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Report of the individual review of the annual submission of Spain submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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Contents

I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Spain, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 16 to 21 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Harry Vreuls (Netherlands) and Ms. Melissa Weitz (United States of America); energy – Mr. Graham Anderson (Australia), Mr. Constantin Harjeu (Romania), Ms. Anna Sikharulidze (Georgia) and Mr. Sergiy Skybyk (Ukraine); industrial processes and solvent and other product use – Ms. Ingrid Person Rocha e Pinho (Brazil) and Mr. Samir Tantawi (Egypt); agriculture – Mr. Michael Anderl (Austria), Ms. Rocio Danica Condor (Italy) and Mr. Paulo Cornejo (Chile); land use, land-use change and forestry (LULUCF) – Mr. Manuel Estrada (Mexico), Ms. Akane Nagahisa (Japan) and Mr. Nalin Srivastava (India); and waste – Ms. Baasansuren Jamsranjav (Mongolia) and Mr. Gustavo Barbosa Mozzer (Brazil). Ms. Person and Mr. Vreuls were the lead reviewers. The review was coordinated by Ms. Kyoko Miwa (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), 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. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Spain was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Spain was carbon dioxide (CO_2), accounting for 81.1 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (9.5 per cent) and nitrous oxide (N_2O) (6.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 77.5 per cent of total GHG emissions, followed by the agriculture sector (10.6 per cent), the industrial processes sector (7.5 per cent), the waste sector (4.0 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 350,483.69 Gg CO_2 eq and increased by 23.0 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as 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, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector. The values in tables 1 and 2 are based on data submitted by the Party on 15 April 2013; however, final adjusted estimates

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

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

and the difference when compared with the values included in the 15 April 2013 submission are provided in the footnotes to the tables.

5. Additional background data on recalculations by Spain in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

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[a] to 2011

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008[b]*	*2009[b]*	*2010[b]*	*2011[b]*	*Base year–2011[b]*
Annex A sources		CO_2	226 712.82	226 712.82	253 892.17	307 023.20	333 386.61	296 949.74	280 938.34	284 407.33	25.4
		CH_4	26 586.45	26 586.45	28 450.45	32 162.63	33 259.98	33 494.97	33 348.63	33 154.86	24.7
		N_2O	26 136.45	26 136.45	24 767.91	30 583.75	24 505.66	24 239.57	25 377.72	23 934.30	–8.4
		HFCs	4 645.55	2 403.18	4 645.55	8 365.60	7 043.22	7 368.77	8 294.37	8 279.39	78.2
		PFCs	832.52	882.92	832.52	436.03	314.84	297.27	303.69	313.45	–62.3
		SF_6	108.34	66.92	108.34	204.60	366.08	362.93	378.57	394.35	264.0
KP-LULUCF	Article 3.3[c]	CO_2					–6 282.12	–6 373.71	–6 373.95	–6 336.49	
		CH_4					1.72	4.94	4.80	4.70	
		N_2O					0.17	0.50	0.49	0.48	
	Article 3.4[d]	CO_2	–711.55				–22 167.90	–21 543.60	–21 978.97	–22 241.38	NA
		CH_4	NO, IE				19.94	56.88	56.05	56.15	NA
		N_2O	NO, IE				2.02	5.77	5.69	5.70	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 CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] The table does not reflect the adjusted estimates for categories in the agriculture sector (see chapter II.H below) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the Party's submission of 15 April 2013 that were subject to these adjustments. The adjustments result in an increase in total greenhouse gas emissions of 675.783 Gg CO_2 eq for 2011, 705.575 Gg CO_2 eq for 2010, 712.770 Gg CO_2 eq for 2009 and 713.371 Gg CO_2 eq for 2008.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2

Greenhouse gas emissions by sector and activity, base year[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008[b]*	*2009[b]*	*2010[b]*	*2011[b]*	*Base year–2011[b]*
Annex A		Energy	210 928.14	210 928.14	239 534.72	289 223.36	314 786.54	283 189.05	266 257.82	271 727.18	28.8
		Industrial processes	28 045.96	25 812.58	26 672.98	33 886.32	31 687.53	26 863.09	28 270.82	26 127.68	–6.8
		Solvent and other product use	1 515.76	1 515.76	1 717.97	1 949.23	1 789.77	1 636.34	1 592.67	1 449.12	–4.4
		Agriculture	37 209.46	37 209.46	35 837.15	42 953.67	37 491.43	37 546.79	38 744.04	37 279.06	0.2
		Waste	7 322.80	7 322.80	8 934.11	10 763.23	13 121.12	13 477.98	13 775.96	13 900.66	89.8
		LULUCF	NA	–19 105.74	–19 256.60	–23 262.92	–29 087.11	–28 507.97	–28 895.46	–29 071.23	NA
		Total (with LULUCF)	**NA**	**263 682.99**	**293 440.33**	**355 512.90**	**369 789.28**	**334 205.28**	**319 745.85**	**321 412.46**	**NA**
		Total (without LULUCF)	**285 022.12**	**282 788.74**	**312 696.93**	**378 775.82**	**398 876.39**	**362 713.25**	**348 641.31**	**350 483.69**	**23.0**
		Other[c]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[d]	Afforestation and reforestation					–6 386.39	–6 475.37	–6 476.73	–6 440.32	
		Deforestation					106.17	107.10	108.06	109.01	
		Total (3.3)					**–6 280.22**	**–6 368.27**	–6 368.66	**–6 331.31**	
	Article 3.4[e]	Forest management					–18 677.23	–18 635.59	–18 679.56	–18 730.33	
		Cropland management	–711.55				–3 468.70	–2 845.36	–3 237.66	–3 449.20	384.7
		Grazing land management	NA				NA	NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA	NA
		Total (3.4)	**–711.55**				**–22 145.93**	**–21 480.95**	**–21 917.22**	**–22 179.54**	**NA**

Abbreviations: KP-LULUCF = LULUCF 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 CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] The table does not reflect the adjusted estimates for categories in the agriculture sector (see chapter II.H below) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the Party's submissions of 15 April 2013 that were subject to these adjustments. The adjustments result in an increase in total greenhouse gas emissions of 675.783 Gg CO_2 eq for 2011, 705.575 Gg CO_2 eq for 2010, 712.770 Gg CO_2 eq for 2009 and 713.371 Gg CO_2 eq for 2008.

[c] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[d] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[e] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. Spain also submitted the 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 in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2013. The annual submission was submitted in accordance with decision 15/CMP.1.

7. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

8. Table 3 contains the ERT's overall assessment of the annual submission of Spain. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: none Non-mandatory: "NE" is reported for: N_2O emissions from storage and refining of oil, N_2O emissions from flaring of oil in refineries, CO_2, CH_4 and N_2O emissions from other non-specified under fugitive emissions from solid fuels, N_2O emissions from refining/storage, and CO_2 and CH_4 emissions from other leakage at industrial plants and power stations, and commercial and residential sectors in the energy sector; potential emissions of HFCs, PFCs and SF_6 in the industrial processes sector; CH_4 emissions from poultry and other poultry under enteric fermentation in the agriculture sector; and N_2O emissions from industrial wastewater and domestic and commercial wastewater (excluding human sewage), CH_4 emissions from hospital waste under waste incineration, and N_2O emissions from other

		General findings and recommendations
		(sludge spreading in the waste sector)
Land use, land-use change and forestry[a]	Not complete	Mandatory: "NE" is reported for: the carbon stock changes in mineral soils under forest land remaining forest land and other land converted to forest land, the carbon stock changes in dead organic matter in forest land remaining forest land and cropland, grassland and other land converted to forest land, the carbon stock changes in living biomass and mineral soils under grassland remaining grassland, the carbon stock changes in living biomass under cropland converted to grassland, the carbon stock changes in soils under cropland, grassland and other land converted to settlements, the carbon stock changes in all pools under cropland, grassland and other land converted to other land, emissions of CO_2, CH_4 and N_2O from controlled burning under forest land remaining forest land, and from wildfires under cropland remaining cropland and grassland remaining grassland
		Non-mandatory: "NE" is reported for: the carbon stock changes in dead organic matter in cropland remaining cropland, dead organic matter under grassland remaining grassland, the carbon stock changes in all pools under wetlands remaining wetlands and under settlements remaining settlements, emissions of CO_2, CH_4 and N_2O from wildfires under wetlands remaining wetlands, and emissions of CO_2, CH_4 and N_2O from biomass burning of other lands
KP-LULUCF	Not complete	"NE" is reported for: the carbon stock changes in litter, dead wood and mineral soils under forest management, the carbon stock changes in dead wood and litter under afforestation, and CO_2, CH_4 and N_2O emissions from biomass controlled burning under forest management
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Consistent	
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Sufficient	Spain has used, to a limited extent, background data from the EU ETS to perform QC analysis of AD, EFs and emission estimates of plants/sectors which are included in the EU ETS. The ERT recommends that Spain include information on the QA/QC measures of its industries and facilities under the EU ETS in its

		General findings and recommendations
		overarching description of the QA/QC system used in the industrial processes sector (see para. 35 below). While the QA/QC system generally performs well, several issues with QA/QC have been identified for certain sectors (see paras. 98 and 99 below)
The ERT's findings on the transparency of the 2013 annual submission	Generally transparent	Spain's inventory is generally transparent with regard to both the NIR and the CRF tables. However, the ERT found areas that require further improvement (including: information on the energy balance; clearer information on the EFs, data and methods used in the agriculture sector; and information on the LULUCF sector) (see paras. 27, 30, 33, 40, 41, 42, 53, 54, 60, 74, 77, 84, 89, 101, 106, 110, 111 and 112 below)

Abbreviations: AD = activity data, Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, EF = emission factor, EU ETS = European Union Emissions Trading System, 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, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

9. The NIR described the national system for the preparation of the inventory. The Directorate-General for Environmental Quality and Assessment and Natural Affairs (la Dirección General de Calidad y Evaluación Ambiental y Medio Natural in Spanish) (DG-CEAMN) of the Ministry for Agriculture, Food and Environment (el Ministerio de Agricultura, Alimentación y Medio Ambiente in Spanish) (MAGRAMA) has overall responsibility for the national inventory. Other organizations are also involved in the preparation of the inventory. The company Análisis Estadístico de Datos, S.A. (AED) provides technical support to DG-CEAMN in developing the inventory and collaborates with STEPA-UPV (Systems and Technology of Animal Production – Valencia Polytechnic University) for the agriculture sector and with TRAGSATEC (Tecnologías y Servicios Agrarios, S.A.) for the LULUCF sector. DG-CEAMN has cooperation agreements with SENASA (Services and Studies for Air Navigation and Aircraft Safety) for the development of an air traffic model and associated emission estimates, and with the joint venture AED-INERCO (Ingeniería, Tecnología y Consultoría, S.A.) for the provision of technical assistance services for the inventory projection systems. Spain also collaborates with regional governments and has several sector-level working groups. Spain has elaborated a quality assurance/quality control (QA/QC) plan. The system is effective and reliable for the estimating and timely reporting of the Party's GHG emissions, and is in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice*

Guidance and Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance).

Inventory preparation

10. Table 4 contains the ERT's assessment of Spain's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Spain

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) 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)?	Yes	
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	Yes	Key categories identified by the qualitative approach include: non-energy use of fuels by sector and process; emissions of N_2O by traffic; the domestic contribution to maritime traffic; the use of HFCs in cooling and refrigeration activities; and emission/absorption flows in the deposit of soil organic carbon
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	For the KP-LULUCF activities, Spain identified the sink from cropland management as a key category according to both the level and the trend using tier 1 and tier 2 methods. The emissions from cropland management were a key category according to both the level and the trend using tier 1 analyses. Afforestation and reforestation as a sink was identified as a key category for 2011 according to both the level and the trend. Forest management sink is a key category for 2011 according to both the level and the trend using a tier 1 method

		General findings and recommendations
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Spain stated that it is planning to move to a tier 2 uncertainty analysis for some sources, starting with animal husbandry
Quantitative uncertainty (including LULUCF)	Level = 14.7% Trend = 2.4%	
Quantitative uncertainty (excluding LULUCF)	Level = 12.3% Trend = 2.3%	

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry.

Inventory management

11. Spain has a centralized archiving system, which includes the archiving of disaggregated emission factors (EFs) and activity data (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. DG-CEAMN and AED both keep a version of the archive. The archive is made up of base data and associated documentation, which are organized based on Selected Nomenclature for Air Pollution (SNAP) categories of CORINAIR, entities and documents, grouped together to form a chronological series of documents. It also includes the reports and the database of the inventory itself. Information is stored as hard copies and/or electronic copies using the Oracle database.

12. The overall organization of the national system allows for the timely reporting of the Party's GHG emissions. However, Spain has not ensured that the organization can respond to the ERT's requests in a timely manner during the review week. The ERT sent a number of preliminary questions to the Party in the week before the review as well as a number of requests for information during the review week. However, most of the responses from Spain, including those to the preliminary questions on the energy and industrial processes sectors and to the follow-up questions on the agriculture sector, were received during the fourth and fifth days of the review week. The ERT also notes that Spain failed to provide the ERT, in a timely manner, with clarifying information on the industrial processes sector that the ERT requested as part of the preliminary questions. Noting that paragraph 16 of the annex to decision 19/CMP.1, on inventory management, requires Annex I Parties to respond to requests for clarifying inventory information resulting from the different stages of the review process of the inventory information in a timely manner in

accordance with Article 8 of the Kyoto Protocol, the ERT recommends that the Party consider the ways of providing the requested information to the ERT, especially during the review week, if these data cannot be provided in the NIR.

4. Follow-up to previous reviews

13. The ERT noted that most of the recommendations made in the 2012 annual review report have not been addressed in the 2013 annual submission, owing to the late finalization of 2012 annual review report (published in July 2013). In the NIR, Spain reports improvements under consideration based on the recommendations made in the previous review reports. However, not many of these improvements have been implemented in the 2013 annual submission. The ERT recommends that Spain strengthen its efforts to fully implement the recommendations made in the previous review reports.

14. Improvements that continue to be under consideration by Spain, as reported in the NIR, include:

(a) The correction and use of more plant-specific data in order to eliminate or reduce the use of IPCC default EFs (mainly for oil refineries) (fuel combustion under energy industries) (see para. 25 below);

(b) The investigation of the use of non-conventional fuels at refineries (fuel combustion under energy industries);

(c) The collection of AD by establishing contacts with the relevant agencies involved in maritime traffic to gather the information directly from them (navigation) (see para. 26 below);

(d) The assessment of the appropriateness of the confidentiality claim and the use of alternative ways of reporting AD and EFs without violating the existing rules on confidentiality, including the issues related to the industrial processes sector (see paras. 33 and 41 below);

(e) The collection of additional information regarding the species composition of land subject to afforestation to improve the accuracy of the emission/removal estimates (see paras. 76, 78 and 105 below);

(f) The implementation of the study of the carbon stock changes in dead organic matter and soil stocks on cropland (see para. 79 below);

(g) The collection of additional information to improve the accuracy of the estimation of the area of land converted to settlements (see para. 83 below).

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

15. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 10 below.

B. Energy

1. Sector overview

16. The energy sector is the main sector in the GHG inventory of Spain. In 2011, emissions from the energy sector amounted to 271,727.18 Gg CO_2 eq, or 77.5 per cent of total GHG emissions. Since 1990, emissions have increased by 28.8 per cent. The key driver for the rise in emissions is a 56.8 per cent increase in emissions from transport.

Within the sector, 32.2 per cent of the emissions were from transport, followed by 31.8 per cent from energy industries, 21.6 per cent from manufacturing industries and construction and 13.0 per cent from other sectors. Fugitive emissions from oil and natural gas accounted for 1.1 per cent and fugitive emissions from solid fuels accounted for 0.2 per cent. Emissions from the category other (fuel combustion activities) were reported as included elsewhere ("IE") or as not applicable ("NA").

