Advance Version

COMPLIANCE COMMITTEE **CC/ERT/ARR/2013/28**
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Report of the individual review of the annual submission of Spain submitted in 2012

Note by the secretariat

The report of the individual review of the annual submission of Spain submitted in 2012 was published on 29 July 2013. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2012/ESP, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the individual review of the annual submission of Spain submitted in 2012*

* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of Spain, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 17 to 22 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Daniela Romano (Italy) and Mr. Tinus Pulles (the Netherlands); energy – Ms. Ana Carolina Avzaradel (Brazil) and Ms. Inga Konstantinaviciute (Lithuania); industrial processes – Mr. Domenico Gaudioso (Italy) and Mr. Koen Smekens (Belgium); agriculture – Mr. Sergio González (Chile) and Mr. Renato Rodrigues (Brazil); land use, land-use change and forestry (LULUCF) – Ms. Ana Blondel (Canada) and Mr. Thiago Mendes (Brazil); and waste – Ms. Medea Inashvili (Georgia) and Mr. Sabin Guendehou (Benin). Mr. Guendehou and Mr. Pulles were the lead reviewers. The review was coordinated by Mr. Vitor Góis Ferreira (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Spain, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2010, the main greenhouse gas (GHG) in Spain was carbon dioxide (CO_2), accounting for 79.9 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (9.8 per cent) and nitrous oxide (N_2O) (7.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 75.8 per cent of total GHG emissions, followed by the agriculture sector (11.2 per cent), the industrial processes sector (7.9 per cent), the waste sector (4.2 per cent) and the solvent and other product use sector (0.8 per cent). Total GHG emissions amounted to 355,901.64 Gg CO_2 eq and increased by 24.9 per cent between the base year[2] and 2010.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector 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.

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

[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.

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 2010

			Gg CO_2 eq							*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010*
Annex A sources		CO_2	225 815.09	225 815.09	253 553.25	306 596.41	366 689.92	334 967.28	297 231.44	284 454.19	26.0
		CH_4	26 043.33	26 043.33	28 606.51	32 824.37	34 327.93	34 772.11	35 061.94	35 011.70	34.4
		N_2O	27 609.51	27 609.51	26 520.08	32 404.09	28 447.04	26 407.40	26 111.34	27 626.49	0.1
		HFCs	4 645.55	2 403.18	4 645.55	8 365.60	5 403.84	7 004.86	7 219.97	8 144.86	75.3
		PFCs	832.52	882.92	832.52	436.03	288.05	314.51	296.93	303.33	–63.6
		SF_6	108.34	66.92	108.34	204.60	271.63	354.07	350.98	361.06	233.3
KP-LULUCF	Article 3.3[b]	CO_2						–6 282.12	–6 384.24	–6 384.49	
		CH_4						1.72	4.94	4.80	
		N_2O						0.17	0.50	0.49	
	Article 3.4[c]	CO_2	–711.55					–22 200.18	–21 580.22	–22 037.09	NA
		CH_4	412.73					360.07	453.91	453.09	NA
		N_2O	125.30					63.30	78.23	78.15	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, 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 activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2010

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010*
Annex A		Energy	210 122.37	210 122.37	239 252.23	288 853.90	345 498.26	316 361.87	283 488.16	269 835.23	28.4
		Industrial processes	28 035.97	25 802.59	26 661.82	33 875.41	33 604.58	31 619.17	26 625.40	28 020.63	–0.1
		Solvent and other product use	1 809.04	1 809.04	2 338.88	2 528.89	2 740.35	2 674.10	2 649.64	2 938.21	62.4
		Agriculture	37 520.98	37 520.98	36 548.31	44 029.42	40 842.74	38 816.04	38 724.86	40 013.76	6.6
		Waste	7 565.96	7 565.96	9 465.01	11 543.48	12 742.48	14 349.06	14 784.53	15 093.80	99.5
		LULUCF	NA	–19 105.74	–19 256.60	–23 262.92	–24 544.97	–29 119.39	–28 544.38	–28 953.38	NA
		Total (with LULUCF)	**NA**	**263 715.20**	**295 009.64**	**357 568.18**	**410 883.45**	**374 700.84**	**337 728.22**	**326 948.26**	**NA**
		Total (without LULUCF)	**285 054.32**	**282 820.94**	**314 266.24**	**380 831.10**	**435 428.42**	**403 820.23**	**366 272.60**	**355 901.64**	**24.9**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation						–6 386.39	–6 485.91	–6 487.27	
		Deforestation						106.17	107.10	108.06	
		Total (3.3)						**–6 280.22**	**–6 378.80**	**–6 379.21**	
	Article 3.4[d]	Forest management						–18 677.23	–18 635.59	–18 679.56	
		Cropland management	–173.52					–3 099.58	–2 412.49	–2 826.30	1 528.8
		Grazing land management	NA					NA	NA	NA	NA
		Revegetation	NA					NA	NA	NA	NA
		Total (3.4)	**–173.52**					**–21 776.81**	**–21 048.08**	**–21 505.86**	**NA**

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

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] 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.

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

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

Table 3
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2010, 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 current inventory year				
CO_2	284 450 266	284 454 194		284 454 194
CH_4	35 011 700			35 011 700
N_2O	27 626 490			27 626 490
HFCs	8 144 858			8 144 858
PFCs	303 334			303 334
SF_6	361 062			361 062
Total Annex A sources	**355 897 710**	**355 901 637**		**355 901 637**
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–6 487 272			–6 487 272
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NO			NO
3.3 Deforestation for current year of commitment period as reported	108 061			108 061
Activities under Article 3, paragraph 4, for current inventory year[c]				
3.4 Forest management for current year of commitment period	–18 679 560			–18 679 560
3.4 Cropland management for current year of commitment period	–2 826 296			–2 826 296
3.4 Cropland management for base year	–173 521			–173 521
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

Abbreviation: 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 4
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	297 225 018	297 231 443		297 231 443
CH_4	35 061 945			35 061 945
N_2O	26 111 339			26 111 339
HFCs	7 219 967			7 219 967
PFCs	296 926			296 926
SF_6	350 975			350 975
Total Annex A sources	**366 266 171**	**366 272 595**		**366 272 595**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	–6 485 907			–6 485 907
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NO			NO
3.3 Deforestation for 2009 as reported	107 103			107 103
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–18 635 585			–18 635 585
3.4 Cropland management for 2009	–2 412 493			–2 412 493
3.4 Cropland management for base year	–173 521			–173 521
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

Abbreviation: 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 5
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	334 965 627	334 967 281		334 967 281
CH_4	34 772 113			34 772 113
N_2O	26 407 395			26 407 395
HFCs	7 004 864			7 004 864
PFCs	314 511			314 511
SF_6	354 066			354 066
Total Annex A sources	**403 818 576**	**403 820 231**		**403 820 231**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	–6 386 390			–6 386 390
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NO			NO
3.3 Deforestation for 2008 as reported	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	–3 099 577			–3 099 577
3.4 Cropland management for base year	–173 521			–173 521
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

Abbreviation: 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.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 17 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Spain also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 17 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1. The ERT noted that Spain submitted the CRF and SEF tables slightly after the due date of 15 April but within the six-week period after which the consequences of late submission apply under decision 15/CMP.1. The Party informed the ERT that, although the submission was ready by 12 April and uploaded to the Central Data Repository (CDR)[3] of the European Environment Agency (EEA) for public access, it could not be uploaded to the UNFCCC submission portal. The ERT recommends that Spain ensure that its future inventory submission will be submitted by 15 April.

7. Spain officially submitted revised emission estimates on 5 November 2012 in response to the list of potential problems and further questions raised by the expert review team (ERT) during the course of the review, including information on KP-LULUCF. The Party also submitted revised estimates of CO_2 emissions from lime production. The values contained in this report are those submitted by the Party on 5 November 2012.

8. The ERT also used the previous year's submission during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[4]

9. During the review, Spain provided the ERT with additional information. The documents concerned are not part of the annual submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

[3] <http://cdr.eionet.europa.eu/es/un/colrdzxpg>.

[4] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), and 6(c) and (k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

Completeness of inventory

10. The inventory generally covers all mandatory[5] source and sink categories for the period 1990–2010 and is complete in terms of years and geographical coverage, but some categories under the LULUCF sector are reported as "NE" (see para. 11 below). The annual submission is complete in terms of the CRF tables provided and the NIR follows the outline set out in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

11. The ERT noted that Spain has improved the completeness of its inventory in recent years. However, the inventory for the LULUCF sector is not complete and some categories or carbon pools are reported as "NE" (see para. 103 below). In addition, the ERT found that several categories are still reported as not estimated ("NE") for which there are no estimation methodologies provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) or in the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) but in relation to which Spain informed the ERT that it is not certain that corresponding emissions do not occur including: CO_2 emissions from coal mining and handling (underground and surface mining); N_2O from refining/storage of oil and flaring of oil; CH_4 emissions from incineration of hospital waste; and N_2O emissions from incineration of corpses. The ERT continues to encourage the Party to make efforts to improve the completeness of its inventory and to include emission estimates for categories currently reported as "NE", calculated using the most accurate methodologies from Spanish or international studies.

12. In addition, as was mentioned in the previous review report, potential emissions of HFCs, PFCs and SF_6 from consumption of halocarbons and SF_6 (CRF table 2(II)) have not been reported. The ERT reiterates the encouragement made in the previous review report for the Party to provide estimates of potential emissions of HFCs, PFCs and SF_6 from consumption of halocarbons and SF_6 in its next annual submission.

13. The LULUCF categories, KP-LULUCF activities and carbon pools that are reported as "NE" or are not reported in the inventory are discussed in chapters II.E and II.G.1 below. In particular, the ERT noted that Spain does not report the carbon stock change in several carbon pools for certain land uses and land-use changes, estimates of CO_2, CH_4 and N_2O emissions from controlled burning on forest land remaining forest land and from wildfires on land other than forest (see para. 103 below) or estimates of CO_2 emissions from the limestone added to soil as a by-product of the sugar industry (see para. 119 below).

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

Overview

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

[5] Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which 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* and the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* provide methodologies and/or emission factors to estimate GHG emissions.

15. Spain described the changes of the national system since the previous annual submission and these changes are discussed in chapter II.G.3 of this report.

Inventory planning

16. The NIR and additional information submitted by Spain described the national system for the preparation of the inventory. The Directorate-General for Environmental Quality and Assessment and Natural Affairs (DGCEA)[6] of the Ministry of Agriculture, Food and Environment (MAGRAMA)[7] has overall responsibility for the national inventory, in accordance with the order of the Ministry of the Environment MAM/1444/2006 and Royal Decree 401/2012.

17. Within DGCEA, the Strategic Environmental Information Unit (UIAE) is responsible for the preparation of the inventory and the processing of the information collected from several data sources. UIAE receives technical assistance from Análisis Estadístico de Datos, S.A. (AED), which acts under public contract with MAGRAMA. Other organizations are also involved in the preparation of the inventory by means of cooperation agreements, including: Tecnologías y Servicios Agrarios, S.A. (TRAGSATEC) for the LULUCF sector and the Industrial Engineering Technical School of the Systems and Technology of Animal Production Unit of the Valencia Polytechnic University for the agriculture sector. DGCEA also cooperates with other organizations, in particular with Services and Studies for Air Navigation and Aeronautical Safety (SENASA), for the development of an air traffic model and the estimation of the relevant emissions, and with the joint venture formed by AED and Ingeniería, Tecnología y Consultoría, S.A. (INERCO), for the provision of technical assistance in relation to inventory projection systems.

18. Different working groups, comprising representatives of MAGRAMA and sectoral experts from other institutions, have been created with the specific objective of supporting the improvement of the inventory, specifically on agriculture and livestock, land use and climatic change, public works and transport, regional coordination of technical aspects regarding activity data (AD) and methodologies, and the forum to handle issues related to the disaggregation of the inventory at the regional level. A specific working group on energy has recently been established to work on issues related to the national energy balance.

19. The inventory is submitted by MAGRAMA to the Government's Delegated Committee for Economic Affairs for final approval.

Inventory preparation

Key categories

20. Spain has reported tier 1 and tier 2 key category analyses, both level and trend assessment, as part of its 2012 annual submission. The Party has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). In addition, according to information provided in the NIR, the Party used qualitative criteria, such as the consideration of the uncertainty of some of the parameters used in the

[6] Formerly designated as the Directorate-General for Environmental Quality and Assessment (La Dirección General de Calidad y Evaluación Ambiental in Spanish).

[7] Ministerio de Agricultura, Alimentación y Medio Ambiente in Spanish; formerly referred to as the Ministry of the Environment and Rural and Marine Affairs (el Ministerio de Medio Ambiente y Medio Rural y Marino in Spanish).

estimation process and/or exceptional trends, to identify additional key categories, resulting in the following categories being identified as key categories: N_2O emissions from road transportation, GHG emissions from navigation, and HFC emissions from refrigeration and air-conditioning equipment.

21. The key category analysis performed by Spain and that performed by the secretariat[8] produced different results, owing to the use of a more detailed level of disaggregation by the Party. The NIR contains a detailed explanation of the level of category disaggregation applied by the Party to perform the key category analysis.

22. In its NIR, Spain has explained that it uses the results of the key category analysis to prioritize the development and improvement of its inventory.

