



United Nations

FCCC/ARR/2010/ESP



**Framework Convention on
Climate Change**

Distr.: General
28 September 2011

English only

**Report of the individual review of the annual submission of
Spain submitted in 2010***

* In the symbol for this document, 2010 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary	1–5	3
A. Overview	1–2	3
B. Emission profiles and trends.....	3–5	3
II. Technical assessment of the annual submission.....	6–216	7
A. Overview	6–43	7
B. Energy	44–73	15
C. Industrial processes and solvent and other product use	74–88	21
D. Agriculture.....	89–104	24
E. Land use, land-use change and forestry.....	105–118	28
F. Waste	119–127	31
G. Adjustments.....	128–185	33
H. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol	186–216	45
III. Conclusions and recommendations.....	217–225	51
IV. Adjustments	226–228	52
V. Questions of implementation	229	53
 Annexes		
I. Documents and information used during the review.....		54
II. Acronyms and abbreviations.....		56

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2010 annual submission of Spain, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 20 to 25 September 2010 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Katarina Mareckova (European Union (EU)) and Ms. Daniela Romano (Italy); energy – Mr. Matej Gasperic (Slovenia), Mr. Norbert Nziramasanga (Zimbabwe) and Mr. Ole-Kenneth Nielsen (Denmark); industrial processes – Ms. Ingrid Person (Brazil) and Mr. Koen Smekens (Belgium); agriculture – Mr. Amnat Chidthaisong (Thailand), Mr. Etienne Mathias (France) and Mr. Yuriy Pyrozhenko (Ukraine); land use, land-use change and forestry (LULUCF) – Ms. Dominique Blain (Canada) and Mr. Walter Oyhantçabal (Uruguay); and waste – Ms. Cherie Sweeney (New Zealand) and Mr. José Villarin (Philippines). Ms. Blain and Mr. Oyhantçabal were the lead reviewers. The review was coordinated by Mr. Vitor Gois Ferreira (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 2008, the main greenhouse gas (GHG) in Spain was carbon dioxide (CO₂), accounting for 83.0 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by methane (CH₄) (8.9 per cent) and nitrous oxide (N₂O) (6.2 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 1.9 per cent of the overall GHG emissions in the country. The energy sector accounted for 78.4 per cent of total GHG emissions, followed by the agriculture sector (9.6 per cent), the industrial processes sector (7.8 per cent), the waste sector (3.8 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 406,407.36 Gg CO₂ eq and increased by 41.4 per cent between the base year² and 2008.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector, respectively. In table 1, CO₂, CH₄ and N₂O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

¹ In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of 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 include emissions from Annex A sources only.

Table 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2008^a

		<i>Gg CO₂ eq</i>									<i>Change</i>	
		<i>Greenhouse gas</i>	<i>Base year</i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>Base year–2008 (%)</i>	
Annex A sources ^b		CO ₂	228 228.16	228 228.16	254 832.23	307 021.42	367 181.99	358 023.08	367 812.23	337 221.83	47.8	
		CH ₄	26 291.29	26 291.29	29 127.69	33 658.53	35 393.90	35 865.20	36 568.06	36 043.25	37.1	
		N ₂ O	27 250.82	27 250.82	25 420.57	31 380.99	27 034.63	27 286.88	27 880.23	25 320.52	-7.1	
		HFCs	4 645.44	2 403.18	4 645.44	8 349.46	5 423.30	6 005.67	6 328.95	7 152.83	54.0	
		PFCs	832.51	882.92	832.51	436.03	288.17	294.17	298.18	314.85	-62.2	
		SF ₆	108.34	66.92	108.34	204.60	271.63	323.62	339.97	354.07	226.8	
KP-LULUCF	Article 3.3 ^c	CO ₂								-10 085.97		
		CH ₄								IE, NO		
		N ₂ O								IE, NO		
	Article 3.4 ^d	CO ₂	-472.38								-42 218.03	8 837.3
		CH ₄	IE, NO								IE, NO	NA
		N ₂ O	IE, NO								IE, NO	NA

Abbreviations: IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

^a “Base year” for Annex A sources 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” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

^b The table does not reflect the adjusted estimates for a number of categories in the energy sector (see section II.G) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the submission of 8 November 2010 that was subject to these adjustments. The adjustments lead to an increase of total GHG emissions for 2008 by 2,355.73 Gg CO₂ eq.

^c Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

^d d Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year to 2008

	Sector	Gg CO ₂ eq								Change
		Base year ^a	1990	1995	2000	2005	2006	2007	2008	Base year–2008 (%)
Annex A	Energy ^b	212 225.93	212 225.93	240 176.86	288 651.72	345 399.42	335 539.55	345 409.83	318 680.11	50.2
	Industrial processes	28 347.90	26 114.63	27 047.34	34 488.49	34 183.80	34 940.22	34 926.80	31 679.01	11.8
	Solvent and other product use	1 387.85	1 387.85	1 343.58	1 667.08	1 619.52	1 604.11	1 580.05	1 527.15	10.0
	Agriculture	37 743.39	37 743.39	36 565.28	43 999.45	40 568.91	41 298.10	42 347.41	38 955.64	3.2
	Waste	7 651.49	7 651.49	9 833.72	12 244.29	13 821.96	14 416.65	14 963.53	15 565.45	103.4
	Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LULUCF	NA	-39 362.24	-41 228.66	-46 313.41	-49 018.77	-49 369.46	-50 336.69	-52 472.90	NA
	Total (with LULUCF)	NA	245 761.05	273 738.12	334 737.62	386 574.85	378 429.16	388 890.93	353 934.46	NA
	Total (without LULUCF)	287 356.56	285 123.29	314 966.77	381 051.03	435 593.62	427 798.63	439 227.62	406 407.36	41.4
KP-LULUCF	Article 3.3 ^c									
	Afforestation & reforestation								-10 274.02	
	Deforestation								188.05	
	Total (3.3)								-10 085.97	
	Article 3.4 ^d									
	Forest management									-39 096.58
	Cropland management	-472.38								-3 097.59
Grazing land management	NA								NA	NA
Revegetation	NA								NA	NA
	Total (3.4)	-39 467.49							-42 194.17	6.91

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

^a “Base year” for Annex A sources 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” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

^b The table does not reflect the adjusted estimates for a number of categories in the energy sector (see section II.G) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the submission of 8 November 2010 that was subject to these adjustments. The adjustments lead to an increase of total GHG emissions for 2008 by 2,355.73 Gg CO₂ eq.

^c Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

^d Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

Table 3

Information to be included in the compilation and accounting database, in tonnes of carbon dioxide equivalent

	<i>As reported</i>	<i>Adjustment^a</i>	<i>Final^b</i>	<i>Accounting quantity^c</i>
Commitment period reserve	1 497 570 670		1 497 570 670	
Annex A emissions for current inventory year				
CO ₂	337 516 184	2 295 019	339 516 853	
CH ₄	36 042 786	53 164	36 096 419	
N ₂ O	25 316 199	7 547	25 328 070	
HFCs	6 255 002		7 152 834	
PFCs	256 049		314 849	
SF ₆	354 066		354 066	
Total Annex A sources	405 740 285	2 355 729	408 763 090	
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	-9 726 124		-10 274 020	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA, NO		NA, NO	
3.3 Deforestation for current year of commitment period as reported	35 501		188 054	
Activities under Article 3, paragraph 4, for current inventory year^d				
3.4 Forest management for current year of commitment period	-39 096 580		-39 096 580	
3.4 Cropland management for current year of commitment period	-3 097 592		-3 097 592	
3.4 Cropland management for base year	IE, NE, NO		-472 383	
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation for base year				

Abbreviations: IE = included elsewhere, NA = not applicable, NO = not occurring.

^a "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

^b "Final" includes revised estimates, if any, and/or adjustments, if any.

^c "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

^d Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more of these activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2010 annual inventory submission was submitted on 15 April 2010; it contains a complete set of common reporting format (CRF) tables for the period 1990–2008 and a national inventory report (NIR). Spain also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2010. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Spain officially submitted revised emission estimates on 8 November 2010, in response to the list of potential problems and further questions raised by the expert review team (ERT) in the course of the review, including information on KP-LULUCF. The Party submitted revised estimates for: CO₂, CH₄ and N₂O emissions from gaseous fuel combustion in the iron and steel industry; CO₂ emissions from cement production; CO₂ emissions from ammonia production; CO₂ emissions from carbide production; HFC and PFC emissions from refrigeration and air conditioning equipment; N₂O from nitrogen leaching and runoff; CO₂ emissions from iron and steel production; CO₂ emissions and removals from cropland management for the base year; and CO₂ emissions from carbon (C) stock changes in mineral soils under afforestation/reforestation and deforestation. The values in this report are those reported by the Party on 8 November 2010. Where necessary, the ERT also used the previous year's submission during the review.

8. In addition, the 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

9. During the review, Spain provided the ERT with additional information and documents which are not part of the annual submission but are in many cases referenced in the NIR. An English version of the NIR was submitted on 16 September 2010. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

10. The inventory covers almost all source and sink categories for the period 1990–2008 and is complete in terms of years and geographical coverage. The NIR follows the outline set out in the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines). Spain has provided all CRF tables for the years 1990–2008, except for CRF table 8(b) on explanations for recalculations.

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.

11. The ERT noted that Spain has improved the completeness of its inventory by reporting estimates for categories of emissions that were reported as not estimated (“NE”) in previous annual submissions, including: CO₂ and CH₄ emissions from use of gaseous fuels in road transportation; CH₄ emissions from exploration of oil; CO₂ and CH₄ emissions from exploration of natural gas; and CO₂ emissions from production/processing of natural gas. However, for some categories for which methodologies for estimating emissions are available in 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) or in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) emission estimates have still not been estimated, and the ERT strongly recommends that the Party, for its next annual submission, prepare emission estimates for: N₂O emissions from use of gaseous fuels in road transportation; and N₂O emissions from flaring of oil.

12. In addition, the ERT encourages the Party to continue its efforts to improve the completeness of its inventory and to include emission estimates or revise the use of the notation keys for other categories reported as “NE”, including: CO₂ emissions from coal handling (underground and surface mining); N₂O from fugitive emissions from solid fuel transformation; PFC and HFC emissions from manufacturing and decommissioning of fire extinguishers and aerosols; CH₄ emissions from incineration of hospital waste; and N₂O emissions from incineration of corpses. Finally, the ERT encourages the Party to provide estimates of potential emissions of HFCs, PFCs and SF₆ from consumption of halocarbons and SF₆, in its next annual submission. The ERT recommends that the Party, when reporting emissions data for the first time for a given category, ensure that the data are provided for the entire inventory time series and that the choice of estimation methods and emission factors (EFs) is clearly explained in the NIR.

13. The LULUCF categories and pools that are reported as “NE” or are not reported in the inventory are discussed in chapter II.E of this report.

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

Overview

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

Inventory planning

15. The NIR and additional information submitted by Spain during the review described in a comprehensive manner the national system and institutional arrangements for the preparation of the inventory. The Directorate-General for Environmental Quality and Assessment (DGCEA)⁴ of the Ministry of the Environment and Rural and Marine Affairs (MARM)⁵ is the single national entity and has overall responsibility for the national inventory, in accordance with the order of the Ministry of the Environment MAM/1444/2006, dated 9 May 2006. Within DGCEA, the Strategic Environmental Information Unit (UIAE) was created last year and is responsible for the preparation of the inventory and the processing of the information collected from several data sources. UIAE is supported in those endeavours by the technical assistance of a joint venture composed of

⁴ Dirección General de Calidad y Evaluación Ambiental, in the Spanish original.

⁵ Ministerio de Medio Ambiente y Medio Rural y Marino, in the Spanish original.

Análisis Estadístico de Datos, S.A. (AED), Net Design Studio, S.L. (NDS) and Estudio Internacional Twobe, S.L. (TWOBE), with AED as the leading entity in this joint venture.

16. Other organizations are also involved in the preparation of the inventory by means of cooperation agreements, including: Tecnologías y Servicios Agrarios, S.A. (TRAGSATEC) for the LULUCF sector; the Industrial Engineering Technical School of the Polytechnic University of Madrid⁶ (ETSII-UPM) for inventory projections; the Systems and Technology of Animal Production Unit of the Valencia Polytechnic University⁷ (STEPA-UPV) for the agriculture sector; Services and Studies for Air Navigation and Aeronautical Safety⁸ (SENASA) for the aviation sector; and the Research Centre for Energy, Environment and Technology⁹ (CIEMAT) for quality control procedures, particularly in the energy sector.

17. A resolution adopted on 8 February 2007 by the Government's Delegated Committee for Economic Affairs (ACDGAE-2007) established the mechanisms for obtaining information under the national system and the deadlines and procedures for drawing up the inventory. Focal points at several ministries are responsible for collecting information from ministries departments or regional institutions and for delivering those data to UIAE. Detailed information on the data that are delivered by each institution is presented in table 1.2.1 of the NIR.

18. Furthermore, in the various thematic contexts, working groups have been set up with specific objectives: the agriculture (GT-INV-AG) and livestock (GT-INV-GAN) thematic groups, comprising representatives from MARM, and with the cooperation of sectoral experts from several institutions (STEPA-UPV, ETSIAgr-UPM and TRAGSA),¹⁰ the land use and climatic change thematic group (GT-USCC), including MARM and the Ministry of Public Works and Transport, and with the cooperation of experts from the Centre for Environmental Studies of the Mediterranean (CEAM);¹¹ the thematic group for the regional coordination of technical aspects regarding activity data (AD) and methodologies; and the forum to handle issues related to the disaggregation of the inventory at the regional level.

19. The procedure for the approval of the inventory is clearly defined: the inventory, prepared by DGCEA, is submitted by MARM to the Government's Delegated Committee for Economic Affairs for final approval.

Inventory preparation

Key categories

20. Spain has reported tier 1 and tier 2 key category analyses, both level and trend assessment, as part of its 2010 annual submission. Spain has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). In addition, the Party used qualitative criteria, such as the consideration of the uncertainty of EFs or AD or exceptional trends, to include the following additional categories in its key

⁶ Escuela Técnica Superior de Ingenieros Industriales – Universidad Politécnica de Madrid, in the Spanish original.

⁷ Sistemas y Tecnologías de la Producción Animal – Universidad Politécnica de Valencia, in the Spanish original.

⁸ Servicios y Estudios para la Navegación Aérea y la Seguridad Aeronáutica, in the Spanish original.

⁹ Centro de Investigaciones Energéticas Medioambientales y Tecnológicas, in the Spanish original.

¹⁰ ETSIAgr-UPM = Escuela Técnica Superior de Ingenieros Agrónomos de la Universidad Politécnica de Madrid, TRAGSA = Empresa de Transformación Agraria, S.A.

¹¹ Centro de Estudios Ambientales del Mediterráneo, in the Spanish original.

category analysis: consumption of halocarbons and SF₆ in refrigeration and air-conditioning equipment; N₂O emissions from road transportation; CO₂ emissions from civil aviation and navigation; and carbon stock changes in soils for relevant categories in the LULUCF sector.

21. The key category analysis performed by the Party and that performed by the secretariat¹² produced different results, owing to the different level of disaggregation used by the Party. Spain includes in the NIR some explanations regarding the level of disaggregation of categories applied to perform the key category analysis, but the ERT considered these insufficient and recommends that the Party provide in its NIR evidence that the level of disaggregation is appropriate in accordance with the IPCC good practice guidance.

22. The ERT commends Spain for having addressed the recommendations and encouragements contained in the previous review report,¹³ and in particular for including the LULUCF sector in its key category assessment and implementing a tier 2 key category analysis.

23. Spain has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol using the tier 2 approach. The LULUCF categories identified as key categories under the Kyoto Protocol are the same as those identified for the LULUCF sector under the Convention.

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

Uncertainties

25. Spain performed and has reported a tier 1 uncertainty analysis for the base year, 2007 and 2008, and for the uncertainty in trend in the period 1990–2008. The ERT considered the uncertainty analysis to be in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Spain reports the results of the uncertainty analysis excluding the LULUCF sector, including the LULUCF sector, and including the uncertainty of the KP-LULUCF activities.

