse gas inventory of Spain submitted in 2007 and 2008. Available at <<http://unfccc.int/resource/docs/2009/arr/esp.pdf>>.

UNFCCC. *Standard independent assessment report, Parts I and II*. (Unpublished document).

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Marta Muñoz Cuesta (Unidad de Información Ambiental Estratégica Dirección General de Calidad y Evaluación Ambiental Ministerio de Medio Ambiente, y Medio Rural y Marino), including additional material on the methodology and assumptions used.

Annex II**Acronyms and abbreviations**

AD	activity data	IPCC	Intergovernmental Panel on Climate Change
CH ₄	methane	ITL	international transaction log
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	kg	kilogram (1 kg = 1 thousand grams)
CO ₂	carbon dioxide	kha	kilohectare
CO ₂ eq	carbon dioxide equivalent	LULUCF	land use, land-use change and forestry
CRF	common reporting format	Mg	megagram (1 Mg = 1 tonne)
DOC	degradable organic carbon	MSW	municipal solid waste
EF	emission factor	NA	not applicable
EMEP/ CORINAIR	European Monitoring and Evaluation Programme/Core Inventory of Air Emissions	NE	not estimated
ERT	expert review team	N _{ex}	nitrogen excretion
EU ETS	European Union emissions trading scheme	NO	not occurring
F-gas	fluorinated gas	N ₂ O	nitrous oxide
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF	NIR	national inventory report
GJ	gigajoule (1 GJ = 10 ⁹ joule)	PFCs	perfluorocarbons
ha	hectare	PJ	petajoule (1 PJ = 10 ¹⁵ joule)
HFCs	hydrofluorocarbons	QA/QC	quality assurance/quality control
IEF	implied emission factor	SEF	standard electronic format
		SF ₆	sulphur hexafluoride
		SIAR	Standard independent assessment report
		TJ	terajoule (1 TJ = 10 ¹² joule)
		UNFCCC	United Nations Framework Convention on Climate Change