23. Spain has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol using the tier 2 approach for 2010. The KP-LULUCF activities identified as key categories under the Kyoto Protocol correspond to those identified as key categories for the LULUCF sector under the Convention: forest land remaining forest land, land converted to forest land, cropland remaining cropland, land converted to grassland and land converted to settlements.

Uncertainties

24. Spain performed and has reported a tier 1 uncertainty analysis for the overall net emissions and for the trend in emissions between the base year and the last two reported years (2009 and 2010), excluding and including the LULUCF sector. The ERT considered the uncertainty analysis to be in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Spain has also reported on uncertainty for the KP-LULUCF activities. In response to a question raised by the ERT during the review regarding some inconsistencies found between the uncertainty values reported in the NIR and in the CRF tables, Spain provided updated uncertainty analyses for 2009 and 2010, both excluding and including the LULUCF sector.

25. The overall uncertainty of the Party's 2010 inventory, excluding LULUCF, was estimated at 13.0 per cent and the trend uncertainty at 2.6 per cent. Including the LULUCF sector in the assessment, the uncertainty for 2010 was estimated at 15.0 per cent and the trend uncertainty at 2.7 per cent. The description of the uncertainty values for each sector is explained in the NIR in a transparent manner.

26. The ERT noted Spain's plan to conduct a tier 2 uncertainty analysis for certain sectors and categories, such as the agriculture sector and the subcategories road transportation and civil aviation. The ERT also noted that this plan was referred to in the previous two review reports,[9] but that it has not yet been implemented. The ERT encourages the Party in its efforts to enhance the uncertainty analysis and to report thereon in its next annual submission.

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

[9] FCCC/ARR/2010/ESP, paragraph 27, and FCCC/ARR/2011/ESP, paragraph 37.

Recalculations and time-series consistency

27. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The major changes, and the magnitude of the impact, include the following: a decrease in the estimated total GHG emissions for 1990 (by 0.1 per cent) and a decrease in 2009 (by 0.9 per cent). The rationale for these recalculations is provided in the NIR and in CRF table 8(b).

28. The ERT noted that recalculations reported by Spain for the period 1990–2009 have been undertaken to take into account:

(a) The revision of AD in the energy sector, including: incorporation of the emissions from the part of the non-energy consumption of petroleum coke and natural gas that is reported in the energy balance but for which appropriate documentation of its use as feedstocks is not available (as identified by recommendations in the previous review reports); and the revision of the AD time series for natural gas consumption in industry for the period 2007–2009;

(b) The use of a new model to estimate GHG emissions from aviation;

(c) The improvement of the estimates of HFC emissions, owing to the revision of the operating loss coefficient for refrigeration and mobile air-conditioning equipment, and the estimation of emissions from the manufacture of aerosols;

(d) The revision of the estimates of CO_2 emissions from lime production with the inclusion of emission estimates from non-marketed intermediate products (following the identification of a related potential problem in the previous review report);

(e) The revision of the estimates for the agriculture sector, by: updating the parameters used to estimate emissions from swine and poultry; updating the estimated crops areas and yields; and providing information on compost under other synthetic fertilizers;

(f) Improvements made to the calculations for the LULUCF sector, including: the improvement of the methodology used to estimate the living biomass carbon pool for forest land remaining forest land; and the update on wildfires data and the woody crop areas subject to different soil preservation practices;

(g) Improvements made to the methodology used to estimate CH_4 emissions from solid waste disposal on land and the update of the AD used to estimate emissions from sludge spreading dried in open air.

Verification and quality assurance/quality control approaches

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

30. The NIR contains a comprehensive and detailed description of the general QC procedures that are performed annually, and information on the procedures implemented at each category level is reported in the sectoral chapters of the NIR. The ERT noted that the results of QC activities and the consequent recalculations have been included in the NIR of the Party's 2012 annual submission, thus following the recommendation in the previous review report. In addition, the ERT acknowledged the new model implemented by Spain for the detection of outliers in the time series of emission estimates and background data.

31. The NIR also contains information on QA and verification activities. In response to the recommendation in the previous review report and to a question raised by the ERT

during the review regarding the use of data from the European Union emissions trading system (EU ETS) in the inventory, as a means of supporting the QA/QC practices, Spain indicated that aggregate data from the EU ETS were available and were used for QA/QC purposes for some categories, such as emissions from cement production, petroleum refineries, coke production, and iron and steel production (related to the industrial activities iron and steel integrated plants and steel electric arc furnaces). In addition, DGCEA, in collaboration with the Spanish Office for Climate Change, is working to advance communication with the regional governments, envisaging the implementation of a common format to facilitate the communication of background EU ETS data to UIAE for the preparation of the inventory. The ERT welcomes the developments since the Party's previous annual submission and recommends that it continue with its efforts to use more information from the EU ETS verifiers' reports from regional governments and use this information to improve the accuracy of the inventory and for QA/QC activities in its next annual submission.

32. The comparison of regional and national inventories can also be considered a QA/QC activity. In response to a question raised by the ERT during the review, Spain stated that UIAE convenes periodic bilateral meetings with the regional governments to discuss the comparison of the inventories at different territorial levels. Of the 17 autonomous communities in the country, only a few compile their own inventory and, in these cases, their emission estimates, as well as background information, are used in the QA/QC of the national inventory. In particular, comparisons related to large combustion plants, plants processing non-metallic minerals, non-organic chemical plants, large landfills, and road and other modes of transportation are performed. The ERT recommends that the Party include this information in the NIR of its next annual submission.

33. Spain has reported in the NIR on its plan to establish institutional arrangements with other European Union member States in order to undertake bilateral independent reviews of their inventories. In response to a request from the ERT during the review for the terms of reference of these arrangements, Spain informed the ERT that it has made an agreement with Italy to conduct a bilateral QA exercise in which the Italian team analyses a selected set of categories from the Spanish inventory (fuel combustion, road transportation and other transportation were planned for 2012) and Spain, in turn, will review other categories from the Italian inventory. It is expected that the review will be extended to other categories for the 2013 annual submission. The ERT commends the efforts made so far by Spain and encourages it to continue with them.

Transparency

34. Spain's inventory is in general transparent, with regard to both the NIR and the CRF tables. However, the ERT found areas that require further improvement.

35. In previous review reports, the discrepancy, at the sectoral level, between the national energy balance provided by the Ministry of Industry, Energy and Tourism (MINETUR),[10] as submitted to different international organizations, and the energy balance calculated by the inventory experts and used for the compilation of the inventory was identified as the most important issue in the Spanish inventory and the one that impaired the general transparency of the reporting the most. The ERT concluded that the problem has not been properly solved in the 2012 annual submission and requested further clarification (see paras. 46–48 below).

36. The ERT noted with appreciation the improvement in the description of the methodologies used to estimate emissions from the industrial processes sector, which were

[10] Ministerio de Industria, Energía y Turismo in Spanish; formerly the Ministry of Industry, Tourism and Trade.

made following recommendations in the previous review report. For example, the Party has included in the NIR more detailed explanations of AD, emission factors (EFs) and the underlying parameters used in the emissions estimation process (see para. 75 below). However, some problems were still detected for some categories in relation to confidentiality restrictions and the limited access to background data from industrial plants (see paras. 68, 69 and 71 below). Therefore, the ERT recommends that Spain improve the transparency of the reporting of background data necessary in order to understand the reasons for emission trends, such as, for example, information on production and abatement technologies for cement production.

Inventory management

37. Spain has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these EFs and AD have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The centralized archiving system is located at DGCEA headquarters in Madrid. The inventory database and all relevant information are also archived at the AED offices. During the review, the ERT was provided with the requested additional archived information.

3. Follow-up to previous reviews

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

(a) Implementing QA activities on a regular basis, and improving the reporting of the results of QA/QC activities, thus facilitating the assessment of the accuracy of the inventory;

(b) Improving the reporting of the non-energy use of natural gas and liquid fuels by clarifying where these fuels are used;

(c) Improving the transparency of the description of the methodologies used to estimate emissions from the industrial processes sector (see para. 36 above).

39. However, the ERT noted that other recommendations have not yet been implemented. In particular:

(a) To provide the official energy balance as an annex to the NIR, or to at least provide the address of the website from which it can be downloaded;

(b) To describe the harmonization procedures undertaken to overcome inconsistencies between the energy balance used to prepare the inventory and the official national energy balance;

(c) To find alternative ways of reporting confidential AD and emission estimates without violating the national rules on confidentiality;

(d) To enhance the transparency of the reporting on the agriculture sector by explaining the assumptions used to derive country-specific parameters and EFs and by improving the explanation of how the time series of livestock numbers are derived;

(e) To continue with the efforts to improve the completeness of the reporting on the LULUCF sector by including emission estimates for missing categories, or parts of categories, and pools;

(f) To continue with the efforts to improve the accuracy of the representation of historical and current land-use data in accordance with the IPCC good practice guidance for LULUCF, to improve the methodological level on the LULUCF sector and to enhance the system for the tracking of deforested land areas;

(g) To include the additional information on KP-LULUCF activities that was provided to the ERT during the review in the next annual submission, in order to ensure that it is complete and in accordance with requirements (see para. 152 below).

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

40. During the review, the ERT identified a number of areas for improvement. These are listed in table 6 below.

41. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 6 below.

B. Energy

1. Sector overview

42. The energy sector is the main sector in the GHG inventory of Spain. In 2010, emissions from the energy sector amounted to 269,835.23 Gg CO_2 eq, or 75.8 per cent of total GHG emissions. Since 1990, emissions have increased by 28.4 per cent. The key drivers for the rise in emissions are transport, in particular road transportation, and other sectors. However, in spite of the overall rising trend in emissions, the total contribution of the energy sector to the Spanish inventory reached its peak in 2005 (contributing 79.3 per cent of total GHG emissions) and has decreased thereafter. It is worthwhile mentioning the decrease, since 1990, in the contribution of solid fuels to the country's emissions, in contrast to the increase in the contribution of emissions from liquid and gaseous fuels, reflecting the rise in the share of natural gas and oil product consumption compared with that of coal.

43. Within the sector, 33.9 per cent of the emissions were from transport, followed by 26.8 per cent from energy industries, 23.5 per cent from manufacturing industries and construction, and 14.5 per cent from other sectors. Fugitive emissions from oil and natural gas accounted for 1.0 per cent of sectoral emissions while fugitive emissions from solid fuels accounted for 0.2 per cent. Emissions from other (energy) were reported as included elsewhere ("IE").

44. Spain has made recalculations for the energy sector between its 2011 and 2012 annual submissions in response to the 2011 annual review report and in order to rectify identified errors. The impact of these recalculations on the energy sector is a decrease in the estimate of emissions for 2009 of 0.5 per cent. The recalculations took place in the following categories and subcategories:

(a) Public electricity and heat production: recalculations for the period 1994-2002 due to the revision of the CO_2 implied emission factor (IEF) and the reallocation of the emissions from consumption of synthetic gas in gas turbines from gaseous fuels to solid fuels in accordance with the Revised 1996 IPCC Guidelines;

(b) Petroleum refining: the reallocation of the emissions from acid gas consumption from gaseous fuels to liquid fuels;

(c) Manufacture of solid fuels and other energy industries: recalculations due to the revision of the EFs for CH_4 and N_2O emissions from coke oven gas, from those

contained in the EMEP/EEA air pollutant emission inventory guidebook[11] and from the French Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique(CITEPA), respectively, to those contained in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines);

(d) Manufacturing industries and construction: the systematic review of the fuel balance, making use of the energy balance from the International Energy Agency (IEA) and Eurostat;

(e) Civil aviation: recalculations due to the implementation of a new simplified estimation methodology for the period 1990–1998, based on annual movements classified according to predefined flight types, and the modification of the consumption- and emission-adjusted curves for cruising for the period 1999–2009;

(f) Other sectors (commercial/institutional): recalculations due to the revision of consumption of fuels for power generation;

(g) Fugitive CH_4 emissions from solid fuels: recalculations due to the revision of AD for coke oven coke production from a dry basis to humid basis;

(h) Fugitive emissions from oil and natural gas: recalculations due to the revision of the estimated CO_2 emissions from refinery plants, in relation to which double counting was detected, and of the estimated CH_4 emissions associated with the vacuum distillation process in refinery plants.

45. In the previous review report, Spain was encouraged to continue its efforts to enhance the completeness of its inventory, in particular by providing estimates of N_2O emissions from the flaring of oil. The ERT noted, however, that in the Party's 2012 annual submission N_2O emissions from the flaring of oil are still reported as "NE" in the relevant CRF table. In response to a question raised by the ERT during the review, the Party stated that it could not find appropriate N_2O EFs for flaring in refinery plants. The ERT acknowledged the difficulty in obtaining data that enables the calculation of good-quality estimates for N_2O emissions from flaring and encourages the Party to continue with its investigations.

46. Similar to what was indicated in previous review reports,[12] the present ERT identified significant differences between the fuel consumptions reported in the energy balance used to elaborate the inventory (which results from the compilation of the AD used to prepare the inventory estimates) and the energy balance that Spain provided to IEA and Eurostat.[13] The Party has not provided any information in the NIR regarding the harmonization of the AD used for the compilation of the inventory and the national energy balance, and the ERT could find no information regarding a possible interaction with MINETUR in order to address and solve this issue. In response to questions raised by the ERT during the review regarding how the problem is being addressed and whether there were priorities in terms of the fuel or subcategory to be accounted for, Spain informed the ERT that preparatory institutional arrangements have been made (technical meetings have already been held and will continue through 2013) and that an Energy Working Group (Energy-WG) has been set up in order to integrate and harmonize the fuel balance used for the inventory with the energy data reported by MINETUR to IEA and Eurostat via international questionnaires, as well as with the background EU ETS data on fuel consumed. The group is composed of experts from MINETUR and MAGRAMA.