26. The overall uncertainty of the 2008 inventory excluding LULUCF was estimated at 10.8 per cent, and the uncertainty in the trend was estimated at 4.4 per cent. When the KP-LULUCF activities are included, the estimated uncertainty of the 2008 inventory increases to 11.8 per cent.

27. The ERT commends Spain for having implemented the recommendations made in previous review reports concerning including the LULUCF sector in its uncertainty analysis and updating its uncertainty analysis on an annual basis. The ERT encourages Spain to apply a tier 2 uncertainty analysis, starting with the sectors for which specific national methodologies are more developed. During the review, Spain informed the ERT that it plans to implement a tier 2 uncertainty analysis for the sectors/categories for which such methodologies are more developed, such as agriculture, road transportation and civil aviation, and to report the results in its 2012 annual submission.

¹² 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.

¹³ FCCC/ARR/2009/ESP, paragraphs 23 and 25.

Recalculations and time-series consistency

28. Recalculations have been performed and reported in accordance with the IPCC good practice guidance.

29. Clear and detailed explanations for the recalculations are provided in the NIR, including effective graphical representations of these recalculations of the time series. The ERT commends Spain for this reporting approach. However, the ERT noted that explanations for recalculations have not been reported in CRF table 8(b) for all categories. The ERT recommends that Spain report in detail on its recalculations in CRF table 8(b) in its next annual submission.

30. According to the NIR, the major recalculations reported by the Party have been undertaken to take into account:

(a) In the energy sector, the update of the energy balance for 2007 and the revision of the methodology used to estimate emissions from road transportation following the update from the use of COPERT III to COPERT IV;¹⁴

(b) In the industrial processes sector, the revision of the estimates of N₂O emissions from nitric acid production and CO₂ emissions from carbide production;

(c) In the agriculture sector, the use of a new methodology to estimate emissions from swine and poultry, and the use of new time series for the number of horses and poultry, the areas under cultivation for certain crops and the use of synthetic fertilizers;

(d) In the waste sector, the revision of data on waste deposited in landfills.

31. The overall impact of the recalculations was a decrease in estimated total GHG emissions both for 1990 and for 2007 of 1.0 and 0.7 per cent, respectively.

Verification and quality assurance/quality control approaches

32. Spain has developed a quality assurance/quality control (QA/QC) plan which is in line with the IPCC good practice guidance. The plan includes general tier 1 as well as tier 2 QC procedures. DGCEA, as the single national entity, is the body responsible for the QA/QC system, coordinating the system and ensuring that tasks are performed on time.

33. The NIR contains a comprehensive and detailed description of the general QC procedures that are performed annually, and information on procedures implemented at each category level is reported in the sectoral chapters of the NIR. Spain states in the NIR that the results of QC activities are archived, but the ERT found that no relevant information was included in the NIR and considered that including such information in the NIR could facilitate the assessment of the Party's inventory during reviews. To increase transparency, the ERT recommends that Spain report on the outcome of its annual QC procedures in its future annual submissions.

34. The NIR also contains information on activities related to QA and verification, in particular how QA procedures are organized. However, the NIR provides reference to only one study finalized to date,¹⁵ and the ERT concluded that QA procedures are not implemented on a regular basis. During the review, the ERT asked for further clarification on the QA and verification activities carried out during the year. Responding to the ERT,

¹⁴ COPERT IV is a software programme developed by the Laboratory of Applied Thermodynamics of the Aristotle University in Thessaloniki to the European Environmental Agency for the calculation of estimates of emissions from road transportation and is available at <http://www.emisia.com/copert/>.

¹⁵ "Programa de garantía de calidad del inventario nacional de emisiones de contaminantes a la atmósfera", prepared by CIEMAT.

Spain elaborated on additional related actions, such as the verification of estimates of emissions from power plants as reported in questionnaires against background data and data from the European Union emissions trading scheme (EU ETS), and the verification of the amount of biogas generated and captured in landfill sites and the quantities used for energy production. In addition, Spain informed the ERT that it envisages establishing institutional arrangements with other EU member States in order to undertake bilateral independent reviews of their inventories during the commitment period (2008–2012). The ERT recommends that Spain describe the QA activities performed and provide the relevant results in its NIR, since this information is useful to provide evidence of the current accuracy of the inventory estimates, of the improvements made to the inventory and of the reasons behind the improvements implemented. The ERT also recommends that Spain implement QA activities on a regular basis.

Transparency

35. Spain's inventory is in general transparent, as regards both the NIR and the CRF tables. However, the ERT found some areas that require further improvement, for example:

(a) The use of the notation keys is not always consistent with the information provided in the notes to the CRF tables and in the NIR. For example, Spain uses the notation key "NE" in cases where emissions are not estimated, but also in cases where emissions are considered negligible. The ERT recommends that Spain use the notation keys in accordance with the UNFCCC reporting guidelines;

(b) The NIR provides detailed analysis of the trends in emissions, but the ERT considered that it does not provide explanations of the underlying reasons for the trends and inter-annual variations in AD and EFs. The ERT recommends that the Party improve transparency by providing explanations for the trends in terms of technological and economic changes;

(c) The ERT considered that the information in the NIR is not sufficient or complete enough to allow for a good assessment of the estimates for the industrial processes sector (e.g. information is not provided in tables 4.4.4, 4.4.5 and 4.4.6 of the NIR) and recommends that the Party provide more information on assumptions used and the origins of country-specific methodologies and EFs.

Inventory management

36. 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. The inventory database, together with the most important data, is duplicated at DGCEA and at AED-NDS-TWOBE.

3. Follow-up to previous reviews

37. Spain has implemented several of the recommendations made in previous review reports, the most relevant being:

(a) To improve the completeness of the inventory by reporting estimates for categories of emissions that were reported as "NE" in previous annual submissions, mostly in the energy and LULUCF sectors;

(b) To include the LULUCF sector in the uncertainty analysis;

- (c) To improve the transparency of the reporting on the energy sector by providing detailed information for each subcategory and a graphical presentation of the time series of data on fuel consumption;
- (d) To report emissions from aviation gasoline and jet kerosene separately in the CRF tables for civil aviation;
- (e) To clarify that fuel consumption for military purposes is included in the inventory;
- (f) To use a higher-tier methodology to estimate N₂O emissions from nitric acid production.

38. However, a number of recommendations made in previous review reports have not yet been implemented, including:

- (a) To include, in its 2010 annual submission, a detailed discussion of the trend in fuel consumption at category level;
- (b) To explain how the share of international bunker fuels is estimated;
- (c) To report estimates of potential emissions of HFCs, PFCs and SF₆ from consumption of halocarbons and SF₆;
- (d) To incorporate the evolution of the body weight of non-dairy cattle into the estimation of emissions from enteric fermentation and manure management;
- (e) To improve the method used to construct the time series of biomass increment on forest land remaining forest land by taking into account the trends in the data relating to harvesting, volume and age-class distribution of forest;
- (f) To improve the transparency of the reporting on the waste sector.

4. Areas for further improvement

Identified by the Party

39. The 2010 NIR identifies several areas for improvement, including plans for general areas and sector-specific improvements. The most important areas for improvement at the general level are:

- (a) The further development of the institutional arrangements, in particular in relation to the collaboration of the ministerial focal points, the thematic groups and the comparison with the inventories prepared by the autonomous authorities;
- (b) The development of a questionnaire to be sent to the autonomous communities, so that these may report background information and emissions data received under the EU ETS to the central administration responsible for the elaboration of the inventory;
- (c) The selective implementation of a tier 2 uncertainty analysis for specific sectors, including the agriculture sector.

40. The NIR lists in detail some more specific areas in need of improvement, including:

- (a) The revision of the methodology for the elaboration of the energy balance for liquid fuels, in collaboration with the Ministry of Industry, Tourism and Trade (MITYC),

and for biomass and waste, in collaboration with the Institute for Diversification and Saving of Energy¹⁶ and the Sub- Directorate General of Production and Sustainable Development;¹⁷

(b) The use of plant-specific AD and EFs for estimating emissions for several categories, such as incineration at large solid waste disposal sites with energy recovery, coke oven plants; combustion in non-ferrous metal industry; cement production; chemical industry; and iron and steel production;

(c) The development of estimation methodologies for several areas, such as for estimating emissions from use of limestone in sugar refineries and copper smelters; and the development of a model to estimate emissions from aviation (METECA model);

(d) The elaboration of carbon balances for electrical steel production;

(e) The development of methodologies to estimate emissions from biomethanization (see para. 121 below);

(f) The improvement of the methodologies used to estimate emissions and removals from KP-LULUCF activities.

41. The ERT commends Spain for the extensive and detailed presentation of its planned improvements, but recommends that the Party prioritize the list of improvements and identify which will be implemented for its next annual submission.

Identified by the expert review team

42. The ERT identifies the following cross-cutting issues for improvement, namely that the Party:

(a) Prepare emission estimates for the remaining categories reported as “NE” for which there are estimation methodologies available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance, namely N₂O emissions from use of gaseous fuels in road transportation and N₂O emissions from flaring of oil;

(b) Continue with its efforts to increase the transparency of its reporting, including in relation to the use of the notation keys and explanations of the underlying reasons for trends and inter-annual variations;

(c) Continue with its efforts to implement a tier 2 uncertainty analysis and to broaden the coverage of sectors in that analysis;

(d) Improve its reporting of the results of QA/QC activities during the preparation of the annual inventory submission in the NIR, in order to facilitate the assessment of the inventory and its accuracy by review teams;

(e) Implement QA activities on a regular basis;

(f) Undertake, as a matter of urgency, a review of the energy balance (see paragraph 52 below), including to ensure consistency between the energy balance used to prepare the inventory and those submitted to the International Energy Agency (IEA) and Eurostat, and include the energy balance in the NIR;

(g) Use EU ETS data to improve the accuracy of the inventory with country-specific data and to enhance the QA/QC procedures;

¹⁶ Instituto para la Diversificación y Ahorro de la Energía del Ministerio de Industria, Turismo y Comercio IDAE-MITYC, in the Spanish original.

¹⁷ Subdirección General de Producción y Consumos Sostenibles del Ministerio de Medio Ambiente, y Medio Rural y Marino, in the Spanish original.

(h) Improve the reporting on feedstocks and non-energy use of fuels, by providing clarity on where these fuels are used;

(i) Find alternative ways to report confidential AD and emission estimates without violating the existing rules on confidentiality.

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

B. Energy

1. Sector overview

44. The energy sector is the main sector in the GHG inventory of Spain. In 2008, emissions from the energy sector amounted to 318,680.11 CO₂ eq, or 78.4 per cent of total GHG emissions. Since the base year, emissions have increased by 50.2 per cent. The key driver for the rise in emissions is the increase in emissions from the transport sector (by 46,139.48 Gg CO₂ eq since 1990 or 80.4 per cent), but other categories have also contributed to the general increase in emissions since 1990: energy industries, with an increase of 28,101.05 Gg CO₂ eq (36.2 per cent); manufacturing industries and construction, with 21,047.93 Gg CO₂ eq (44.4 per cent); other fuel combustion, with 11,787.34 Gg CO₂ eq (44.6 per cent); and fugitive emissions from oil and natural gas, with 436.82 Gg CO₂ eq (19.5 per cent). Only fugitive emissions from solid fuels decreased between 1990 and 2008, by 1,058.42 Gg CO₂ eq or -57.7 per cent. Within the sector, 33.2 per cent of the emissions were from energy industries, followed by 32.5 per cent from transport, 21.3 per cent from manufacturing industries and construction and 12.0 per cent from other fuel combustion. Fugitive emissions from oil and natural gas accounted for 0.8 per cent and fugitive emissions from solid fuels accounted for the remaining 0.2 per cent.

45. The ERT noted that total emissions from the energy sector decreased by 7.7 per cent in a single year between 2007 and 2008. The decrease was mostly the result of the decrease in emissions from energy industries (14.1 per cent decrease from 2007 to 2008), but the decrease in emissions from transport (5.9 per cent decrease) and from manufacturing industries and construction (4.5 per cent decrease) also contributed. The Party explained that the decrease in emissions from transport and from manufacturing industries and construction was due to the economic downturn in 2008, while the decrease in emissions from energy industries was mainly the result of the phasing out of coal use.

46. The ERT commends Spain for having followed the recommendations made in the previous review report¹⁸ and having improved the completeness of the inventory for the energy sector. However, Spain still reports as “NE” emissions for the following categories for which there are estimation methodologies available in the IPCC good practice guidance: N₂O emissions from use of gaseous fuels in road transportation and N₂O emissions from flaring of oil. The ERT strongly recommends that the Party provide estimates for these categories in its next annual submission.

47. The ERT commends the improvements made by Spain in terms of the transparency of its reporting on the energy sector. The Party has followed the recommendations made in previous review reports¹⁹ and has provided disaggregated AD for the categories commercial/institutional, residential and agriculture/forestry/fisheries, in its 2010 annual submission. In addition, Spain has included information on the composition of the fuel

¹⁸ FCCC/ARR/2009/ESP, paragraph 38.

¹⁹ FCCC/ARR/2009/ESP, paragraph 40.

mixes and has explained the changes in the implied emission factors (IEFs) over time with the changes in the fuel mixes.

48. The ERT considered that other recommendations made in previous review report²⁰ related to transparency remain to be addressed. In fact, the ERT noted that the Party did not implement its stated plan to include a detailed discussion of the trend in fuel consumption at category level, in its 2010 annual submission. Therefore, the ERT recommends that the Party address issues of time-series consistency in the NIR of its future annual submissions. For that purpose, the ERT suggests that the Party provide graphical presentations of fuel consumption and GHG emissions for all categories. The ERT also recommends that the Party include the energy balance as an annex to the NIR in its next annual submission.

49. As in its previous annual submission, Spain has provided clear explanations of its recalculations in the 2010 submission for the energy sector. The largest changes to emission estimates were identified for the period 2002–2007. The recalculations for 2007 resulted in an overall increase in the estimated emissions from the energy sector of around 200 Gg CO₂ eq, or 0.1 per cent. The main category responsible for this increase is manufacturing industries and construction, for which numerous recalculations have been performed, resulting mainly from the availability of updated AD provided by Spanish industrial associations and updated CH₄ EFs. The ERT considered that the recalculations were performed in accordance with the IPCC good practice guidance.

50. Spain has not used EU ETS data to estimate emissions from the energy sector, for verification of its estimates or for any other purpose. The ERT considered that the detailed EU ETS data could provide useful information for the Party's inventory, such as carbon contents of fuels, net calorific values (NCVs) and EFs. Furthermore, EU ETS data may be used as a valuable instrument for the QA/QC of both AD and emission estimates. The ERT recommends that the Spanish inventory team obtain access to EU ETS data and consider using them in the preparation of the inventory, as appropriate.

2. Reference and sectoral approaches

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

51. Estimated CO₂ emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. For 2008, CO₂ emissions estimated using the reference approach are 1.2 per cent higher than those calculated using the sectoral approach. Generally, the difference between the estimates calculated using the two approaches in the period 1990–2008 is less than 2 per cent, with the exception of for 1997 and 1998, for which the differences in the estimates were 2.3 per cent and 2.0 per cent, respectively. Spain provided an extensive discussion of the reasons for the differences in annex 4 to the NIR, the most important reasons being: the different coverage of fuels; and the different coverage of activities (e.g. fugitive emissions are included in the reference approach but not in the sectoral approach). The ERT noted that the Party's explanations could be further expanded, in particular with reference to the use of non-energy products, and recommends that Spain provide additional information regarding discrepancies between the reference approach and the sectoral approach for each specific fuel, in particular for the method used to determine the fraction of carbon stored in non-energy use of fuels such as petroleum coke and other petroleum products.

52. During the review, the ERT identified significant differences between the fuel consumptions reported in the energy balance which was provided to the ERT during the review and in the energy balances that Spain provided to Eurostat and to IEA. Some examples include the use of liquid fuels in non-ferrous metal industry (see para. 64 below),

²⁰ FCCC/ARR/2009/ESP, paragraph 41.

the use of solid fuels in other sectors (see para. 66 below) and the use of liquid fuels under the category railways (see para. 72 below).

53. The ERT noted that the improvements that Spain was planning in accordance with the previous review report²¹ were not yet concluded, such as the revision of its liquid fuels balance, in cooperation with MITYC, in order to quantify a sectoral breakdown of liquid fuel consumption and non-energy fuel use and to address apparent inconsistencies between IEA data and the data used in the emission inventory.