17. In previous review reports, it was recommended that Spain include the official energy balance, as submitted to the International Energy Agency (IEA) and Eurostat, or to include in the NIR the address of the website where this energy balance can be consulted. This recommendation was made because of the ERT's concern regarding the significant difference between the fuel consumption reported in the energy balance used to develop the inventory and the energy balance that Spain provided to IEA and Eurostat. The present ERT noted that Spain has not addressed those issues, and also noted that some differences between the fuel consumption data between the two energy balances still remain. In response to a question raised by the ERT during the review, Spain provided the ERT with the energy balance prepared by the inventory team for use in the calculation of the emission estimates and the one provided to IEA and Eurostat, and explained the differences noted between the different AD used in the two energy balances (see also paras. 21, 22 and 26 below). The ERT reiterates the recommendation made in the previous review reports that the Party include the official energy balance as submitted to IEA and Eurostat in the NIR and explain the differences between this energy balance and the one used for the inventory for each category and fuel.

18. The ERT noted that Spain does not include, in the NIR, background information on the plant-specific CO_2 EFs and the net calorific values (NCVs) used for the emission estimates. This makes it impossible for the ERT to replicate the emission estimates. In response to a question raised by the ERT during the review week, Spain provided the ranges for the plant-specific CO_2 EFs by fuel and by category used for the inventory. The ERT found this information very useful for the review. Therefore, the ERT recommends that Spain provide plant-specific NCVs and EFs in the corresponding chapters in its NIR.

19. The ERT noted that the Party has used the notation key "NA" to report emissions and implied emission factors (IEFs) in cases where the Party has reported AD as not occurring ("NO") (e.g. solid fuel combustion in petroleum refining in CRF table 1.A(a), and fugitive emissions from oil exploration in CRF table 1.B.2). In response to a question raised by the ERT during the review regarding the use of the notation key "NA" to report emissions and IEFs, Spain stated that in its next annual submission it will revise the assignment criteria for the notation key. The ERT recommends that the Party ensure the appropriate use of the notation keys and provide justification for their use in the NIR and in the CRF tables.

2. Reference and sectoral approaches

20. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more elaborated in paragraphs 21–24 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: –45.96 PJ, –1.25%	

		Paragraph cross-references
	CO_2 emissions: –2,641.50 Gg CO_2 eq, –1.00%	21
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	21
Are differences with international statistics adequately explained?	No	21
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	22, 23
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	24

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

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

21. The comparison of the apparent fuel consumption reported in the CRF tables and the national energy balance reported to IEA highlights discrepancies within the range of 2–3 per cent for all years of the time series, with the values in the CRF tables systematically lower. Responding to the questions raised during the earlier stages of the review, Spain explained that it considers the main source of these differences to be the NCVs applied to the apparent fuel consumption AD which are expressed in physical units (units of mass or volume) in the national energy balance reported to IEA. In CRF table 1.A(b), the factors reported are averaged values derived from the data used in the sectoral approach. In the NIR, Spain states that an energy working group (GT-Energía) was set up in 2012 in order to harmonize the fuel balances used in the inventory with the data reported to IEA and Eurostat, but the Party does not indicate any outcomes from the working group. In response to a question raised by the ERT during the review, Spain explained that in 2012 GT-Energía concentrated on the analysis of natural gas and some oil products, such as petroleum coke. Spain also explained, in its response, that in 2013 GT-Energía created a system for coordinating national energy data via its national focal point at the Ministry of Industry, Energy and Tourism (MINETUR), and new priorities and urgent needs are being identified for the 2014 workplan of this working group. The ERT recommends that Spain include detailed information on the progress of the work of GT-Energía in its next annual submission.

International bunker fuels

22. The fuel consumption data for international aviation reported in the CRF tables are 20–70 per cent lower than the IEA data, while the fuel consumption data for domestic aviation reported in the CRF tables are 30–60 per cent higher than in the IEA data. In the previous stages of the review, Spain explained that the total aviation fuel consumption (the sum of international and domestic fuel consumption) is the same in the CRF tables and the IEA data, but the methodologies used for estimating the shares between domestic and

international fuel consumption differ. In the CRF tables, the fuel consumption shares are estimated for each air traffic segment (national versus international) using the MECETA (Modelo Español de Cuantificación de Emisiones del Transporte Aéreo) model (a Spanish model for the quantification of emissions from air transport). Spain explains in the NIR that this method is a national adaptation of the tier 2b methodological approach provided in the IPCC good practice guidance and is based on national and international flights (routes) from airports located on all territories of Spain, and that this is consistent with the higher-tier methodology. In the previous review report, the ERT recommended that Spain provide an explanation for the differences in the domestic and international fuel consumption estimated by MECETA (and used in the inventory) and the IEA/Eurostat energy balance. The previous review report also recommended that Spain include more detailed information on the methodology used for the estimation of emissions from aviation, including the documentation on the use of expert judgement.[3] However, the current ERT noted that that information has not been included in the 2013 NIR. In response to a question raised by the ERT during the review, Spain stated that it plans to include this information in section 3.6 of the sectoral chapter (3. Energy) of the NIR and provide additional information in annex 6. The ERT welcomes the Party's intention of providing more detailed information and reiterates the recommendation made in the previous review report that Spain include the aforementioned information.

23. The NIR states that the total fuel consumption of domestic aviation also includes the fuel used for military aviation piston-engine aircrafts or helicopters in the flight registers, and any possible fuel bunkering or fuel used for other activities and equipment. The ERT observed that through the application of the methodology described in the previous paragraph (see para. 22 above) this additional consumption would also be split between domestic aviation and international bunkers using shares from the MECETA model. In response to a question raised by the ERT during the review regarding the appropriateness of splitting military fuel between domestic and international shares, Spain explained that, for the next inventory submission, it plans to discriminate the fuel used for tactical military equipment, excluding this item from the IPCC category civil aviation, and include it in the category other (energy). As a result, the reallocated military aviation fuel will be deducted from the total annual sales, with the remaining item broken down between domestic and international air traffic in accordance with the estimated share according to MECETA. The ERT welcomes the proposed approach and encourages Spain to apply this approach in the next inventory submission.

Feedstocks and non-energy use of fuels

24. No problems were identified.

3. Key categories

Stationary combustion: all fuels – CO_2, CH_4 and N_2O[4]

25. In the previous review reports it was recommended that Spain enhance the use of plant-specific data in order to improve the quality of the inventory, in particular by improving the national system so that data available at the regional level could be obtained by the inventory team. In response to a question raised by the ERT concerning the inclusion of new plant-specific data in the 2013 inventory submission compared with the previous

[3] FCCC/ARR/2012/ESP, paragraphs 52–53.

[4] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

submission, Spain stated that there are only two combined-cycle power plants in Spain, from which information has been obtained via specific individualized questionnaires. The ERT reiterates the recommendation made in the previous review report that the Party enhance the national system in order to be able to correct and use more plant-specific data in its emission estimates. The ERT also reiterates the recommendation made in the previous review report that Spain report on its achievements on this issue in its next annual submission.

Navigation: liquid fuels – CO_2, CH_4 and N_2O[5]

26. The fuel consumption data for national navigation reported by Spain substantially differ from international sources. In particular, the gas/diesel oil consumption data in the CRF tables (e.g. table 1.A) are 40–90 per cent lower. For residual fuel oil, the values in the CRF table are up to several times larger than those reported to IEA from 1997 onwards. During previous stages of the review, Spain explained that the AD (in terms of mass units) are estimated considering information from IEA, the Association of Spanish Ship Owners (ANAVE) and activity rates from the statistical yearbook produced by the Ministry of Public Works. The ERT noted, from the explanation provided in page 3.93–94 of the NIR, that the methodologies used to obtain the fuel consumption data and fuel breakdown information are not consistent throughout the time series. For the fuel consumption data before 2005, Spain relies on the information provided by ANAVE, and from 2005, the fuel consumption was estimated from a mean consumption factor derived from the energy consumption series for this activity and from the information published in the Yearbook produced by the Ministry of Public Works. The ERT also noted high statistical differences for residual fuel oil (43 per cent of final energy consumption) in the inventory energy balance provided by Spain to the ERT during the review, which may also indicate a possible inaccuracy. Spain notes in the NIR that it is currently establishing contacts with the relevant agencies involved in maritime traffic, including the General Directorate of the Merchant Navy, the State Ports body and ANAVE, to gather the information directly from them. The ERT welcomes these efforts by Spain and recommends that the Party revise its tier 1 method to estimate CO_2 emissions from this category by applying the fuel consumption for maritime transport directly obtained from the relevant data providers to ensure the accuracy of the inventory.

Road transportation: liquid fuels (diesel oil) – CO_2, CH_4 and N_2O[6]

27. Spain has reported 862,142.40 TJ of diesel oil consumption in CRF table 1.A(a). The ERT noted that this value differs from the amount of diesel oil consumption for road transportation in the inventory energy balance (given as 904,319.9 TJ), which was provided by the Party during the review in response to a request by the ERT. In response to a question raised by the ERT during the review regarding the difference between these two values, Spain explained that the fuel consumption by "industrial mobile machinery" is reported under "other", under manufacturing industries and construction and, therefore, there is no underestimation of CO_2 emissions. The ERT recommends that Spain provide a more transparent explanation of the allocation of fuel consumption for off-road machinery between different subcategories in the NIR.

[5] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

[6] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

Fugitive emissions: solid fuels – CH_4

28. In previous review reports, Spain was recommended to undertake a study to determine the extent of CH_4 recovery and flaring in coal mining, and to assess the possible impacts of these activities on the emission estimates for fugitive emissions and stationary combustion categories. In response to questions raised by the ERT during the review, the Party stated that it does not have any new information on this study. Spain assumes that all CH_4 released from mining activities is emitted, given that no information is available regarding the installation of recovery systems in underground mining or the amount of CH_4 recovered to be used later for energy or flaring. The ERT acknowledged that this is a conservative approach and encourages Spain to complete the aforementioned study to estimate CH_4 recovery and flaring in coal mining in order to improve the accuracy of the inventory.

4. Non-key categories

Road transportation: biomass – CH_4 and N_2O

29. Spain has reported the notation key "IE" for CH_4 and N_2O emissions from biomass in road transportation in CRF table 1.A(a). Spain explained in the NIR that the emissions from the biogenic share of gasoline and diesel oil are included together with the fossil fuel shares in the CRF tables. In response to a question raised by the ERT during the review regarding the methods used to estimate emissions for both the biofuel and fossil shares, Spain explained that the CH_4 and N_2O emissions have been calculated by adding the mass of the biogenic share to the mass of the fossil share and then applying specific EFs provided by COPERT IV for fossil fuels, due to a lack of specific EFs for fuel mixtures. The ERT noted that in CRF table 1.A(a) the AD for fossil fuels do not include the biogenic share, and in this sense the inclusion of CH_4 and N_2O emissions from the biogenic part into the emission totals for fossil fuels affects the comparability of the IEFs for these gases with those of other Parties. Therefore, the ERT recommends that Spain report the CH_4 and N_2O emissions from biogenic fuels under biomass. The ERT encourages the Party to consult the available publications, such as the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), for CH_4 and N_2O EFs and apply them to the biogenic share of biofuels instead of applying the EFs for fossil fuels.

Other (energy): liquid and gaseous fuels – CO_2, CH_4 and N_2O

30. The previous review reports raised the issue of the lack of transparency of the reporting on military fuel consumption, and recommended that Spain include information on military fuel consumption and the associated emissions for the category other (energy) in the NIR. The ERT noted that this issue has not been addressed in the 2013 annual submission. In response to a question raised by the ERT during the review, Spain explained that, for the next annual submission, it plans to separate the fuel used for tactical military equipment and report this information at a more detailed level in the NIR. To that end, Spain is planning to gather information from the Ministry of Defence for the whole time series. The ERT reiterates the recommendation made in the previous review report that Spain include the military fuel consumption and the associated emissions in the corresponding section of the NIR.

C. Industrial processes and solvent and other product use

1. Sector overview

31. In 2011, emissions from the industrial processes sector amounted to 26,127.68 Gg CO_2 eq, or 7.5 per cent of total GHG emissions, and emissions from the solvent and other

product use sector amounted to 1,449.12 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 6.8 per cent in the industrial processes sector, and decreased by 4.4 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector since the base year is the decreased production (e.g. cement, limestone and dolomite, iron and steel, and difluoromonochloromethane (HCFC-22) production) as a result of the economic downturn after 2008. Nevertheless, consumption of halocarbons and SF_6 has shown more than a 72-fold increase since the base year (from 116.36 Gg CO_2 eq in 1995 to 8527.81 Gg CO_2 eq in 2011). Within the industrial processes sector, 49.8 per cent of the emissions were from mineral products, followed by 32.6 per cent from consumption of halocarbons and SF_6, 12.0 per cent from metal production and 4.1 per cent from the chemical industry. The remaining 1.5 per cent were from production of halocarbons and SF_6.

32. The ERT notes that Spain has not improved its industrial processes sector inventory much since the 2012 annual submission. Therefore, some of the findings in the sections below are the same as those included in the 2012 review report.[7]

33. Spain has made some improvements in the transparency of its 2013 annual submission with regard to the industrial processes and solvent and other product use sectors by including in the NIR clearer and more detailed descriptions of calculations and explanations (e.g. information on the relative use of production technologies for aluminium production in the NIR), which provided the ERT with a better understanding of the emissions and trends. However, the ERT found that, as already identified in the previous review reports, the availability of background data is still limited for confidentiality reasons, impairing the transparency and comparability of the inventory and making the assessment and review of the inventory difficult. Confidential information was not provided to the ERT during the review in a timely manner (see para. 12 above), even though requests had been made by the ERT during previous stages of the review to give Spain time to gather the information required. In response to a question raised by the ERT during the review, Spain reassured the ERT that it is striving to overcome confidentiality restrictions, for example by using information currently submitted by plant operators to the regional authorities. The ERT reiterates the recommendations made in the previous review reports that Spain assess the appropriateness of the confidentiality claim and find alternative ways of reporting the AD and EFs without violating the existing rules on confidentiality in its next annual submission.

34. In response to a question raised by the ERT during the review week as to why confidential data were not provided in a timely manner in order to allow the ERT to review them appropriately, Spain explained that the inventory team of the Party is not responsible for data from the European Union emissions trading system (EU ETS), and in this sense, it has no access to the background data used to estimate the emissions from the industries and facilities under the EU ETS. In order to make this information available to the ERT, the inventory team of Spain needs permission from the companies of those industries, and that requires time. The ERT recommends that Spain take the necessary measures to remove such difficulties in order to allow the ERT to obtain the necessary information during the review in a timely manner.

35. Spain has used, to a limited extent, background data from the EU ETS to perform QC analysis of the AD, EFs and emission estimates of plants/sectors which are included in the EU ETS. In response to a question raised by the ERT during the review, Spain explained that, for its industries and facilities under the EU ETS, QA/QC procedures for the inventories are applied under the EU ETS, and that these procedures are in line with the

[7] FCCC/ARR/2012/ESP.

IPCC good practice guidance. However, those QA/QC procedures are not well described in the NIR. The ERT recommends that the Party describe the QA/QC measures of its industries and facilities, including those under the EU ETS for which the inventory team has no direct QA/QC responsibilities in the next inventory submission.