[11] The EMEP/EEA air pollutant emission inventory guidebook was formerly referred to as the EMEP/CORINAIR emission inventory guidebook.

[12] FCCC/ARR/2010/ESP, paragraphs 52–54, and FCCC/ARR/2011/ESP, paragraph 47.

[13] Spain considers the official national energy balance to be that submitted to IEA and Eurostat.

47. In addition, the Party explained that priority was given to the analysis of light petroleum distillates and natural gas, medium and heavy petroleum distillates, coal and derived fuels, solid biomass and biogas and other renewable energy sources and other fuels derived from residues. Spain informed the ERT that the final results are not yet available, but that the work is envisaged to continue throughout 2012 and 2013. In addition, Spain provided the ERT with examples of the questionnaires sent to plants, specifically power plants and refineries, in order to collect data to compile the inventory. The ERT welcomes the Party's efforts and recommends that Spain elaborate on the efforts undertaken so far by the working group and on the preliminary outcomes of the discussions in its next annual submission.

48. Recommendations in the previous review reports included that Spain include the official energy balance (prepared by MINETUR and sent to IEA and Eurostat) in the NIR and explain the differences between that energy balance and the energy balance used for the compilation of the inventory for each category and fuel.[14] The ERT noted that this recommendation has not yet been implemented by the Party. The ERT, acknowledging the potential physical limit on the number of pages within the inventory, encourages the Party to indicate in the NIR the address of the website where the energy balance can be obtained and consulted. In addition, the present ERT reiterates the recommendation in the previous review report that Spain further explain in the NIR of its next annual submission the differences between the official energy balance prepared by MINETUR and the energy balance used for the compilation of the inventory, in order to improve the transparency of the reporting.

49. The ERT identified inconsistencies between the CRF tables and the NIR; for example, the conversion factor from gross calorific value to net calorific value (NCV) for gaseous fuels in 2010 is presented as 0.901 in table A8.1 in annex 8 to the NIR and as 0.00091 in CRF table 1.A(b). According to the Party, in response to a question raised by the ERT during the review, this can be attributed to a problem with the CRF Reporter software when generating the Excel files. The ERT recommends that the Party enhance its QA/QC procedures, in its next annual submission, in order to detect this type of inconsistency in the final version of its annual submissions.

2. Reference and sectoral approaches

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

50. The emission estimates calculated using the sectoral approach are 1.5 per cent higher than the estimates calculated using the reference approach for 2010 and the differences between the estimates are less than 2.0 per cent for almost the entire time series 1990–2010, with the exception of 1996 (2.4 per cent) and 1997 (2.3 per cent). Annex 4 to the NIR provides a detailed discussion of the reference and sectoral approaches and the differences between them. A trend reversion is observed in energy apparent consumption and differences between the reference approach and the sectoral approach are also addressed in Annex 4. In addition, in response to questions raised by the ERT during the review, the Party provided the ERT with a table indicating the differences between both the estimates of fuel consumption and of CO_2 emissions for solid, liquid and gaseous fuels, separately. The ERT encourages the Party to include this information in the NIR of its next annual submission.

51. The comparison of the apparent fuel consumption reported in the CRF tables and that reported to IEA highlights differences that vary between 1.1 per cent and 3.1 per cent from 1990 to 2010 (1.7 per cent in 2010). Responding to a question raised by the ERT

[14] FCCC/ARR/2011/ESP, paragraph 69.

during the review, the Party offered a possible explanation, namely the difference in the NCVs applied by the Party to the inventory and those reported to IEA. However, the ERT concluded that this explanation may not be sufficient, since it is stated in the NIR that the NCVs applied in the reference approach are based on the characteristics of fuels used in the sectoral approach. In response to a question raised by the ERT during the review, Spain indicated that the issue of the improvement and harmonization of the fuel characteristics as used in the inventory and as reported in official statistics is an ongoing priority objective of the Energy-WG (see para. 46 above), but that the causes of the discrepancies have not yet been identified by the group. The ERT recommends that Spain report on the progress of the work on this issue in its next annual submission.

International bunker fuels

52. It is stated in the NIR (page 3.61 and footnote 25) that expert judgement has been used to determine the types of aircraft used in the country. Responding to a question raised by the ERT during the review, Spain provided the ERT with a detailed description of the use of expert judgement in relation to this issue. For 1999 onwards the information available on civil flight movements (departures) at national airports is detailed by airport origin-destination and aircraft type. For the landing/take off ground phases, fuel consumption and emissions are estimated using data from the International Civil Aviation Organization's (ICAO) database on engine EFs, taking into consideration each aircraft type. For the cruise phase, EFs from the EMEP/CORINAIR air pollutant emission inventory guidebook have been adapted to country-specific flight settings and circle distances by the MECETA model:[15] on the basis of a survey of actual flights operated in a representative week for a subset of 21 aircraft types. Based on these data, the MECETA experts have estimated a consumption model. For the period 1990–1998, since information on national movements registered by aircraft type was not available, aeronautical sectoral experts (from SENASA) have designed a simplified methodology based on fuel consumption and emission functions applied to the advanced methodology. Specifically, the experts elaborated typical aircraft fleets characterized by 12 large aircraft families, taking for each of these families a representative type of aircraft. An actual flight route was then assigned to each aircraft family. The selected route is a flight operated in 1999 with the representative type of aircraft and its distance is close to the average distance registered in 1999 for a subset of the aircraft types with technical characteristics and flight range similar to the aircraft family. Finally, the annual fuel consumption and emissions calculated using the MECETA model, based on the consumption curves and the fleet (flight) composition, were adjusted for the total aviation fuel sales (the sum of the fuel figures reported in the international questionnaires for international aviation and domestic aviation). This adjustment was carried out by applying the rate of sales to consumption (from the MECETA model) as a scaling factor. The ERT recommends that the Party include this information in the NIR of its next annual submission.

53. The ERT noted that the NIR (subsection 3.6.2(b)) indicates that the MECETA model produces figures for total fuel consumption, both national and international, that are different from those obtained from the MINETUR questionnaires. In addition, the NIR states that the range of differences is approximately –7.0 per cent for 2000 and 4.5 per cent for 1991. The ERT observed that the comparison with IEA data shows differences between the civil aviation data reported in the CRF tables and the domestic figures extracted from IEA of 45–130 per cent (IEA figures higher), while for international bunker fuels there are differences in the figures of 15–40 per cent (higher figures in the CRF tables). In response to a question raised by the ERT during the review, the Party stated that the aforementioned comment in the NIR referred to the comparison of the total aviation fuel consumption,

[15] Modelo para el cálculo y simulación de emisiones de contaminantes del transporte aéreo español.

national and international. In addition, the Party stated that for civil aviation for the period 1999–2010 the estimates are calculated using a tier 2 methodology based on national and international flights (routes) from national airports, consistent with the higher-tier methodology contained in the IPCC good practice guidance, and are therefore accurate and express an accurate split between domestic and international fuel consumption. The Party provided the ERT with a table of the differences between the estimates produced by MECETA and those provided in the inventory energy balance, but a clear explanation of the differences between the data in the CRF tables and the IEA data was not provided. The ERT recommends that the Party provide an explanation for these differences in the NIR of its next annual submission and make efforts to enhance the consistency of the reporting between the energy balance (IEA/Eurostat data) and the AD used for the compilation of the inventory.

54. In the previous review report, Spain was encouraged to revise the methodology that it uses to estimate fuel consumption from international maritime bunkers by using data on movements registered between national ports and a characterization of the vessels, and to use these data to obtain a better allocation of liquid fuels between domestic navigation and international marine bunkers. In response to questions raised by the ERT during the review, Spain stated that values for international marine bunkers (residual oil and gas/diesel oil) are taken directly from the IEA/Eurostat energy balance and are consistent with the results of the questionnaires provided to these institutions by MINETUR. MINETUR uses its own procedures to split marine fuel consumption between national and international navigation. These procedures are yet to be discussed by the Energy-WG. In addition, for national navigation, there are two sources of information: data from the official energy balance and information on fuel consumption per individual ship belonging to the companies within the Spanish Entrepreneurial Association (ANAVE). Data from ANAVE's ships were collected following an agreement between Puertos del Estado and ANAVE. Since ANAVE data are only available until 2001, for the remaining years expert judgement based on the evolution of maritime activity was used to extrapolate the time series. The ERT commends Spain's ongoing efforts and recommends that the Party improve the documentation of the procedures it uses, including expert judgement, and report on the progress made by the Energy-WG in discussing this issue in its next annual submission.

55. There are large inter-annual variations in the time series relative to CO_2 emissions from marine bunkers, which were also identified in previous review reports, as follows: an increase of 46.0 per cent in the period 1995–1996; and an increase of 23.3 per cent in the period 1996–1997. The ERT reiterates the recommendation in the previous review report that Spain include in the NIR of its next annual submission a discussion of the AD and emission estimates for international bunker fuels, including an analysis of the emission trends and drivers.

Feedstocks and non-energy use of fuels

56. In previous review reports it was concluded that the information provided in the NIR regarding the quantities of the carbon fraction emitted from or stored in products was incomplete, in particular the amount of natural gas and petroleum coke stored in non-energy uses. Recommendations in the previous review reports included that Spain continue its efforts to identify and report all uses of natural gas and petroleum coke for feedstocks and non-energy use of fuels and to allocate any emissions to the appropriate categories. The ERT found that the Party stated in its 2012 annual submission (footnote 5 of annex 4 to the NIR) that investigations have been carried out in this regard, but no relevant detailed and transparent information has been provided. The present ERT reiterates the recommendation in the previous review reports that the Party provide more information on the use of feedstocks and non-energy fuel use reported in the energy balance in its next annual submission, in order to improve the transparency of the NIR.

3. Key categories

Stationary combustion: all fuels – all gases

57. In the previous review report it was recommended that Spain enhance the usage 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.[16] The ERT noted some improvements due to the use of plant-specific data for specific categories, such as public electricity and heat production, petroleum refining and power generation in the category commercial/institutional, on the basis of the analysis of information gathered from research conducted by MINETUR and IDAE. In addition, expert judgement has been used to increase the accuracy of the estimates of fugitive emissions from oil and natural gas by identifying recovery units in plant installations which were not previously recorded. The ERT welcomes the Party's efforts in improving the accuracy of the emission estimates, but reiterates the recommendation in the previous review report that the Party enhance the national system in order to be able to use more plant-specific data available at the regional level to improve the accuracy of the estimates in a comprehensive manner, and that it report on its achievements in its next annual submission

Fugitive emissions from solid fuels– CH_4

58. In previous review reports[17] it was recommended that Spain 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 informed the ERT that it assumes that all of the gas released from mining activities is emitted, given that no information is available regarding the installation of recovery systems in underground mining or on the amount of CH_4 recovered to be used later for energy or flaring. The ERT acknowledged that this is a conservative approach and reiterates the recommendation in the previous review report that Spain complete the aforementioned study as soon as possible.

59. An increasing trend in the CH_4 IEFs has been detected for both underground and surface mining. For underground mining the value for 2010 (4.56 kg/t) is 19.8 per cent higher than the value for 1990 (3.81 kg/t). For surface mining, the value for 2010 (0.32 kg/t) is 108.7 per cent higher than the value for 1990 (0.16 kg/t). In response to questions raised by the ERT during the review, the Party informed the ERT that the CH_4 EFs are country-specific and calculated on the basis of the CH_4 content of the different types of coal at a few underground coal mining basins and expert judgement. The evolution of the IEF is determined by the weighted average contribution of gross production of each coal type multiplied by the EFs for extraction processes emissions. Spain has kept the EFs per coal type constant and, consequently, the fluctuations in the IEFs result from changes in the coal mix. Regarding underground mining, the contribution of domestically mined coal to total apparent consumption is gradually decreasing and, hence, the CH_4 IEF (per t gross production) for first treatment activities, assumed to affect total apparent consumption, shows an increasing trend. In addition, the CH_4 IEF for coal loading and storage has increased over the last three years, as a result of a larger mass of coal being stored in the electricity and heat plants and mine coal piles. With regard to open-cast mining, a change of the mix in the types of coal extracted is the key determinant of the time evolution of the IEFs, and the termination of national brown coal mining since 2008 is the main driver for

[16] FCCC/ARR/2011/ESP, paragraph 64.
[17] Including FCCC/ARR/2011/ARR, paragraph 98.

the increase in the IEF for 2008 onward, as the CH_4 content estimated for this coal type (surface-mined brown lignite) is among the lowest for mined coal.