54. On the basis of the findings referred to in paragraphs 52 and 53 above, it appears that the Party's energy balance is not stable. The ERT noted that the energy balance is a key factor in the preparation of the GHG inventory and that the accuracy of the inventory is strongly dependent on the accuracy of the energy balance. The ERT strongly recommends that the Party review the way in which it prepares the energy balance and ensure its consistency with the energy balances prepared for other purposes (submission to Eurostat and IEA), and report on the progress and outcome achieved in its next annual submission.

55. The ERT encourages Spain to include information regarding biomass combustion in CRF table 1.A(b), which is currently reported in the reference approach as "NE", given the fact that the energy balance includes information on biomass fuels.

International bunker fuels

56. The ERT found that large inter-annual variations in the CO₂ emissions from international aviation have occurred: an increase of 19.2 per cent in the period 1990–1991; an increase of 18.6 per cent in the period 1991–1992; and an increase of 14.5 per cent in the period 1993–1994. Large inter-annual variations in the CO₂ emissions from marine bunkers were also identified: an increase of 46.0 per cent in the period 1995–1996; and an increase of 23.3 per cent in the period 1996–1997. The information in the NIR on bunker fuels is very brief and contains no explanations for these inter-annual changes. The ERT reiterates the recommendation made in the previous review report that Spain include in the NIR a discussion of the AD and emission estimates for international bunker fuels, including an analysis of the trends and drivers, in its next annual submission.

57. The ERT commends Spain's plans to revise the methodology that it uses to estimate fuel consumption from international maritime bunkers using data on movements registered between national ports and a characterization of the vessels. The ERT considered that this could provide a good basis for a better allocation of liquid fuels between domestic navigation and international marine bunkers, and recommends that the Party report on its progress in its next annual submission.

Feedstocks and non-energy use of fuels

58. The ERT considered that Spain did not report information on feedstocks and non-energy use of fuels in a transparent manner. Although information is provided in CRF table 1.A(d), concerning the quantities of the carbon fractions that are emitted from or stored in products and under which categories they are reflected, the information in the NIR is incomplete (e.g. the use of fuels for specific purposes is not detailed, and in the NIR it is explained that information regarding the use of fuels and life cycles of non-energy fuel uses is not available). Therefore, the ERT recommends that Spain improve transparency, in particular with regard to the fuels that are listed in the energy balance as "final energy consumption" (e.g. petroleum coke and natural gas). The ERT suggests that the Party determine the amounts of the fuels used for specific purposes ensuring that the carbon balances for each case are balanced. The ERT also suggests that Spain use the planned

²¹ FCCC/ARR/2009/ESP, paragraph 44.

study to enhance the energy balance for liquid fuels (see para. 53 above) to obtain the necessary data. The ERT recommends that Spain report on these issues in the NIR and adapt the fractions of carbon stored and emitted in CRF table 1.A(d) accordingly, in its next annual submission. For that purpose, the ERT encourages Spain, to the extent possible, to use the fractions of carbon stored derived from information provided by installations (e.g. under the EU ETS).

3. Key categories

Stationary combustion: all fuels – CO₂

59. The ERT commends Spain for having improved the transparency of its reporting by including in the NIR tables of energy use detailed by fuel type for all categories within the energy sector, including the category other fuel combustion, and for using graphical presentations of the time series of data on fuel consumption.

60. Spain reported emissions from coke production under two categories: emissions from the use of fuels are reported under manufacture of solid fuels and other energy industries, and fugitive CH₄ and CO₂ emissions are reported under solid fuel transformation. The ERT found that insufficient information was included in the NIR to enable an assessment of whether all emissions from transformation of coking coal into coke are included in the inventory, since, for example, Spain has not included a carbon balance in the NIR. Spain could not clarify this issue during the review and the ERT listed this as a potential problem and pending question. In particular, the ERT requested the Party to provide a complete carbon balance for coke production.

61. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain provided information on the input to the carbon balance (3,490 kt coking coal) and the outputs (2,647 kt coke, 736 kt coke oven gas, 83 kt tar and 8 kt benzol), and also on the characteristics of the various products, such as the NCV and the EF (expressed in t C/TJ). According to the information provided, 2,640.17 Gg C is input in coking coal, whereas 2,623.99 Gg C is output as several products. Spain explained that the difference of 16.18 Gg C is included under solid fuel transformation (under that category, 84.52 Gg CO₂ are reported, which is equivalent to 23.05 Gg C). Further, Spain informed the ERT that it corrects the amount of coking coal by subtracting the quantity of water in coking coal (5 per cent), since the Party explained that the NCV (30.44 TJ/t) is expressed in dry matter. However, the ERT noted that the Party could not clarify to the ERT whether this correction was made in a consistent manner to the amount of coking coal used in all energy uses of coal or only in coke production. In addition, the ERT noted that the information on the verified emissions report of one coke oven plant that was responsible for 78.0 per cent of total fuel use for coke production (2,728 kt) did not show that 5 per cent of water was removed from coking coal.

62. The ERT concluded that the information provided by Spain is not sufficiently transparent to prove that there are no missing sources which have not been accounted for, and that the corresponding emissions may have been underestimated. Therefore, the ERT calculated and applied an adjustment (see paras. 133–144 below). Concerning the Party's next annual submission, the ERT recommends that the Party report transparent information on the carbon balances for coke and iron and steel production.

63. In the energy balance provided by Spain during the review, 521 kt petroleum coke are reported as final non-energy consumption in the chemical industry. In CRF table 1.A(d) this amount of fuel is reported as a consumption of 16,948.13 TJ coke, which corresponds to 521 kt coke multiplied by the conversion factor used in CRF table 1.A(b) (32.53 TJ/kt). In the same table it is stated that 80.0 per cent of the carbon is stored in non-fuel uses, while 20.0 per cent (335.66 Gg CO₂) is emissions allocated under metal production. During the

review, the ERT requested the Party to provide details on which industrial activities this petroleum coke was used in. Spain could not provide the requested information during the review and the ERT listed this as a potential problem and pending question.

64. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain informed the ERT that from the total of 521 kt coke it could trace the use of 200 kt in the iron and steel, chemical and non-ferrous metals industries, but that it had no information on the use of the remaining 321 kt petroleum coke. The ERT concluded that the corresponding emissions could have been underestimated and calculated and applied an adjustment (see paras. 145-156 below). Concerning the Party's next annual submission, the ERT recommends that the Party obtain the necessary information to improve the completeness of the inventory. The ERT also recommends that Spain revise the fraction of carbon stored reported in CRF table 1.A(d) in line with the new information available in its next annual submission.

65. Spain reports in CRF table 1.A(d) that 17,327.42 TJ natural gas is used as feedstock or for non-energy uses, and that 33.0 per cent of the carbon in the natural gas was stored in chemical products, while the remaining carbon was emissions allocated under chemical industry. During the review, the ERT requested the Party to provide details on which industrial activities this natural gas was used in. Spain could not provide the requested information during the review and the ERT listed this as a potential problem and pending question. Responding to the ERT at the end of the review week, Spain informed the ERT that it had collected information from emission inventory registries and that it could trace the use of 15,010.23 TJ natural gas in hydrogen plants in petroleum refineries and in ammonia production. In addition, Spain revised CRF table 1.A(d), reporting that no carbon from natural gas is stored as non-energy products. Finally, in its last communication with the ERT, Spain revised the value of natural gas that is used as feedstock or for non-energy uses from 17,327.42 TJ to 16,452.48 TJ.²² The ERT concluded that the Party could not trace the use of 1,442.25 TJ natural gas and that the inventory corresponding emissions could have been underestimated. The ERT calculated and applied an adjustment (see paras. 157-167 below) and recommends that Spain obtain the necessary information to complete the inventory for its next annual submission.

66. In the NIR (table 3.9.5), Spain reports a constant consumption of hard coal (4,551 TJ)²³ under the category other sectors (1.A.4) for the period 2004–2008. This value corresponds to a consumption of 150 kt coal, as reported in the energy balance. The ERT found that in the energy balances that Spain had provided to Eurostat and IEA the consumption of hard coal increased in the period 2004–2008 and the value reported for 2008 is double (300 kt) that reported in the Party's GHG inventory. The ERT noted that the increase in the prices of oil and natural gas in the period 2004–2008 is more consistent with an increase in the use of coal as a less expensive substitute, as reported in the energy balances provided to Eurostat and IEA. During the review, Spain could not provide the ERT with explanations for this issue, and the ERT listed this as a potential problem and pending question.

67. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain stated that the decision to report a constant use of coal was the responsibility of the inventory team and was based on the assumption that the existing municipal incentives to replace the use of coal by the use of other fuels with lower air-pollutant emissions would reduce consumption of coal in the category other sectors (1.A.4),

²² Both values are expressed as net calorific value. Spain also explained and provided evidence that this value has been submitted to IEA and EUROSTAT, although the new value was not yet reflected in the EUROSTAT database at the time of finalization of this report.

²³ Total consumption of solid fuels under the category other was 6,424.43 TJ.

but did not provide data or explanations supporting this assumption or reasons for the different data in the energy balances provided to EUROSTAT and IEA. Further, the Party stated that MITYC will revise the values reported to EUROSTAT and IEA for the coming years. The ERT recommends that the Party report on the results of this revision in a transparent manner in its next annual submission. Based on the available information provided by Spain the ERT concluded that the inventory corresponding emissions have probably been underestimated for 2008 and calculated and applied an adjustment (see paras. 170–185 below).

Civil aviation – CO₂

68. In its 2010 annual submission, Spain has followed the recommendation made in the previous review report²⁴ and reported estimates of emissions from aviation gasoline and jet kerosene separately in the CRF tables. The ERT commends the improvement made and encourages Spain to further improve transparency by including separate time series of emission estimates for each fuel in its next NIR.

69. Spain uses the IPCC tier 2a methodology to estimate emissions from civil aviation (i.e. using aggregated information on aircraft movements) and the disaggregation of fuel consumption is based on questionnaires made by MITYC. The ERT noted that the aviation sector in Spain, as an EU member State, will be included in the EU ETS in the future, and recommends that the Party use this opportunity to use to the extent possible verified bottom-up data on fuel consumption and emission estimates based in distance and payload²⁵ data to improve the accuracy of its inventory.

Coal mining and handling – CH₄

70. Previous review reports²⁶ have included the recommendation that Spain undertake a study to determine the extent of degasification activities and CH₄ recovery and flaring in coal mining, and to assess the possible impacts of these activities on GHG emissions for the fugitive emissions and stationary combustion categories. The ERT asked the Party to provide information with regard to the progress on this issue, and Spain responded that the issue is still being analysed and that no definitive results are available yet. The ERT reiterates the recommendation made in the previous review report that Spain report on its progress or the results of this study in its next annual submission.

4. Non-key categories

Railways – CO₂

71. The ERT noted that the NIR does not contain information on the category railways. Although it represents a minor category, responsible for 290.05 Gg CO₂ eq of emissions, the lack of information reduces transparency and creates difficulties for the review process. The ERT recommends that the Party provide information on the AD, EFs and methodologies used for its estimations for this category in its next annual submission.

72. The ERT found the data on fuel consumption under the category railways to be inconsistent. In the energy balance provided by Spain during the review, Spain reports a consumption of 92 kt gas/diesel oil, which is consistent with the value expressed in energy units (3,955.05 TJ) in CRF table 1.A(a). However, in the energy balances submitted to IEA and Eurostat the value reported for consumption of gas/diesel oil is 705 kt, which is 7.6 times higher than the value reported in the energy balance provided during the review.

²⁴ FCCC/ARR/2009/ESP, paragraph 49.

²⁵ Payload is defined as the total mass of freight, mail and passengers carried.

²⁶ For example, FCCC/ARR/2009/ESP, paragraph 50.

Responding to the ERT during the review, Spain informed the ERT that the value reported in the energy balance during the review was provided by the main railway companies and that it is accurate. In addition, the Party stated that the value reported is very close to the value published by the Ministry of Public Works and Transport.²⁷ Nevertheless, the Party could not provide reasons for the difference in that value from the values reported in the energy balances submitted to IEA and Eurostat. The ERT recommends that Spain investigate this difference and report on the results of its investigation in its next annual submission.

Other – CO₂

73. In the previous review report it was noted that the NIR was not sufficiently clear on whether fuel consumption for military purposes was included in the energy statistics. The ERT found that, in its 2010 submission, Spain explains in the NIR²⁸ that consumption of fuels in this activity, which should be included in category other (1.A.5), are not established in the energy balance and reports fuel consumption as ‘NO’ and emissions as ‘NA’. However, in CRF table 1.A(a) the Party reports fuel consumption and emissions in the category other (1.A.5) as ‘IE’ for liquid and gaseous fuels and the NIR does not refer other emission categories included under other (1.A.5). The ERT recommends that Spain improve the transparency and consistency of reporting for this category in its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

74. In 2008, emissions from the industrial processes sector amounted to 31,679.01 Gg CO₂ eq, or 7.8 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1,527.15 Gg CO₂ eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have increased by 11.8 per cent in the industrial processes sector and increased by 10.0 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are the increases in CO₂ emissions from cement production (by 1,846.36 Gg CO₂ eq, or 14.7 per cent), HFC emissions from refrigeration and air-conditioning equipment (by 4,307.58 Gg CO₂ eq) and from fire extinguishers (by 1,908.59 Gg CO₂ eq), and CO₂ emissions from iron and steel production. On the other hand, HFC emissions from the production of hydrochlorofluorocarbon (HCFC)-22 (–4,307.58 Gg CO₂ eq, or 92.9 per cent) and from nitric acid production (–1,812.37 Gg CO₂ eq, or 64.7 per cent) have decreased since the base year, partly offsetting the overall increase in emissions from the sector. Within the industrial processes sector, 59.3 per cent of the emissions were from mineral products, followed by 22.2 per cent from consumption of halocarbons and SF₆, 11.3 per cent from metal production and 5.1 per cent from chemical industry. Production of halocarbons and SF₆ accounted for 2.1 per cent.

75. The ERT noted that emissions from the industrial processes sector decreased by 9.3 per cent between 2007 and 2008, which was due to the decreased economic activity in Spain in 2008. In particular, the decrease in emissions between 2007 and 2008 was evident in the following categories: CO₂ emissions from cement production (–2,923.90 Gg CO₂ eq or a 16.9 per cent decrease); CO₂ emissions from limestone and dolomite use (–492.77 Gg CO₂ eq or a 27.3 per cent decrease); CO₂, CH₄ and N₂O emissions from iron and steel

²⁷ “*Los transportes y los servicios postales*”.

²⁸ English version of the NIR, appendix 5.

production (-477.79 Gg CO₂ eq or a 20.1 per cent decrease); and CO₂ emissions from ammonia production (-116.74 Gg CO₂ eq or a 18.8 per cent decrease).

76. Spain's inventory for the industrial processes sector is generally complete, with only emissions of fluorinated gases (F-gases) from manufacturing and disposal of fire extinguishers and aerosols being reported as "NE" (see para. 84 below).

77. The ERT noted that Spain reports AD and IEFs as confidential ("C") for a significant number of categories: soda ash production and use; magnesite production (other (mineral products)); silicon carbide and calcium carbide production; ethylene and styrene production; pig iron and sinter production; flaring in iron and steel production (other iron and steel production); and aluminium production. The ERT considered that such reporting impairs the transparency and comparability of the inventory and makes the proper assessment and review of the inventory difficult. The ERT recommends that the Party, in its future annual submissions, find alternative ways to report AD and IEF without violating the existing rules on confidentiality. As an example of a possible solution, the ERT suggests that the Party aggregate its emission estimates for the categories for which there are concerns over confidentiality and provide the EF values in the NIR. The ERT also recommends that the Party provide information on the trends in the AD time series.

78. Recalculations were performed by the Party for the its 2010 inventory submission for the following categories in the industrial processes and solvent and other product use sectors: CO₂ emissions from lime production, limestone and dolomite use, soda ash production and use, ferroalloys production and silicium production (other metal production); N₂O emissions from nitric acid production; CH₄ emissions from carbide production; HFC emissions from refrigeration and air-conditioning equipment; and N₂O emissions from solvents. The recalculations have been properly reported in the NIR and resulted in a decrease of 1.4 per cent in the estimated emissions from the industrial processes sector for 2007 and a reduction of 5.6 per cent in the estimate of emissions from the solvent and other product use sector.