2. Key categories

Cement production – CO_2

36. Spain has used a tier 2 method, based on plant-specific monitoring data, to estimate CO_2 emissions from cement production. The ERT notes that Spain has not yet included in the NIR the background information necessary to understand the trend in emissions (e.g. the content of calcium oxide (CaO) and magnesium oxide (MgO)) and a qualitative assessment of the IEFs in the NIR, despite the fact that this issue had already been identified in the previous review report. In addition, the cement kiln dust (CKD) correction factor is also not clearly explained in the NIR. For example, it is not clear to the ERT whether or not the CKD correction factor was included in the IEF for decarbonization. In response to a question raised by the ERT during the review, the Party provided the IEFs for all (36) facilities in the country and further explained that for each installation's emission estimates, where appropriate, the bypass dust or CKD leaving the kiln system is reflected in the calculation of the CO_2 emissions. Therefore, the Party considers that it is not necessary to provide the correction factor for a partial calcination ratio of CKD calculated in accordance with the European Union (EU) regulation pursuant to directive 2003/87/EC.

37. However, the ERT notes that the qualitative assessment of the IEFs is not yet included in the NIR. Spain explained that, according to the national legislation for the implementation of the EU ETS, the emission reports have to be submitted by the operators exclusively to the regional competent authorities and are validated by the responsible officers of the regional governments; therefore, the inventory agency has no access to the required background information on those emissions data. During the review, Spain informed the ERT that it is working on the implementation of a harmonized electronic reporting format throughout the national territory and the strengthening of information exchange between authorities that would improve the availability of information for the elaboration of the national inventories. The ERT therefore reiterates the recommendation from the previous review report that Spain provide a qualitative assessment of the IEFs for decarbonization, also including the information associated with CKD in its NIR.

Lime production – CO_2

38. In addition to the CO_2 emissions from the subcategories quicklime and calcined dolomite, which have specified with their default EFs in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), Spain has reported CO_2 emissions from non-market intermediate products (calcium carbide (CaC_2), iron and steel, and sugar production), as recommended in the previous review report, and described the estimation methods and EFs of those newly estimated emissions in the NIR (pp. 4.14 and 4.15) (see also para. 40 below). Spain also provided information on the application of carbonate foam (a by-product of sugar beet production) in agricultural soils. The ERT considers that Spain follows the IPCC good practice guidance with regard to its lime production estimates, as it clearly explains country-specific circumstances and enhances the completeness and transparency of the inventory by conducting an investigation on other non-marketed lime production as soda ash production. The ERT commends Spain for its efforts to improve completeness, and encourages the Party to include the results of its investigation in its NIR. The ERT also reiterates the recommendation that the Party analyse the possibility of reporting CO_2

emissions from the use of carbonate foam (from beet root sugar production) in the agriculture and LULUCF sectors.

39. In response to a question raised by the ERT during the review about the status of the investigation into impurities of lime reported by some plants which resulted in lower EFs in 2011 in comparison with the default EFs in the Revised 1996 IPCC Guidelines, Spain informed the ERT that a meeting is planned with the entrepreneurial association (ANCADE) to address the analysis of the purity percentage of quicklime and calcined dolomite and, according to the results, it may be necessary to revise the EFs and estimates for these emissions for the time series between 1990 and 2012. The ERT recommends that the Party include the results of the investigation, and detailed information on recalculations if applicable, in its next annual submission.

40. Although Spain included detailed descriptions of the methodologies and assumptions applied to estimate CO_2 emissions from non-marketed intermediate products as recommended in the previous review report, the AD (either carbonate consumption or production) are not yet provided in the NIR. The ERT recommends that the Party provide a table with all types of carbonate consumed (or the production used as AD) in each type of industry with a description of the emissions allocation, in order to increase the transparency of reporting all carbonates covered in the emission estimates of Spain in the NIR (see also para. 38 above).

Nitric acid production – N_2O

41. Spain has estimated the N_2O emissions from nitric acid production using plant-specific information. The emissions data are available for 2008 onwards, and these values were used to derive the EFs for the period 1990–2007 for the plants that still existed after 2008. The default EFs from the IPCC good practice guidance were used to estimate the emissions for those plants that were not operating after 2008. During the previous review, Spain provided, under the confidentiality restrictions, information including the average EF for each production technology and information on abatement devices and their efficiency for each year of the time series in response to a request from the ERT in order to understand the emissions trend. The previous review report therefore recommended that the Party include the necessary information to evaluate the time-series consistency in the next annual submission by finding alternative ways of reporting the necessary information without violating the existing rules on confidentiality. During the current review, noting that the information provided in the annual submission was still not sufficient for the ERT to consider the time-series consistency of the EFs used in emission estimates, the ERT asked Spain how it would address the issue regarding the provision of the necessary information in the annual submission to justify the time-series consistency of the EFs used in the emission estimates and the progress made since the previous review. The Party explained again that it could not provide the information in the NIR but only during the review for confidentiality reasons. The ERT reiterates the recommendation made in the previous review report that the Party improve the transparency of its reporting by finding alternative ways of reporting the necessary information without violating the existing rules on confidentiality and provide the required information in the next annual submission in order to allow the ERT to review the N_2O emission estimates.

Iron and steel production – CO_2, CH_4 and N_2O[8]

42. Spain has estimated the CO_2 emissions from the production of steel, pig-iron and sinter using a tier 2 method by developing a carbon balance for the whole production process. The carbon balances of these processes (blast furnace, steel and sinter) are presented in tables in the NIR in a transparent manner, although no AD (quantitative background information) is included in the CRF tables or in the NIR, for confidentiality reasons. This transparency issue had already been raised in the previous review reports. CO_2, CH_4 and N_2O emissions from flaring (from residual gases) are included in this category, whereas the emissions from coke production are reported as "IE" and included in the categories manufacture of solid fuels and other energy industries (combustion in coke ovens) and fugitive emissions from solid fuel transformation (fugitive emissions in door leakage and quenching). The ERT recommends that Spain make available the coke production carbon balance and provide quantitative information in the NIR on all carbon balances related to steel-making processes.

43. Spain provides information on the installed technology in the country on sinter production, blast furnace and steelwork in the NIR (pp. 4.21 and 4.22). Nevertheless, there is a lack of information regarding coke plants (an overview of how many) and their technologies (for the coking process and quenching). In order to ensure the completeness and the transparency of the inventory, the ERT recommends that Spain provide this information in the NIR of its next annual submission.

Production of halocarbons and SF_6 – HFC-23

44. Spain has used a combination of tier 1 and tier 2 methods to estimate emissions of trifluoromethane (HFC-23) from the production of HCFC-22. Spain has used plant-specific emissions data for 1999 onwards and the IPCC default EF for the period 1990–1998, for which estimates from plants were not available. However, due to confidentiality restrictions, the annual submission does not include information on AD (AD and recovery are reported as confidential ("C") in CRF table 2(II).E and in pp. 4.50 and 4.51 of the NIR) and process parameters.

45. Following recommendations made in the previous review reports, Spain, as indicated in the NIR, has conducted a comparison between the IEFs and the IPCC default EF. However, Spain did not provide the results of this comparison to the ERT in a timely manner during the review week due to confidentiality reasons (see also para. 41 above, on nitric acid production). The ERT reiterates the recommendation made in the previous review report that the Party provide a qualitative discussion in the NIR regarding the comparison between the IEFs and the IPCC default EF in its next annual submission.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6[9]

46. The reporting for this category is complete with regard to actual emissions and is in accordance with the IPCC good practice guidance (a tier 2 bottom-up approach has been used together with consumption data disaggregated by each specific use). Spain has reported HFC, PFC and SF_6 emissions from refrigeration and air conditioning, foam blowing, fire extinguishers, aerosols and electrical equipment. However, Spain has reported

[8] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

[9] Not all emissions related to all gases under this category are key categories, particularly SF_6 emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

potential emissions as not estimated ("NE"). This issue had already been identified in the previous review reports. Therefore, the ERT reiterates the encouragement made in the previous review reports for Spain to provide, in its next annual submission, estimates of potential emissions of HFCs, PFCs and SF_6 from consumption of halocarbons and SF_6.

47. In response to a question raised by the ERT during the review regarding SF_6 emissions from electrical equipment, Spain explained that a voluntary agreement between MAGRAMA, the electricity industry and Red Eléctrica of Spain (REE), was made to limit emissions of SF_6 and obtain more information for the estimation of emissions from this sector. The ERT commends the Party for this effort, as it increases the accuracy of the SF_6 emission estimates.

D. Agriculture

1. Sector overview

48. In 2011, emissions from the agriculture sector amounted to 37,279.06 Gg CO_2 eq, or 10.6 per cent of total GHG emissions. Since 1990, emissions have increased by 0.2 per cent. The key driver for the rise in emissions is the overall 26.8 per cent increase in emissions from manure management (a 27.8 per cent increase in CH_4 emissions and a 23.0 per cent increase in N_2O emissions), although emissions from agricultural soils and enteric fermentation have decreased by 5.7 and 5.4 per cent, respectively. Within the sector, 47.6 per cent of the emissions were from agricultural soils, followed by 28.2 per cent from enteric fermentation, 22.2 per cent from manure management, 1.3 per cent from field burning of agricultural residues and 0.8 per cent from rice cultivation.

49. The ERT concluded that the agriculture sector inventory is almost complete, as it includes all gases, covers all of the national territory and includes all categories for which emissions occur in Spain. However, the ERT notes, for example, that Spain does not report N_2O emissions from histosols as the Party explains that this area is considered negligible (see para. 61 below). The ERT commends Spain for revising and improving the GHG emission estimates for the agriculture sector by developing country-specific methodologies based on studies carried out by the Inventory Working Group for Livestock (Grupo de Trabajo sobre Ganadería para el Inventario Nacional de Emisiones a la Atmósfera in Spanish) (GT INV-GAN) coordinated by MAGRAMA. For example, Spain established data on the separate animal categories and completed an update of the methodologies applied to cattle (both dairy and non-dairy) and swine (see also para. 52 below.)

50. The ERT noted that Spain provides in the agriculture chapter of the NIR many references that were used to develop the country-specific methodologies. In response to a request from the ERT during the review week, Spain shared with the ERT some of those methodological documents. The ERT recommends that Spain develop a summary table providing details of the references used to develop the country-specific methodologies and parameters used for the tier 2 approaches and methods by category in the next annual submission, which will facilitate the understanding of the rationale used to derive those country-specific methods and parameters.

51. The ERT commends Spain for the explanation of the emission trends for all categories. However, the ERT recommends that Spain provide an explanation for the key drivers of such trends for the whole agriculture sector and by category in the next annual submission.

2. Key categories

Enteric fermentation – CH_4

52. Spain explains in the NIR that for cattle (both dairy and non-dairy) and swine it has used updated country-specific tier 2 methodologies. These are based on newly established animal category data for different breeds based on food balances and energy needs; for sheep it has used tier 2 methods; and for the other animal species it has used tier 1 methods to estimate the emissions. The ERT considered that this methodological approach is in accordance with the IPCC good practice guidance, because the emissions for the most significant animal species (cattle (both dairy and non-dairy) and swine) are estimated by applying higher-tier methods.

53. The ERT recognized that Spain has made an important improvement in the 2013 annual submission in comparison with the previous annual submission, namely the improvements made to the explanatory text on the derivation of the EFs for cattle (pp. 6.14–6.16 of the NIR, in the chapter entitled "Ganado Bovino y Porcino"). In response to a question raised by the ERT during the review requesting the references and documentation, such as the methodological and statistical reports used for the emission estimates, Spain provided scientific documentation (see also annex II to this report). The ERT recommends that Spain incorporate detailed explanations of the data and assumptions used for the emission estimates, in particular when it uses country-specific parameters, to improve the transparency of the annual submission.

54. The ERT noted that Spain has not included in its NIR a summary table of information that could improve the transparency of the tier 2 methods used, in accordance with the recommendation made in the previous review report. The ERT therefore reiterates the recommendation made in the previous review report that the Party include, in its NIR, a summary table containing information such as the EFs for the key categories and the relevant parameters.

Manure management – CH_4 and N_2O

55. To estimate CH_4 emissions from manure management, Spain explained in the NIR that for dairy cattle, non-dairy cattle, swine and poultry (hens and chickens) it used country-specific tier 2 methods in accordance with the decision tree provided in the IPCC good practice guidance, and it used a tier 1 method for other animal types. The ERT considered this approach to be in line with the IPCC good practice guidance, because for the most significant animal species the emissions are estimated using higher-tier methods.

56. Spain has reported, in CRF table 4.B(b), the nitrogen excretion (Nex) per animal waste management system (AWMS) of dairy cattle, swine and poultry (hens and chickens) under "other" only, and the notation key "NO" is reported for all other AWMS of those animals. During the review week, the ERT requested that Spain provide more detailed descriptions and the assumptions used for allocating the Nex, especially for dairy cattle. In response to a question raised by the ERT, Spain explained that the methodology has been updated, including the use of the new surveys of AWMS, and the results revealed that, in Spain, manure is usually managed in a series of concatenated systems, which are not simple to allocate into one of the "groups of AWMS" in CRF table 4.B(b). For example, for dairy cattle, 20 per cent of the manure is first managed as "cattle and swine deep litter <1 month" and then managed in "dry lot"; 6 per cent of the manure is first managed as "cattle and swine deep litter >1 month" and then managed in "dry lot"; and 11 per cent of the manure is first managed as "open pits below animal confinements >1 month" and then managed in "liquid/slurry". The ERT considered Spain's approach to be in line with the IPCC good practice guidance. The ERT recommends that the Party include the same explanations in the NIR of its next annual submission.

57. The ERT reiterates the recommendations made in the previous review report that Spain, in its next annual submission, provide additional information on the AWMS and the share of AWMS that are specific to Spain,[10] focusing on the differences between those described in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

Agricultural soils – N_2O

58. Spain has estimated the N_2O emissions from agricultural soils using the IPCC tier 1 methodology, disaggregated as tiers 1a and 1b, country-specific values for the following parameters: fraction of crop residue burned ($Frac_{BURN}$); fraction of synthetic fertilizer nitrogen (N) applied to soils that volatilizes as ammonia (NH_3) and nitrogen oxides (NO_x) ($Frac_{GASF}$); fraction of livestock Nex that volatilizes as NH_3 and NO_x ($Frac_{GASM}$); fraction of livestock N excreted and deposited onto soil during grazing ($Frac_{GRAZ}$); fraction of total above-ground biomass of N-fixing crop that is N ($Frac_{NCRBF}$) and fraction of residue dry biomass that is N ($Frac_{NCRO}$) and the default EF (0.0125 kg N_2O-N/kg N) from the IPCC good practice guidance.

59. To estimate the N_2O emissions from pasture, range and paddock manure, Spain used equation 4.18 of the IPCC good practice guidance and the default EF; however, the ERT noted that Spain subtracted part of the Nex as volatilization on pasture, range and paddock before using it as AD to calculate the direct N_2O emissions. However, the ERT was of the view that the subtraction of part of the Nex before calculating the direct N_2O emissions is not in line with the IPCC good practice guidance (equation 4.18), since the value of the Nex for pasture, range and paddock manure should be the total Nex on pasture, range and paddock. In response to questions contained in the list of potential problems and further questions raised by the ERT during the review week, Spain officially submitted additional information on the methods used on 31 October 2013. Spain also provided, on 11 December 2013, additional explanations of its methods and parameters used for the emission estimates in response to the additional questions raised by the ERT. After considering the Party's responses, the ERT concluded that the method used by the Party is not in line with the IPCC good practice guidance, and the Nex and N_2O emissions from pasture, range and paddock manure are underestimated for the whole time series. Therefore, the ERT considers the potential problem unresolved and has proposed the calculation of adjustments for the subcategory pasture, range and paddock manure (see chapter II.H below). The ERT strongly recommends that Spain revise the estimates of N_2O emissions for the whole time series for pasture, range and paddock manure in line with the IPCC good practice guidance, in its next annual submission.