60. In response to questions raised by the ERT during the review, the Party provided additional detailed information on the use of expert judgement for the determination of EFs. These are country-specific and derived from a single research work on the firedamp content of the coal extracted from various national underground-mining basins (survey elaborated in 1998 by the sectoral research entity contracted by the Ministry of Energy from samples of coal collected in 109 mine-layers of 19 coalfields). The issues that required expert judgement were: (a) the firedamp composition – it has been assumed that all mine gas is CH_4; (b) the characterization of coal types extracted and mining techniques (underground vs. surface mining); and (c) improving the completeness of the information on mining by establishing assumed CH_4 contents of coal from open-cast mining (in-situ gas content), which were not explicitly sampled in the aforementioned survey. The ERT found this explanation to be very useful and, thus, recommends that the Party include it in the NIR of its next annual submission.

4. Non-key categories

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

61. Previous review reports raised the issue of the lack of transparency of the reporting on military fuel consumption, and inconsistencies between the CRF tables and the NIR were found. For example, comments in the CRF tables indicate that liquid and gaseous fuel consumption and emissions from "stationary" are allocated to the category commercial/institutional, while liquid fuels from "mobile" emissions were allocated to the categories civil aviation, road transportation and navigation. However, there is no specific section in the NIR to address the category other (energy) and no explicit mention in section 3.9 of the NIR (combustion in other sectors) regarding the inclusion of military fuel consumption. In response to a question raised by the ERT during the review, the Party informed the ERT that military fuel consumption by tactical mobile equipment has been allocated according to the most similar transport mode and the fuel type consumed. The Party also informed the ERT that the relevant fuels allocated to the categories road transportation and navigation are gasoline and diesel oil, liquefied petroleum gas for road transportation and residual fuel oil and gas/diesel oil for navigation. The ERT recommends that the Party include this information in section 3.9 of the NIR regarding accounting for fuel consumption and the associated emissions for the category other (energy), in order to improve the transparency of the reporting and to maintain consistency with the CRF tables, in its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

62. In 2010, emissions from the industrial processes sector amounted to 28,020.63 Gg CO_2 eq, or 7.9 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 2,938.21 Gg CO_2 eq, or 0.8 per cent of total GHG emissions. Since the base year, emissions have decreased by 0.1 per cent in the industrial processes sector and increased by 62.4 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is the decrease in emissions that occurred for all categories, except for consumption of halocarbons and SF_6, as result of the economic downturn. However, sector-level emissions increased between 2009 and 2010, by 5.2 per cent, as a consequence of the increase in steel production and the consumption of halocarbons in refrigeration and air-conditioning equipment. The

increasing trend in the emissions from the solvent and other product use sector between the base year and 2010 is due primarily to the increase in the use of N_2O for anaesthesia, whereas CO_2 emissions from paint application declined over that period, albeit with an oscillating trend. Within the industrial processes sector, 51.9 per cent of the emissions were from mineral products, followed by 28.0 per cent from consumption of halocarbons and SF_6, 12.4 per cent from metal production and 4.6 per cent from chemical industry. The remaining 3.1 per cent were from production of halocarbons and SF_6.

63. The Party has made recalculations for the industrial processes sector between its 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the industrial processes sector is a decrease in the estimate of emissions for 2009 of 0.6 per cent. The main recalculations for 2009 took place in the following categories:

(a) CO_2 emissions from limestone and dolomite use (decrease of emissions by 61.03 Gg CO_2 eq, or 8.3 per cent);

(b) HFC emissions from consumption of halocarbons and SF_6 (decrease of emissions by 43.85 Gg CO_2 eq, or 0.6 per cent);

(c) HFC emissions from production of chlorodifluorormethane (HCFC-22) (decrease of emissions by 38.36 Gg CO_2 eq, or 13.4 per cent);

(d) CO_2 emissions from iron and steel production (decrease of emissions by 31.46 Gg CO_2 eq, or 1.9 per cent);

(e) CO_2 emissions from lime production (increase of emissions by 25.49 Gg CO_2 eq, or 1.8 per cent).

64. The Party has made recalculations for the solvent and other product use sector between its 2011 and 2012 annual submissions following changes in AD and EFs. The impact of these recalculations on the solvent and other product use sector is an increase in the estimate of emissions for 2009 of 96.75 Gg CO_2 eq or 3.8 per cent.

65. The inventory for the industrial processes and solvent and other product use sectors is complete in terms of gases, geographical coverage and categories for which there are estimation methodologies provided in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance.

66. Spain has considerably improved the transparency of its 2012 annual submission with regard to the industrial processes and solvent and other product use sectors by including in the NIR more clear and detailed descriptions of calculations and explanations which allow a better understanding of the emission trends. However, the ERT found that, in line with what was identified in previous review reports,[18] the availability of background data is often limited for confidentiality reasons, impairing the transparency and comparability of the inventory and making the assessment and review of the inventory difficult. Nevertheless in response to questions raised by the ERT during the review, confidential information was provided to the ERT. The Party also informed the ERT that it is striving to overcome confidentiality restrictions, for example by using information currently submitted by plant operators to regional authorities. The ERT reiterates the recommendations in the previous review report that, in its next annual submission, Spain assess on a case-by-case basis the appropriateness of the confidentiality claim and find alternative ways of reporting AD and IEFs without violating the existing rules on confidentiality.

[18] FCCC/ARR/2011/ESP, paragraph 107.

67. The ERT concluded that Spain has the appropriate and detailed procedures in place to collect information from individual installations and to use it in the preparation of the inventory. However, considering that the amount of information collected is probably significant, the ERT encourages Spain to strengthen its category-specific QA/QC for its next annual submission.

2. Key categories

Cement production – CO_2

68. Spain has used a tier 2 approach, based on plant-specific monitoring data, to estimate emissions from cement production. Similar to what was identified in the previous review report, Spain has not included in the NIR the background information necessary for understanding the trend in the emissions (e.g. contents of calcium oxide (CaO) and magnesium oxide (MgO) and the cement kiln dust (CKD) factor), which the Party has stated is due to confidentiality restrictions. Responding to a question raised by the ERT during the review for further clarification, Spain provided the time series of IEFs for each plant and explained that UIAE, the inventory agency, has no access to the required background information. Information reported by installations within the EU ETS is aggregated by an industrial association, which supplies to the inventory agency plant-specific data (but without reference to the industrial plant due to confidentiality restrictions) on clinker production and IEFs. In addition, Spain informed the ERT that other channels are being explored that could facilitate access to process background data at the plant level in the near future. The ERT recommends that the Party strive to improve the transparency of the information in its next annual submission by including the missing information in the NIR (i.e. CaO and MgO content and CKD factor for the whole time series). In case the required information is not available in time for the next annual submission, the ERT recommends that the Party provide a qualitative assessment of the range of IEFs and their trend, on the basis of the composition of the raw material used in the country.

Nitric acid production – N_2O

69. Spain has estimated N_2O emissions from nitric acid production using plant-specific information: emission data are available for 2008 onwards. These values were also used to derive EFs for the period 1990–2007 for the plants that still existed after 2008; default EFs from the IPCC good practice guidance were used to estimate emissions for those plants that were not operating after 2008. During the review, in order to understand the emission trend, the ERT requested that Spain provide the average EF for each production technology, as well as information on abatement devices and their efficiency, for each year of the time series. The Party provided the ERT this information, but placed it under confidentiality restrictions. The ERT recommends that, as nitric acid production is a key category, the Party improve the transparency of the information provided in the next annual submission by finding alternative ways of reporting the necessary information without violating the existing rules on confidentiality.

Iron and steel production – CO_2

70. Spain has estimated CO_2 emissions from production of steel, sinter, pig-iron and sinter using the IPCC tier 2 method by developing a carbon balance for the whole production process. Emissions from flaring are included in this category, whereas the emissions from coke production are reported 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 extinction of coke ovens).

71. The ERT considered that, generally, the methodology used by Spain is presented in the NIR in a transparent manner, although no quantitative information is included in the annual submission, owing to confidentiality reasons. This lack of transparency was already identified in the previous review report. In response to a question raised by the ERT during the review, Spain clarified that information concerning material flow, carbon content and carbon balance is reported by installations through questionnaires, and the Party provided disaggregated information on AD, IEFs and emissions for basic oxygen furnaces, electric arc furnaces, pig-iron production, sinter production and flares for the complete time series. The ERT recommends that the Party continue to explore channels that could allow direct access to background data and report this information in its next annual submission.

Aluminium production – CO_2 and PFCs

72. For the estimation of tetrafluoromethane (CF_4) and hexafluoroethane (C_2F_6) emissions from aluminium production, Spain has used the tier 2 method provided in the IPCC good practice guidance, while information on AD and parameters was gathered by means of an individualized questionnaire sent to each of the three production plants (for the 'slope' variable, a default value was used). Regarding estimating CO_2 emissions, the methodology used is that proposed by the International Aluminium Institute in its document entitled *Greenhouse Gas Emissions Monitoring and Reporting by the Aluminium Industry*, which is in accordance with the methodology suggested in *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*, which was prepared by the World Business Council for Sustainable Development (WBCDS) and the World Resources Institute (WRI). This methodology uses estimation procedures based on the balance of materials in CO_2-emitting sources during the aluminium manufacturing process, which the ERT considers to be consistent with IPCC good practice guidance.

73. Following recommendations in previous review reports, the Party has provided in the NIR qualitative information on the relative use of production technologies. In addition, in response to a question raised by the ERT during the review, Spain provided the time series of AD and IEFs (both for CO_2 and for PFCs), disaggregated by technology. However, the information provided is reported as confidential in the annual submission, as the aluminium production plants are owned by a single company. The ERT considered that the information provided clarified the issues identified in previous review reports, but reiterates the recommendation that the Party include information on the relative use of production technologies in the NIR of its next annual submission.

Production of halocarbons and SF_6 – HFCs

74. 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 emission data for 1999 onward and the IPCC default EF for the period 1990–1998, for which estimates from plants were not available. However, owing to confidentiality restrictions (the plants are currently owned by only two companies), the annual submission does not include information on AD (AD and recovery are reported as confidential ("C") in CRF table 2(II).E) and process parameters. In response to a question raised by the ERT during the review, Spain provided: information on AD and IEFs; a comparison between the IEFs and the IPCC default EF; and a detailed explanation for the time trend in emissions. The comparison of the IEFs and the IPCC default EF showed good agreement (differences are lower than 1.0 per cent and are gradually decreasing over time). To enhance the transparency of the reporting, the ERT recommends that the Party report in its next annual submission on the result of the comparison of the IEFs and the IPCC default EF.

Consumption of halocarbons and SF6 – HFC, PFC and SF_6

75. The reporting for this category is complete with regard to actual emissions and is in accordance with the IPCC good practice guidance. Spain has reported HFC, PFC and SF_6 emissions from refrigeration and air conditioning, plastic foam, firefighting, aerosols and electrical equipment. A tier 2a (bottom-up) estimation methodology was used, together with consumption data disaggregated by each specific use. Following a recommendation in previous review reports, the Party has provided clear information on the assumptions that it used to prepare the estimates, and the ERT commends the Party for this improvement.

76. However, Spain has not estimated potential emissions (reported as "NE"), providing the justification that production, import and export data are available only for some subcategories and are not complete for individual gas species. Therefore, the ERT reiterates the encouragement made in the previous review report[19] 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.

77. Emissions from semiconductor manufacture are reported as not applicable ("NA") in the CRF tables. Responding to a question raised by the ERT during the review, the Party explained that two surveys on the use of PFCs were carried out in 2007 and 2010, with both concluding that the single company producing semiconductors in the country makes no use of these substances in the manufacturing process. The ERT took note of the information provided and recommends that Spain change the notation key used to report the emissions for this subcategory from "NA" to not occurring ("NO").

3. Non-key categories

Lime production – CO_2

78. In this category, Spain has reported emissions produced in the decarbonation processes during the manufacture of lime and calcined dolomite, as well as, for 2006 onward, emissions from the production of sintered dolomite. In order to estimate CO_2 emissions from lime production, Spain multiplied the production AD provided by the industrial association by the default EFs provided in the Revised 1996 IPCC Guidelines and also took into consideration the degree of purity of the material. The time series of CO_2 EFs, calculated by multiplying the default EF by the degree of purity of the material, is provided in the NIR, as recommended in the previous review report.

79. However, in response to a question raised by the ERT during the review, Spain recognized that the information supplied by the industrial association does not cover the production of lime as a non-marketed intermediate in a number of applications and reported that it was conducting research aimed at identifying such production and providing appropriate AD. In particular, Spain is aware that lime is produced in sugar mills, but does not account for the corresponding emissions in the category lime production, assuming that the CO_2 produced is captured in a subproduct (scum) that is used for soil amelioration. The ERT noted that insufficient information has been included in the NIR and, in particular, that it is insufficient to conclude whether the total flow of CO_2 produced is captured or whether a portion is emitted.

80. The ERT concluded that the lack of consideration of emissions from the production of lime in sugar mills indicated that the inventory was potentially incomplete for the industrial processes sector and included this on the list of potential problems and further questions raised by the ERT during the review week. During the review, Spain provided

[19] FCCC/ARR/2011/ESP, paragraph 22.

AD for the five plants that produce lime in sugar production facilities in Spain, as well as preliminary estimates of CO_2 emissions released from those plants.

81. Responding to the list of potential problems and further questions raised by the ERT during the review week, the Party submitted on 5 November 2012 revised estimates of CO_2 emissions from lime production (the estimate for 2010 had been increased by 3.93 Gg CO_2 eq), together with detailed information on the assumptions and methodology used to estimate emissions occurring from the production process and the part of the carbon that is retained in the limestone and used in agricultural soils (about 90 per cent of the carbon in the original carbonates used as input to the industrial process is retained).