2. Key categories

Cement production – CO₂

79. Spain estimates CO₂ emissions from cement production using a constant EF for the period 1990–2007 (0.54 t/t clinker). The NIR indicates that the EF was calculated on the basis of the calcium oxide (CaO) and magnesium oxide (MgO) contents of the cement, which were determined as the average values of measurements made in 12 industrial plants in 2005: 65.7 per cent for CaO and 1.9 per cent for MgO. The ERT noted that the information in the NIR on the calculation of the EF is insufficient to enable it to conclude whether the cement kiln dust (CKD) factor was considered in the calculation of the EF, in which case the associated emissions could have been underestimated, and the ERT requested, during the review, that the Party provide clarification on this issue.

80. Responding to the ERT during the review, Spain informed the ERT that it did not have data on CKD. However, the Party informed the ERT that for 2008 it had available emission estimates for 36 plants,²⁹ which were estimated under the EU ETS and include CO₂ emissions from clinker production, CKD and CO₂ emissions from non-carbonated carbon in raw materials, and that the resultant average IEF from this data is 0.527 t/t clinker. Therefore, Spain provided a revised estimate of CO₂ emissions from cement production for 2008 in its submission of 8 November 2010, calculated using the newly calculated EF, but kept the emission estimates for the period 1990–2007 unchanged. The

²⁹ The 36 plants were responsible for producing 27,179,455 t clinker in 2008, out of a total production of 27,304,551 t clinker (by 37 plants).

ERT commends the Party for the improvement made with regard to the estimate for 2008, but noted that the time series is not consistent. The ERT recommends that Spain recalculate the emission estimates and the IEF time series for the whole period (1990–2008), ensuring consistency in accordance with the IPCC good practice guidance, and provide the necessary transparent information (e.g. on contents of CaO and MgO and CKD) in the NIR of its next annual submission.

Nitric acid production – N₂O

81. Following the recommendation made in the previous review report,³⁰ Spain has moved to a higher-tier methodology to estimate N₂O emissions from nitric acid production: for the plants in operation in 2008, the applied EF was calculated using measured emissions data and information on the production technologies. For these plants the EF is 5 kg N₂O/t production. Spain clarified during the review that the relatively low EF for the plants existing in 2008 is due to the N₂O abatement (destruction) technology in operation in some of the plants. For those plants that were already closed in 2008, the EF used for previous years is 7 kg N₂O/t production, which was based on information from the Spanish Chemical Industry Federation. The ERT commends the improvements made by the Party.

Other (chemical industry) – CO₂

82. Spain reported CO₂ and CH₄ emissions from silicon carbide production and CO₂ emissions from calcium carbide (CaC₂) production, but reported the AD and IEFs as “C” both in the CRF tables and in the NIR, thus preventing the ERT from assessing whether these emissions were underestimated or not. Therefore, during the review, the ERT requested the Party to provide data on the consumption of carbon materials (e.g. petroleum and coke oven coke, and limestone), their carbon contents and the quantities of carbon stored in products. Responding to the ERT, Spain provided the requested confidential information and the EF for each production plant for 2008. The ERT concluded that the IEFs calculated using the plant-specific data used by Spain are similar to the default IPCC EFs in the Revised 1996 IPCC Guidelines, which are 2.30 t/t coke for the production of silicon carbide and 1.8 t/t CaC₂ produced for the production of CaC₂, and it concluded that no underestimation of emissions had occurred.

Iron and steel production – CO₂

83. The methodology that Spain uses to estimate emissions from iron and steel production is presented in the NIR in a transparent manner, but the ERT noted that quantitative information on carbon balances is not provided (i.e. tables 4.4.4 to 4.4.6 of the NIR are empty). Responding to the list of potential problems and further questions raised by the ERT during the review, the Party provided separated carbon balances, one for the two iron and steel plants existing in the country in 2008 and the other for all electric arc furnaces. The ERT concluded that the information provided by the Party resolved the issue, and recommends that the Party provide a complete carbon balance in the NIR of its next annual submission.

Consumption of halocarbons and SF₆ – HFCs

84. Emissions of F-gases from manufacturing and disposal of fire extinguishers and aerosols are reported as “NE”, and Spain explains in the CRF tables that this is due to a lack of data. The ERT encourages the Party to complete the inventory for these sub-categories, in its next annual submission, by providing emission estimates for the missing components.

³⁰ FCCC/ARR/2009/ESP, paragraph 58.

85. In its original 2010 annual submission, Spain reported the AD for HFCs remaining in products at the decommissioning of domestic refrigeration and air-conditioning equipment as “NE” for all species of gases and all uses. The ERT informed the Party that this could have led to an underestimation of emissions and, in the list of potential problems and further questions, requested the Party to provide corresponding estimates. In its submission of 8 November 2008, Spain provided estimates of emissions of F-gases from disposal of refrigeration and air-conditioning equipment. In addition, the Party has revised the EFs that it uses to estimate the original emissions and in operating systems for domestic and commercial refrigeration for the whole time series 1990–2008. The ERT agrees with the revised estimates submitted by Spain.

86. Potential emissions of HFCs, PFCs and SF₆ are reported as “NE” for all gases and years of the time series. The ERT reiterates the recommendation made in the previous review report³¹ that Spain provide, in its next annual submission, estimates of potential emissions of HFCs, PFCs and SF₆ from consumption of halocarbons and SF₆.

3. Non-key categories

Ammonia production – CO₂

87. Spain explains in the NIR that it estimates emissions for this category using plant-specific information on consumption of feedstocks (natural gas, refinery gas and naphtha), and that the CO₂ storage in urea is not subtracted from the emission estimates. The ERT noted that the IEF for 2008 (1.07 t/t ammonia) is lower than the IPCC default value (1.5 to 1.6 t/t ammonia) and has decreased by 13.6 per cent since 1990 (1.24 t/t ammonia) and by 9.6 per cent from 2007 (1.18 t/t ammonia) to 2008 (1.07 t/t ammonia). The ERT also noted that the background information used to estimate emissions (consumption of feedstocks and CO₂ emissions) is not reported in the NIR due to confidentiality reasons.

88. Responding to the list of potential problems and further questions, Spain clarified that the decreasing trend in the IEF between 1990 and 2008 results from changes in the mix of the feedstock that was used (refinery gas, which is responsible for a higher level of emissions, has been replaced by the use of natural gas), and the Party provided the necessary information for 2008 on feedstock consumption, CO₂ emissions and the IEF used to the ERT. In addition, the Party revised the emission estimate for 2008, using the revised IEF of 1.20 t/t ammonia. The ERT concluded that the revised estimate has resulted in greater consistency in the time series, but recommends that the Party explain why the IEF used is lower than the IPCC default EF, and enhance QC procedures to ensure that the emissions and IEF are not underestimated, in its future annual submissions.

D. Agriculture

1. Sector overview

89. In 2008, emissions from the agriculture sector amounted to 38,955.64 Gg CO₂ eq, or 9.6 per cent of total GHG emissions. Since 1990, emissions have increased by 3.2 per cent. The key drivers for the rise in emissions are the increase in CH₄ emissions from enteric fermentation (by 1,098.57 Gg CO₂ eq, or a 9.5 per cent increase since the base year) and in CH₄ and N₂O emissions from manure management (by 1,922.33 Gg CO₂ eq, or a 30.3 per cent increase since the base year), which, to a large extent, are due to the increase in the livestock numbers of non-dairy cattle and swine, which have increased by 54.1 per cent and 54.9 per cent between 1990 and 2008, respectively. This increase in emissions was partially offset by the decrease in N₂O emissions from agricultural soils (by 1,734.44 Gg CO₂ eq, or

³¹ FCCC/ARR/2009/ESP, paragraph 55.

a 9.1 per cent decrease since the base year), which was due to the decrease in the application of synthetic fertilizers by 31.5 per cent since the base year. Within the sector, 44.5 per cent of the emissions were from agricultural soils, followed by 32.5 per cent from enteric fermentation and 21.2 per cent from manure management. The remaining 1.8 per cent were from field burning of agricultural residues (1.1 per cent) and rice cultivation (0.7 per cent).

90. The Party's 2010 annual submission is complete with regard to the agriculture sector, covering all categories and gases. Prescribed burning of savannas does not occur in Spain and is reported as not occurring ("NO").

91. Spain has made substantial recalculations of its estimates of emissions from manure management for 2007 (resulting in a decrease of 38 per cent between the estimates reported in the 2009 and 2010 annual submissions) and indicates in the NIR that these recalculations resulted from the revision of the methodology used to estimate CH₄ emissions from manure management for swine and poultry, which now uses a country-specific EF and is classified by the Party as tier 3, and the update of the time series of livestock numbers for several animal types with new data. However, the ERT noted that Spain has not yet implemented some of the relevant recommendations made in the previous review report,³² and reiterates that Spain should undertake the necessary work to incorporate the evolution of the body weight of non-dairy cattle into the estimation of emissions from enteric fermentation and manure management, for its next annual submission.

92. The ERT noted that the information in the NIR is not sufficiently transparent to enable a clear understanding of the methodologies, underlying assumptions and country-specific information that are used in determining the EFs when tier 3 methods are used for estimating emissions (e.g. for estimating CH₄ emissions from manure management). During the review, the Party provided to the ERT supplementary material, including comprehensive documentation of the models used, which led to a better understanding. The ERT recommends that Spain include in the NIR of its next annual submission a short description of the methodologies and underlying information used for the calculation of country-specific EFs.

2. Key categories

Enteric fermentation – CH₄

93. Spain uses the IPCC tier 2 methodology to estimate emissions from dairy cattle, non-dairy cattle and sheep, uses country-specific EFs (reported as tier 3) to estimate emissions from swine, and uses the tier 1 methodology to estimate emissions from all other animal types. The ERT considered that this approach is in accordance with the IPCC good practice guidance, since non-dairy cattle (responsible for 48.6 per cent of the total emissions from enteric fermentation) and sheep (contributing 28.9 per cent) are the most significant contributors to the emissions from enteric fermentation.

94. The country-specific method used to estimate emissions from swine is only briefly presented in the NIR, but the detailed documentation of the method is referenced in the NIR³³ and was made available to the ERT during the review. The important features of the methodology include the differentiation of the two major breeds existing in Spain, the white and the black Iberian pigs, and the consideration of their typical diets on the basis of expert opinion. As explained in the NIR, the country-specific methodology was verified by the comparison of its results with the results of other methodologies available. The ERT

³² FCCC/ARR/2009/ESP, paragraphs 65 and 66.

³³ MARM. 2010. *Bases zootécnicas para el cálculo del balance de nitrógeno y de las emisiones de gases producidas por la actividad ganadera en España*. Madrid.

commends Spain for the development of this country-specific methodology, but recommends that the Party provide additional details in the NIR on the basic information and assumptions used to estimate the emissions, and on the EF used for each sex/age class.

Manure management – CH₄ and N₂O

95. To estimate CH₄ emissions from manure management, Spain uses a country-specific method (reported in the NIR as tier 3) for swine and poultry, the tier 2 methodology for dairy cattle and non-dairy cattle, and tier 1 methods for the other animal types. This is in line with the IPCC good practice guidance.

96. Spain explains in the NIR that the country-specific methodology that is used to estimate emissions from swine and poultry estimates the excretion of volatile solids (VS) on the basis of the requirements of metabolic energy and typical diets. Responding to a request made by the ERT during the review, Spain further explained to the ERT that the methodology that it used for estimating emissions from swine takes into account that the waste of swine is handled by different animal waste management systems (AWMS) at different stages. This methodology for estimating emissions from swine was used for the first time for the Party's 2010 annual submission, and the following changes in the data for 2007 in comparison with those in the previous annual submission were noted by the ERT with respect to swine: excretion of volatile solids decreased from 0.38 kg dry matter/head/day to 0.27 kg dry matter/head/day; the IEF decreased from 15.27 kg CH₄/head/year to 9.37 kg CH₄/head/year; and total emissions for this category decreased by 3,297.17 Gg CO₂ eq (38.7 per cent).

97. The ERT noted that the information in the NIR on the country-specific information that was used for estimating emissions from swine and poultry is insufficient to gain a transparent understanding of the country-specific methodology (e.g. the NIR does not present what stages of manure management are considered and how the estimation method takes into consideration the moving of waste in several steps). During the review, the Party provided detailed and clear documentation of the assumptions, calculations and parameters involved. The ERT concluded that the method used by Spain is appropriate and has improved the accuracy of the estimates, but recommends that Spain improve the transparency of its reporting by including in its next NIR a short description of the methodology, main parameters and assumptions used.

98. The ERT noted that the information in the NIR on the parameters and assumptions used to calculate the EFs for dairy cattle and non-dairy cattle is insufficient and that no explanations for the trends in the time series are provided. During the review, and upon the request of the ERT, Spain provided the necessary detailed information (e.g. weight by breed and sex of cattle, average daily weight gain by age and sex, milk yield by breed, and digestibility by age and sex) and analysis, and the ERT recommends that Spain include such information and analysis in its NIR in the next annual submission.

99. To determine the methane conversion factors (MCFs) that are used in tier 2 methodologies and the EFs that are used in tier 1 methodologies, Spain does not use the IPCC defaults for each climate region (cool, temperate and warm) directly, but uses a set of linear equations, which are functions of the average temperature and which interpolate the IPCC defaults for each region. The Party states in the NIR that this methodology was considered appropriate by the IPCC Technical Support Unit (TSU)³⁴. However, the ERT noted that the calculations are made at province level and that the average MCFs for each climate region and AWMS are not reported in CRF table 4.B(a) or in the NIR, meaning that it is not possible to compare the emission estimates calculated using this approach with those calculated using the MCFs and EFs from the Revised 1996 IPCC Guidelines and the

³⁴ Based at the Institute for Global for Global Management Strategies (IGES).

IPCC good practice guidance. The ERT recommends that Spain, for the sake of increased transparency, improve the reporting in its next annual submission by providing the average MCFs and EFs for each animal type, climate region and AWMS, and that it compare the emission estimates obtained using these data with the results that would be obtained if the IPCC tier 2 methodology were used.

100. In CRF table 4.B(a), Spain reports in the “Allocation (%)” rows livestock numbers treated by AWMS, instead of the percentage of manure treated as required by the UNFCCC reporting guidelines. The ERT recommends that the Party correct the reporting in this table for its next annual submission.

101. Spain uses the default IPCC methodology and country-specific nitrogen (N) excretion rates (Nex) to estimate N₂O emissions from manure management. The country-specific Nex are based on nitrogen balances for dairy cattle, non-dairy cattle, sheep, swine and poultry, for which reference documents were provided to the ERT during the review.³⁵ Given that nitrogen balances are not available for goats and equines (horses, mules and asses), the Party uses the IPCC defaults contained in the Revised 1996 IPCC Guidelines (table 4.20) for the Near East and Mediterranean for other animals. For swine and poultry Nex were calculated considering the revised quantities of manure generated and the percentages of manure being treated by individual AWMS that were also used to estimate CH₄ emissions from manure management. The ERT considered that the methodology used by Spain is in accordance with the IPCC good practice guidance, but recommends that the Party include more information, such as the detailed Nex by age and sex, in the NIR of its next annual submission. The ERT also recommends that Spain explain, in its next annual submission, why it is using the IPCC default Nex for the Near East and Mediterranean (40 kg N/head/year) instead of that for Western Europe (25 kg N/head/year).

Agricultural soils – N₂O

102. Spain estimates N₂O emissions from agricultural soils using the IPCC tier 1 methodology and country-specific values³⁶ for the following parameters: Frac_{GASF}, Frac_{GASM}, Frac_{GRAZ}, the ratio of above-ground biomass to crop product mass (Res_{BF}/Crop_{BF}), the fraction of dry matter in the above-ground biomass (Frac_{DM}), and Frac_{NCRBF}.