60. To estimate the N_2O emissions from N leaching and run-off, Spain used equation 4.36 of the IPCC good practice guidance, the default value of fraction of N input to soils that is lost through leaching and run-off ($Frac_{LEACH}$) and the default EF. In response to a question raised by the ERT during the review regarding the clarification of the applied methodology, the Party explained that its method is country-specific, and that N_2O emissions from N leaching and run-off include N applied as sludge and compost, and also N from synthetic N fertilizer applied to soils and animal manure Nex after subtracting volatile losses during manure management. The ERT was of the view that the country-specific methodology used was not transparently described in the NIR and that the subtraction of part of the Nex before calculating the direct N_2O emissions could lead to an underestimation of emissions. In response to the list of potential problems and further questions raised by the ERT during the review week, Spain officially submitted additional information on the methods used on 31 October 2013 and further elaborated on its country-

[10] FCCC/ARR/2012/ESP, paragraph 94.

specific estimation method. Spain also provided, on 11 December 2013, additional explanations of its methods and parameters used for the emission estimates in response to the additional questions raised by the ERT. The Party demonstrated that the country-specific consideration of volatile losses from manure management resulted in a more precise estimation of the amount of N leached in Spain. The ERT concluded that this country-specific method is in line with the IPCC good practice guidance and that the chosen approach does not cause an underestimation of indirect soil emissions. The ERT concluded that the methodological issues regarding the N_2O emission estimates of N leaching and run-off were resolved, but strongly recommends that Spain describe its country-specific methodology in detail and document all N-flow amounts, including those related to losses on farms, in the NIR of its next annual submission.

61. Spain reported histosols as "NO" under this category. In response to a question raised by the ERT during the review week, Spain indicated that there are no histosols in the country. However, Spain reported in the chapter on the LULUCF sector that 0.04 per cent of the national surface is organic soils (reference: IGN maps of Spain, 1992). In response to a question on the potential inconsistency in the reporting under the agriculture and LULUCF sectors raised by the ERT during the review, Spain explained that this area is considered negligible, and is therefore not included in the CRF tables. The ERT recommends that Spain verify the existence of cultivated organic soils for the next annual submission, and report the related emissions, if appropriate.

3. Non-key categories

Field burning of agricultural residues – CH_4 and N_2O

62. In the previous review reports, Spain was recommended to include information on the legal status of field burning of agricultural residues. During the review week in 2013, Spain explained that it has been working to address the ERT's recommendation on the legal status of field burning of agricultural residues and the legal bodies controlling it. Nevertheless, the complexity of the national framework regarding permits for this activity has prevented the Party from providing conclusive information on the legal status of this activity and satisfying the ERT's request. The ERT strongly reiterates the recommendation made in the previous review report that Spain include this information in the NIR. In addition, the ERT recommends that Spain include a separate chapter with complete information regarding the emissions from field burning of agricultural residues in its next annual submission, rather than including that information in the chapter on other non-key categories in its NIR.

Rice cultivation – CH_4

63. Spain estimates the CH_4 emissions from rice cultivation using the country-specific factor for Spain available in table 4.9 of the Revised 1996 IPCC Guidelines, Reference Manual. The ERT recommends that Spain include a separate chapter with complete information and documentation on this subcategory in the next annual submission, rather than including this information in the chapter of other non-key categories in its NIR.

E. Land use, land-use change and forestry

1. Sector overview

64. In 2011, net removals from the LULUCF sector amounted to 29,071.23 Gg CO_2 eq. Since 1990, net removals have increased by 52.2 per cent. The key drivers for the rise in net removals are the increase in carbon stock for land converted to forest land since 1990 and the increase in carbon stock for mineral soils on cropland remaining cropland since 2005.

Within the sector, 25,170.65 Gg CO_2 eq of net removals were from forest land, followed by 3,526.80 Gg CO_2 eq from cropland and 934.47 Gg CO_2 eq from grassland. Settlements accounted for net emissions of 560.69 Gg CO_2 eq. Emissions and removals from wetlands and other land are reported as a combination of "NO" and "NE".

65. The ERT notes that Spain has not improved its LULUCF sector inventory much since the 2012 annual submission. Therefore, some of the findings in the sections below are the same as those included in the 2012 review report.[11]

66. Spain's inventory for the LULUCF sector is generally in accordance with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for most of the reported land categories, except for some issues relating to the identification of land representation (see paras. 68 and 108 below) and the use of a tier 1 method for the carbon stock change estimates for the mandatory categories. For example, Spain assumes that the land-use areas and soil management in the period 1970–1990 are constant without providing any justification for this assumption in the NIR (see para. 68 below). Spain uses the tier 1 method to estimate the carbon stock changes in dead organic matter and soil organic carbon in forest land remaining forest land, based on the stock change method; the Party uses the tier 1 assumption for the key categories (e.g. the carbon stock changes in mineral soils in forest land remaining forest land) (see paras. 70, 72, and 73 below).

67. The inventory for the LULUCF sector is not complete. Some of the carbon stock changes in the pools, including the pools under the mandatory categories, are reported as "NE" due to problems with the application of methods (e.g. the carbon stock changes in dead organic matter in forest land remaining forest land and cropland, grassland and other land converted to forest land; the carbon stock changes in living biomass and mineral soils under grassland remaining grassland; the carbon stock changes in living biomass under cropland converted to grassland; and all carbon pools except for dead organic matter for grassland remaining grassland). Additionally, some categories are reported as "NE" due to a lack of AD (e.g. CO_2, CH_4 and N_2O emissions from controlled burning for forest land remaining forest land and from wildfires under cropland remaining cropland, grassland remaining grassland, wetlands remaining wetlands and other land remaining other land). Some carbon pools are reported as "NE", with the argument that they are not net emission sources (e.g. the carbon stock changes in dead organic matter and mineral soils for forest land remaining forest land and other land converted to forest land and for dead organic matter under cropland and grassland converted to forest land; the carbon stock changes in dead organic matter for cropland remaining cropland; the carbon stock changes in soils for land converted from cropland, grassland and other land to settlements, and living biomass for cropland converted to grassland; and all carbon pools for the conversion of cropland and grassland to other land). As indicated in the two previous review reports, the carbon stock changes and GHG emissions are not reported for herbaceous crops for cropland remaining cropland and for grassland remaining grassland, or for a fraction of the forest land categories (e.g. land converted to forest land without human intervention), as well as for forest land converted to land uses other than settlements. The ERT strongly reiterates the previous recommendations that Spain continue with its efforts to improve the completeness of its reporting on the LULUCF sector and report on its achievements in its next annual submission.

68. Spain assumes that the land-use areas and soil management in the period 1970–1990 are constant, but the justification for this assumption is not provided in the NIR. This issue was raised in the previous review report as an unresolved problem. During the previous

[11] FCCC/ARR/2012/ESP.

review, Spain explained that work was under way on a major upgrade to the base cartographies used to identify land uses and land-use changes, but that no compatible and reliable information for estimating land uses and land-use changes before 1990 had yet been identified. Therefore, the previous review report recommended that the Party explore ways of matching the base cartography maps available in order to consider pre-1990 land uses and land-use changes in its reporting. The current ERT noted that this issue remains unaddressed in the current annual submission, and therefore reiterates the recommendation made in the previous review report, as explained above, that the Party explore ways of matching the base cartographies available (e.g. using overlap, interpolation or extrapolation methods, as set out in chapter 5 of the IPCC good practice guidance for LULUCF), in order to consider pre-1990 land uses and land-use changes in its reporting of GHG emissions/removals in its next annual submission to improve the accuracy of its LULUCF sector inventory.

69. The ERT identified a few inconsistencies between the NIR and the CRF tables in relation to the reported net removals of CO_2 in forest land: the values provided in table 7.1.3 of the NIR for net removals of CO_2 from the LULUCF sector (29,071 Gg CO_2 eq) differ from those in CRF table 5 for 2011 (29,138.26 Gg CO_2 eq) because the removals shown in NIR table 7.1.3 for forest land (25,289 Gg CO_2 eq) are bigger than those presented in CRF table 5 (25,237.68 Gg CO_2 eq) on LULUCF. Likewise, the values provided for carbon sequestration in forest systems in table 7.2.1 of the NIR do not correspond to those presented in CRF table 5.A for forest land, even if the emissions from biomass burning provided in CRF table 5(V) are considered. The ERT recommends that the Party improve its QC processes in order to ensure consistency between the NIR and the CRF tables in its next annual submission.

2. Key categories

Forest land remaining forest land – CO_2

70. In 2011, net removals from forest land remaining forest land were responsible for 64.5 per cent of the total net removals from the LULUCF sector, down from 98.0 per cent in 1990. The carbon stock changes in living biomass (above-ground and below-ground) were estimated using the stock change method with country-specific parameters (tier 2). The carbon stock changes in soils and dead organic matter were reported as "NE".

71. Net removals from forest land remaining forest land have been showing a decreasing trend from 1990 (18,716.37 Gg CO_2 eq) to 2009 (18,698.24 Gg CO_2 eq), which turned to show an increasing trend since 2010 (18,741.30 Gg CO_2 eq). In 2011, net removals amounted to 18,792.18 Gg CO_2 eq. A similar trend is observed in the carbon stock changes in living biomass under this category. During the previous review, Spain explained to the ERT that areas of forest land have decreased over time owing to deforestation and that the sudden increase in removals in 2010 is due to the areas afforested in 1990, which were reported during the 20-year transition period in the category land converted to forest land, but which have now been moved to the category forest land remaining forest land. However, the previous ERT was of the view that this unusual trend was the result of Spain not considering pre-1990 forest transitions in its emission estimates. In addition, noting that Spain takes into account its national forest inventory (NFI) only since 1975, the previous ERT considered that the NFI for the earlier period would provide suitable data on transitions and that this would help improve the time-series consistency. The current ERT noted that Spain, in its 2013 submission, has provided neither information on the results or progress made nor any future plan to address the recommendation made in the previous review report on this matter. Therefore, the ERT reiterates the recommendation from the previous ERT that the Party explore ways of reconciling these data sources and improve the time-series consistency of its estimates of emissions and removals from forest land

remaining forest land by considering the effect of pre-1990 forest transitions for its next annual submission.

72. Spain does not estimate the net carbon stock changes in dead organic matter for forest land remaining forest land. Spain explains in the NIR that these carbon stock changes in dead organic matter are reported as "NE" as they are not considered as net sources in the reporting under the Kyoto Protocol. In response to a question raised by the ERT during the review, Spain explained that, currently, there is neither available information nor IPCC default parameters that could be used for this estimation. For Convention reporting, according to the IPCC good practice guidance for LULUCF, the concept of good practice requires that the inventory estimates should neither be underestimated nor overestimated. Therefore, the ERT reiterates the recommendations made in the previous review reports and strongly recommends that Spain continue its efforts to estimate emissions from those pools under this key category in its next annual submission.

73. Spain reports the net carbon stock changes in mineral soils as "NE", using the tier 1 assumption of no carbon stock changes. In response to a question raised by the current ERT during the review, Spain pointed out that, according to the IPCC good practice guidance for LULUCF, the default methodology (tier 1) may be used for subcategories contributing less than 25–30 per cent to the total emissions/removals of the category. Furthermore, Spain explained that it can use a tier 1 method since no significant changes have been observed in the inventory years and the variation in the carbon stock changes was zero, as a result of its investigation on soil organic carbon under forest land remaining forest land. Nevertheless, during the previous review, Spain explained that an investigation on the possibility of using a higher-tier method was under way. The ERT recommends that Spain provide the results of its investigation on the possibility of using a higher-tier method, and provide justification for the method that the Party used for the estimate in the NIR of its next annual submission.

74. Spain uses a biomass expansion factor (BEF) that is derived by multiplying two parameters in equation 3.2.3 of the IPCC good practice guidance for LULUCF: density and BEF_2. This BEF is different from the ones presented in the IPCC good practice guidance for LULUCF. Therefore, the previous review reports recommended that Spain report these two parameters (the density and BEF parameters) used to estimate the carbon stock in biomass in a disaggregated manner in the NIR, in order to improve the transparency of the reporting.[12] During the previous review, Spain had explained that the parameters in question were calculated using information from the Centre for Ecological Research and Forestry Applications (CREAF), and that the original document has been requested and will be used to improve transparency in the next annual submission. However, the current ERT noted that Spain has not yet addressed this issue, and has again reported the BEF after multiplying the density and BEF_2 parameters. Therefore, the ERT reiterates the recommendation made in the previous review reports that the Party transparently report these parameters in a disaggregated manner, using the available information from CREAF if appropriate, in the NIR of its next annual submission.

Land converted to forest land – CO_2

75. In 2011, this category accounted for 22.3 per cent of the total GHG net removals from the LULUCF sector, up from 1 per cent in 1990. The carbon stock changes in living biomass (above-ground and below-ground) were estimated using the default method with country-specific parameters (tier 2). With the exception of other land converted to forest land, the carbon stock changes in mineral soils were also estimated using a tier 2 method. Spain reported the carbon stock changes in dead organic matter as "NE" for cropland,

[12] FCCC/ARR/2012/ESP and FCCC/ARR/2011/ESP.

grassland and other land converted to forest land, with the explanation that these pools are not net sources of carbon (see also paras. 70, 72, 73 above and 79 below). For Convention reporting, according to the IPCC good practice guidance for LULUCF, the concept of good practice requires that the inventory estimates should neither be underestimated nor overestimated. Therefore, the ERT reiterates the recommendation made in the previous review reports that Spain improve the accuracy of the inventory by reporting estimates for the dead organic matter carbon pool in its next annual submission.

76. In order to estimate the biomass growth rate for land converted to forest land, Spain uses the value of biomass stocks per hectare for forest land remaining forest land and divides it by 20, assuming all the biomass growth to be reached at year 20. The ERT considers that this could indicate an overestimation of the growth rate for species with longer rotation lengths, leading to an overestimation of carbon removals, given that the 20-year transition period provided in the IPCC good practice guidance for LULUCF is based on the time it takes for the dead organic matter and soil carbon pools to reach equilibrium and not for the biomass carbon stocks. In response to a question raised by the ERT during the review, Spain pointed out that it had not found any text in the IPCC good practice guidance for LULUCF that contains a restriction for using this 20-year default period for biomass growth. The ERT recommends that Spain provide explicit justification for assuming all the biomass growth to be reached at year 20 or, if this is not possible, that the Party revise the approach it uses to estimate the biomass growth on land converted to forest land in its next annual submission.

77. The ERT noted that table 7.2.1 (on p. 7.20 of the NIR) shows figures for forest in transition since 1990, but the source of this information is not specified in the NIR. In response to a question raised by the ERT during the review regarding the source of such figures (i.e. whether these figures were the output of the land-cover maps from the European programme CORINE (Coordination of Information on the Environment), or were based on data from reforestation programmes from 1970 onwards), Spain explained that for the period between 1990 and 2011, the area reported as forest in transition is the accumulated surface area for the last 20 years of lands forested, and that the areas of forestation are obtained from the registries of reforestation programmes. The ERT recommends that, in order to improve the transparency of its NIR, Spain specify the sources of information used to estimate the areas of land converted to forest land, particularly for those resulting from afforestation and reforestation carried out before 1990 in the NIR.

78. Spain did not use specific information on the mix of species and growth rates of trees for the areas of land converted to forest land, assuming instead that these areas had the same mix of species and growth rates as the areas of forest land remaining forest land characteristic of the provinces where they are located, thereby introducing great uncertainty to the estimates of the carbon stock changes. This issue has already been pointed out in the previous review reports. The ERT reiterates the strong recommendation made in the previous review reports that Spain develop and use a more accurate characterization of land converted to forest land for the inventory.