82. After assessing the revised calculations, the background information and the descriptive summary of the calculations provided by Spain, the ERT concluded that the revised estimates are in accordance with the Revised 1996 IPCC Guidelines and that the industrial processes sector inventory is complete. It recommends that the Party include the detailed information on the revised estimates in its next annual submission. The ERT also recommends that the Party analyse the possibility of CO_2 emissions from the use of the subproduct (scum) in the agriculture and LULUCF sectors (see para. 119 below).

Soda ash production and use – CO_2

83. Spain has estimated CO_2 emissions from soda ash production using AD and EFs provided by the industry, while emissions from soda ash use were calculated by multiplying the apparent consumption of sodium carbonate by the EF of 0.415 t CO_2/t sodium carbonate from the Revised 1996 IPCC Guidelines. However, produced and consumed quantities of soda ash and the corresponding IEFs are reported as "C" in the CRF tables for both subcategories.

84. In response to a question raised by the ERT during the review, Spain provided the time series of AD and IEFs for both production and use of soda ash, and explained that production data had been considered confidential owing to the fact that only one company produces soda ash in Spain, while data on use had been held as confidential in order to preserve the confidentiality of the production data. The ERT did not agree that this constitutes a valid justification for reporting the consumption of soda ash as "C". The ERT recommends that Spain remove the confidentiality of the AD used to estimate emissions from soda ash use and, given that the value selected for the EF is the default, that the Party change the use of the "C" notation key to report the IEF.

Ammonia production – CO_2

85. Although fuel consumption data are available for 2005 onward, Spain has estimated CO_2 emissions from ammonia production on the basis of production data and EFs supplied by plant operators. The ERT noted that, in accordance with the Revised 1996 IPCC Guidelines, this method is less accurate and presents the risk of double counting emissions also under the energy sector. In response to a question raised by the ERT during the review, the Party stated that natural gas used in ammonia production is considered as non-energy consumption and not included under the energy sector. The ERT took note of the information provided by Spain and encourages the Party, in its next annual submission, to use available fuel consumption data to check the estimates for the same year obtained using production data, for the years that all of the relevant information is available, as a way of verifying the EF supplied by plant operators, for the rest of the time series.

D. Agriculture

1. Sector overview

86. In 2010, emissions from the agriculture sector amounted to 40,013.76 Gg CO_2 eq, or 11.2 per cent of total GHG emissions. Since 1990, emissions have increased by 6.6 per cent. The key driver for the rise in emissions is the overall 29.6 per cent increase in emission from manure management (37.6 per cent increase in CH_4 emissions and 15.8 per cent increase in N_2O emissions). Although emissions from rice cultivation have increased significantly since the base year (by 32.1 per cent), the low emission levels did not have a significant impact on the national totals. Within the sector, 47.1 per cent of the emissions were from agricultural soils, followed by 30.9 per cent from enteric fermentation, 20.1 per cent from manure management and 1.2 per cent from field burning of agricultural residues. The remaining 0.8 per cent were from rice cultivation.

87. Spain has made recalculations for the agriculture sector between its 2011 and 2012 annual submissions, following small changes in AD owing to the availability of new information and some methodological changes. The impact of these recalculations on the agriculture sector is a decrease in the estimate of emissions for 2009 of 0.4 per cent. The main recalculations took place in the category N_2O emissions from agricultural soils (the emission estimate for 2009 decreased by 298.85 Gg CO_2 eq or 1.7 per cent).

88. The ERT concluded that the agriculture sector inventory is complete, as it includes all gases, covers all of the national territory and includes all categories for which emissions occur in Spain.

89. The ERT noted that transparency of the agriculture sector has improved since the previous annual submission, for example by including a figure (figure 6.2.4 in the NIR) that facilitates the understanding of the rationale used to derive country-specific EFs for swine and poultry. The ERT commends the Party for this improvement, which responds to recommendations in the previous review report.

90. The ERT noted that chapter 6.6 of the NIR in the original Spanish version is entitled "Other key sources" ("Otras fuentes clave"); however, this is not correct, as that part of the NIR deals with the non-key categories under the agriculture sector. The ERT recommends that the Party correct this in its next annual submission.

2. Key categories

Enteric fermentation – CH_4

91. Spain has used a country-specific tier 2 method to estimate emissions from enteric fermentation for swine, IPCC tier 2 methods to estimate emissions for cattle and sheep, and tier 1 methods to estimate emissions for the other animal species. The ERT considered that this methodological approach is in accordance with the IPCC good practice guidance, as for the most significant animal species the emissions are estimated by applying higher-tier methods.

92. The ERT recognized an important improvement in the 2012 annual submission in comparison with the previous annual submission, namely the improvements made to the explanatory text on the derivation of the EFs for swine (pages 6.14–6.16 of the NIR, chapter entitled "Ganado porcino"). The Party has, therefore, followed the recommendation in the previous review report that it include brief information on the country-specific tier 2 method implemented. Important features of the method are the differentiation between the two major breeds of swine existing in Spain (white and black Iberian pigs) and the consideration of their typical diets on the basis of expert judgement. However, the ERT

reiterates the recommendation in the previous review report that the Party include, in the NIR of its next annual submission, a summary table containing information that could improve transparency of this issue (e.g. by providing EFs for selected examples).

Manure management – CH_4 and N_2O

93. To estimate CH_4 emissions from manure management, Spain has used country-specific tier 2 methods for swine and poultry (hens and chicken), IPCC tier 2 methods for dairy cattle and non-dairy cattle and a tier 1 method for other animal types. The ERT considered this approach to be in line with the IPCC good practice guidance, as for the most significant animal species the emissions are estimated using higher-tier methods.

94. The ERT reiterates recommendations in the previous review report that Spain, in its next annual submission, provide additional information on the animal waste management system (AWMS) and the share of AWMS that are specific to Spain,[20] focusing on the differences between those described in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

95. In response to a question raised by the ERT during the review concerning advances in QC procedures related to the surveys sent to animal producers on animal waste management systems, the Party provided a response from a regional questionnaire as an example, as well as a clarification of the operational preparation and management of the survey and the personnel involved. The ERT recommends that the Party include a description of the used QC procedures in the NIR of its next annual submission.

Agricultural soils – N_2O

96. On page 6.29 of the NIR, Spain has reported the "Decision tree to estimate direct N_2O emissions from agricultural soils", as included in the IPCC good practice guidance. Spain has estimated N_2O emissions from agricultural soils using the IPCC tier 1 methodology, disaggregated as 1a and 1b, and country-specific values for the following parameters: $Frac_{GASF}$; $Frac_{GASM}$; $Frac_{GRAZ}$; the ratio of above-ground biomass to crop product mass; the fraction of dry matter in above-ground biomass; and $Frac_{NCRBF}$.

97. In response to questions raised by the ERT during the review, the Party provided some explanations for some trends in fractions, which were not explained in the NIR. The ERT recommends that the Party include similar explanations to the following in the NIR of its next annual submission:

(a) The overall trend in $Frac_{BURN}$ is decreasing (the value for 2010 (0.20 ratio) is 36.4 per cent lower than the value for 1990 (0.31 ratio)). The Party informed the ERT that field burning of agricultural residues decreased over that period for most crops, except olive and vineyard residues (these crop burning practices are currently being studied);

(b) The overall trend in $Frac_{GASF}$ is increasing (the value for 2010 (0.065 ratio) is 7.5 per cent higher than the value for 1990 (0.060 ratio). The Party explained to the ERT that the ratio of nitrogen (N) volatilized as ammonia (NH_3) and nitrogen oxide (NO_x) was obtained by employing the methodology from the EMEP/CORINAIR guidebook.[21] In accordance with that methodology, NH_3 volatilization varies depending on the fertilizer used. As the fertilizer mix varies over time, as it depends strongly on fertilizer prices, it affects the amount of N volatilized as NH_3 and $Frac_{GASF}$;

(c) The overall trend in $Frac_{GASM}$ is decreasing (the value for 2010 (0.197 ratio) is 3.9 per cent lower than the value for 1990 (0.205 ratio). The Party informed the ERT that

[20] FCCC/ARR/2011/ESP, para. 131.

[21] The country-specific parameters are based on the 2009 methodology from the EMEP/EEA air pollutant emission inventory guidebook.

the IPCC default values are not used to calculate $Frac_{GASM}$, since the NH_3 and NO_x emissions are calculated using methodologies based on those in the EMEP/CORINAIR guidebook and, therefore, these parameters are country-specific. The fluctuations in the fraction over time result from the variability in the mix of animals and their different NH_3 EFs (the NO_x EF remains constant);

(d) The overall trend in $Frac_{GRAZ}$ is decreasing (the value for 2010 (0.38 ratio) is 4.5 per cent lower than the value for 1990 (0.40 ratio)). The Party confirmed to the ERT that this parameter is neither fixed nor the IPCC default value, but estimated taking into consideration the fluctuations in the fraction due to the changing mix of animals and their management practices;

(e) The trend in $Frac_{NCRO}$ is decreasing (the value for 2010 (0.005 ratio) is 3.4 per cent lower than the value for 1990 (0.006 ratio)). The Party explained that as crop mix varies from year to year so its average "fraction of residues dry biomass that is N" also varies, which explains the trend.

3. Non-key categories

Field burning of agricultural residues – CH_4 and N_2O

98. Recommendations in the previous review report included that Spain include information on the legal status of field burning of agricultural residues in the NIR of its 2012 annual submission; however, the ERT could not find such information in the NIR. Therefore, the ERT reiterates the recommendation in the previous review report that the Party include information on the legal bodies that regulate, control and/or forbid the use of fire on agricultural land in its next annual submission.

E. Land use, land-use change and forestry

1. Sector overview

99. In 2010, net removals from the LULUCF sector amounted to 28,953.38 Gg CO_2 eq. Since 1990, net removals have increased by 51.5 per cent. The key driver for the rise in removals is the increase in carbon stock of land converted to forest land since 1990 and the increase in carbon stock of mineral soils on cropland remaining cropland since 2005. Within the sector, 25,156.29 Gg CO_2 eq of net removals were from forest land, followed by 3,420.14 Gg CO_2 eq from cropland and 934.23 Gg CO_2 eq from grassland. Settlements accounted for net emissions of 557.28 Gg CO_2 eq. Emissions and removals from wetlands and other land are reported as a combination of "NO" and "NE".

100. Spain has made recalculations for the LULUCF sector between its 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and in order to rectify internally identified errors. The impact of these recalculations on the LULUCF sector is a decrease in the estimate of removals for 2009 of 0.3 per cent. The main recalculations took place in the following categories:

(a) Forest land remaining forest land: increase in the estimate of net removals for 2009 by 71.49 Gg CO_2 eq, or 0.4 per cent, owing to a change to the methodology for estimating the variation in the living biomass carbon pool. In the 2012 annual submission, variations in the living biomass carbon pool were calculated using the area that remain forest from one year to another;

(b) Land converted to forest land: decrease in the estimate of net removals for 2009 by 37.34 Gg CO_2 eq, or 0.6 per cent, owing to the change to the disaggregation of wildfires between forest land remaining forest land and forest land in transition. This

modification was due to the use of areas to disaggregate wildfires, instead of biomass as was used for the previous annual submission;

(c) Cropland remaining cropland: decrease in the estimate of removals for 2009 by 117.73 Gg CO_2 eq, or 3.7 per cent, owing to the update of the woody crop areas subject to soil preservation practices.

101. Spain's inventory for the LULUCF sector is generally in accordance with the IPCC good practice guidance for LULUCF for most of the reported land categories, and is documented in a transparent manner. However, the inventory for the LULUCF sector is not complete. Some categories are reported as "NE", due to problems with the application of methods (all carbon pools for grassland remaining grassland; and living biomass for cropland converted to grassland) or a lack of AD (CO_2, CH_4 and N_2O emissions from controlled burning on forest land remaining forest land and from wildfires on cropland remaining cropland, grassland remaining grassland, wetlands remaining wetlands and other land remaining other land). Some carbon pools are reported as "NE", with the argument that they are not net emission sources (e.g. carbon stock change in dead organic matter and mineral soils for forest land remaining forest land and other land converted to forest land; carbon stock change in dead organic matter for cropland remaining cropland; carbon stock change in soils for land converted from cropland, grassland and other land to settlements; and all carbon pools for the conversion of cropland and grassland to other land). As indicated in the previous review report, carbon stock change and GHG emissions are not reported for herbaceous crops for cropland and for grassland remaining grassland, or for a fraction of the forest land categories (land converted to forest land without human intervention). The ERT reiterates the previous strong recommendation 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.

102. The previous review report identified as an unresolved problem[22] the fact that land-use areas and soil management in the period 1970–1990 are assumed to be constant and are not reported in the NIR. In response to questions raised by the ERT during the review, the Party explained that work is currently 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 has yet been identified. The ERT acknowledged the usual constraints faced when working with historical maps and data and recommends 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 from the LULUCF sector in its next annual submission.

103. 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 transitions: the values provided in table 7.2.1 of the NIR for net removals of CO_2 in transitions to and from forest land are on average 10 per cent lower than CO_2 emission/removals estimates of land converted to forest land as reported in CRF tables for all years except 1990. In response to a question raised by the ERT during the review, Spain recognized that the values reported in the NIR are incorrect (the values do not include emissions/removals in the pool mineral soils) and confirmed that the values reported in the CRF tables are correct. The ERT noted the clarification and recommends that the Party improve its QC processes in order to ensure consistency between the NIR and the CRF tables in next annual submission.