103. The ERT noted that the overall trend in the N₂O IEF for the category nitrogen leaching and run-off is decreasing and that the IEF for the period 2002–2008 (0.0249 kg N₂O-N/kg N) is 0.4 per cent lower than the value for the period 1990–2001 (0.0250 kg N₂O-N/kg N). During the review, Spain informed the ERT that it uses the default IPCC value for Frac_{LEACH}, and that the trend in the IEF resulted from the fact that, while the AD were complete, the emissions from one province were not included in the total estimate. Spain provided revised estimates of emissions from this sub-category in its submission of 8 November 2010, thus resolving the identified problem. The ERT recommends that Spain improve its QC procedures in order to identify such errors for its next and future annual submission.

104. Spain reports in the NIR that it uses the default IPCC EF (0.0125 kg N₂O-N/kg N) to estimate emissions from synthetic fertilizers and from animal manure applied to soils. However, the ERT found that in CRF table 4.D the reported IEFs are 0.012 kg N₂O-N/kg N

³⁵ UPV. 2006. *Methodology for the estimation of atmospheric emissions in the agricultural sector for the national inventory of emissions*. Prepared as a result of a specific contract between DGCEA and the Superior Technical School of Agricultural Engineers at the University of Valencia for technical consulting services in the area of animal husbandry and the environment (ref. CV122004).

³⁶ The country-specific parameters are based on the *EMEP/EEA Air Pollutant Emission Inventory Guidebook* (European Environment Agency (EEA), 2009 methodology).

for synthetic fertilizers and 0.010 kg N₂O-N/kg N for animal manure. The ERT concluded that this difference is due to the fact that Spain reports the AD before subtraction of the fraction of N lost through volatilization of nitrous oxides (NO_x) and ammonia, which is not in accordance with the Revised 1996 IPCC Guidelines. The ERT recommends that Spain report the AD after subtraction of the fraction volatilized in its next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

105. In 2008, net removals from the LULUCF sector amounted to 52,472.90 Gg CO₂ eq. Since the base year, net removals have increased by 33.3 per cent. The key driver for the rise in removals is the increase in removals of CO₂ from forest land, which have grown by 24.0 per cent since 1990. Within the sector, the forest land was responsible for removals of 49,371.56 Gg CO₂, followed by 2,474.27 Gg removals from cropland and 887.81 Gg removals from grassland. The category settlements is a net source, responsible for 260.74 Gg CO₂.

106. Compared with those reported in the Party's 2009 annual submission, the estimates of net removals have increased very significantly for all years from 1990 to 2007; in particular, the estimate of net removals for 2007 has increased by 22,339.91 Gg CO₂ eq, or by 79.7 per cent. The reason for this trend was the increase in the estimates of removals from forest land remaining forest land (by 17,650.15 Gg CO₂ eq), from land converted to forest land (3,089.87 Gg CO₂ eq) and from land converted to grassland (745.06 Gg CO₂ eq). Spain explains in the NIR that the recalculations were undertaken to improve the consistency between the reporting on the LULUCF sector under the Convention and the reporting on KP-LULUCF activities under the Kyoto Protocol. In particular, the recalculations were due to the revision of the fraction of canopy cover from 10 per cent, used in the 2009 annual submission, to 20 per cent for the 2010 annual submission, in accordance with the definition of forest for KP-LULUCF activities, and the fact that the subtraction of the less densely forested areas increases the average growth of living biomass per ha. During the review, the ERT noted in the information in the CRF tables that the major cause of the change in these estimates was the increase in the implied carbon stock change factor for living biomass on forest land remaining forest land, which for 2007 increased by 95.9 per cent, from 0.43 Mg C/ha in the 2009 annual submission to 0.85 Mg C/ha in the 2010 annual submission. Responding to the ERT at the end of the review week Spain acknowledged that the change in this value is an error and will be corrected in the next annual submission. The ERT recommends that the Party provide transparent explanations for this revision in its next annual submission, including the implications of the error detected.

107. The ERT noted that Spain has increased the completeness of the inventory for the LULUCF sector since its 2009 annual submission and has provided estimates for the first time for: carbon stock change in living biomass on grassland and other land converted to forest land; net carbon stock change in mineral soils in areas of cropland and grassland converted to forest land; carbon stock change in living biomass on cropland remaining cropland; carbon stock change on land converted to settlements; and net carbon stock change in mineral soils in areas of forest land converted to settlements.

108. However, the ERT also noted that some categories and pools have still not been estimated, such as: carbon stock change in all pools for grassland remaining grassland, cropland converted to grassland, and wetlands remaining wetlands; carbon stock change in dead organic matter (DOM) on forest land converted to settlements; and CO₂, CH₄ and N₂O emissions from controlled burning on forest land remaining forest land and from wildfires on cropland remaining cropland, grassland remaining grassland, wetlands remaining

wetlands, and other land remaining other land. The ERT recommends that Spain continue to improve the completeness of the inventory by providing estimates of emissions and removals for the mandatory categories and pools in its future annual submissions.

109. Spain has reported other categories as “NE”, but it has provided notes in the CRF tables stating that the pools are assumed balanced or are not net sources of emissions. These include carbon stock change: in DOM on forest land remaining forest land; for cropland, grassland and other land converted to forest land, cropland remaining cropland, and settlements remaining settlements; in mineral soils on forest land remaining forest land, and on cropland, grassland and other land converted to settlements; and in all pools for cropland and grassland converted to other land. The ERT recommends that the Party revise the use of the notation keys or provide estimates for these pools and categories in its next annual submission.

110. The ERT noted that, generally, the NIR is well structured and transparent with regard to the reporting on the LULUCF sector, and that the necessary information on methods, AD, EFs and parameters used is provided in the NIR and its annexes. The ERT commends the Party for having included in its 2010 annual submission a detailed uncertainty analysis for the sector, which is an improvement in comparison with the Party’s 2009 annual submission.

111. From its observation of the time series, the ERT believes that the annual areas reported as land converted to forest land and to grassland represent the cumulative areas since 1990, since these areas grew continually from 1990 to 2008, while the area under forest management and grassland management was constant or decreased. However, the ERT noted that the area reported as land converted to settlements is constant for the period 1990–2008 (20.47 kha) and represents the annual area converted. The ERT recommends that the Party use the same reporting approach for all categories, reporting either the annual areas converted or the cumulative areas, in its next annual submission.

112. The ERT noted that Spain reports an area of 540 ha having been converted from forest land to settlements in CRF table 5.E, whereas it reports total forest land converted to other land uses as “NO” in CRF table 5. During the review, the Party informed the ERT that the reporting in CRF table 5 is incorrect. The ERT recommends that Spain correct this information in its next annual submission.

2. Key categories

Forest land remaining forest land – CO₂

113. To estimate emissions and removals from forest land remaining forest land, Spain used the stock change method from the IPCC good practice guidance for LULUCF, using data from the second and third National Forest Inventories, conducted in the periods 1986–1995 and 1997–2007, respectively. Spain uses country-specific (tier 2) values for a limited number of parameters (e.g. annual extracted volume, biomass expansion factor and wood density), whereas it uses the default values from the IPCC good practice guidance for LULUCF (tier 1) for other parameters (root-to-shoot ratio and the carbon fraction of dry matter). Spain reported carbon stock change in DOM on forest land remaining forest land as “NE” and provided information in the NIR stating that this pool is not a net source of emissions, stating that since the 1970s the density of forest has been increasing and that the previous practice of burning residues has been replaced by the crushing of residues and their incorporation into the soil. Finally, the Party used the tier 1 methodology to estimate carbon stock change in soil organic carbon (SOC) and it reports emissions/removals for this category as “NE”. The ERT concluded that the inventory for this category is not fully in accordance with the IPCC good practice guidance for LULUCF, since that guidance states (page 3.25) that the stock change method excludes the use of the tier 1 methodology.

Therefore, the ERT recommends that Spain continue its efforts to move to higher-tier estimation methodologies by obtaining country-specific values for all parameters for all pools.

114. Using the stock change method, Spain uses a constant net carbon stock change for living biomass (0.85 Mg C/ha) for all years from 1990 to 2008, while the area reported under forest land remaining forest land decreases slightly, by 0.1 per cent, between 1990 (12,587.19 kha) and 2008 (12,577.46 kha). The ERT reiterates the conclusion stated in the previous review report³⁷ that assuming a constant land area for such a long period leads to inaccurate estimates of emissions and removals, and reiterates the recommendation made in the previous review report that Spain either improve the method used to construct the time series of data on biomass increment, by taking into account the trends in the data relating to harvesting, volume and age-class distribution of forest, or switch to the gain-loss method if a third biomass stock data set is not expected to be obtained in the near future.

Land converted to forest land – CO₂

115. Spain uses the default method from the IPCC good practice guidance for LULUCF (gains minus losses) to estimate emissions and removals from land converted to forest land, and uses country-specific parameters to estimate carbon stock change in above-ground living biomass, using the IPCC default value for root-to-shoot ratio. Total area reported under this category increases significantly from 1990 (23.31 kha) to 2008 (1,067.51 ka), which corresponds to a 52.4 times increase in net removals, from 196.12 Gg CO₂ in 1990 to 10,274.98 Gg CO₂ in 2008. For 2008, the cumulative area converted to forest land was distributed by origin in the following manner: 65.3 per cent from cropland; 24.8 per cent from other land; and 9.9 per cent from grassland. Conversion of settlements and wetlands to forest land are reported as “NO”.

116. Spain reports carbon stock losses in living biomass as “IE” under gains, incorporated in the considered growing factors. The ERT considered that this approach impairs the transparency of the reporting and encourages the Party to revise the methodology it uses to estimate gains and losses of carbon following the corresponding steps and equations contained in the IPCC good practice guidance for LULUCF, and by identifying the different sources of carbon losses (commercial fellings, fuel gathering and other losses), in its next annual submission. The ERT notes that information on felling is provided in the NIR in section 11.3.1.2 related to the Kyoto Protocol reporting requirements.

117. In its original submission, Spain reported carbon stock changes in DOM and SOC on cropland, grassland and other land converted to forest land as “NE” and, responding to a question raised by the ERT during the review, justified this approach with the use of the tier 1 method from the IPCC good practice guidance for LULUCF. Given that the category land converted to forest land is a key category, the ERT concluded that the use of the default tier 1 methodology is not in accordance with the IPCC good practice for LULUCF, particularly in the case of cropland converted to forest land, and recommended that Spain provide either transparent and verifiable evidence that these pools are not sources of emissions or estimates of corresponding emissions and removals calculated using higher-tier methods. Responding to the ERT, at the end of the review, Spain provided estimates of carbon stock changes in SOC (mineral soils) on cropland and grassland converted to forest land.

³⁷ FCCE/ARR/2009/ESP, paragraphs 77 and 78.

3. Non-key categories

Other land – CO₂

118. Other land remaining other land accounted for an area of 10,924.30 kha in 2008, or about 20 per cent of the total territory of Spain, and land converted to other land totalled 383.22 kha in 2008. Spain explains in the NIR that under the category other land it has included shrubland and other land dominated by woody vegetation that does not fall under the definition of forest. The ERT noted that, in accordance with the IPCC good practice guidelines for LULUCF, bare soil, rock, ice and unmanaged land areas that do not fall into any of the other land categories are intended to be reported under the category other land, with the result that the sum of the identified land areas matches the total national area. Also, change in carbon stocks and emissions and removals for other land remaining other land do not need to be assessed, assuming that these are typically unmanaged areas. The ERT noted, however, that the Party does not provide information demonstrating that the total area reported under other land is unmanaged. On the other hand, the IPCC good practice guidance states that grassland includes systems with vegetation that fall below the threshold used for the forest land category. Therefore, the ERT recommends that Spain, for its next annual submission, review the allocation of these areas or disaggregate them further so that they are allocated to the appropriate land categories.

F. Waste

1. Sector overview

119. In 2008, emissions from the waste sector amounted to 15,565.45 Gg CO₂ eq, or 3.8 per cent of total GHG emissions. Since the base year, emissions have increased by 103.4 per cent. The key driver for the rise in emissions is the increase in the quantity of solid waste generated and disposed on land, from which emissions increased by 6,341.36 Gg CO₂ eq between 1990 and 2008, or by 78.6 per cent since 1990. Also, emissions from wastewater handling and from sludge spreading (category other (6.D)) increased substantially from 1990 to 2008, by 1,243.13 Gg CO₂ eq and 408.08 Gg CO₂ eq, respectively, reflecting the increase in the volume of wastewater treated. Within the sector, 72.8 per cent of the emissions were from solid waste disposal on land, followed by 22.9 per cent from wastewater handling and 4.3 per cent from sludge spreading at treatment plants. The remaining 0.1 per cent were from waste incineration. Estimates of GHG emissions from waste incineration with energy recovery are included under the energy sector in accordance with the Revised 1996 IPCC Guidelines.

120. Recalculations performed by Spain for the waste sector resulted in a decrease in the estimate of CH₄ emissions by 0.3 per cent for 1990 and an increase in the estimate for 2007 by 7.7 per cent. The recalculations for 1990 were due to minor revisions of AD, in particular with regard to consumption of protein, quantity of wastewater treated in the pulp and paper industry and incineration of corpses. The recalculations for 2007 were due principally to the revision of the quantity of solid waste deposited in landfills and the incorporation in the calculations of the residues from compost production, which were not previously included in the inventory.

121. The inventory for the waste sector is generally complete, and the not-estimated emissions relate to those categories for which there are no estimation methodologies available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance, such as CH₄ emissions from incineration of hospital waste and N₂O emissions from incineration of corpses, both reported under waste incineration, and N₂O emissions from handling of industrial and commercial wastewater. The Party states in the NIR that it is making efforts,

together with plant operators, to include estimates of emissions from biomethanization³⁸ in its next annual submission. The ERT encourages the Party to explore approaches available in the scientific literature to estimate emissions for categories that do not have estimation methodologies prescribed in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance, with a view to further enhancing, to the extent possible, the completeness and accuracy of its inventory.

2. Key categories

Solid waste disposal on land – CH₄

122. To estimate CH₄ emissions from solid waste disposal on land, Spain uses the tier 2 method (first-order decay method) and collects data on solid waste disposal to managed landfills from questionnaires on landfill activities and from statistical information contained in the publication entitled “Environment in Spain”.³⁹ Following up on the conclusion made in the previous review report,⁴⁰ the ERT noted that, on page 8.3 of the NIR, Spain refers to the lack of information for some years, and no information is provided in the NIR on how the time series of the quantity of solid waste was derived. Responding to a question raised by the ERT during the review, Spain confirmed that the information received from the questionnaires is not comprehensive, and it provided detailed information on the data contained in the aforementioned publication, which are derived from information provided by regional governments, and on the way in which the time series of the quantity of solid waste deposited at unmanaged disposal sites was extrapolated for the periods 1970–1990 and after 2005. The ERT recommends that Spain include this information in its next annual submission, in order to improve the transparency of the inventory.

123. As noted in the previous review report,⁴¹ the degradable organic carbon (DOC) values are estimated by extrapolation (pre-1981) or are kept constant for more than 10 years (1997–2008), and only for the period 1980–1997 are they based on data on the composition of municipal solid waste, as can be seen in table 8.2.3 of the NIR. Responding to a question raised by the ERT during the review, Spain stated that it envisages using other sources of information or expert judgement to extend the time series of DOC values. The ERT recommends that the Party either obtain the necessary updated data or justify why it considers that the assumption of a constant value is valid.

124. To estimate CH₄ emissions from unmanaged landfill sites, Spain has made assumptions related to the depth of these sites (50 per cent deep and 50 per cent shallow) and the amount of waste that is burned, and the ERT reiterates the recommendation made in the previous review report⁴² that Spain improve the transparency of its reporting by providing further insights to support these assumptions in its next annual submission. During the review, Spain informed the ERT that more information on open burning at unmanaged landfills is being collected from the regional governments. The ERT commends Spain for these efforts and recommends that Spain use the new data to improve the quality of the inventory for its next annual submission.

125. Spain has reported GHG emissions from the burning at unmanaged landfills under solid waste disposal on land (other), which the ERT considered not to be in accordance with the IPCC good practice guidance, since these emissions are not related to anaerobic decomposition. The ERT reiterates the recommendation made in the previous review

³⁸ According to information provided by Spain, biomethanization refers to a process whereby biogas is produced through a process of anaerobic treatment of organic waste with energy recovery.