Cropland remaining cropland – CO_2

79. In 2011, this category accounted for 12.1 per cent of the total GHG net removals from the LULUCF sector, up from 4.8 per cent in 1990. The carbon stock changes in living biomass (above-ground and below-ground) were estimated using a tier 2 method. The carbon stock changes in mineral soils were estimated using a combination of tier 1 and tier 2 methods with country-specific reference values for the soil organic carbon content and IPCC default values for the stock change factors, while the carbon stock changes in dead organic matter were reported as "NE", with the supporting argument that it is in neutral balance (see also paras. 70, 72 and 73 above). In the NIR of its 2012 annual submission,

Spain mentioned a plan to study the occurrence of carbon stock changes in dead organic matter on cropland. However, Spain has not changed its reporting of this pool as "NE" has been reported in its 2013 annual submission, and the same improvement plan is repeated in the current NIR (p. 10.38). The ERT reiterates the encouragement made in the previous review report for Spain to implement this improvement and revisit the assumption that no carbon stock changes occur in dead organic matter.

80. In the previous review reports, some issues were raised due to the Party's deviation from the IPCC good practice guidance for LULUCF, including: that the cropland area was not stratified by production systems, as required in order to choose the stock change factors in accordance with the each combination of practices; and that the Party's chosen soil depth associated with the country-specific reference values for soil organic carbon (1 m) does not match those of the IPCC stock change factors (0.3 m), which may result in an overestimation of the changes in soil organic carbon (either removals or emissions). In chapter 7 of its 2013 NIR, as in its previous NIR, Spain has mentioned plans to obtain information at the regional level and to review the categorization of the soil organic carbon stock change factors for management practices for woody crops. With regard to the inconsistency in the soil depth value, Spain has repeated in the past two NIRs that it intends to obtain soil organic carbon values for a 0.3 m depth. The ERT reiterates the strong recommendation made in the previous review reports that Spain implement and complete those improvement plans to ensure that its reporting conforms with the IPCC good practice guidance for LULUCF in the reporting of emission estimates for this key category in its next annual submission.

81. In its 2013 submission, Spain reported the carbon stock changes in mineral soils for cropland remaining cropland before 2006 as "NO" with increasing values reported thereafter up to the value for 2011 (0.05 Mg C/ha). In response to a question raised by the ERT during the review, Spain explained that the carbon stock changes in soils are due to "soil conservative practices" which started in 2006, and that, consequently, as no management changes occurred in the period 1990–2005, no emissions or absorptions were reported. This issue was also raised in previous review reports. In response to a question raised by the ERT during the 2012 review, Spain explained that there is no information on conservative soil practices before 2006 and that all areas under cropland are considered to be under conventional tillage from 1990 to 2005. Noting that Spain explained in the previous review that it used expert judgement to estimate the values around 1990, and the conclusion that it is most likely that the management practices for woody crops resulting in increased removals may have started at a significant level only a few (three to four) years before 2006, the ERT reiterates the strong recommendation from the previous review report that Spain explore ways of improving the accuracy and consistency of the time series for its estimates of the carbon stock changes in mineral soils for cropland, by applying an actual tier 2 method, in its future annual submissions.

3. Non-key categories

Land converted to settlements – CO_2

82. Land converted to settlements was responsible for emissions of 560.69 Gg CO_2 in 2011, which represents an increase of 14.4 per cent with respect to the emissions reported for this category for 1990 (490.23 Gg CO_2). The land-use change cropland converted to settlements (264.49 Gg CO_2) was responsible for 47.2 per cent of the emissions from this category, whereas conversions from other land and from forest land represented 32.2 per cent and 19.4 per cent of the emissions, respectively.

83. Spain reports that the area of land converted to settlements remains constant throughout the time series 1990–2011 at 20.47 kha/year. This issue had already been raised

during the in-country review in 2011. In response to questions raised by the previous ERT during the 2012 review, Spain indicated that data on land cover were collected for only two years of the time series. In addition, the Party explained that, owing to the spatial resolution of the maps that are used as the main basis for determining land-use changes (the CORINE land-cover maps), the areas of settlements and of land converted to settlements have a relatively high uncertainty. Spain also introduced its plan to seek additional information to improve the estimations in the 2012 NIR. However, the current ERT noted that Spain continues to report the same value for the area of land converted to settlements throughout the time series 1990–2011 (20.47 kha/year) in its 2013 annual submission, and the same improvement plan is repeated in the NIR. Therefore, the ERT recommends that the Party complete the improvement plan and reconsider its estimation of emissions based on more recent AD for the entire time series in order to address the recommendation in the previous review reports that Spain improve the accuracy of its estimates of the areas of land that have been converted to settlements.

84. As the previous review report had already pointed out, in spite of the fact that Spain has reported the constant value (20.47 kha/year) for all years of the time series as the area of forest land converted to settlements (see para. 83 above), the IEF values for the carbon stock losses in the living biomass and dead organic matter pools kept increasing (e.g. the IEF for the carbon stock changes in living biomass for 2011 was 28.1 per cent higher than the same value for 1990). In response to a question raised by the ERT during the previous review, Spain explained that living biomass per hectare (biomass/ha) of forest is not constant for the entire time series, but is estimated using the second and third NFIs, and that the carbon stock losses in both living biomass and dead wood depend on the amount of living biomass per hectare (parameter Gt). During the previous review, Spain provided the ERT with a spreadsheet containing the base values for the parameter Gt from the second and third NFIs, and provided the estimated forest biomass by province and year, as a result of which the ERT found that the national average amount of biomass per hectare derived from the third NFI is 21.5 per cent higher than the same average derived from the second NFI. The ERT appreciated this explanation and recommended that Spain include the additional information provided to the ERT in the NIR of its next annual submission, in order to improve transparency. However, Spain has still not included such information in its 2013 submission. Therefore, the ERT reiterates the recommendation made in the previous review report that Spain include additional information, such as the base values for the parameter Gt from the second and third NFIs, and provide the estimated forest biomass by province and year, in the NIR of its next annual submission.

Emissions from liming of agricultural soils – CO_2

85. In CRF table 5(IV) Spain reported the CO_2 emissions from agricultural lime application as "NO". In the previous review report, Spain had provided a revised time series of the estimates of the lime produced. Furthermore, in its response to questions raised by the ERT during the review and in section 7.2 of the NIR, Spain mentioned ongoing studies on the possible application of lime subproducts in agriculture. The ERT recommends that Spain collect AD and estimate and report the CO_2 emissions from liming of agricultural soils in its next annual submission. If this is not possible, the ERT recommends that the Party change the notation key from "NO" to "NE", and report on the progress of the studies on the application of lime on agricultural soils.

Biomass burning – CO_2, CH_4 and N_2O

86. Spain reported emissions from controlled fires as "NE". The previous two review reports noted this as a potential underestimation of emissions. Responding to the previous ERT, Spain explained that these fires are normally not reported and, therefore, no official statistics are available covering the areas of land and types of forest that are subject to this

practice. In chapter 10 of the 2013 NIR, Spain describes its plan to seek additional information on the practice, as already mentioned in its 2012 annual submission. The ERT reiterates the recommendation made in the previous review reports that Spain collect AD and report the emissions for this category in its future annual submissions.

87. While CO_2 emissions from biomass burning due to wildfires that have occurred on land converted to forest land are transparently reported in CRF table 5(V), Spain has not applied the same approach to the reporting of such emissions from wildfires that have occurred on forest land remaining forest land, explaining in the NIR that the loss of biomass caused by fire is already discounted in the net biomass variation when comparing consecutive inventories. Moreover, the time series of net emissions/removals from forest land remaining forest land shows a linear trend between 1990 and 2009 (see para. 71 above), and does not appear to reflect the impact on forest carbon of important wildfires that occurred in 1990, 1991, 1994, 2005 and 2006. In response to a question raised by the ERT during the previous review, Spain explained that, since its methodology is based on the net variation between consecutive NFIs, the biomass gains and losses cannot be estimated separately; and since the carbon stock losses due to wildfires are quite small in contrast to the carbon stock gains of the whole Spanish forest, the impact of wildfires at the national level would probably be almost negligible, owing to the uncertainty of the variation in the living biomass stock (around 50 per cent). The previous ERT considered that this approach impairs the transparency of the Party's reporting. The current ERT subscribes to this view and reiterates the recommendation made by the previous ERT that Spain explore ways of transparently reporting CO_2 emissions due to wildfires on forest land remaining forest land in CRF table 5(V) of its next annual submission, instead of reporting them as already discounted from the total biomass carbon gains in CRF table 5.A.

F. Waste

1. Sector overview

88. In 2011, emissions from the waste sector amounted to 13,900.66 Gg CO_2 eq, or 4.0 per cent of total GHG emissions. Since 1990, emissions have increased by 89.8 per cent. The key drivers for the rise in emissions are the increases in CH_4 emissions from solid waste disposed on land, CH_4 emissions from wastewater handling and N_2O emissions from human sewage. These increasing trends in emissions were caused mainly by the increases in the population and the percentage of the population served by managed landfills and connected to wastewater treatment plants. Within the sector, 85.6 per cent of the emissions were from solid waste disposal on land, followed by 14.1 per cent from wastewater handling, 0.2 per cent from other (anaerobic digestion at biogas facilities and sludge spreading) and 0.1 per cent from waste incineration.

89. The information on the waste sector in the NIR is generally presented in a transparent manner. In response to a recommendation from the previous review report, additional information has been provided in the 2013 NIR compared with the previous NIR (see, for example, para. 92 below). However, some issues still need to be addressed, including the justification of the use of country-specific data in the estimates of CH_4 emissions from landfills (see para. 91 below) and the description of the method used to estimate the emissions reported under other (waste) (see para. 101 below). The ERT recommends that Spain improve the transparency of its documentation on the waste sector inventory by providing more background information on the emission estimates in the NIR.

2. Key categories

Solid waste disposal on land – CH_4

90. Spain has reported in this category emissions from managed and unmanaged solid waste disposal on land and has used the tier 2 first-order decay estimation method from the IPCC good practice guidance. Spain reported, in the NIR, that AD on landfill activities for managed landfill sites in large installations and for biogas collection were collected from individual landfill sites by questionnaires. AD for smaller managed landfills and unmanaged landfills were obtained from the statistical yearbooks published annually by MAGRAMA.[13]

91. The ERT noted that Spain still uses IPCC default values for the parameters in its emission estimates (e.g. for the methane conversion factor (MCF), the fraction of degradable organic carbon (DOC) dissimilated and methane generation rate constant (k)). In the NIR, Spain explains some of the constraints on its AD. For example, the AD necessary to obtain country-specific k values, MCF and oxidation factors are still scarce. Due to the lack of historical data and gaps in the time series, extrapolation and interpolation methods have to be used to complete the time series of landfill AD, including the amount of municipal solid waste (MSW) deposited in the landfills. The AD for CH_4 recovery from the landfills are not complete. The Party informed the ERT during the review that it is working on applying the method provided in the 2006 IPCC Guidelines and considers that this will be the opportunity to apply more reliable parameters, such as more suitable k and DOC values. The ERT recommends that Spain improve the accuracy of the emission estimates by using more country-specific parameters.

92. In response to a recommendation made in the previous review report, Spain has provided additional clarification on the inference techniques applied to complete the time series of type compositions for household waste belonging to large individualized landfills, specifically when no data are available for two consecutive years. Spain has clarified that linear interpolation will be applied between the years for which the landfill has provided information. The ERT commends Spain for improving the time-series consistency of its reporting.

93. The ERT noted that there are still other instances where Spain has not provided, in the NIR, sufficient country-specific data or sufficient justification to ensure the accuracy of the estimates for this key category. In response to a question raised by the ERT during the review, Spain provided additional information on management practices for recycling and composting, including the method and parameters used for data collection to estimate the amount of waste entering the composting process. The ERT recommends that Spain include such information in the NIR.

94. The ERT noted that Spain reports a substantial decrease in the amount of urban residues disposed in managed landfills observed since 2008, as can be seen from the table in the NIR (table 8.2.1). In response to a question raised by the ERT during the review, Spain indicated that the increasing trends for recycling, biomethanization and composting for 2008/2009 should be checked since those would compensate for the decrease in waste disposed in the landfill sites. Spain further indicated that the enforcement of policies on recycling and reusing of urban residues has made it possible to introduce packaging classification plants and biological or biological/mechanical treatment plants, which has contributed to the increase in recycling activities and the treatment of organic matter via the biomethanization process or via its utilization in composting techniques. The ERT recommends that Spain maintain the same level of information on waste management

[13] Entitled *Environment in Spain* (*Medio Ambiente en España* in Spanish).

regarding the AD and EFs for all alternative disposal and treatment possesses as those provided for solid waste disposal in landfills in its NIR.

95. The ERT reiterates the recommendation made in the previous review reports that the Party update the time series of the composition of waste and the calculated DOC values for unmanaged waste disposal sites for the period 1997–2009, for which the Party applies constant values, and revise the assumptions related to the depth of solid waste disposal sites and the amount of waste that is burnt, for its next annual submission.

96. In the 2013 NIR, Spain explains that it is making efforts to reduce uncertainty, and is focusing on improving the characterization of waste streams and identifying the specific k values by type of waste. In response to a question raised by the ERT during the review, Spain also explained that it is currently reviewing the data source used for estimating the emissions from sludge spreading, in order to make the data more reliable. The ERT recommends that Spain continue its efforts to reduce uncertainties in the AD and EFs and reflect them in its emission estimates in its next annual submission.

Wastewater handling – CH_4

97. Spain has calculated CH_4 emission estimates for the industrial and residential/commercial wastewater fractions. The ERT concluded that the calculations are in accordance with the IPCC good practice guidance. As identified in previous review reports, Spain uses a limited number of country-specific values for the calculation of the CH_4 EFs for domestic, commercial and industrial wastewater: it uses IPCC default values for biological oxygen demand and chemical oxygen demand (COD); while for other parameters, such as the MCF and maximum CH_4 producing capacity, it uses values from the 2006 IPCC Guidelines. In response to a question on industrial point sources raised by the ERT during the review, Spain explained that it used the specific COD values for each type of industry that are obtained from the different studies on controlling wastewater dumping provided by the Department for Public Works and Water Quality from the Ministry of the Environment. Spain also informed the ERT that the parameters used for the MCF value could have evolved over time due to the incorporation of new processes in the industries; therefore, the Party is currently searching for the best information available with the necessary focal points (the Directorate-General for Water) in order to obtain the most appropriate values for those parameters. The ERT commends Spain for its efforts to keep the most appropriate available information updated for wastewater from the industries.

98. Spain has improved the quality of the information with respect to the different treatment systems applied to both wastewater and sludge. In the NIR, Spain explains that this has made it possible to estimate more accurate activity variable due to more precise information on the population treated, and also to obtain more accurate EFs depending on the different treatment systems applied for both the wastewater and the sludge lines. The ERT has not found in the NIR information on the QA/QC procedures applied to ensure the quality of the new information generated, and therefore recommends that the Party provide information on the QA/QC procedures applied to ensure the quality of the new information generated in the next annual submission.

99. Due to the implementation of the new set of data for wastewater and sludge treatment for domestic and commercial wastewater treatment, a significant increase in CH_4 capture from sludge (243.00 Gg CH_4 eq in 2010) was reported in the 2013 submission compared with the 2012 submission (84.04 Gg CH_4 eq in 2010). Spain explained in the NIR that with the new set of data it would be possible to obtain AD and EFs for each of the treatment processes in both the wastewater and sludge streams. Nevertheless, Spain reports that CH_4 capture is only being generated in the sludge stream, and the notation key "NO" is used to report the wastewater stream assuming that 100 per cent of all generated CH_4 is captured in closed and monitored anaerobic systems. The ERT recommends that Spain

provide more information, including on the QA/QC procedures applied, to verify whether the captured CH_4 really represents 100 per cent of the potential generation, in order to justify its assumption that 100 per cent of CH_4 is captured.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

100. As stated in previous review reports, the ERT noted that the emissions from the incineration of MSW in unmanaged landfills are still reported in the category other (solid waste disposal on land) for waste incinerated at solid waste disposal sites, hospital wastes, corpses and sludge from industrial wastewater. The Party has demonstrated difficulty in addressing this particular issue due to the impossibility of creating nodes with the activities that are represented in CRF table 6.C(a) (biogenic). The ERT reiterates the recommendation made in the previous review report that Spain report such emissions under the category waste incineration, and provide a description for all subcategories in the NIR.