[22] FCCC/ARR/2011/ESP, paragraph 147(c).

2. Key categories

Forest land remaining forest land – CO_2

104. In 2010, 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 97.0 per cent in 1990. Carbon stock change in living biomass (above-ground and below-ground) was estimated using the stock change method with country-specific parameters (tier 2). Carbon stock change in organic soils was reported as "NO". For the other carbon pools (dead organic matter and mineral soils), the IPCC tier 1 method was used, resulting in the reporting of no carbon stock change over time (Spain has reported these pools as "NE").

105. In previous review reports[23] it was recommended that the Party use higher-tier methods for estimating carbon stock changes for dead organic matter and soil organic carbon in its reporting on forest land remaining forest land, because the IPCC good practice guidance for LULUCF excludes the use of tier 1 methodologies when the stock change method is used. In response to a question raised by the ERT during the review regarding details on planned improvements, Spain explained that an investigation is under way and several options are being considered, including: using data from the large-scale forest condition monitoring network (level I or II); using raw data from the second and third National Forest Inventories (NFIs); adapting neighbour countries' methodologies to the Spanish situation; or using clean development mechanism methodologies or IPCC default values. Also, Spain pointed out that no decision on the way forward has been taken yet, as the availability of information and the relevance of methodologies to Spain is still being studied. The ERT welcomes this investigation and strongly recommends that Spain continue its efforts to move to higher-tier estimation methods for pools reported under this key category and report on progress in its next annual submission.

106. Net removals from forest land remaining forest land show a linear decreasing trend (by 0.1 per cent) between 1990 and 2009, but a sudden increase between 2009 and 2010 (by 0.2 per cent). During the review, Spain informed 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. The ERT considered that this trend is not consistent and is the result of not considering pre-1990 forest transitions in emission estimates. In addition, , the Party explained that three NFIs have been completed so far (the fourth is ongoing) and that, for the purpose of time-series comparisons, relevant data for the inventory were collected only since the second NFI. The first NFI, which was compiled between 1966 and 1975 and would provide suitable data on transitions occurring around 1970, is not suitably ready for such comparison. The ERT acknowledged the usual challenges of working with historical data sources and recommends that the Party explore ways of reconciling these data sources and improve the consistency of its time series by considering the effect of pre-1990 forest transitions for its next annual submission.

107. Recommendations in the previous review report included that Spain report the density and biomass expansion factor parameters used to estimate carbon stock in biomass in a disaggregated manner in the NIR, in order to improve the transparency of the reporting. However, the ERT concluded that the disaggregated parameters have not yet been reported. In response to a question raised by the ERT during the review, Spain 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. The

[23] FCCC/ARR/2010/ESP, paragraph 113, and FCCC/ARR/2011/ESP, paragraph 151.

ERT noted this initiative, but reiterates the recommendation in the previous review report that the Party transparently report these parameters in a disaggregated manner in the NIR of its next annual submission.

Land converted to forest land – CO_2

108. In 2010, this category was responsible for 22.4 per cent of the total GHG net removals from the LULUCF sector, up from 0.5 per cent in 1990. Carbon stock change in living biomass (above-ground and below-ground) was estimated using the default method with country-specific parameters (tier 2). With the exception of other land converted to forest land, carbon stock change in mineral soils was also estimated using a tier 2 method, and carbon stock change in dead organic matter was reported as "NE" for cropland, grassland and other land, supported by the argument that these pools are not net sources of carbon. The ERT reiterates the recommendation in previous review reports that Spain improve the accuracy of the inventory by providing estimates for the dead organic matter carbon pool in its next annual submission.

109. The previous review report mentioned that 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 carbon stock change. The ERT reiterates the strong recommendation in the previous review report that Spain develop and use for the inventory a more accurate characterization of land converted to forest land.

Cropland remaining cropland – CO_2

110. In 2010, this category was responsible for 11.8 per cent of the total GHG net removals from the LULUCF sector, up from 4.9 per cent in 1990. Carbon stock change in living biomass (above-ground and below-ground) was estimated using a tier 2 method. Carbon stock change in mineral soils was estimated using a combination of tier 1 and tier 2 methods with country-specific reference values for reference soil organic carbon contents and IPCC default values for the stock change factors, while carbon stock change in dead organic matter was reported as "NE", with the supporting argument that it is in neutral balance.

111. Chapter 10 of the NIR mentions a plan to study the occurrence of carbon stock change in dead organic matter and soil stocks on cropland. The ERT welcomes this plan and encourages Spain to implement this improvement and revisit the assumption of no carbon stock change in dead organic matter for its next annual submission.

112. In the previous review report it was noted that the coverage of land area for this category is incomplete, because it includes land with permanent crops only. Chapters 7 and 10 of the 2012 NIR mention Spain's current efforts to collect information on soil crop management practices for herbaceous crops and fallows. The ERT noted these efforts and reiterates the recommendation in the previous review report that the Party improve the completeness of its inventory by providing estimates of carbon stock change and GHG emissions for land with temporary crops and fallow in its next annual submission.

113. In the previous review report it was strongly recommended that Spain stratify the areas of cropland following the IPCC good practice guidance for LULUCF, and resolve the inconsistency in soil depth between the reference soil organic carbon contents and the IPCC stock change factors (Spain uses 1 m instead of the IPCC reference value of 30 cm). In chapter 7 of its 2012 NIR, Spain has mentioned plans to obtain information at the regional level and to review the categorization of soil organic carbon stock change factors for management practices for woody crops. With regard to the inconsistency in the soil depth

value, Spain has mentioned in the NIR that it intends to obtain soil organic carbon (SOC) values for a 30 cm depth. The ERT noted these planned improvements and reiterates the strong recommendation in the previous review report that Spain stratify the areas of cropland and resolve the inconsistency in soil depth between the reference soil organic carbon contents and the IPCC stock change factors in its next annual submission.

114. The ERT noted that the IEF for carbon stock change in mineral soils for cropland remaining cropland is reported as 0.00 Mg carbon (C)/ha for the period 1990-2005, with increasing values reported thereafter up to the value for 2010 (0.05 Mg C/ha). In response to a question raised by the ERT during the review, Spain referred to explanations already provided in the NIR, stating that there is only one statistical source of information regarding soil management practices for woody crops, the Survey on Areas and Agriculture Yields (ESYRCE),[24] whose information started in 2006. Acknowledging this as a drawback in relation to the existing information that would be necessary to develop a proper assessment of the carbon stock changes in the period 1990–2005, expert judgement has been used to estimate the values around 1990, and the conclusion was that most likely the management practices for woody crops resulting in increased removals may have started at a significant level only a few (3–4) years before 2006. The ERT acknowledged the existing constraints due to the lack of information on soil management practices around the base year and strongly recommends that the Party explore ways of improving the accuracy and consistency of the time series for its estimates of carbon stock change in mineral soils for cropland, by developing an actual tier 2 method, for its future annual submissions.

3. Non-key categories

Land converted to settlements – CO_2

115. Land converted to settlements was responsible for emissions of 557.28 Gg CO_2 in 2010, which represents an increase of 13.7 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 was responsible for 47.5 per cent of the emissions in the category, whereas conversions from other land and from forest land represented 32.0 per cent and 19.4 per cent of the emissions, respectively.

116. Spain has decided to use one year as the transition period for land converted to settlements (instead of the 20-year period suggested in the IPCC good practice guidance for LULUCF), and has assumed that all losses in carbon stock of biomass, dead wood (for forest land only) and soils (for forest land only) associated with this category occurred in the year of conversion, and that all of the biomass and dead wood, and 20 per cent of the soil organic carbon, are lost when land is converted to settlements. Spain has justified its decision on the basis that these transitions take less than a year and that living biomass, dead wood and litter are removed in the initial phases of these works. In response to a question raised by the ERT during the review in relation to the fate of the carbon after being removed from the site in the case of forest conversion to settlements, Spain noted that the elected methodological approach, which is in accordance with the IPCC good practice guidance for LULUCF, does not require that information. The ERT agreed, but still considered that such information would better support Spain's current assumption that all carbon is oxidized in the year of conversion. The ERT encourages the Party to provide evidence to support its current assumption in the NIR of its next annual submission or, if that is not possible, to revise its methodology for estimating the effect of land conversions to settlements.

[24] Encuesta sobre Superficies y Rendimientos Cultivos in the Spanish original.

117. As noted in the previous review report, the area of land converted to settlements has remained constant throughout the time series 1990–2010 at 20.47 kha/year. In response to questions raised by the ERT during the review, Spain indicated that data on land cover were collected only for 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 land cover maps from the European programme CORINE (Coordination of Information on the Environment)), the areas of settlements and of land converted to settlements have a relatively high uncertainty. The NIR mentioned a plan to seek additional information in order to improve the current estimation of the areas of land converted to settlements. The ERT welcomes this plan and reiterates the recommendation in the previous review report that Spain improve the accuracy of its estimation of the areas of land that have been converted to settlements by collecting more recent AD for the entire time series and to report thereon in its next annual submission.

118. The ERT noted that, in spite of the fact that the area of forest land converted to settlements was constant over the time series (see para. 117 above), the IEF values for carbon stock losses in the living biomass and dead organic matter pools kept increasing (e.g. the IEF for carbon stock change in living biomass for 2010 was 37.2 per cent higher than the same value for 1990). In response to a question raised by the ERT during the review, Spain explained that living biomass/ha forest is not constant for the entire time series, but is estimated using the second and third NFIs, and that carbon stock losses in both living biomass and dead wood depend on the amount of living biomass/ha (parameter Gt). During the review, Spain provided to the ERT a spreadsheet containing 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/ha 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 recommends that Spain include the additional information provided to the ERT in the NIR of its next annual submission, in order to improve transparency.

Emissions from liming of agricultural soils – CO_2

119. The previous ERT noted that Spain reported that the application of lime to agricultural land did not occur in the country, even though there was an indication that calcium carbonate residues from the sugar industry were applied to soils (see paras. 79 – 81 above). The previous review report concluded that if this was the case, and if the emissions were not included under the industrial processes sector, this would represent an underestimation of emissions. The ERT noted that the same potential problems remained in the 2012 annual submission. Responding to the list of potential problems and further questions raised by the ERT during the review week, Spain provided a revised time series of estimates of the lime produced and revised estimates of CO_2 emissions from lime production under the industrial processes sector (see para. 82 above). In its response and in section 7.2 of the NIR, Spain mentioned studies on the possible application of lime subproducts in agriculture. The ERT welcomed such studies and strongly recommends that Spain revisit the assumption that liming of agricultural soils does not occur in the country, and in particular the use of carbonate residues from the sugar industry, and, if deemed necessary, report emissions for this category (e.g. in CRF table 5(IV)) and document on this issue in the NIR of its next annual submission.

Biomass burning – CO_2, CH_4 and N_2O

120. The previous review report noted a potential underestimation of emissions, because Spain reported emissions from biomass burning in controlled fires as "NE", explaining 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. Chapter 10 of

the NIR mentions Spain's plan to seek additional information on the practice. The ERT welcomed this plan and reiterates the recommendation in the previous review report that Spain collect AD to enable the estimation of emissions for this category for future annual submissions.

121. While CO_2 emissions from biomass burning due to wildfires having occurred on land converted to forest land are transparently reported in CRF table 5(V), Spain has not applied the same approach to reporting such emissions for 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, 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 review, Spain explained that, since its methodology is based on net variation between consecutive NFIs, biomass gains and losses cannot be estimated separately; and since 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 reporting and recommends 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

122. In 2010, emissions from the waste sector amounted to 15,093.80 Gg CO_2 eq, or 4.2 per cent of total GHG emissions. Since 1990, emissions have increased by 99.5 per cent. The key drivers for the rise in emissions are the rise in CH_4 emissions for all subcategories of the waste sector except other, and the increase in N_2O emissions from wastewater handling. These increasing trends in emissions were caused mainly by the increasing population and the percentage of the population served by managed landfills and connected to wastewater treatment plants, as well as being due to the fact that waste treatment methods such as composting, selective collection, waste incineration and CH_4 recovery have developed at a slower pace than traditional systems; for example, municipal solid waste (MSW) disposed of in landfills still accounted for 64 per cent of all MSW generated in the country in 2010. Within the sector, 75.8 per cent of the emissions were from solid waste disposal on land, followed by 23.9 per cent from wastewater handling, 0.2 per cent from other and 0.1 per cent from waste incineration.

123. Spain has made recalculations for the waste sector between its 2011 and 2012 annual submissions, following changes in AD and parameters and owing to the addition of a new category (anaerobic digestion at biogas facilities, reported in the category other) and in response to the 2011 annual review report. The impact of these recalculations on the waste sector is a decrease in the estimate of emissions for 2009 of 9.1 per cent and for 1990 of 1.1 per cent. The main recalculations for 2009 took place in the following categories:

(a) CO_2 and CH_4 emissions from solid waste disposal on land: decrease in the estimate of emissions by 768.15 Gg CO_2 eq or 6.4 per cent;

(b) CH_4 and N_2O emissions from other (waste): decrease in the estimate of emissions by 691.27 Gg CO_2 eq or 94.2 per cent;

(c) Wastewater handling: decrease in the estimate of N_2O emissions by 22.07 Gg CO_2 eq or 0.6 per cent.