³⁹ “*Medio Ambiente en España*”, in the Spanish original.

⁴⁰ FCCC/ARR/2009/ESP, paragraph 84.

⁴¹ FCCC/ARR/2009/ESP, paragraph 86.

⁴² FCCC/ARR/2009/ESP, paragraph 85.

report⁴³ that Spain reallocate the estimates of emissions from the open burning of solid waste to the category waste incineration.

Wastewater handling – CH₄

126. It was noted in the previous review report that Spain's reporting on emissions from wastewater handling in the NIR is limited and lacks transparency. In the previous review report it was recommended that more information be provided on the method of interpolation and extrapolation of population data. The ERT reiterates this recommendation, with a view to improving transparency. The ERT further recommends that Spain's reporting on point sources of industrial wastewater treatment should include more information (e.g. type and GHG emission process).

3. Non-key categories

Waste incineration – CO₂ and N₂O

127. To estimate emissions from incineration of sludge, Spain uses a CO₂ EF of zero, assuming that the sludge is renewable organic waste. This is true of urban and municipal solid waste (MSW) sludge, but this EF may vary according to the nature of industrial sludge (i.e. CO₂ emissions from the pulp and paper industry may be negligible, but those from the oil refining industry are not). Spain acknowledged this during the last review and stated that it was aiming to differentiate between types of industrial sludge incineration in its next annual submission. During the present review, Spain informed the ERT that this investigation is still being undertaken and that it will report on it in its next annual submission. The ERT strongly recommends that Spain make this improvement to the completeness of its inventory for its next annual submission.

G. Adjustments

128. The ERT identified and recommended adjustments in the energy sector for 2008. In accordance with the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol" (annex to decision 20/CMP.1), the adjustments in the energy sector were prepared by the ERT in consultation with Spain. Also, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), the ERT officially notified Spain of the calculated adjustments.

129. The underestimations leading to adjustments in the energy sector for 2008 relate to CO₂, CH₄ and N₂O emissions from: coking coal (solid fuel) consumption under manufacture of solid fuels and other energy industries; liquid fuel consumption under non-ferrous metals; gaseous fuels under chemical industry; and hard coal (solid fuel) consumption under other sectors.

130. The applied adjusted estimate of GHG emissions from the energy sector for 2008 amounts to 321,035.84 Gg CO₂ eq, compared with 318,680.11 Gg CO₂ eq as originally reported by Spain in its 2010 annual submission. The adjustments in the energy sector lead to an increase in estimated total Annex A GHG emissions for 2008 by 0.6 per cent (2,355.73 Gg CO₂ eq), from 406,407.36 Gg CO₂ eq as reported by Spain to 408,407.36 Gg CO₂ eq as calculated by the ERT.

131. In its response to the draft annual review report Spain notified the secretariat of its intention to accept the calculated adjustment.

⁴³ FCCC/ARR/2009/ESP, paragraph 88.

132. The ERT notes that Spain may submit revised estimates for a part of its inventory to which adjustments were applied, in conjunction with its next inventory, or at the latest with the inventory for the year 2012. The revised estimates will be part of the Article 8 review and if accepted by the ERT the revised estimates will replace the adjustments.

1. Manufacture of solid fuels and other energy industries (solid fuels) – CO₂, CH₄ and N₂O

The original estimate

133. Spain reports emissions from coke production under two categories: emissions from the use of fuels are reported under manufacture of solid fuels and other energy industries, and fugitive CH₄ and CO₂ emissions are reported under solid fuel transformation. According to information in the NIR and the energy balance, the coke oven gas resulting from coke production is also consumed in public electricity and heat production and in iron and steel production.

The underlying problem

134. The ERT found that insufficient information was included in the NIR to enable it to assess whether double counting or underestimation of emissions had occurred in the category manufacture of solid fuels and other energy industries: for example, Spain did not include information on the carbon balance for coke production in its original 2010 annual submission neither the energy balance. Spain could not clarify this issue during the review and the ERT listed it as a potential problem and pending question. In particular, the ERT requested the Party to provide a complete carbon balance for coke production.

The recommendation to the Party

135. The ERT recommended that Spain prepare and present a complete carbon balance of the carbon inputs and carbon outputs from coke production, ensure that all emissions are accounted for either in category solid fuels consumption in manufacture of solid fuels and other energy industries, solid fuel transformation or iron and steel production, and no missing source exist. Otherwise, the ERT recommended that the Party estimate emissions of the missing sources, report emissions under the appropriate category, and include the emission estimates in the CRF tables.

The rationale for the adjustment

136. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain provided information on the input to the carbon balance (3,490 kt coking coal) and the outputs (2,647 kt coke, 736 kt coke oven gas, 83 kt tar and 8 kt benzol), and also on the characteristics of the various products, such as the NCV and the EF (expressed in t C/TJ). Spain provided detailed information for one individual plant, covering 78 per cent of total fuel use for all coke production in the country, and total emissions, as reported under the EU ETS, for the remaining 3 plants existing in the country.

137. According to the information provided, 2,640.17 Gg C is input in coking coal, whereas 2,623.99 Gg C is output as several products. Spain explained that the difference of 16.18 Gg C is included as emissions reported under solid fuel transformation (under that category, 84.52 Gg CO₂ is reported, which is equivalent to 23.05 Gg C). However, Spain informed the ERT that it corrects the amount of coking coal by subtracting the quantity of water in coking coal (5 per cent), since the Party provided information that the NCV (30.44 TJ/t) is expressed in dry matter. However, the ERT noted that the Party could not clarify to the ERT whether this correction was made in a consistent manner to the amount of coal used in all energy uses of coal or only in coke production. In addition, the ERT

noted that the information on the verified emissions report of one coke oven plant that was responsible for 78.0 per cent of total fuel use for coke production (2,728 kt) did not document in a transparent manner that 5 per cent of water was removed from coking coal. The ERT concluded that the assumption to subtract the water content (5 per cent) is still not documented in a transparent manner.

138. The ERT concluded that the information provided by Spain is not transparent enough to ensure that all emissions have been accounted for and that the data have not been underestimated by the correction made for the water content. Therefore, the ERT recommended the calculation of an adjustment and applied it.

139. The ERT noted that, in accordance with paragraph 19 of the annex to decision 20/CMP.1, an adjustment procedure should be initiated if the information provided by the Party is not sufficiently transparent.

The assumptions, data and methodology used to calculate the adjustment

140. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1) an ERT should calculate the adjustment at the level at which the problem was identified. However, the problem was identified from the comparison of the carbon balance for the total coke production: an excess of carbon in the input (coking coal) in comparison with the products (coke oven gas, coke, tar and benzol). Given that there is a problem of transparency in the inventory and since it was not possible to conclude where the possible underestimation of emissions should be allocated, the ERT decided to estimate emissions for the quantity of coal corresponding to the carbon fraction that could not be traced in the output products (155.14 Gg C).⁴⁴

141. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1), the ERT calculated the adjustment using the IPCC tier 1 method from the IPCC good practice guidance and AD calculated from the carbon balance provided by the Party.

142. The calculation of the estimate of emissions for the adjustment exercise was done using the IPCC default EFs from the Revised 1996 IPCC Guidelines for CH₄ (1.00 kg/TJ) and N₂O (1.40 kg/TJ), and the country-specific EF for CO₂ (95.92 t/TJ, as reported in CRF table 1.A(b) for coking coal).

The adjusted estimate

143. Table 4 describes the steps for the calculation of the adjustment.

Table 4

Description of the adjustment calculation for Annex A sources

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: coking coal (solid fuel) consumption under manufacture of solid fuels and other energy industries (1.A.1.c) – CO ₂ , CH ₄ and N ₂ O			
Party’s estimate of CO ₂ , CH ₄ and N ₂ O emissions from Use of solid fuels in manufacture of solid fuels and other	1 084.52	Gg CO ₂ eq	Common reporting format (CRF)

⁴⁴ This value represents the difference in the input and output of carbon in the carbon balance provided by Spain if the water content of the coking coal is not subtracted.

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
energy industries			tables I.A.1 and I.B.1
Applied data for calculation of adjustment: missing source of carbon (C) in the carbon balance	155.14	Gg C	Calculated from the carbon balance provided by Spain during the review shows that a part of the carbon in the coal is not accounted for in the products (coke), fuels (coke oven gas, tar and benzol) consumed in energy industries and manufacturing industries and construction, or as fugitive emissions (solid fuel transformation)
Carbon content of coking coal	26.16	t C/TJ	Value provided by the Party during the review in response to the list of potential problems and further questions
Applied data for calculation of adjustment: quantity of coal not accounted for	5 930.26	TJ	Estimated from the carbon content of coal
CO ₂ emission factor (EF)	95.92	t/TJ	Calculated from the carbon content of coking coal
CH ₄ EF	1.00	kg/TJ	Intergovernmental Panel on Climate Change (IPCC) Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual Table 1-7
N ₂ O EF	1.40	kg/TJ	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual Table 1-7
Adjusted emission estimate, before applying conservativeness factor: CO ₂	568.83	Gg CO ₂ eq	Calculated by the expert review team (ERT)
Adjusted emission estimate, before applying conservativeness factor: CH ₄	0.12	Gg CO ₂ eq	Calculated by the ERT
Adjusted emission estimate, before applying conservativeness factor: N ₂ O	2.57	Gg CO ₂ eq	Calculated by the ERT
Conservativeness factor (activity data)	1.02		Table 2 of appendix III to decision 20/CMP.1
Adjusted conservative emission estimate: CO ₂	580.21	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission estimate: CH ₄	0.13	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission estimate: N ₂ O	2.63	Gg CO ₂ eq	Calculated by the ERT
Estimate of total aggregated GHG emissions (excluding LULUCF) as reported by the Party	406 407.36	Gg CO ₂ eq	CRF table 10
Estimate of total aggregated GHG	406 990.32	Gg CO ₂ eq	Calculated by the ERT

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
emissions (excluding LULUCF) after application of adjustment			
Difference between original and adjusted estimates of total aggregated GHG emissions	582.96	Gg CO ₂ eq	
	0.14	%	

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

Conservativeness of the calculation of the adjustment

144. In line with paragraph 5 of decision 20/CMP.1, conservativeness was ensured by applying the conservativeness factor of 1.02 (AD for energy industries) from table 2 of appendix III to the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1). The ERT therefore considers that the resulting adjusted values are conservative.

2. Non-ferrous metals (liquid fuels) – CO₂, CH₄ and N₂O

The original estimate

145. Spain reported in CRF table 1.A(d) a consumption of 16,948.13 TJ coke. In the same table it is stated that 80.0 per cent of the carbon in petroleum coke is subtracted from non-ferrous metals and stored in non-fuel uses, while 20.0 per cent (335.66 Gg CO₂) is emissions allocated under metal production.

146. In accordance with the energy balance provided by Spain during the review, 521 kt petroleum coke is reported as final non-energy consumption in the chemical industry. This value multiplied by the conversion factor used in CRF 1.A(b) (32.53 TJ/kt) results in the same consumption of 16,948.13 TJ coke as reported in CRF table 1.A(d).

147. The ERT concluded from the information provided by the Party during the review that estimates of emissions from the use of petroleum coke are not included under the energy sector.

The underlying problem

148. During the review, the ERT noted that the information in the NIR was insufficient to support the percentages reported in CRF table 1.A(d), in particular that 80.0 per cent of the 521 kt petroleum coke was stored in non-fuel uses.

The recommendation to the Party

149. During the review week, the Party could not provide details on which industrial activities this quantity of petroleum coke was used in, and the ERT listed this as a potential problem and pending question, requesting the Party to report the use of the 521 kt petroleum coke for each separate process. The ERT also requested Spain to estimate the carbon stored and released in each process, report the estimate of the GHG emissions in a transparent manner, and revise the information in CRF table 1.A(d) accordingly.

The rationale for the adjustment

150. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain informed the ERT that from the total 521 kt petroleum coke it could trace the use of 200 kt in the iron and steel, chemical and non-ferrous metals industries, but that it had no information on the use of the remaining 321 kt petroleum coke.

Spain also informed the ERT of what percentages of carbon were sequestered or emitted during each industrial use (95 per cent of the 200 kt petroleum coke is emitted). The Party further informed the ERT that, in spite of all its efforts, it was unable to obtain all necessary information, but that it will continue to try to obtain it and report it in its next annual submission.

151. The ERT notes that Spain did not follow the recommendation by the ERT. The ERT therefore concluded that the information provided by Spain is incomplete and not transparent, and that emissions of use of liquid fuels in non-ferrous metals could have been underestimated.

The assumptions, data and methodology used to calculate the adjustment

152. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1) an ERT should calculate the adjustment at the level at which the problem was identified, which is as a lack of transparency in the AD. Given that Spain could not trace the use of all the petroleum coke, the ERT concluded that the approach of subtracting consumption of petroleum coke from non-ferrous metals is not supported by the information provided by the Party, since there is no evidence that carbon in the petroleum coke was not oxidised, and decided to assume that the AD for this category is the level at which the adjustment should be calculated.

153. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1), the ERT calculated the adjustment using the IPCC tier 1 method from the IPCC good practice guidance and AD provided by the Party (321 kt petroleum coke).

154. The ERT decided to use, as much as possible, data provided by the Party, which was possible for the NCV (32.53 GJ/t) and the CO₂ EF (98.04 t/TJ, as available for petroleum coke in CRF table 1.A(b)). However, for the CH₄ (2.00 kg/TJ) and N₂O (0.60 kg/TJ) EFs the ERT had to use the IPCC defaults from the Revised 1996 IPCC Guidelines.

The adjusted estimate

155. Table 5 describes the steps for the calculation of the adjustment.

Conservativeness of the calculation of the adjustment

156. In line with paragraph 5 of decision 20/CMP.1, conservativeness was ensured by applying the conservativeness factor of 1.06 (AD for manufacturing industries and construction) from table 2 of appendix III to the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1). The ERT therefore considers that the resulting adjusted values are conservative.

Table 5
Description of the adjustment calculation for Annex A sources

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: petroleum coke (liquid fuel) consumption under non-ferrous metals (1.A.2.b) – CO ₂ , CH ₄ and N ₂ O			
Party’s estimate of liquid fuel consumption	18 361.38	TJ	Common reporting format (CRF) table 1.A.2

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Party's estimate of CO ₂ , CH ₄ and N ₂ O emissions use of liquid fuels in non-ferrous metals	1 411.80	Gg CO ₂ eq	CRF table 1.A.2
Applied data for calculation of adjustment: missing use of liquid fuels	321.00	kt	Value provided by the Party during the review in response to the list of potential problems and further questions
Net calorific value	32.53	GJ/t	CRF table 1.A(b) for petroleum coke
Applied data for calculation of adjustment: quantity of coal not accounted for	10 442.13	TJ	Calculated by the expert review team (ERT)
CO ₂ emission factor (EF)	98.04	t/TJ	EF = 27.01 t carbon/TJ in CRF table 1.A(d); oxidation factor = 0.99
CH ₄ EF	2.00	kg/TJ	Intergovernmental Panel on Climate Change (IPCC) Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, <i>Reference Manual Table 1-7</i>
N ₂ O EF	0.60	kg/TJ	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, <i>Reference Manual Table 1-7</i>
Adjusted emission estimate, before applying conservativeness factor: CO ₂	1 023.70	Gg CO ₂ eq	Calculated by the ERT
Adjusted emission estimate, before applying conservativeness factor: CH ₄	0.44	Gg CO ₂ eq	Calculated by the ERT
Adjusted emission estimate, before applying conservativeness factor: N ₂ O	1.94	Gg CO ₂ eq	Calculated by the ERT
Conservativeness factor (activity data)	1.06		Table 2 of appendix III to decision 20/CMP.1
Adjusted conservative emission estimate: CO ₂	1 085.12	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission estimate: CH ₄	0.46	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission estimate: N ₂ O	2.06	Gg CO ₂ eq	Calculated by the ERT
Estimate of total aggregated GHG emissions (excluding LULUCF) as reported by the Party	406 407.36	Gg CO ₂ eq	CRF table 10
Estimate of total aggregated GHG emissions (excluding LULUCF) after application of adjustment	407 495.01	Gg CO ₂ eq	Calculated by the ERT

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Difference between original and adjusted estimates of total aggregated GHG emissions	1 087.64	Gg CO ₂ eq	
	0.27	%	

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

3. Chemicals (gaseous fuels) – CO₂, CH₄ and N₂O

The original estimate

157. In its original 2010 annual submission, Spain reported (in CRF table 1.A(d)) that 17,327.42 TJ natural gas is used as feedstock or for non-energy uses, and that 33.0 per cent of the carbon in the natural gas was stored in chemical products, while the remaining carbon was emissions allocated under chemical industry. Later, in its submission of 8 November 2010, Spain reported that no fraction of the carbon in the natural gas is stored in products and that the emissions are reported under the categories chemical products and fugitive emissions from oil refining and storage.