Other (waste) – CH_4

101. Two sources of CH_4 emissions are reported in this category: sludge spreading after removal of the sludge from wastewater treatment plants; and anaerobic digestion at biogas facilities (from biomethanization), including CH_4 flaring. However, as already indicated in the previous review report, the description of the method used for the estimation in the NIR is not sufficiently transparent. The ERT reiterates the recommendation made in the previous review report that Spain, by its next annual submission, improve the description in the NIR by providing more information, including data on the quantity of CH_4 burnt (in mass units) and the EFs that are used for flaring.

102. In addition, the ERT reiterates the assessment made in previous review reports concerning the high uncertainty of the data, parameters and EFs used in the estimates for sludge spreading. Taking into consideration all of the above-mentioned facts, the ERT recommends that Spain further explore methodologies for estimating CH_4 emissions from sludge drying and the entire pathway of the sludge after it is removed from wastewater treatment plants, and allocate the associated emissions in accordance with the category in which they occur. In response to a request from the ERT during the review week, Spain stated that efforts are being made to improve the quality of these AD. The Party also acknowledged the need to improve the data in order to reduce uncertainty and that current revisions are being implemented to specific data sources in order to correctly assess this issue. The ERT commends Spain for its efforts to improve the quality of the AD and recommends that the Party adequately report such improvements in the NIR.

103. In response to the recommendations made in the previous review reports, Spain reported that it will study the feasibility of transferring the emissions from sludge spreading from the category other to the category solid waste disposal on land by its next annual submission. The ERT commends Spain for its ongoing efforts to improve the completeness and quality of its reporting, and recommends that the Party complete its study and reflect the results in its next annual inventory submission. In doing so, Spain should also appropriately refer to these changes in the agriculture sector to ensure the comparability of the related emissions associated with solid waste disposal reported in both the agriculture and the waste sectors.

G. 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

104. Table 6 provides an overview of the information reported and parameters selected by the Party under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

		Findings and recommendations
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Not sufficient	No verifiable information has been provided to demonstrate that the dead wood and litter carbon pools are not net sources in afforestation and reforestation activities, as required by paragraph 6(e) of the annex to decision 15/CMP.1 (see para. 106 below). There is no verifiable information in the national inventory report (NIR) to demonstrate that the litter, dead organic matter and soil carbon pools in forest management activities are not net sources (see paras. 110 and 111 below) No system is in place to monitor and track deforestation since 2006 onwards, as required by paragraph 6(b) of the annex to decision 15/CMP.1 and paragraph 20 of the annex to decision 16/CMP.1 (see para. 107 below)
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management and cropland management Years reported: 1990, 2008, 2009, 2010 and 2011	
Identify the period of accounting	Commitment period accounting	
Assessment of the Party's ability to identify areas of land and areas of land-use change	Not sufficient	No system is in place to monitor and track deforestation since 2006 onwards, as required by paragraph 6(b) of the annex to decision 15/CMP.1 and paragraph 20 of the annex to decision 16/CMP.1 (see paras. 107 and 108 below) Not all of the area under cropland management activity is included, as required by paragraph 6(d) of the annex to decision 15/CMP.1 and paragraphs 19 and 20 of the annex to decision 16/CMP.1 (see para. 114 below)

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

Afforestation and reforestation – CO_2

105. In order to estimate the living biomass growth rate for afforestation and reforestation areas, Spain applies a biomass increment rate based on the difference between biomass stocks at two points in time in forest land remaining forest land within the inventory cycle and divides it by 20, thus assuming all biomass growth to be reached at year 20. The ERT found that the method applied by Spain could potentially result in an overestimation of the growth rate for species with longer rotation lengths, leading to an overestimation of carbon removals. In response to a request from the ERT during the review for clarification of this method, Spain cited the IPCC good practice guidance for LULUCF and stated that it followed the default period of 20 years for biomass growth as recommended in the IPCC good practice guidance for LULUCF. However, the ERT notes that the default 20-year transition period from land to forest land proposed in the IPCC good practice guidance for LULUCF is for reporting in the land-use category. In addition, even after the 20-year default period has passed, changes in biomass growth still occur. The ERT recommends that Spain estimate and report the carbon stock changes in the living biomass pool in afforestation and reforestation activities in a manner that is consistent with the guidance in the IPCC good practice guidance for LULUCF by revising the biomass growth rate of areas under afforestation and reforestation activities using appropriate data from measurements, literature, data from neighbouring countries or other sources.

106. Spain reports the carbon stock changes in litter and dead wood as "NE" for cropland, grassland and other land converted to forest land, supported by the argument that these pools are not net sources of carbon. In reply to a request from the ERT to provide verifiable information that such pools are not net sources in accordance with paragraph 6(e) of the annex to decision 15/CMP.1, Spain explained that the information was derived in accordance with the tier 1 assumption in the IPCC good practice guidance for LULUCF. The ERT considered that this did not constitute verifiable information that the pools are not net sources and their non-inclusion could result in the potential overestimation of removals from afforestation and reforestation activities. The ERT recommends that Spain provide transparent and verifiable information in accordance with the IPCC good practice guidance for LULUCF (page 4.30), demonstrating that the dead wood, litter and soil carbon pools are not net sources in afforestation and reforestation activities to ensure that these pools can be handled as unaccounted. In case such information cannot be provided, the ERT strongly recommends that Spain estimate and report the carbon stock changes in these pools and account for them in the next annual submission.

Deforestation – CO_2

107. Spain reports in the NIR and in the CRF tables that deforestation only involves forest land converted to settlements. Spain estimates deforestation emissions based on information from the CORINE land-cover maps for 1990 and 2006 and the Spanish Forest Map called MFE50. The surface area of deforestation between the start of 1990 and the end of 2006 has been obtained from the maps, assuming a uniform deforestation rate for each year in the period 1990–2011. In reply to a question raised by the ERT during the review, Spain explained that the CORINE land-cover maps are not available after the 2006 edition, and that options are being considered to obtain maps for the years from 2006 onwards. However, the ERT concluded that there is no system in place to monitor and track deforestation from 2006 onwards. The ERT considered that this is not in accordance with the requirements for the identification and tracking of units of lands subject to activities under Article 3, paragraph 3, of the Kyoto Protocol, as set out in paragraph 20 of the annex to decision 16/CMP.1. The ERT strongly recommends that Spain develop a system to identify and track the units of land deforested since 2006 and report the areas of deforested

land since 1990 up to and including 2012 in a time-consistent way and in accordance with the requirements in decisions 15/CMP.1 and 16/CMP.1 in the next annual submission.

108. Spain states in the NIR (section 11.4.2) that the general pattern is that the land use of areas affected by management practices (including disturbances as a consequence of forest fires) does not change, and that the forest cover will recover, either by direct action or by a natural regeneration process. In order to demonstrate this, the NIR states that 75 per cent of the provinces in which plots damaged by fire have been re-measured show normal or abundant regeneration in half or more of the plots analysed, and the subsequent regeneration of the remaining plots is not excluded. Table 11.4.2 of the NIR presents data on the percentage of forest areas affected by wildfires that are not naturally regenerated, which, in some cases, such as Navarra and León, represent up to 67 per cent of the burnt areas in such provinces. In response to a question raised by the ERT regarding how the areas that do not regenerate are differentiated from those that are subject to deforestation, Spain explained that the areas shown in NIR table 11.4.2 that appear under the heading "Without natural regeneration" are considered to be those that would eventually regenerate, as stated in the NIR, and that from 2003 onwards, changing the land use of these areas to any other land use is forbidden by law, and if a land-use change has occurred before 2003, it would have been reflected in the map as deforestation, and included as such in the inventory. Therefore, these areas continue being forest land, although they are temporarily with no stock. The ERT recommends that Spain provide sufficient information to demonstrate that those areas actually regenerate by tracking them and by establishing a procedure to systematically differentiate them from deforested areas in line with the provisions of paragraph 8(b) of the annex to decision 15/CMP.1.

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

Forest management – CO_2

109. Spain reports the areas under forest management as equal to the area of forest land remaining forest land, also for 2011. However, the ERT considers that these areas should be different, starting from 2011 onwards. While the area of land converted to forest land in 1990 starts to be reported under forest land remaining forest land in the 2011 inventory year, the area of afforestation/reforestation in 1990 continues to be reported under this category. However, Spain includes the 1990 afforestation/reforestation area also under forest management, which results in double counting. In the course of the review, Spain accepted that the areas reported under forest management were incorrect and agreed to correct them in the next annual submission. The ERT recommends that Spain report the area of forest management in such a way that double counting is avoided.

110. Spain reports in the NIR (p. 7.33) the assumption, following the tier 1 method, that when forest land remains forest land the carbon in mineral soils remains constant unless significant management changes, forest type changes or disturbances take place. The soil carbon pool under forest management activities (for which CO_2 emissions are a key source) is reported as "NE", assuming a neutral balance. Verifiable information that demonstrates that this unaccounted pool is not a source (i.e. that significant management changes and disturbances do not take place) is not presented or referred to in the NIR. In response to a request by the ERT to provide peer-reviewed articles, scientific reports or other verifiable information to support this assumption, Spain noted that the NIR (section 11.3.1.2) provides the following explanation regarding the neutral balance assumption: "Regarding the omission of soil organic carbon stocks for soils of forest land remaining forest land (forest management), neutral carbon balance is assumed. However, it is argued that this deposit does not constitute a source. In fact, taking into account the argument (see explanation below) that in a forest with growing biomass (case of forest management), with the increase of deposit of dead wood and detritus it is also increasing the soil organic

carbon stock, as the last is supplied with their additional contributions." The ERT considered that this does not constitute verifiable information that the pool is not a net source and its non-inclusion could result in a potential overestimation of removals from forest management activities. The ERT strongly recommends that Spain provide transparent and verifiable information in accordance with the IPCC good practice guidance for LULUCF (page 4.30), demonstrating that the mineral soil carbon pool is not a net source in forest management activities to ensure that this pool can be handled as unaccounted. In case such information cannot be provided, the ERT recommends that Spain estimate, report and account the carbon stock changes in this pool.

111. Spain assumes that the litter and dead wood pools are not net sources based on arguments presented in the NIR (p. 11.18). In reply to a request from the ERT to provide transparent and verifiable information that such pools are not net sources in accordance with paragraph 6(e) of the annex to decision 15/CMP.1, Spain explained that the information was derived in accordance with the tier 1 assumption in the IPCC good practice guidance for LULUCF. The ERT considered that this did not constitute verifiable information that the pools are not net sources and their non-inclusion could result in the potential overestimation of removals from forest management activities. The ERT recommends that Spain provide transparent and verifiable information in accordance with the IPCC good practice guidance for LULUCF(page 4.30), demonstrating that the dead wood and litter carbon pools are not net sources in forest management activities to ensure that this pool can be handled as unaccounted. In case such information cannot be provided, the ERT strongly recommends that Spain estimate, report and account the carbon stock changes in these pools.

112. While CO_2 emissions from biomass burning due to wildfires that have occurred on afforestation/reforestation land are transparently reported in CRF table 5(KP-II)5, Spain has not applied the same approach to the reporting of such emissions from wildfires that have occurred on land under forest management, explaining in the NIR that the loss of biomass caused by fire is already discounted in the net biomass variation when comparing consecutive inventories. Moreover, the time series of net emissions/removals from forest land remaining forest land shows a linear trend between 1990 and 2009, and does not appear to reflect the impact on forest carbon of important wildfires that occurred in 1990, 1991, 1994, 2005 and 2006. In response to a question raised by the previous ERT during the review, Spain explained that, since its methodology is based on the net variation between consecutive NFIs, the biomass gains and losses cannot be estimated separately; and since the carbon stock losses due to wildfires are quite small in contrast to the carbon stock gains of the whole Spanish forest, the impact of wildfires at the national level would probably be almost negligible, owing to the uncertainty of the variation in the living biomass stock (around 50 per cent). The ERT considered that this approach impairs the transparency of the Party's reporting and recommended that Spain explore ways of transparently reporting the CO_2 emissions due to wildfires on land under forest management in CRF table 5(KP-II)5 of its next annual submission, instead of reporting them as already discounted from the total biomass carbon gains. The ERT reiterates the recommendation from the previous review report that the Party collect the necessary AD to enable the estimation of emissions from biomass burning, including the reporting of the CO_2 emissions from wildfires separately from the gains and losses.

113. Spain reports controlled burning in CRF table 5(KP-II)5 as "NE" for forest management while it reports controlled burning in CRF table 5(V) as "NE" with the explanation that this is "due to the lack of reliable statistics on AD". The ERT considered that not estimating emissions of controlled burning results in the potential underestimation of emissions. The ERT strongly recommends that Spain report the corresponding AD and emissions in its next annual submission.

Cropland management – CO_2

114. The ERT considered that Spain does not correctly estimate and report emissions from cropland management for the following reasons. The Party does not track all of the area under cropland management activity, as it does not report emissions from changes in the carbon stocks of mineral soils due to practices other than conservation agriculture (e.g. emissions from changing from no tillage to full tillage (p. 7.53 of the NIR)), assuming the rest of the area under woody crops to be in equilibrium. In relation to the reporting of woody crops, the NIR states that: "Given that there is no information which makes it possible to determine whether the areas maintain the practices analysed, it was decided to opt for a conservative criterion. Thus, only the absorptions/emissions related to the minimal area remaining under the practice until that moment is taken into account for any given year and practice. Using this criterion, in case of reduction of the area under a practice over time, it is assumed that only a part of the area that was under that practice in the beginning is still under it. Thus, only this part must be considered." The ERT considers that this is inconsistent with the requirements of paragraph 6(d) of the annex to decision 15/CMP.1 and paragraphs 19 and 20 of the annex to decision 16/CMP.1, and could result in a potential overestimation of removals or underestimation of emissions. The ERT strongly recommends that Spain correctly estimate and report the emissions from cropland management by tracking and including all of the areas under woody crops.

115. The carbon emissions from lime application under cropland management are reported as "NO" in KP-LULUCF CRF table 5(KP-II)4. As indicated in paragraph 85 above, Spain also reported the CO_2 emissions from agricultural lime application as "NO" in CRF table 5(IV). In addition, in the chapter on the LULUCF sector in the NIR (p. 7.88) and also in its explanation provided during the review, Spain indicated its ongoing studies of CO_2 emissions through applying lime-based improvements in agricultural soils. The ERT recommends that Spain collect AD and estimate and report the carbon emissions from lime application under cropland management in its next annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

116. 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 standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[14] 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.

117. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, 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 referred to in decision 22/CMP.1, annex, paragraph 88(a–j). 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

[14] The SEF comparison report is prepared by the international transaction log (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.

discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

118. In response to a question raised by the ERT during the review, Spain provided access to information on its national registry that substantiated and clarified the information reported in its annual submission.

Calculation of the commitment period reserve

119. Spain has reported its commitment period reserve in its 2013 annual submission. Spain reported that its commitment period reserve has not changed since the initial report review (1,499,576,336 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

120. Spain reported that there are no changes in its national system since the previous annual submission. 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. Spain stated in the NIR that, due to a new government taking office at the end of December 2012, a reorganization that affects the institutional structure of the Spanish inventory system with effect from 2013 will be described in the next NIR.