124. The inventory for the waste sector is complete, covering all gases and categories. The reported information on the waste sector is complete, including all required information on uncertainties, QA/QC, recalculations and planned improvements.

125. The information on the waste sector in the NIR is presented, generally, in a transparent manner. However, the ERT considered that some issues require additional transparency, for example regarding waste treatment practices in Spain, the interrelations and flow of the waste treatment, and the movement and distribution of different parts of waste between subcategories in the sector (e.g. sludge-dried and later incinerated or deposited at landfill sites). The ERT recommends that Spain improve the transparency of the reporting in its next annual submission by supplementing the NIR with the additional information provided during the review (see paras. 135 and 141 below).

126. Consistent with observations in the previous review report, the present ERT noted that the uncertainty of the emission estimates for the waste sector remains high, mostly because of the use of default EFs, as well as the lack of complete AD for some categories and the consequent use of interpolation and data from non-official statistics. Therefore, the ERT welcomes Spain's plan, referred to in the NIR, to improve the collection of AD for its next annual submission.

127. The ERT commends Spain for adding estimates for biomethanization in the category other (waste) (reported as anaerobic digestion at biogas facilities), as it was encouraged to do in the previous review report, and encourages the Party to continue to explore other possible sources of emissions (e.g. composting practices).

2. Key categories

Solid waste disposal on land – CH_4

128. 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. The collection of the necessary AD varies in accordance with the type of waste: for managed landfill sites in large installations, and for biogas collection, data are obtained via questionnaires on landfill activities; while for the other landfills (smaller managed landfills and unmanaged landfills) data from the statistical yearbooks published annually by MAGRAMA[25] are used. The ERT concluded that the estimation methodology and calculation of emissions are in accordance with the IPCC good practice guidance.

129. However, the ERT noted that, in line with what was identified in the previous review report, for the waste sector, substantial use is made of IPCC default values for the parameters used in the calculations (e.g. for the methane conversion factor (MCF), the fraction of degradable organic carbon (DOC) dissimilated and the methane generation rate constant (k)). The Party informed the ERT during the review that it will work to improve these parameters for the next annual submission.

130. In addition, the ERT concluded that there are other instances where Spain has not used sufficient country-specific data or provided sufficient justification to ensure the accuracy of the estimates for this key category; for example: Spain has not provided sufficient justification in the NIR for the use of some parameters (e.g. for the oxidation factor, there is no reference to management practices); the Party has not considered fractions of MSW when determining k values, instead using the same value for all fractions

[25] Entitled *Environment in Spain* (*Medio ambiente en España* in Spanish).

of MSW; the Party has not supported with data the assumption that 50 per cent of waste is deposited in deep and 50 per cent in shallow unmanaged landfills; and DOC values have still been extrapolated for the period 1997–2010, regardless of recommendations made in previous review reports.

131. Furthermore, the ERT found some inconsistency between the information obtained by the questionnaires, as provided by the Party during the review, and the MSW composition reported in the NIR: the MSW composition reported in the NIR excludes garden and park waste, as well as sludge from wastewater treatment, which are deposited in landfills after having been dried. This impairs also the accuracy of the DOC value. Spain clarified to the ERT during the review week that this situation results mostly from differences between levels of accessibility to information for individualized and non-individualized landfills. Therefore, the ERT reiterates the encouragement made in previous review reports for Spain to enhance its efforts to establish country-specific parameters, improve the AD collection process and recommends that Span increase the transparency of the documentation of its choice of parameters for its next annual submission.

132. The ERT also reiterates the recommendations in the previous review reports[26] that the Party: update the time series of composition of waste and calculated DOC values for the period 1997–2009, which were kept constant, 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.

Wastewater handling – CH_4 and N_2O

133. 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. Emissions from industrial wastewater from area sources are reported in the category industrial wastewater, while emissions from point sources are reported in the subcategory other (wastewater handling). The ERT encourages the Party to report emissions from industrial point sources together with area sources under the category industrial wastewater, separating emissions from wastewater from emissions from sludge, to enhance comparability, in its next annual submission.

134. As identified in the previous review report, Spain uses a limited number of country-specific values for the calculation of CH_4 EFs for domestic, commercial and industrial wastewater: it uses IPCC default values for biological oxygen demand (BOD) 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. For industrial point sources, the EFs were obtained directly from the EMEP/CORINAR guidebook (expressed in g CH_4/m^3 treated water). Taking into consideration that this is a key category, the ERT reiterates the encouragement in the previous review report for the Party to develop country-specific EFs for the estimation of emissions for this category and to report thereon in its next annual submission.

135. The ERT considered that the NIR is not sufficiently transparent regarding under which subcategories of the waste sector the sludge fractions are reported: emissions from all sludge spread drying is reported in the category other (waste); after the drying process, part of the sludge is incinerated; another part is deposited in landfills; and the remaining part is reported in the category wastewater handling. The Party provided some of the requested information, in response to questions raised by the ERT during the review. The ERT recommends that Spain enhance transparency in its next annual submission regarding the fractions of sludge and the treatment pathway. For example, the ERT recommends that Spain, in its next annual submission, provide a table or tables in the NIR with a quantitative

[26] FCCC/ARR/2010/ESP, paragraphs 123–125, and FCCC/ARR/2011/ESP, paragraphs 176.

balance of the sludge portions, enabling the process from sludge removal to its end-use to be followed and ensuring that there is no double counting or underestimation of the associated emissions.

136. N_2O emissions from wastewater handling have been estimated using the methodology from the 2006 IPCC Guidelines. An updated time series for protein consumption for the period 1990–2009, provided by official sources (the Directorate-General for Industry and Markets at MAGRAMA), was used for recalculations, which resulted in a decrease in the estimate for 2009 of 22.09 Gg CO_2 eq in comparison with the estimate reported in the previous annual submission. The ERT commends the Party for its efforts and the improvements made to the inventory and encourages it to periodically update the data on protein consumption for its future annual submissions.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

137. The ERT noted that the emissions from burning 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 ERT reiterates the recommendation in a previous review report[27] that the Party report them in the category waste incineration in its next annual submission and improve the reporting by including a description for all subcategories, in the NIR of its next annual submission.

Other (waste) – CH_4

138. 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. The latter source was included in the inventory for the first time in the Party's 2012 annual submission and the ERT comments the Party for this action, which has increased the completeness of the inventory.

139. However, the ERT found that the description of the estimates for this category is not transparent and recommends that the Party improve the description of the methodology used to estimate emissions from other (waste) in the NIR of its next annual submission, including data on the quantity of CH_4 burnt (in mass units) and the EFs that are used for flaring.

140. The ERT noted that the Party reported emissions from the portions of sludge landfilled (reported in the category solid waste disposal on land) and sludge used in agriculture (reported in the category direct soil emissions in the agriculture sector). The ERT commends the Party for this achievement. However, the ERT found that the quantity of landfilled sludge is not reflected in the composition of waste that is used to estimate emissions for the category solid waste disposal on land (only MSW is considered).

141. In addition, the ERT reiterates the assessment made in the previous review report concerning the high uncertainty of the data, parameters and EFs used in the estimations for sludge spreading. Taking into consideration all of the above-mentioned facts, the ERT recommends that the Party 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 where they occur: solid waste disposal on land, waste incineration, agricultural soils, energy and wastewater handling (for the remaining portion), taking into account a complete

[27] FCCC/ARR/2010/ESP, paragraph 125.

balance of the organic matter contained in the waste fractions. The ERT recommends that the Party report thereon in its next annual submission.

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

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

143. The Party's reporting is generally in accordance with the reporting requirements: it has provided supplementary information on KP-LULUCF activities, in accordance with the requirements outlined in decision 15/CMP.1, annex, paragraphs 5–9. Information for the period 2008–2010 and for the base year (1990) has been reported in the KP-LULUCF CRF tables and in the NIR. However, the ERT concluded that areas afforested and reforested were not accounted for in accordance with the IPCC good practice guidance (see para. 148 below).

144. The geographical locations of the boundaries of the areas that encompass units of land subject to afforestation/reforestation, deforestation, forest management and cropland management activities are specified at the national boundary level, and these areas have been identified using reporting method 1 from the IPCC good practice guidance for LULUCF. The definition of forest and the land-identification system used to determine the areas subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are in accordance with the IPCC good practice guidance for LULUCF.

145. Spain has performed a key category analysis for the KP-LULUCF activities, in accordance with the IPCC good practice guidance for LULUCF (section 5.4), with the result that afforestation/reforestation, forest management and cropland management were identified as key categories (identified as the following LULUCF categories under the Convention: forest land remaining forest land, land converted to forest land, cropland remaining cropland, land converted to grassland and land converted to settlements).

146. Spain has made recalculations for the KP-LULUCF activities between its 2011 and 2012 annual submissions, for 1990, 2008 and 2009, for similar reasons as to those recalculations applied to related categories under the Convention (see para. 100 above), i.e. in response to the 2011 annual review report, following changes in AD and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

(f) Afforestation/reforestation: decrease in the estimate of net removals by 26.81 Gg CO_2 eq or 0.4 per cent;

(g) Forest management: increase in the estimate of net removals by 71.49 Gg CO_2 eq or 0.4 per cent;

(h) Cropland management: a decrease in the estimate of net removals in 2009 by 587.22 Gg CO_2 eq or 19.6 per cent.

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

Afforestation and reforestation – CO_2

147. Spain has reported an area under afforestation and reforestation in 2010 of 1,077.81 kha and associated net removals of 6,544.88 Gg CO_2, which corresponds to an implied stock change factor of 6.07 Mg CO_2/ha. Afforestation and reforestation on units of land harvested since the beginning of the commitment period are reported as "NA, NO". The same comments and recommendations as made in relation to the LULUCF category land converted to forest land also apply to this activity, i.e. that Spain improve the accuracy of the inventory by providing estimates for the pools litter and dead wood, and that Spain use specific information on the mix of species and growth rates of trees for the areas afforestated and reforestated (see paras. 108 and 109 above).

148. The ERT noted that the area of afforestation and reforestation reported in CRF table 5(KP-I)A.1.1 decreased between 2009 and 2010, from 1,091.91 kha to 1,077.81 kha, and that the reduction corresponds to the area that was afforested in 1990 and is included in the area of forest management reported in CRF table 5(KP-I)B.1. This is not in line with the rules for the categorization of land areas under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (see chapter 4 of the IPCC good practice guidance for LULUCF), which establish that "once a land is reported under Article 3.3 or Article 3.4, all anthropogenic greenhouse gas emissions by sources and removals by sinks on this land must be reported during the first and throughout subsequent and contiguous commitment periods" and, furthermore, that "afforestation, reforestation and deforestation have precedence over the other activities for land classification and reporting purposes not only in a given year, but for the entire period between 1990 and 2012". The ERT recommends that the Party revise its reporting on the KP-LULUCF activities in accordance with the requirements of decision 16/CMP.1, annex, paragraph 19.

Deforestation – CO_2

149. Spain has reported, in KP-LULUCF CRF table NIR-2, a total area under deforestation in 2010 of 11.35 kha and corresponding net emissions of 108.06 Gg CO_2 eq in CRF table 5(KP-I)A.2, which is due to the conversion of forest land to settlements only. However, in CRF table 5(KP-I)A.2 Spain has reported an area of 0.54 kha under deforestation, which is the area converted in one year, arguing that all emissions from this activity, which arise from losses of carbon stock in biomass, dead organic matter and soil organic carbon, are conservatively assumed to occur within one year. The implied stock change factor is 200.00 Mg CO_2/ha.

150. In the previous review report the recommendation was strongly reiterated that Spain report the cumulative area of land under deforestation since 1990 in CRF table 5(KP-I)A.2 in accordance with the IPCC good practice guidance for LULUCF and decision 16/CMP.1. The ERT concluded that the recommendation has not yet been implemented. In response to a question raised by the ERT during the review, Spain asserted that the resulting IEF would be not relevant, since the numerator (emissions) would refer only to one year, while the denominator (ha) would refer to the cumulative area deforested since the beginning of the time series. The ERT acknowledged this argument and recommends that the Party report the total area in CRF table 5(KP-I)A.2 and include this explanation in the documentation box of CRF table 5(KP-I)A.2 in its next annual submission.

151. Furthermore, the same comments and recommendations as made in relation to the LULUCF category land converted to settlements also apply to this activity, i.e. that Spain improve the accuracy of its estimation of units of land deforested to settlements by revising the length of the transition period and collecting more recent AD for the entire time series and to report thereon in its next annual submission (see paras. 116 and 117 above).

152. Recommendations in the previous review report included that Spain collect information related to deforested land (e.g. uses and management practices), particularly for lands that were not converted to settlements, and use this information to improve the associated area and emissions estimates for its next annual submission. The ERT could find no mention of planned improvements in this regard in the NIR. In response to a question raised by the ERT during the review, Spain referred to the major revision of the cartography currently in progress (see para. 102 above) and noted that it could be possible that some deforestation (not to settlements) would be identified and, if that were the case, then estimates for these land-use changes would be provided. The ERT welcomes this initiative and recommends that Spain continue its efforts to improve the estimates for deforestation and provide any necessary updated information or recalculations for its next annual submission.