The underlying problem

158. During the review, the ERT requested the Party to provide details on which industrial activities this natural gas was used in. Spain could not provide the requested information during the review and the ERT listed this as a potential problem and pending question.

The recommendation to the Party

159. During the review, the ERT recommended that Spain determine and report the amount of natural gas used for non-energy purposes and not included under the energy sector, and the amount consumed for each specific purpose, and provide information on where the carbon is stored and where the emissions are allocated.

The rationale for the adjustment

160. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain informed the ERT that it had collected information from emission inventory registries and that it could trace the use of 15,010.23 TJ natural gas in hydrogen plants in petroleum refineries and in ammonia production (all carbon is emitted). In addition, Spain revised the value of natural gas that is used as feedstock or for non-energy uses from 17,327.42 TJ to 16,452.48 TJ.⁴⁵

161. The ERT noted that the Party could not trace the use of 1,442.25 TJ natural gas and concluded that the corresponding data/emissions have possibly been underestimated.

162. The ERT noted that the CO₂ IEF for the category ammonia production (1.20 t/t ammonia), which is a related category, is low in comparison with those of other European countries⁴⁶ and the IPCC defaults (1.50 t/t ammonia) (see para. 87 above), and recommends

⁴⁵ Both values are expressed as net calorific value. Spain also explained and provided evidence that this value has been submitted to IEA and EUROSTAT, although the new value was not yet reflected in the EUROSTAT database at the time of finalization of this report. However, the ERT decided to take the national data provided by Spain into account for the calculation of adjustments.

⁴⁶ According to *Methodology for the free allocation of emission allowances in the EU-ETS post 2012 – Sector report for the chemical industry*, prepared by the European Commission in November 2009 all 35 ammonia plants in the European Union have IEF much larger than 1.2 t CO₂/t ammonia.

that the Party verify if this results from the fact that the remaining fraction of natural gas is not being considered under that category, in which case the EF would be closer to the IPCC defaults (1.50 t/t ammonia).

163. The information collected by Spain only traces the use of 15,010 TJ natural gas for non-energy purposes, out of 16,452.48 TJ, leaving the use of 1,442.25 TJ unjustified. The Party informed the ERT that, in spite of all its efforts, it was unable to obtain all necessary information, but that it will continue to try to obtain it and report it in its next annual submission.

164. The ERT notes that Spain did not follow the recommendation made by the ERT and could not provide information on all uses of natural gas used as feedstock. Therefore the ERT concluded that the information provided by Spain is incomplete and not transparent, and that the relevant emissions of the category chemicals could have been underestimated.

The assumptions, data and methodology used to calculate the adjustment

165. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1) an ERT should calculate the adjustment at the level at which the problem was identified, which is as a lack of transparency in the AD. Given that Spain could not trace the use of the natural gas subtracted from the chemical industry in the energy balance, the ERT decided to assume that the AD for the category chemical is the level at which the adjustment should be calculated.

166. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (decision 20/CMP.1), the ERT calculated the adjustment using the IPCC tier 1 method from the IPCC good practice guidance and AD provided by the Party (1,442.25 TJ natural gas).

167. The ERT decided to use, as much as possible, data provided by the Party, and used the IEF reported for chemical industry in CRF table 1.A(a) to estimate emissions of CO₂ (56.00 t/TJ), CH₄ (51.88 kg/TJ) and N₂O (1.11 kg/TJ) from use of gaseous fuels in chemicals.

The adjusted estimate

168. Table 6 describes the steps for the calculation of the adjustment.

Table 6

Description of the adjustment calculation for Annex A sources

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: gaseous fuels under chemical industry – CO ₂ , CH ₄ and N ₂ O			
Party's estimate of gaseous fuel consumption	123 244.27	TJ	Common reporting format (CRF) table 1.A(a)
Party's estimate of CO ₂ , CH ₄ and N ₂ O emissions use of gaseous fuels in chemicals	7 078.22	Gg CO ₂ eq	CRF table 1.A(a)
Applied data for calculation of adjustment: quantity of natural gas not accounted for	1 442.25	TJ	Value provided by the Party during the review in response to the list of potential problems and further questions

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
CO ₂ emission factor (EF)	56.00	t/TJ	Implied emission factor (IEF) in CRF table 1.A(a)
CH ₄ EF	51.88	kg/TJ	IEF in CRF table 1.A(a)
N ₂ O EF	1.11	kg/TJ	IEF in CRF table 1.A(a)
Adjusted emission estimate, before applying conservativeness factor: CO ₂	80.77	Gg CO ₂ eq	Calculated by the expert review team (ERT)
Adjusted emission estimate, before applying conservativeness factor: CH ₄	1.57	Gg CO ₂ eq	Calculated by the ERT
Adjusted emission estimate, before applying conservativeness factor: N ₂ O	0.49	Gg CO ₂ eq	Calculated by the ERT
Conservativeness factor (activity data)	1.06		Table 2 of appendix III to decision 20/CMP.1
Adjusted conservative emission estimate: CO ₂	85.61	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission estimate: CH ₄	1.67	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission estimate: N ₂ O	0.52	Gg CO ₂ eq	Calculated by the ERT
Estimate of total aggregated GHG emissions (excluding LULUCF) as reported by the Party	406 407.36	Gg CO ₂ eq	CRF table 10
Estimate of total aggregated GHG emissions (excluding LULUCF) after application of adjustment	406 495.16	Gg CO ₂ eq	Calculated by the ERT
Difference between original and adjusted estimates of total aggregated GHG emissions	87.80	Gg CO ₂ eq	
	0.02	%	

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

Conservativeness of the calculation of the adjustment

169. In line with paragraph 5 of decision 20/CMP.1, conservativeness was ensured by applying the conservativeness factor of 1.06 (AD for manufacturing industries and construction) from table 2 of appendix III to the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1). The ERT therefore considers that the resulting adjusted values are conservative.

4. Other sectors (solid fuels) – CO₂, CH₄ and N₂O

The original estimate

170. In the NIR (table 3.9.5), Spain reports a constant consumption of hard coal (4,551 TJ) under the category other sectors (1.A.4) consumption for the period 2004–2008. This value corresponds to a consumption of 150 kt coal, as reported in the energy balance. Total consumption of solid fuels under the category other sectors, including coal pellets and synthetic gas, for the same period was 6,424.43 TJ.

The underlying problem

171. The ERT found that in the energy balances that Spain submitted to Eurostat and IEA the consumption of hard coal increased in the period 2004–2008 and the value reported for 2008 is double (300 kt) that reported in the inventory (150 kt).

172. During the review, Spain could not provide the ERT with explanations in relation to this issue, and the ERT listed this as a potential problem.

The recommendation to the Party

173. During the review, the ERT recommended that Spain provide either explanations for the difference in the data reported in the CRF tables and in the energy balances submitted to IEA and Eurostat, or revised estimates, calculated using AD consistent with those reported to IEA and Eurostat.

The rationale for the adjustment

174. In response to the list of potential problems and further questions formulated by the ERT during the review, Spain stated that the decision to report a constant use of coal was the responsibility of the inventory team and was based on the assumption that the existing municipal incentives to replace the use of coal by the use of other fuels resulting in lower air-pollutant emissions would reduce consumption of coal in the other sectors. Further, the Party stated that MITYC is planning to revise the values reported to Eurostat and IEA for the coming years.

175. The explanations provided by Spain to the ERT, in its response to the list of potential problems and further questions, do not justify the difference between the data in the CRF tables and in the energy balances submitted to IEA and Eurostat. Furthermore, they are based on expert judgement that is neither reflected in the NIR nor supported by verifiable data.

176. The ERT informed the Party during the review that the increase in the prices of oil and natural gas in the period 2004–2008 is more consistent with an increase in the use of coal as a less expensive substitute, as reported in the energy balances submitted to IEA and Eurostat. Spain responded to the ERT that it did not agree with that reasoning, stating that once coal-using equipment is dismantled in commercial and domestic settings, it is not possible to return to using this equipment. The ERT noted that this argument is again based on expert assumptions and not supported by verifiable data.

177. The ERT indicated to the Party that Eurostat data are reported by Spain to the European Commission in accordance with official regulations and its obligations as an EU member State, and therefore the submission to Eurostat should be considered an official submission.

178. At the end of the review, Spain informed the ERT that MITYC, the entity responsible for submitting the energy balance to Eurostat, plans to revise the time series of data on hard coal consumption for this category.

179. The ERT concluded that Spain did not follow the recommendation by the ERT and could not document the use of 150 kt of hard coal instead of 300 kt and that the corresponding emissions may have been underestimated for 2008.

180. The ERT concluded that the information provided by Spain is incomplete and not transparent, and that the relevant emissions may have been underestimated.

The assumptions, data and methodology used to calculate the adjustment

181. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1) an ERT should calculate the adjustment at the level at which the problem was identified, which is as a lack of transparency in the AD in relation to consumption of hard coal under the category other sectors.

182. In accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1), the ERT calculated the adjustment using the IPCC tier 1 method from the IPCC good practice guidance and AD from the energy balances provided to IEA and Eurostat (8,070 TJ anthracite and 1,563 TJ bituminous coal).

183. The ERT decided to use, as much as possible, data provided by the Party, and used the IEFs reported for chemical industry in table 3.9.9 of the NIR to estimate emissions of CO₂ (101.00 kg/TJ), CH₄ (450.00 kg/TJ) and N₂O (1.40 kg/TJ) from use of solid fuels in category other sectors (1.A.4)

The adjusted estimate

184. Table 7 describes the steps for the calculation of the adjustment.

Table 7

Description of the adjustment calculation for Annex A sources

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: hard coal (solid fuel) consumption under other sectors – CO ₂ , CH ₄ and N ₂ O			
Party’s estimate of hard coal consumption in category other sectors (1.A.4)	4 551.00	TJ	Table 3.9.5 of the national inventory report (NIR)
Applied data for calculation of adjustment: quantity of coal not accounted for	5 082.00	TJ	Value provided by the Party during the review in response to the list of potential problems and further questions
CO ₂ emission factor (EF)	101.00	t/TJ	Table 3.9.9 of the NIR
CH ₄ EF	450.00	kg/TJ	Table 3.9.9 of the NIR
N ₂ O EF	1.40	kg/TJ	Table 3.9.9 of the NIR
Adjusted emission estimate, before applying conservativeness factor: CO ₂	513.28	Gg CO ₂ eq	Calculated by the expert review team (ERT)
Adjusted emission estimate, before applying conservativeness factor: CH ₄	48.02	Gg CO ₂ eq	Calculated by the ERT
Adjusted emission estimate, before applying conservativeness factor: N ₂ O	2.21	Gg CO ₂ eq	Calculated by the ERT
Conservativeness factor (activity data)	1.06		Table 2 of appendix III to decision 20/CMP.1
Adjusted conservative emission estimate: CO ₂	544.08	Gg CO ₂ eq	Calculated by the ERT
Adjusted conservative emission	50.91	Gg CO ₂ eq	Calculated by the ERT

<i>Parameter/estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
estimate: CH ₄			
Adjusted conservative emission estimate: N ₂ O	2.34	Gg CO ₂ eq	Calculated by the ERT
Estimate of total aggregated GHG emissions (excluding LULUCF) as reported by the Party	406 407.36	Gg CO ₂ eq	CRF table 10
Estimate of total aggregated GHG emissions (excluding LULUCF) after application of adjustment	407 004.68	Gg CO ₂ eq	Calculated by the ERT
Difference between original and adjusted estimates of total aggregated GHG emissions	597.32	Gg CO ₂ eq	
	0.15	%	

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

Conservativeness of the calculation of the adjustment

185. In line with paragraph 5 of decision 20/CMP.1, conservativeness was ensured by applying the conservativeness factor of 1.06 (AD for other sectors) from table 2 of appendix III to the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1). The ERT therefore considers that the resulting adjusted values are conservative.

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

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

186. Spain submitted estimates for afforestation, reforestation and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol. The Party has elected the activities forest management and cropland management under Article 3, paragraph 4, of the Kyoto Protocol. It chose to account for activities under Article 3, paragraph 3 and 4, of the Kyoto Protocol at the end of the commitment period.

187. In its original 2010 annual submission, submitted on 15 April 2010, Spain provided a complete set of CRF tables for the purpose of submitting information on LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (KP-LULUCF CRF tables), but it did not report all the information outlined in paragraphs 5–9 of the annex to decision 15/CMP.1. In particular, the Party did not:

(a) Account for changes in carbon stock change in the SOC pool for the activities afforestation/reforestation, deforestation and forest management, nor did it provide verifiable information that demonstrates that this unaccounted pool was not a net source of anthropogenic GHG emissions, as required by paragraph 6(e) of the annex to that decision;

(b) Account for changes in carbon stock change in the litter and deadwood pools for the activities deforestation and cropland management, nor did it provide verifiable

information that demonstrates that these unaccounted pools were not net sources of anthropogenic GHG emissions, as required by paragraph 6(e) of the annex to that decision;

(c) Provide estimates of anthropogenic GHG emissions by sources and removals by sinks for the base year for cropland management, as required by paragraph 9(b) of the annex to that decision.

188. In response to the questions raised by the ERT in the course of the review, Spain, in its submission of 8 November 2010, submitted revised estimates and reported additional information on changes in carbon stock change in the SOC pool for the activities afforestation/reforestation, deforestation and forest management (see paras. 192, 194 and 196 below) and on GHG emissions by sources and removals by sinks for the base year for cropland management (see para. 198 below). The ERT considered that Spain has now fulfilled all the requirements of paragraph 9(b) of the annex to decision 15/CMP.1, and recommends that the Party, in its next annual submission, include information on changes in carbon stock change in the litter and deadwood pools for the activities deforestation and cropland management, as required by paragraph 6(e) of the annex to that same decision.

189. Spain reported AD on and emissions and removals from areas under afforestation/reforestation that have been harvested since the beginning of the commitment period as not applicable, without providing relevant explanations in the NIR. The ERT noted that this approach is not in accordance with the IPCC good practice guidance for LULUCF and recommends that the Party provide, in its next annual submission, either the necessary explanations for the use of this notation key or revised estimates in CRF table 5(KP-I)A.1.2.

190. The ERT noted that Spain, when reporting the geographical locations of the areas subject to KP-LULUCF activities, uses the boundaries of the country, whereas information provided in the NIR suggests that the Party is in a position to provide this information at a more disaggregated level. During the review, Spain clarified that it could provide information on the areas subject to afforestation/reforestation and cropland management at the level of the autonomous regions. The ERT encourages the Party to do so, in order to increase the transparency of the reporting, in its next annual submission.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO₂

191. Spain reports an area under afforestation and reforestation of 1,067.51 kha for 2008 and net removals of 10,274.02 Gg CO₂ eq, which corresponds to an implied stock change factor of 9.62 Mg CO₂/ha for all carbon pools. There is consistency between the areas and estimates of emissions/removals reported under the Convention and under Article 3, paragraph 3, of the Kyoto Protocol.

192. In the Party's original 2010 annual submission, the estimates of emissions from afforestation and reforestation did not include net carbon stock changes from mineral soils, and the Party did not provide any information demonstrating that this pool is not a net source of emissions, which is not in line with the requirements of decisions 15/CMP.1 and 16/CMP.1. Therefore, the ERT included this in the list of potential problems and further questions. Responding to the ERT, in its submission of 8 November 2010, Spain provided estimates of carbon stock changes in mineral soils under afforestation and reforestation, calculated using the IPCC tier 2 method and country-specific reference SOC values for forest land, cropland and grassland areas, calculating the changes at province level. Spain assumed that the reference SOC value for other land is the same as that for forest land. The ERT recommends that the Party continue its efforts to improve the accuracy of these estimates by obtaining a country-specific reference SOC value for other land, given the

importance of the category other land converted to forest land (as reported in CRF table 5.A), and that it provide revised estimates in its next annual submission.