4. Changes to the national registry

121. Spain reported that there are changes in its national registry since the previous annual submission. The Party described the changes, specifically due to the centralization of the EU ETS operations into a single EU registry operated by the European Commission called the Consolidated System of EU Registries (CSEUR), in its NIR (see pp. 14.1–14.6). CSEUR is a consolidated platform which implements the national registries in a consolidated manner and was developed together with the new EU registry.

122. The ERT noted that there were recommendations in the SIAR that had not been addressed related to the CSEUR, in particular recommendations related to the public availability of information on the website, the reporting of a description of the changes in database structure and the reporting of test results. In response to questions raised by the ERT during the review, Spain provided further confidential information on the changes to the national registry, including on the public availability of information on the website, reporting a description of the changes in database structure and the reporting of test results.

123. The ERT concluded that, taking into account the confirmed changes in the national registry, including the additional information provided to the ERT during the review, Spain'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). With respect to the provision of information related to database structure specifically, the ERT encourages the Party to provide additional information in the NIR. The ERT recommends that Spain include all other additional information in response to the SIAR findings in its NIR in accordance with decision 15/CMP.1, annex, chapter I.G.

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

124. Spain reported that there is a change in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The Party described the change, which is additional

information on its activities to minimize adverse impacts, in its NIR. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent.

125. Spain highlights its work to minimize adverse impacts with the Ibero-American Network of Climate Change Offices (RIOCC), the Regional Portal for Technological Transfer and Action against Climate Change (REGATTA) in Latin America and the Caribbean, and the clean development mechanism. Many Spanish agencies are involved in efforts to minimize adverse impacts, including the Institute for Energy Saving and Diversification (IDAE), the Centre for Energy, Environmental and Technological Research (CIEMAT), the Centre for Industrial and Technological Development (CDTI) and the Geological and Mining Institute (IGME). Spain also lists activities related to sustainable use of CO_2, photovoltaic research and geological storage research. Spain describes key scientific and technical reference facilities, and technological platforms.

H. Adjustments

126. The ERT identified underestimations in the emission estimates and recommended adjustments in the agriculture sector for 2008, 2009, 2010 and 2011.

127. The underestimations leading to the adjustments in the agriculture sector in 2008, 2009, 2010 and 2011 include N_2O emissions from agriculture, agricultural soils (4.D), pasture, range and paddock manure (4.D.2) and are presented in table 7 below.

Table 7
Summary information on adjustments[a]

	2008		*2009*		*2010*		*2011*	
	As reported (Gg CO_2 eq)	*Calculated by the ERT (Gg CO_2 eq)*	*As reported (Gg CO_2 eq)*	*Calculated by the ERT (Gg CO_2 eq)*	*As reported (Gg CO_2 eq)*	*Calculated by the ERT (Gg CO_2 eq)*	*As reported (Gg CO_2 eq)*	*Calculated by the ERT (Gg CO_2 eq)*
Agriculture sector-level emissions	37 491.428	38 204.799	37 546.786	38 259.556	38 744.039	39 449.614	37 279.058	37 954.841
Total Annex A sources	**398 876.386**	**399 589.758**	**362 713.247**	**363 426.017**	**348 641.307**	**349 346.882**	**350 483.690**	**351 159.473**

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, ERT = expert review team.

[a] In accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1), the adjustments to the agriculture sector were prepared by the ERT in consultation with Spain. In addition, in accordance with the Article 8 review guidelines, the ERT officially notified Spain of the calculated adjustments.

128. In its response to the draft annual review report, Spain notified the secretariat of its intention to accept the calculated adjustments.

Agricultural soils: pasture, range and paddock manure – N_2O

Original estimate

129. To estimate N_2O emissions from pasture, range and paddock manure, Spain used equation 4.18 provided in the IPCC good practice guidance. Spain has subtracted the amount of N volatilized as NO_X and NH_3 from the total N excreted in the manure applied to soils during grazing, and then multiplied this amount by the IPCC default EF_3 for N_2O (0.02 kg N_2O-N/kg N excreted) to estimate the N_2O emissions for the whole time series.

The reported N_2O emissions from the subcategory pasture, range and paddock manure were 8.62 Gg for 2008, 8.62 Gg for 2009, 8.49 Gg for 2010 and 8.07 Gg for 2011, and are identified as a key category according to the level and trend.

Underlying problem

130. The methodology described in the NIR and used by Spain is not in line with the IPCC good practice guidance, which, in using its equation 4.18, requires that all N in manure excreted during grazing (including the amount of N which has been emitted as NO_X and NH_3) should be included in the calculation when the EF_3 is applied. The amount of N in manure applied to soils during grazing as reported by Spain is lower than the amount required according to the methodology described in the IPCC good practice guidance and, therefore, results in an underestimation of N_2O emissions.

131. In its response to the additional questions raised by the ERT, Spain explained that the decision tree for the N_2O emissions from manure management in the IPCC good practice guidance allows Parties to choose the use of available country-specific and default EFs (in combination with the country-specific methods) where necessary. However, Spain did not provide scientific evidence from its field studies that determines whether the IPCC default N_2O EF_3 for manure N that is deposited directly on soils already takes into account the volatilization of NH_3 and N_2O; and thus did not provide evidence that the country-specific approach of Spain does not lead to an underestimation of emissions. Therefore, the ERT is of the opinion that the multiplication of the amount of N, after subtracting the amount of N which has been emitted as NO_X and NH_3, by EF_3 causes an underestimation of N_2O emissions from pasture, range and paddock manure which is not in line with the IPCC good practice guidance.

Rationale for adjustments

132. The rationale for the adjustments is the fact that the estimate is prepared in a way that is not consistent with the IPCC good practice guidance and leads to an underestimation of emissions in the reported years.

133. The ERT is of the opinion that the multiplication of the amount of N, after subtracting the amount of N which has been emitted as NO_X and NH_3, by IPCC default EF_3 causes an underestimation of N_2O emissions from pasture, range and paddock manure which is not in line with the IPCC good practice guidance.

134. The ERT notes that IPCC default EF_3, as defined in the IPCC good practice guidance, table 4.12, corresponds to the manure N which is directly deposited on soils. In response to questions contained in the list of potential problems and further questions raised by the ERT during the review week, Spain explained that the discounting of volatile losses is related to the special characteristics of the Spanish weather and the natural processes that produce N_2O in the soils, and that it intends to avoid double counting in its estimates. Additionally, Spain justified its country-specific approach by reference to equation 4.23 and IPCC default EF_1 (table 4.17) of the IPCC good practice guidance: this approach is justifiable considering that it is comparable with the methodology presented in equation 4.23 for daily spread, which is based on the N available after the volatilization of NH_3 and N_2O and EF_1 in table 4.17 of the IPCC good practice guidance. Spain also considers that the EF for pasture, as defined in table 4.12 of the IPCC good practice guidance, corresponds to the manure N which is directly deposited on soils. The ERT disagrees with the response by Spain because equation 4.23 is applicable to animal manure N used as fertilizer, while the IPCC good practice guidance is explicit in indicating that the estimation of direct N_2O emissions from pasture, range and paddock manure is covered in section 4.4: "N_2O emissions from manure management". As the EFs presented in table 4.12 of the

IPCC good practice guidance refer to the total N excreted, the subtraction of volatile losses would cause an underestimation of emissions.

Recommendation to the Party

135. The ERT recommended that Spain revise the estimate of N_2O emissions for the whole time series for pasture, range and paddock manure, using equation 4.18 from the IPCC good practice guidance and the total Nex for pasture, range and paddock manure as reported in CRF table 4.B(b) without subtracting the amount of N which has been emitted as NO_X and NH_3.

Assumptions, data and methodology used to calculate the adjustments

136. In its 2013 annual inventory submission, Spain has reported recalculations for the whole time series of N_2O emissions from pasture, range and paddock manure due to the methodological changes in manure management for cattle (both dairy and non-dairy) that affected the Nex on pasture, range and paddock manure. Therefore, the adjustments were conducted by the ERT for the N_2O emissions from pasture, range and paddock manure for 2008, 2009, 2010 and 2011 in accordance with paragraph 12 of the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol" (decision 20/CMP.1).

137. In accordance with the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol" (decision 20/CMP.1) the adjustment should be calculated at the level at which the problem was identified which, in the case of Spain, was identified in relation to the AD (the amount of N) used to estimate N_2O emissions from pasture, range and paddock manure.

138. The ERT used equation 4.18 from the IPCC good practice guidance to calculate the N_2O emissions from pasture, range and paddock manure. The amount of total Nex was taken from CRF table 4.B(b) of the 2013 annual submission. The amount of N as reported by the Party was 274,182,182.00 kg N for 2008; 274,321,995.00 kg N for 2009; 270,148,799.00 kg N for 2010; and 256,787,433.00 kg N for 2011. The ERT has used 327,737,819.80 kg N for 2008; 327,811,519.80 kg N for 2009; 323,177,846.80 kg N for 2010; and 307,688,031.57 kg N for 2011 from CRF table 4.B(b) without discounting N volatilization.

Adjusted estimate

139. Table 8 shows the steps for the calculation of the adjustments.

Table 8
Description of the calculation of adjustments for Annex A sources

Parameter/estimate	*Value*				*Unit*	*Source*
	2008	*2009*	*2010*	*2011*		
Category: 4.D. agricultural soils: 4.D.2. pasture, range and paddock manure – N_2O						
Party's estimate of: N excretion on pasture, range and paddock	274 182 182.000	274 321 995.000	270 148 799.000	256 787 433.000	kg N	CRF v1.4 – table 4, Ds1
Party's emission/removal estimate from pasture, range and paddock manure – N_2O	8.617	8.622	8.490	8.070	Gg N_2O	CRF v1.4 – table 4, Ds1
Input data/parameter for calculation of adjustment	327 737 819.800	327 811 519.800	323 177 846.800	307 688 031.570	kg N	ERT calculation
Calculated estimate for pasture, range and paddock manure – N_2O	10.300	10.303	10.157	9.670	Gg N_2O	ERT calculation
Conservativeness factor	1.06	1.06	1.06	1.06		Table 2 of appendix III of the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol" (decision 20/CMP.1)
Adjusted conservative estimate for N_2O emissions from pasture, range and paddock manure	10.918	10.921	10.766	10.250	Gg N_2O	ERT calculation
Adjusted conservative estimate for N_2O emissions from pasture, range and paddock manure	3 384.689	3 385.450	3 337.596	3 177.626	Gg CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF) as reported by the Party	398 876.386	362 713.247	348 641.307	350 483.690	Gg CO_2 eq	CRF v1.4 – table 10s5; table 10s5.2; table 10s5.3
Total aggregated GHG emissions (excluding LULUCF) after application of adjustment	399 589.758	363 426.017	349 346.882	351 159.473	Gg N_2O	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	713.371	712.770	705.575	675.783	Gg CO_2 eq	ERT calculation
	0.179	0.197	0.202	0.193	%	ERT calculation

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, N = nitrogen.

Conservativeness of the expert review team's calculation of the adjustment

140. The ERT applied a conservativeness factor of 1.06 (agriculture, agricultural soils, N_2O emissions from manure, AD, table 2 of appendix III contained in the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2 of the Kyoto Protocol" (decision 20/CMP.1)) to estimate the Nex on pasture, range and paddock manure.

III. Conclusions and recommendations

A. Conclusions

141. Table 9 summarizes the ERT's conclusions on the 2013 annual submission of Spain, in accordance with the Article 8 review guidelines.

Table 9
Expert review team's conclusions on the 2013 annual submission of Spain

		Paragraph cross-references
The ERT concludes that the inventory submission of Spain is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Complete	
LULUCF[a]	Not complete	67
KP-LULUCF	Not complete	109 and 113
The ERT concludes that the inventory submission of Spain has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (the IPCC good practice guidance) and the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Generally, yes The ERT recommends adjustments in the agriculture sector considering that the method used is not in accordance with the IPCC good practice guidance	59
Spain has reported information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Yes	
Spain has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	

		Paragraph cross-references
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	12
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Spain provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

142. The ERT concludes, based on the review of the 2011 inventory, that for the subcategory N_2O emissions from pasture, range and paddock manure (4.D.2) the methods and AD used are not fully in line with the IPCC good practice guidance as required by Article 5, paragraph 2, of the Kyoto Protocol. Following the review of the additional information provided by Spain during and after the review week, the ERT concluded that the Party did not satisfactorily correct the problem through the submission of acceptable revised estimates and decided to calculate and recommend adjustments in accordance with the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol" (decision 20/CMP.1). Since Spain has reported a recalculation between the 2012 and 2013 submissions for the whole time series of N_2O emissions from pasture, range and paddock manure due to the methodological changes in manure management for cattle (both dairy and non-dairy) that affected the Nex on pasture, range and paddock manure, the adjustments were conducted for the N_2O emissions for 2008, 2009, 2010 and 2011 in accordance with paragraph 12 of the "Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol" (decision 20/CMP.1).

143. Spain in its communication of 6 May 2014, accepted the calculated adjustments. In accordance with the Article 8 review guidelines, the ERT applied the calculated adjustments.

B. Recommendations

144. The ERT identified the issues for improvement listed in table 10 below. All recommendations are for the next annual submission, unless otherwise specified.

Table 10
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
Cross-cutting		Consider the ways of providing the requested information to the ERT, especially during the review week, if these data cannot be provided in the NIR	12
		Strengthen the efforts to fully implement the recommendations made in the previous review reports	13
Energy	General	Include the official energy balance as submitted to IEA and Eurostat, and provide explanation of the differences between this energy balance and the one used to prepare the inventory for each category and fuel	17
		Provide plant-specific NCVs and EFs in corresponding chapters in the NIR	18
		Ensure the appropriate use of the notation keys and provide justification for their use in the NIR and in the CRF tables	19
	Comparison of the reference approach with the sectoral approach and international statistics	Include detailed information on the progress of the work of GT-Energía	21
	International bunker fuels	Include more detailed information on the methodology used for the estimation of emissions from aviation, including the documentation on the use of expert judgement	22
	Stationary combustion: all fuels – CO_2, CH_4 and N_2O	Enhance the national system in order to be able to correct and use more plant-specific data in the emission estimates	25
	Navigation: liquid fuels – CO_2	Revise the tier 1 method used to estimate CO_2 emissions from this category by applying the fuel consumption of maritime transport directly obtained from the relevant data providers	26
	Road transportation: liquid fuels (diesel oil) – CO_2, CH_4 and N_2O	Provide a more transparent explanation of the allocation of fuel consumption for off-road machinery	27
	Road transportation: (biomass) –	Report CH_4 and N_2O emissions from biogenic fuels under biomass	29

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	CH_4 and N_2O		
	Other (energy): liquid and gaseous fuels – CO_2, CH_4 and N_2O	Include information on military fuel consumption and the associated emissions in the corresponding section of the NIR	30
Industrial processes and solvent and other product use	General	Assess the appropriateness of the confidentiality claim and find alternative ways of reporting the AD and EFs without violating the existing rules on confidentiality	33
		Take the necessary measures to remove the difficulties in obtaining the background data used to estimate the emissions from the industries and facilities under the EU ETS in order to allow the ERT to obtain the necessary information during the review in a timely manner	34
	QA/QC	Describe the QA/QC measures of the industries and facilities, including those under the EU ETS	35
	Cement production – CO_2	Provide a qualitative assessment of the IEFs for decarbonization, including the information associated with the CKD	37
	Lime production – CO_2	Analyse the possibility of reporting CO_2 emissions from the use of carbonate foam (from beet root sugar production) in the agriculture and LULUCF sectors	38
		Include the results of the analysis of the purity percentage of quicklime and calcined dolomite, and detailed information on recalculations, if applicable	39
		Provide a table with all types of carbonate consumed (or the production used as AD) in each type of industry with a description of the emissions allocation	40
	Nitric acid production – N_2O	Improve the transparency of the reporting by finding alternative ways of reporting the necessary information without violating the existing rules on confidentiality	41
	Iron and steel production – CO_2, CH_4 and N_2O	Make available the coke production carbon balance and provide quantitative information in the NIR on all carbon balances related to steel-making processes	42
		Provide information on coke plants (an overview of how many) and their technologies in the NIR	43
	Production of halocarbons and SF_6 – HFC-23	Provide a qualitative discussion in the NIR regarding the comparison between the IEFs and the IPCC default EF	45