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

Forest management – CO_2

153. Spain has reported an area under forest management in 2010 of 12,599.69 kha and associated net CO_2 removals of 18,741.30 Gg CO_2, which corresponds to an implied stock change factor of 1.49 Mg CO_2/ha. The level of net removals in 2010 is much higher than the cap established in the annex to decision 16/CMP.1 for forest management in the commitment period (12,283.33 Gg CO_2). The same comments and recommendations as made for the LULUCF categories forest land remaining forest land also apply to this activity, and the ERT recommends that Spain move to higher-tier estimation methods for the pools litter, dead wood and mineral soils, currently reported as "NE" and revise the time trends of the area reported as forest management (see paras. 105–106 above); and, concerning biomass burning, the ERT recommends that the Party collect AD to enable the estimation of emissions from biomass burning, including reporting CO_2 emissions from wildfires separately from gains and losses(see paras. 120 and 121 above).

Cropland management – CO_2

154. Spain has reported an area under cropland management in 2010 of 20,485.84 kha (21,207.96 kha in 1990) and associated net removals of 3,295.79 Gg CO_2 eq (711.55 Gg CO_2 eq in 1990), which corresponds to an implied stock change factor of 0.16 Mg CO_2/ha (0.03 Mg CO_2/ha in 1990). The same comments and recommendations as made for the LULUCF category cropland remaining cropland also apply to this activity: that Spain report carbon stock changes for the pools litter and dead wood, in the next annual submission, improve the completeness of its inventory by providing estimates of carbon stock change and GHG emissions for land with temporary crops, stratify the areas of cropland management and resolve the inconsistency of the used solid depth in accordance with the IPCC good practice guidance, and improve the accuracy and consistency of the time series for its estimates of carbon stock change in mineral soils (see paras. 111–114 and 119 above).

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

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

comparison report.[28] 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.

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

National registry

157. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate. However, the SIAR identified the following problems: cross browser compatibility causes difficulties when trying to access and download holdings and transactions information that should be publicly accessible pursuant to 13/CMP.1 (Annex II paragraph 47). The ERT recommends that Party address this problem and report the results in its next annual submission.

Calculation of the commitment period reserve

158. Spain has reported its commitment period reserve in its 2012 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 on the most recently reviewed inventory. The ERT agrees with this figure.

2. Changes to the national system

159. Spain reported that there have been no changes in its national system since the previous annual submission. However, Spain described in the NIR that, subsequent to the general elections held in November 2011, changes have been made to the names of two institutions involved in the preparation of the inventory: the Ministry of Environment and Rural and Marine Affairs was renamed the Ministry of Agriculture, Food and Environment; and the Directorate-General for Environmental Quality and Assessment was renamed the Directorate-General for Environmental Quality and Assessment and Natural Affairs. In addition, by Royal Decree 401/2012, the Directorate-General for Environmental Quality and Assessment and Natural Affairs was designated as the single national entity with overall responsibility for the national system.

160. The ERT concluded that Spain's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

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

3. Changes to the national registry

161. Spain reported that there has been a change in its national registry since the previous annual submission. The Party described in the NIR the change, consisting of the introduction of security measures, based on second-factor authentication, to prevent unauthorized data manipulations and operator error. The ERT concluded that, taking into account the confirmed change in the national registry, 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 CMP decisions.

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

162. Spain did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its 2012 annual submission. However, in response to questions raised by the ERT during the review, Spain informed of the following changes in its reporting under Article 3, paragraph 14:

(a) Enhanced description of the progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all GHG-emitting sectors, taking into account the need for energy price reforms to reflect market prices and externalities, including experiences in Spain and information on the energy system;

(b) Additional information reported on cooperating in the technological development of non-energy uses of fossil fuels, and supporting developing country Parties to this end;

(c) Availability of additional information on biofuels and the European Union Common Agricultural Policy.

163. The ERT concluded that, taking into account the confirmed changes, the information provided is complete and transparent. The ERT recommends that Spain, in its next annual submission, report any change(s) in the information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.

III. Conclusions and recommendations

A. Conclusions

164. Spain made its annual submission on 17 April 2012. The annual submission contains the GHG inventory (comprising the CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

165. The ERT concludes that the inventory submission of Spain has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and Spain has submitted a complete set of CRF tables for the years 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. Although emissions from all

mandatory Annex A sources have been estimated, Spain has not reported all carbon pools and emission estimates for all LULUCF categories (see para. 101 above).

166. 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.

167. Spain's inventory is in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, and it can be considered to be of high quality.

168. Spain has made recalculations for the inventory between its 2011 and 2012 annual submissions in response to previous review reports, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the national totals is a decrease in the estimate of emissions for 2009 of 0.9 per cent. The main recalculations took place in the following sectors/categories:

(a) Energy sector: in particular in the category energy industries, in order to take into consideration emissions from biogas burnt in landfills with energy recovery; and in the manufacturing industries and construction category, for the inclusion of emissions from petroleum coke use in non-energy use (previously not reported as emissions);

(b) Industrial processes and solvent and other product use sectors: CO_2 emissions from lime production, limestone and dolomite use, and iron and steel production, and gas from the use of N_2O in anaesthesia;

(c) LULUCF sector: in particular in the category cropland remaining cropland, owing to the update of the woody crop areas subject to soil preservation practices.

169. The ERT concluded that the reporting of activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is generally in accordance with the requirements outlined in decision 15/CMP.1, annex, paragraphs 5–9, and also complete, taking into account the additional information provided during the review. However, the ERT concluded that the reporting of areas under afforestation and reforestation has not been done in accordance with the IPCC good practice guidance for LULUCF, since areas are removed from this KP-LULUCF activity after 20 years (see paras. 143 and 148 above). The ERT noted that, in accordance with the IPCC good practice guidance for LULUCF, once land is reported as subject to a KP-LULUCF activity, all anthropogenic emissions by sources and removals by sinks on this land must be reported during the first and throughout subsequent and contiguous commitment periods.

170. Spain has made recalculations for the KP-LULUCF activities between its 2011 and 2012 annual submissions in response to the 2011 annual review report. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows.

(a) Afforestation/reforestation: decrease in the estimate of removals by 0.4 per cent;

(b) Forest management: increase in the estimate of removals by 0.4 per cent;

(c) Cropland management: decrease in the estimate of removals by 19.6 per cent.

171. 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.

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

173. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the

technical standards for data exchange between registry systems in accordance with relevant decisions of the CMP.

174. Spain has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2012 annual submission, but it has not identified the changes in the actual reporting compared with that in its previous annual submission. Upon request, Spain provided the ERT with this information during the review. The ERT concluded that the information is transparent and complete.

B. Recommendations

175. The ERT identifies issues for improvement as listed in table 6 below.

Table 6
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
General	QA/QC	Continue with the efforts to use more information from the EU ETS verifiers' reports from regional governments, and use this information to improve the accuracy of the inventory and for QA/QC activities	31
		Include in the NIR information on the comparison and harmonization of regional and national inventories	32
		Enhance the QA/QC system for specific categories	49 and 103
Energy	Reference and sectoral approaches	Report on the progress of the Energy Working Group and its findings on the differences between the fuel balances used for the inventory and those reported in international statistics	35, 46–48 and 51
	International bunker fuels (aviation)	Include in the NIR background information on the methodology used and document the use of expert judgement in the estimation of emissions from aviation	52
		Document the differences in the total fuel consumption estimated by MECETA (and used in the inventory) and the IEA/Eurostat energy balance	53
	International bunker fuels (maritime)	Include in the NIR background information on fleet characterization and the estimation methodology used, including the use of expert judgement, and include a trend analysis	54 and 55
	Feedstocks and non-energy use of fuels	Provide more information on the use of natural gas reported in the energy balance	56
	Stationary combustion	Use more plant-specific data available at the	57

Sector	*Category*	*Recommendation*	*Paragraph reference*
	– all gases	regional level	
	Fugitive emissions– CH_4	Complete the study on degasification activities and CH_4 recovery and flaring in coal mining, and include information in the NIR on the use of expert judgement	58–60
	Other categories CO_2, CH_4 and N_2O	Include information on fuel consumption and the associated emissions	61
Industrial processes and solvent and other product use	Transparency	Enhance the transparency of the reporting of plant-specific data where issues of confidentiality exist	36, 66, 68, 69, 71, 73, 74 and 84
	Cement production – CO_2	Provide a qualitative assessment of the range of IEFs, on the basis of the quality of the raw material used in the process, and include information in the NIR on CaO and MgO content and CKD factor	68
	Nitric acid production – N_2O	Find ways of reporting confidential information, such as the trends in the use of specific technologies and information on abatement technologies	69
	Iron and steel production – CO_2	Continue to explore channels that could allow access to necessary background data	71
	Aluminium production – CO_2 and PFCs	Include information related to the specific use of technologies	73
	Production of HCFC-22 – HFC	Report in the NIR on the result of the comparison of the IEFs and the IPCC default EFs	74
	Lime production – CO_2	Include detailed descriptions of the methodology, assumptions and data used to estimate CO_2 emissions from lime produced as a non-marketed intermediate	82
	Consumption of halocarbons and SF_6 – HFC, PFC and SF_6	Investigate the use of PFCs in PV-system production facilities	77
	Soda ash production and use – CO_2	Remove the confidentiality of the activity data used to estimate emissions from soda ash use	84
Agriculture	Transparency	Correct the name of chapter 6.6. in the NIR (referring to “Otras fuentes clave” in the original version in Spanish)	90
	Enteric fermentation – CH_4	Include in the NIR a summary table with EFs by sex, age class and species for swine	92

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Manure management – CH_4 and N_2O	Report on QC procedures related to the surveys of animal producers on animal waste management systems	95
	Agricultural soils – N_2O	Enhance the explanations for the trends in fractions in the NIR	97
	Field burning of agricultural residues – CH_4 and N_2O	Include information on the legal bodies that regulate, control and/or forbid the use of fires on agricultural land	98
LULUCF	General	Continue the efforts to improve the completeness of the reporting	101, 108 and 112
		Revise the time series of land-use areas and soil management practices for the period 1970–1990	102
	Forest land remaining forest land – CO_2	Continue the efforts to move to a higher-tier estimation method for dead wood, litter and soil organic carbon	105
		Explore ways to enhance the consistency of the time series of net removals and AD	106
		Report the parameters D and BEF2 in a disaggregated manner in the NIR	107
	Land converted to forest land – CO_2	Improve accuracy by providing estimates for the dead organic matter carbon pool and use a more accurate characterization of land converted to forest land	108
		Provide information on the mix of species and the growth rates of trees for the areas of land converted to forest land	109
	Cropland remaining cropland – CO_2	Improve the accuracy of the estimates of carbon stock change in mineral soils by implementing a tier 2 method	111
		Enhance the coverage of the cropland area and include information on soil crop management practices for herbaceous crops and fallows	112
		Stratify the areas of cropland and resolve the inconsistency in the soil depths between the reference soil organic carbon contents and the IPCC stock change factors	113
		Improve the accuracy and consistency of the time series of estimates of carbon stock change in mineral soils for cropland	114
	Land converted to settlements – CO_2	Revise the methodology used to estimate the effect of land converted to settlements by collecting more recent AD	117

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Enhance the explanation of the trend in the IEF for carbon stock change in living biomass and dead organic matter	118
	Liming of agricultural soils – CO_2	Revisit the assumption that liming of agricultural soils does not occur in the country	81–82 and 119
	Biomass burning – CO_2, CH_4 and N_2O	Collect AD on controlled fires to estimate the associated emissions	120
		Enhance the transparency of the reporting of CO_2 emissions from wildfires for forest land remaining forest land	121
Waste	General	Enhance treatment for the several fractions of sludge that contribute to emissions in several categories	125, 135 and 141
	Solid waste disposal on land – CH_4	Enhance the efforts to establish country-specific parameters and improve the collection of AD	131
		Update the time series of waste composition and DOC values for the period 1997–2009	132
		Revise the assumptions related to the depth of solid waste disposal sites	132
	Other – CH_4	Improve the transparency of the reporting	139
KP-LULUCF	Afforestation and reforestation	Revise the identification of areas of land afforested and reforested, so that areas are not converted to land under forest management after 20 years	148
	Deforestation	Include the cumulative area of land under deforestation since 1990 in CRF table 5(KP-I)A.2	150
		Continues efforts to improve the estimates for deforestation	151
Additional information under Article 7, paragraph 1, of the Kyoto Protocol	National registry	To address issues related to accessing information on holdings and transactions	157
	Article 3, paragraph 14, of the Kyoto Protocol	Report any change(s) in the information provided	163

IV. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

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

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

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

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FCCC/ARR/2011/ESP. Report of the individual review of the annual submission of Spain submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/esp.pdf>.

UNFCCC. *Standard independent assessment report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Marta Muñoz and Mr. Nieves Mestre (Dirección General de Calidad y Evaluación Ambiental y Medio Natural/Directorate-General of Environmental Quality and Assessment and Natural Affairs; and Ministerio de Agricultura, Alimentación y Medio Ambiente/Ministry of Agriculture, Food and Environment), including additional material on the methodologies and assumptions used.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
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
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
LULUCF	land use, land-use change and forestry
m^3	cubic metre
Mg	megagram (1 Mg = 1 tonne)
NA	not applicable
N_2O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change