Deforestation – CO₂

193. In its original 2010 annual submission, in KP-ULUCF CRF table 5(KP-I)A.2, Spain reported that the total deforested area since 1990 is 10.266 kha. However, the ERT noted that Spain reported for the LULUCF sector under the Convention a total deforested area for 2008 of 0.540 kha (this area is reported in CRF table 5.E as forest land converted to settlements, since Spain reported all conversions of forest land to other land uses as “NO”). In its submission of 8 November 2010, Spain reported in KP-LULUCF CRF table 5(KP-I)A.2 that the total deforested area since 1990 is 0.540 kha. The ERT noted that while Spain reported in both submissions the same value for estimated net emissions from carbon stock change in living biomass (9.68 Gg C), the IEF for that pool was increased from 0.94 Mg C/ha to 17.92 Mg C/ha in its report under the Convention, which the ERT considers to be incorrect. The ERT recommends that Spain correctly report the total area deforested since 1990 in KP-LULUCF CRF table 5(KP-I)A.2 in its next annual submission.

194. In Spain’s original 2010 annual submission, the estimates of emissions and removals from deforestation did not include carbon losses from mineral soils, and the Party did not provide any information demonstrating that this pool is not a net source of emissions, which is not in line with the requirements of decisions 15/CMP.1 and 16/CMP.1. Therefore, the ERT included this in the list of potential problems and further questions. Responding to the ERT, in its submission of 8 November 2010, Spain provided estimates of carbon stock changes in mineral soils under deforestation, calculated using the value for annual forest land converted to settlements (540 ha/year), the IPCC tier 2 method and country-specific reference SOC values for forest land, disaggregated at province level. The ERT concluded that this issue was solved during the review.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO₂

195. Spain reports an area under forest management of 12,577.46 kha for 2008 and net removals of 39,120.44 Gg CO₂ eq, which corresponds to an implied stock change factor of 3.11 Mg CO₂/ha for all carbon pools. There is consistency between the areas and estimates of removals reported under the Convention and under Article 3, paragraph 4, of the Kyoto Protocol.

196. Spain did not estimate emissions and removals from mineral soils in areas under forest management and did not provide any information demonstrating that this pool is not a net source of emissions, which is not in line with the requirements of decisions 15/CMP.1 and 16/CMP.1. Therefore, the ERT included this in the list of potential problems and further questions. Responding to the ERT, the Party stated that the potential decrease in SOC due to changes in forest types, management practices and disturbances was offset by the effects of changes in global management practices. The ERT considered that the Party did not provide transparent and verifiable information supporting this assumption and recommends that Spain include such information in its next annual submission.

Cropland management – CO₂

197. Spain reports an area under cropland management of 21,175.15 kha for 1990 and 19,921.16 kha for 2008. However, net removals increased from 472.38 Gg CO₂ eq in 1990 (which corresponds to an implied stock change factor for all carbon pools of 0.02 Mg CO₂/ha) to 3,097.59 Gg CO₂ eq in 2008 (which corresponds to an implied stock change factor for all carbon pools of 0.15 Mg CO₂/ha). The ERT noted that there is consistency

between the areas and estimates of removals reported under the Convention (CRF table 5.B) and for KP-LULUCF activities for 1990, but not for 2008 (in CRF table 5.B, a total area of cropland remaining cropland of 19,888.35 kha is reported).

198. In its original 2010 annual submission, Spain did not include estimates of emissions and removals from cropland management for the base year, owing to the lack of reliable statistical information. In the list of potential problems and further questions, the ERT indicated to the Party that once the activity cropland management is selected, it is subject to net-net accounting, which requires emissions and removals from that activity to be estimated for the base year, and the ERT requested Spain to provide such estimates, at least using the tier 1 methodology from the IPCC good practice guidance for LULUCF. Responding to the request made by the ERT, Spain provided revised estimates of emissions and removals from cropland management for 1990, calculated using data from the Yearbook of Agricultural Statistics on the net change in areas devoted to permanent crops (vineyards, olive groves and other woody crops). Such emissions in 1990 resulted from the removal of vineyards (23 kha), while such removals resulted from new areas of olive groves and other woody crops in years previous to 1990 (40 years for olive groves and 10 years for other woody crops).

199. The ERT concluded that the revised estimates provided by Spain have improved the completeness of its reporting, but noted that the method and underlying AD used do not guarantee the accuracy of the estimates. The ERT recommends that the Party continue its efforts to improve the calculation of emissions and removals from cropland management for the base year, by estimating the total areas that were converted between permanent crops and annual crops and not only the net change in the areas. For that purpose, Spain may use more disaggregated data by autonomous region or use statistical information on the land plots that were converted. The ERT also recommends that Spain use, as much as possible, information on the changes in agricultural practices (e.g. tillage practices, rotations, cover crops, fertility and liming management, management of plant residues, erosion control and irrigation management) occurring in years previous to and which had an impact on emissions in 1990, particularly for SOC.

200. The ERT further recommends that Spain report the methodology and assumptions that it uses to calculate emissions and removals from cropland management in the NIR of its next annual submission, improving on what was reported to the ERT during the review by presenting the methodology and parameters used for each pool, by clarifying each period in which an equilibrium in SOC was considered to be achieved, by clarifying what classes are included in "other woody crops", and by clarifying the approach used to identify the areas subjected to change in the base year.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

201. Spain has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and the SEF comparison report.⁴⁷ 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.

⁴⁷ The SEF 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.

202. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. 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 paragraph 88(a-j) of the annex to decision 22/CMP.1. The transactions of 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. The national registry has adequate procedures in place to minimize discrepancies.

National registry

203. 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 also took note of the SIAR and its finding 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 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.

204. However, the ERT noted that the SIAR identified that the following required public information was missing:

(a) Information on the type of government accounts (i.e. holding, cancellation or retirement), in accordance with paragraph 45(b) of the annex to decision 13/CMP.1;

(b) For the government accounts, information on the commitment period associated with each account, in accordance with paragraph 45(c) of the annex to decision 13/CMP.1.

205. The ERT noted that the SIAR recommended that the Party make publicly available all required information, in particular the information on accounts required by paragraph 45(b) and (c) of the annex to decision 13/CMP.1, and provide a direct reference to the location of this information in its annual submission. If any information is considered confidential, the Party should state this in its annual submission and on its public website, along with the relevant regulation supporting this confidentiality.

206. During the review, the ERT asked Spain for its reasons for not making publicly available the information required by paragraph 45(b) and (c) of the annex to decision 13/CMP.1. Spain responded that this information was not included in the initial design of the development and implementation of the Spanish registry's public interface, but that this issue will be addressed as soon as possible.

207. The ERT also asked the Party to provide its reasons for not reporting the name of the representative and contact information for most account numbers. Responding to the ERT during the review, Spain informed the ERT that this information has been recently eliminated from the publicly available information at the Spanish Registry, owing to a new EU regulation that will amend the currently applicable regulation to support anti-fraud and anti-phishing measures. According to information provided by Spain, these measures are a high priority for the EU registry system, which is the reason Spain applied them in advance of their entry into force.⁴⁸ One of these measures consists in changing the default status of the contact information for account representative to "confidential"; the information will

⁴⁸ The new regulation entered into force on 15 October 2010.

only be published upon written request by the account holder. The ERT recommends that the Party provide this information in its next annual submission.

Calculation of the commitment period reserve

208. Spain has reported its commitment period reserve in its 2010 annual submission. Spain 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 on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

209. Spain reported that there have been changes in its national system since its previous annual submission. Changes to the national system were mainly undertaken to improve the efficiency of the system:

(a) A specific Strategic Environmental Information Unit has been instituted within the designated national authority for conducting the tasks of the national inventory system;

(b) The resolution of the Government's Delegated Commission for Economic Affairs on mechanisms for obtaining information for the application of the national system has been developed;

(c) Ministerial departments and other organisms involved in the national system have designated one or more contact persons to act as interlocutors with DGCEA to ensure a better application of the quality checks and a more coordinated collaboration in the exchange of information;

(d) The system for collecting, processing and presenting the information contained in the NIR and the CRF tables has been extended in order to accommodate the supplementary information required under the Kyoto Protocol;

(e) SENASA has joined the national system, with the specific task of improving the emission estimates for the aviation sector.

210. 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.

4. Changes to the national registry

211. Spain reported that there have been changes in its national registry since its previous annual submission, including changes to: the name or contact details of the persons responsible for the administration and management of the registry; the conformance to the technical standards for data exchange; security measures employed to prevent operator errors; the list of publicly accessible information; and measures ensuring the integrity of data storage and the recovery of registry services in the event of a disaster.

212. 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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

213. Spain has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H

of the annex to decision 15/CMP.1, in its 2010 annual submission. The reported information is considered complete and transparent.

214. In the NIR, it is reported that national programmes are in place for minimizing the possible adverse effects that national policies and measures for the mitigation of GHG emissions implemented in Spain could have on developing countries. Specifically, Spain makes reference to the National Allocation Plan 2008–2012, in the context of the EU ETS, and to the Renewable Energy Plan, specifically in the area of biofuels. The rationale for both these plans, relating to potential positive and negative effects, is clearly described in the NIR.

215. In addition, Spain provided in the NIR a summary of the policies and measures implemented at the national level, including the identification of both positive and negative possible effects on developing countries.

216. The ERT recommends that Spain improve the reporting in its future NIRs by structuring the section on the minimization of adverse impacts in line with the specific reporting requirements of paragraphs 23 and 24 of the annex to decision 15/CMP.1.

III. Conclusions and recommendations

217. Spain made its annual submission on 15 April 2010. The annual submission contains the GHG inventory (comprising the CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and to the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

218. The ERT concludes that the inventory submission of Spain has been prepared and the information reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2008 and an NIR; these are complete in terms of geographical coverage, years and sectors, and generally complete in terms of categories and gases. A few categories, particularly in the energy sector (N₂O emissions from use of gaseous fuels in road transportation and N₂O emissions from flaring of oil), were reported as “NE”. The ERT recommends that the Party provide estimates for these categories in its next annual submission, in order to improve completeness.

219. The information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. However, Spain did not account for changes in carbon stock change in the litter and deadwood pools for the activities deforestation and cropland management, nor did it provide verifiable information that demonstrates that these unaccounted pools were not net sources of anthropogenic GHG emissions, as required by paragraph 6(e) of the annex to decision 15/CMP.1.

220. The Party’s inventory is in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, and generally in line with the IPCC good practice guidance for LULUCF.

221. Spain has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

222. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. The institutional arrangements for the national system are clearly explained in the NIR, including the procedures for the approval of the inventory.

223. 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 CMP. However, the ERT noted that the SIAR identified that some required information that should be publicly available was missing.

224. Spain has reported the information requested in chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2010 annual submission. The information reported was transparent and complete.

225. In the course of the review, the ERT formulated a number of recommendations relating to the information presented in Spain's 2010 annual submission. The key recommendations are that Spain:

(a) Prepare emission estimates for the remaining categories reported as "NE" for which there are estimation methodologies available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance, namely N₂O emissions from use of gaseous fuels in road transportation and N₂O emissions from flaring of oil;

(b) Continue with its efforts to increase the transparency of its reporting, including with regard to the use of the notation keys, and explanations of the underlying reasons for trends and inter-annual variations;

(c) Continue with its efforts to implement a tier 2 uncertainty analysis and to broaden the coverage of sectors in that analysis;

(d) Improve its reporting of the results of QA/QC activities in the NIR;

(e) Implement QA activities on a regular basis;

(f) Undertake, as a matter of urgency, a review of the energy balance, and include the energy balance in the NIR;

(g) Use EU ETS data to improve the accuracy of the inventory and to enhance the QA/QC procedures;

(h) Improve the reporting on feedstocks and non-energy use of fuels by providing clarity on where such fuels are used;

(i) Find alternative ways to report confidential AD and emission estimates without violating the existing rules on confidentiality.

IV. Adjustments

226. The ERT concluded, on the basis of the review of Spain's 2008 inventory, that for the categories/activities CO₂, CH₄ and N₂O emissions from solid fuel consumption under manufacture of solid fuels and other energy industries, liquid fuel consumption under non-ferrous metals, gaseous fuel consumption under chemical industry, and solid fuel consumption under other sectors the AD 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. The ERT recommended that the Party either submit revised estimates or provide further justifications for its calculations for the identified categories, as a way of resolving the identified potential problems. The ERT, following the review of the

additional information provided by Spain during and after the review, concluded that the Party did not satisfactorily correct the problems through its submission of acceptable revised estimates, and decided to calculate and recommend four adjustments, in accordance with the “Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol” (annex to decision 20/CMP.1).

227. Spain in its communication of 13 September 2011 accepted the calculated adjustments. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol, the ERT applied the calculated adjustments.

228. The application of adjustments by the ERT resulted in a change in the estimate of the 2008 emissions from the energy sector – from 318,680.11 Gg CO₂ eq, as originally reported by Spain, to 321,035.84 Gg CO₂ eq or 0.7 per cent. This in turn resulted in a change in the estimated total emissions of Spain for 2008 – from 406,407.36 Gg CO₂ eq, as originally reported by Spain to 408,763.09 Gg CO₂ eq or 0.6 per cent.

V. Questions of implementation

229. 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. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

Available at <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>.

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.htm>>.

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/gpplulucf/gpplulucf.htm>>.

“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 2010.

Available at <<http://unfccc.int/resource/docs/2010/asr/esp.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2010.

Available at <<http://unfccc.int/resource/webdocs/sai/2010.pdf>>.

FCCC/ARR/2009/ESP. Report of the individual review of the annual submission of Spain submitted in 2009. Available at <<http://unfccc.int/resource/docs/2010/arr/esp.pdf>>.

UNFCCC. *Standard independent assessment report*, parts I and II. Available at

<http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Javier Cachón de Mesa (Unidad de Información Ambiental Estratégica) and Ms. Marta Muñoz Cuesta (Ministerio de Medio Ambiente y Medio Rural y Marino), including additional material on the methodologies and assumptions used. The following documents¹ were also provided by Spain:

MARM. Year. *Caracterización de Sistemas de Gestión de Deyecciones. Sector Aves de Puesta*. Ministerio de Medio Ambiente y Medio Rural y Marino.

MARM. Year. *Caracterización de Sistemas de Gestión de Deyecciones. Sector Porcino Intensivo*. Ministerio de Medio Ambiente y Medio Rural y Marino.

MARM. 2008. *Metodología para la Estimación de las Emisiones a la Atmósfera del Sector beim Ganadero para el Inventario Nacional de Emisiones*. Ministerio de Medio Ambiente y Medio Rural y Marino.

MAPYA. 2003. *Estimación de Emisiones de Gases Efecto Invernadero. Agricultura. Año 2001.*. Dirección General de Agricultura. Ministerio de Agricultura, Pesca y Alimentación.

Salvador, A.G.T., S.C. Sanz, M. C. López, F. E. Barber and P. F. Riera. Year. *Metodología para la Estimación de las Emisiones a la Atmósfera del Sector Agrario para el Inventario Nacional de Emisiones*. Ministerio de Medio Ambiente

¹ Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
BEF	biomass expansion factor
C	carbon
CaO	calcium oxide
CaC ₂	calcium carbide
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CRF	common reporting format
CKD	cement kiln dust
DOC	degradable organic carbon
DOM	dead organic matter
EF	emission factor
ERT	expert review team
EU ETS	European Union emissions trading scheme
F-gas	fluorinated gas
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
GJ	gigajoule (1 GJ = 10 ⁹ joule)
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
kha	thousand hectares
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
Mg	megagram (1 Mg = 1 tonne)
MgO	magnesium oxide
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
Nex	nitrogen excretion
NO	not occurring
N ₂ O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF ₆	sulphur hexafluoride
SIAR	standard independent assessment report

SO ₂	sulphur dioxide
TJ	terajoule (1 TJ = 10 ¹² joule)
UNFCCC	United Nations Framework Convention on Climate Change