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
Agriculture	General	Provide a summary table with the references used to develop the country-specific methodologies and parameters used for the tier 2 approaches and methods by category	50
		Provide an explanation for the key drivers of the trends for the whole agriculture sector and by category	51
	Enteric fermentation – CH_4	Provide detailed explanations of the data and assumptions used for the emission estimates, in particular when country-specific parameters are used	53
		Provide a summary table containing information such as the EFs for the key categories and the relevant parameters	54
	Manure management – CH_4 and N_2O	Provide more detailed descriptions of the methodologies and approach used for allocating the Nex, especially for dairy cattle	56
		Provide information on the AWMS and the share of AWMS that are specific to Spain compared with those described in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance	57
	Agricultural soils – N_2O	Revise the estimates of N_2O emissions for the whole time series for pasture, range and paddock manure in line with the IPCC good practice guidance	59
		Describe in greater detail the country-specific methodology used to estimate N_2O emissions from N leaching and run-off and document all N-flow amounts, including those related to losses on farms	60
		Verify the existence of cultivated organic soils	61
	Field burning of agricultural residues – CH_4 and N_2O	Provide information on the legal status of field burning of agricultural residues in a separate chapter with complete information on the emissions from field burning of agricultural residues	62
	Rice cultivation – CH_4	Document this subcategory in a separate chapter in the NIR	63
LULUCF	General	Continue with the efforts to improve the completeness of the reporting on the LULUCF sector and report on the achievements	67
		Explore ways of matching the base cartographies available, in order to consider pre-1990 land uses and land-use changes	68
		Improve the QC processes in order to ensure consistency between the NIR and the CRF tables	69

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	Forest land remaining forest land – CO_2	Explore ways of reconciling the different data sources and improve the time-series consistency of the emission/removal estimates by considering the effect of pre-1990 forest transitions	71
		Continue the efforts to estimate emissions from the missing pools	72
		Provide the results of the investigation on the possibility of using a higher-tier method, and provide justification for the method used in the estimate	73
		Report information on the density and BEF_2 parameters in a disaggregated manner	74
	Land converted to forest land – CO_2	Report estimates for the dead organic matter carbon pool	75
		Provide explicit justification for assuming all the biomass growth to be reached at year 20 or revise the approach used to estimate the biomass growth	76
		Specify the sources of information used to estimate the areas of land converted to forest land, particularly for those resulting from afforestation and reforestation carried out before 1990	77
		Develop and use a more accurate characterization of land converted to forest land	78
	Cropland remaining cropland – CO_2	Implement and complete the improvement plans to ensure that the reporting conforms with the IPCC good practice guidance for LULUCF	80
		Explore ways of improving the accuracy and consistency of the time series for the estimates of the carbon stock changes in mineral soils for cropland, by applying an actual tier 2 method	81
	Land converted to settlements – CO_2	Complete the improvement plan and reconsider the estimation of emissions based on more recent AD for the entire time series	83
		Include the additional information used for the emission estimates in the NIR	84
	Emissions from liming of agricultural soils – CO_2	Collect AD and estimate and report the CO_2 emissions	85
		Change the notation key from “NO” to “NE”, if estimation is not possible	85

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	Biomass burning – CO_2, CH_4 and N_2O	Collect AD and report the emissions from controlled fires	86
		Explore ways of transparently reporting CO_2 emissions due to wildfires on forest land remaining forest land	87
Waste	General	Improve the transparency of the documentation on the waste sector inventory by providing more background information on the emission estimates	89
	Solid waste disposal on land – CH_4	Improve the accuracy of the emission estimates by using more country-specific parameters	91
		Provide information on management practices for recycling and composting, including the method and parameters used for data collection to estimate the amount of waste entering the composting process in the NIR	93
		Provide detailed information on waste management regarding the AD and EFs for all alternative disposal and treatment possesses in the NIR	94
		Update the time series of the composition of waste for unmanaged waste disposal sites and the calculated DOC values for the period 1997–2009	95
		Continue the efforts to reduce the uncertainties in the AD and EFs and reflect them in the emission estimates	96
	Wastewater handling – CH_4 and N_2O	Provide information on the QA/QC procedures applied to ensure the quality of the new information generated on different wastewater treatment systems	98
		Provide more information, including on the QA/QC procedures applied, to verify whether the captured CH_4 really represents 100 per cent of the potential generation	99
	Waste incineration – CO_2, CH_4 and N_2O	Report the emissions from the incineration of biogenic MSW in unmanaged landfills under the category waste incineration	100
	Other (waste) – CH_4	Provide more information, including data on the quantity of CH_4 burnt (in mass units) and the EFs that are used for flaring	101
		Explore methodologies for estimating CH_4 emissions from sludge drying and the entire pathway of the sludge after it is removed from wastewater treatment plants, and allocate the associated emissions in accordance with the category in which they occur, and report the improvements	102

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
		Complete the study of the feasibility of transferring the emissions from sludge spreading from the category other to the category solid waste disposal on land and reflect the results, and refer to these changes in the agriculture sector to ensure the comparability of the related emissions associated with solid waste disposal reported in both the agriculture and the waste sectors	103
KP-LULUCF	Afforestation and reforestation – CO_2	Estimate and report the carbon stock changes in the living biomass pool in afforestation and reforestation by revising the biomass growth rate of areas under afforestation and reforestation activities using appropriate data from measurements, literature, data from neighbouring countries or other sources	105
		Provide transparent and verifiable information demonstrating that the dead wood, litter and soil carbon pools are not net sources in afforestation and reforestation activities to ensure that these pools can be handled as unaccounted, or if this is not possible, estimate and report the carbon stock changes in these pools and account for them	106
	Deforestation – CO_2	Develop and use a system to identify and track the units of land deforested since 2006 and report the areas of deforested land since 1990 up to and including 2012 in a time-consistent way and in accordance with the requirements of paragraph 6(b) of the annex to decision 15/CMP.1	107
		Provide sufficient information to demonstrate that the areas affected by management practices actually regenerate by tracking them and by establishing a procedure to systematically differentiate them from deforested areas	108
	Forest management – CO_2	Report the area of forest management in such a way that double counting is avoided	109
		Provide transparent and verifiable information demonstrating that the mineral soil carbon pool is not a net source in forest management activities to ensure that this pool can be handled as unaccounted, or estimate, report and account the carbon stock changes in this pool	110
		Provide transparent and verifiable information demonstrating that the dead wood and litter carbon pools are not net sources in forest management activities to ensure that these pools can be handled as unaccounted. In case such information cannot be provided, estimate, report and account the carbon stock changes in these pools	111

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
		Collect the necessary AD to enable the estimation of emissions from biomass burning, including the reporting of the CO_2 emissions from wildfires separately from the gains and losses	112
		Report the AD and emissions for controlled burning	113
	Cropland management – CO_2	Correctly estimate and report emissions from cropland management by tracking and including all of the areas under woody and herbaceous crops	114
		Collect AD and estimate and report the carbon emissions from lime application	115
National registry		Include additional information in response to the SIAR findings in the NIR	116
		Include all other additional information in response to the SIAR findings in the NIR	123

Abbreviations: AD = activity data, AWMS = animal waste management system, BEF = biomass expansion factor, CKD = cement kiln dust, CRF = common reporting format, DOC = degradable organic carbon, EF = emission factor, ERT = expert review team, EU ETS = European Union Emissions Trading System, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, MSW = municipal solid waste, N = nitrogen, NCV = net calorific value, NE = not estimated, Nex = N excretion, NIR = national inventory report, NO = not occurring, QA = quality assurance, QC = quality control, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, SIAR = standard independent assessment report.

IV. Questions of implementation

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

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 11
Recalculations in the 2013 annual submission for the base year and the most recent year

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
1. Energy	**805.77**	**–3 577.41**	**0.4**	**–1.3**	EF, AD, addition of source, statistical change
A. Fuel combustion (sectoral approach)	806.31	–3 560.89	0.4	–1.3	
1. Energy industries	–7.38	133.65	–0.01	0.2	
2. Manufacturing industries and construction	47.10	–3 868.19	0.1	–6.1	
3. Transport	766.59	485.81	1.4	0.5	
4. Other sectors		–312.16		–0.8	
5. Other					
B. Fugitive emissions from fuels	–0.54	–16.52	–0.01	–0.5	
1. Solid fuels		–10.52		–1.8	
2. Oil and natural gas	–0.54	–6.00	–0.02	–0.2	
2. Industrial processes	**9.99**	**250.18**	**–0.02**	**0.9**	EF, AD, reallocation, correction of notation key
A. Mineral products	23.21	7.73	0.04	0.1	
B. Chemical industry	–11.45	–23.21	0.2	–1.8	
C. Metal production	–1.78	98.29	–0.3	2.8	
D. Other production			–0.04		
E. Production of halocarbons and SF_6		43.30		4.9	
F. Consumption of halocarbons and SF_6		124.08		1.6	
G. Other					
3. Solvent and other product use	**–293.28**	**–1 345.54**	**–16.2**	**–45.8**	EF, AD
4. Agriculture	**–311.52**	**–1 269.72**	**–0.8**	**–3.2**	Changed method, AD
A. Enteric fermentation	–447.74	–1 433.42	–3.9	–11.6	
B. Manure management	326.39	195.88	5.3	2.4	
C. Rice cultivation					
D. Agricultural soils	–190.17	–32.19	–1.0	–0.2	

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					
5. Land use, land-use change and forestry		**57.92**		**–0.2**	AD
A. Forest land					
B. Cropland		58.16		–1.7	
C. Grassland		–0.24		0.03	
D. Wetlands					
E. Settlements					
F. Other land					
G. Other					
6. Waste	**–243.16**	**–1 317.84**	**–3.2**	**–8.7**	EF, AD
A. Solid waste disposal on land	437.41	334.41	8.9	2.9	
B. Wastewater handling	–680.57	–1 651.41	–29.4	–45.8	
C. Waste incineration		–0.84		–6.8	
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	–32.20	–7 260.33	–0.01	–2.0	
Total CO_2 equivalent with LULUCF	–32.20	–7 202.41	–0.01	–2.2	

Abbreviations: AD = activity data, EF = emission factor, LULUCF = land use, land-use change and forestry.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	1 499 576 336			1 499 576 336
Annex A emissions for 2011				
CO_2	284 407 334			284 407 334
CH_4	33 154 857			33 154 857
N_2O	23 934 299		675 783	24 610 082
HFCs	8 279 392			8 279 392
PFCs	313 453			313 453
SF_6	394 355			394 355
Total Annex A sources	**350 483 690**			**351 159 473**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–6 440 321			–6 440 321
3.3 Afforestation and reforestation on harvested land for 2011	NA, NO			NA, NO
3.3 Deforestation for 2011	109 015			109 015
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–18 730 332			–18 730 332
3.4 Cropland management for 2011	–3 449 204			–3 449 204
3.4 Cropland management for the base year	–711 550			–711 550
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, 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] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	280 938 336			280 938 336
CH_4	33 348 625			33 348 625
N_2O	25 377 716		705 575	26 083 291
HFCs	8 294 373			8 294 373
PFCs	303 689			303 689
SF_6	378 567			378 567
Total Annex A sources	**348 641 307**			**349 346 882**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–6 476 725			–6 476 725
3.3 Afforestation and reforestation on harvested land for 2010	NA, NO			NA, NO
3.3 Deforestation for 2010	108 061			108 061
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	–18 679 560			–18 679 560
3.4 Cropland management for 2010	–3 237 663			–3 237 663
3.4 Cropland management for the base year	–711 550			–711 550
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, 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] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	296 949 735			296 949 735
CH_4	33 494 968			33 494 968
N_2O	24 239 571		712 770	24 952 341
HFCs	7 368 775			7 368 775
PFCs	297 271			297 271
SF_6	362 926			362 926
Total Annex A sources	**362 713 247**			**363 426 016**[c]
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–6 475 373			–6 475 373
3.3 Afforestation and reforestation on harvested land for 2009	NA, NO			NA, NO
3.3 Deforestation for 2009	107 103			107 103
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–18 635 585			–18 635 585
3.4 Cropland management for 2009	–2 845 362			–2 845 362
3.4 Cropland management for the base year	–711 550			–711 550
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, 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] This number differs from the total Annex A sources in tables 7 and 8 due to the rounding of emissions of each individual gas in this table prior to the calculation of the total.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 15
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	333 386 615			333 386 615
CH_4	33 259 976			33 259 976
N_2O	24 505 658		713 371	25 219 029
HFCs	7 043 218			7 043 218
PFCs	314 843			314 843
SF_6	366 077			366 077
Total Annex A sources	**398 876 386**			**399 589 758**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–6 386 390			–6 386 390
3.3 Afforestation and reforestation on harvested land for 2008	NA, NO			NA, NO
3.3 Deforestation for 2008	106 167			106 167
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–18 677 230			–18 677 230
3.4 Cropland management for 2008	–3 468 704			–3 468 704
3.4 Cropland management for the base year	711 550			711 550
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, 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] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

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/gpglulucf/gpglulucf.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 2013. Available at <http://unfccc.int/resource/docs/2013/asr/esp.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

"Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol". Decision 20/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf>.

FCCC/ARR/2012/ESP. Report of the individual review of the annual submission of Spain submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/esp.pdf>.

UNFCCC. *Standard Independent Assessment Report*, Parts 1 and 2. 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 Ms. Marta Muñoz Cuesta, (Ministerio de Medio Ambiente y Medio Rural y Marino), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Spain:

Bases Zootécnicas Para El Cálculo del Balance de Nitrógeno y de las Emisiones de Gases producidas por la Actividad Ganadera En España:Volumen 7. Aves De Carne.

EMEP/EEA emission inventory guidebook 2009, updated May 2012, extract pp 41, 42.

Energy balance 2011, fossil fuel, biomass, gasoil, diesel and residual oil.

Ministerio de Agricultura, Alimentación, direccion general de agricultura, 2003, *Estimación de Emisiones de Gases de Efecto Invernadero* - Agricultura Ano 2001, Criterios Utilizados, Sistema de Información Geográfica de Datos Agrarios (SIGA) 1999–2002.

Ministerio de Medid Ambiente, 2006, Metodología Para la Estimación de las Emisiones a la Atmósfera Del, Sector Agrario Para El Inventario Nacional De Emisiones.

Umweltbundesamt GmbH, 2012, *Final report of the 2012 technical review of the greenhouse gas emission inventory of Spain to support the determination of annual emission allocations under Decision 406/2009/EC*, DG CLIMA.C.1/SER/2011/0019.

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
BEF	biomass expansion factor
C	carbon
CaC_2	calcium carbide
CaO	calcium oxide
CH_4	methane
CKD	cement kiln dust
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
CRF	common reporting format
CSEUR	Consolidated System of European Union Registries
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading system
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
k	methane generation rate constant
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare
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
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
Nex	N excretion
NFI	national forest inventory
NIR	national inventory report
NH_3	ammonia
NO	not occurring

NO_x	nitrogen oxides
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change