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**Report of the individual review of the greenhouse gas inventory of Spain  
submitted in 2006\***

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\* In the symbol for this document, 2006 refers to the year in which the inventory was submitted, and not to the year of publication.

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## I. Overview

### A. Introduction

1. This report covers the in-country review of the 2006 greenhouse gas (GHG) inventory submission of Spain, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 23 to 28 April 2007 in Madrid, Spain, and was conducted by the following team of nominated experts from the roster of experts: generalist – Ms. Anke Herold (European Community); energy – Ms. Branca Americana (Brazil); industrial processes – Mr. Riccardo de Lauretis (Italy); agriculture – Mr. Jorge Alvarez (Peru); land use, land-use change and forestry (LULUCF) – Mr. Aquiles Neuenschwander (Chile); waste – Mr. Oscar Paz (Bolivia). Mr. Riccardo de Lauretis and Mr. Aquiles Neuenschwander were the lead reviewers. The review was coordinated by Ms. Rocio Lichte (UNFCCC secretariat).
2. In accordance with the “Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”, a draft version of this report was communicated to the Government of Spain, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

### B. Inventory submission and other sources of information

3. In its 2006 submission, Spain submitted a complete set of common reporting format (CRF) tables for the years 1990–2004 and a national inventory report (NIR). Spain officially resubmitted its CRF tables for the years 1990–2004 on 8 June 2007 in response to questions raised by the expert review team (ERT) during the course of the in-country visit. Spain also provided additional information in support of these revisions as requested by the ERT. This revised GHG inventory is the basis for this report. Where needed the ERT also used the previous and following years’ submissions, including the CRF tables for the years 1990–2005 from the 2007 submission, additional information provided during the review, such as an additional methodological document, and other information. The full list of materials used during the review is provided in the annex to this report.

### C. Emission profiles and trends

4. In 2004, the most important GHG in Spain was carbon dioxide (CO<sub>2</sub>), contributing 82.7 per cent to total<sup>1</sup> national GHG emissions expressed in CO<sub>2</sub> equivalent, followed by methane (CH<sub>4</sub>), 8.7 per cent, and nitrous oxide (N<sub>2</sub>O), 7.4 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) taken together contributed 1.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 78.0 per cent of total GHG emissions, followed by agriculture (11.1 per cent), industrial processes (7.6 per cent), waste (2.9 per cent) and solvent and other product use (0.4 per cent). Total emissions amounted to 428,724.82 Gg CO<sub>2</sub> equivalent in 2004 and increased by 49.1 per cent between 1990 and 2004.
5. Tables 1 and 2 show the greenhouse gas emissions by gas and by sector, respectively.

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<sup>1</sup> In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> equivalent excluding LULUCF, unless otherwise specified.

Table 1. Greenhouse gas emissions by gas, 1990–2004<sup>a</sup>

GHG emissions	Gg CO <sub>2</sub> equivalent										Change BY-2004 (%)
	Base year Convention	1990	1995	2000	2001	2002	2003	2004			
CO <sub>2</sub> (with LULUCF)	205 484.19	205 484.19	230 949.31	277 428.76	279 766.07	299 102.86	303 626.28	323 974.12			57.7
CO <sub>2</sub> (without LULUCF)	228 511.44	228 511.44	255 696.67	307 648.62	311 526.18	330 525.53	333 860.52	354 516.65			55.1
CH <sub>4</sub>	27 880.33	27 880.33	30 881.33	35 600.87	36 498.76	36 956.83	37 133.01	37 412.55			34.2
N <sub>2</sub> O	27 795.15	27 795.15	26 546.02	33 080.86	31 848.46	31 115.58	32 835.36	31 655.99			13.9
HFCs	2 403.18	2 403.18	4 645.44	8 170.02	5 284.18	3 892.39	4 995.80	4 612.49			91.9
PFCs	882.92	882.92	832.51	411.71	239.77	264.02	267.31	272.04			-69.2
SF <sub>6</sub>	66.92	66.92	108.34	204.60	182.79	207.13	207.66	255.11			281.2

Note: BY = Base year; LULUCF = Land use, land-use change and forestry.

<sup>a</sup> Spain submitted revised estimates for all years of the 1990–2004 time series in the course of the initial review on 8 June 2007. These estimates differ from Spain's GHG inventory submitted in 2006.

Table 2. Greenhouse gas emissions by sector, 1990–2004<sup>a</sup>

Sectors	Gg CO <sub>2</sub> equivalent										Change BY-2004 (%)
	Base year Convention	1990	1995	2000	2001	2002	2003	2004			
Energy	212 564.52	212 564.52	241 045.98	289 380.65	293 025.53	311 393.57	314 266.93	334 619.52			57.4
Industrial processes	25 645.79	25 645.79	27 441.51	34 509.98	31 540.04	30 924.33	32 514.66	32 706.94			27.5
Solvent and other product use	1 391.42	1 391.42	1 346.57	1 678.56	1 595.92	1 653.46	1 595.94	1 516.81			9.0
Agriculture	40 330.20	40 330.20	39 877.04	48 191.07	47 461.61	46 589.43	48 455.56	47 497.21			17.8
LULUCF	-23 027.25	-23 027.25	-24 747.36	-30 219.86	-31 760.12	-31 422.67	-30 234.23	-30 542.53			32.6
Waste	7 608.01	7 608.01	8 999.20	11 356.41	11 957.05	12 400.71	12 466.57	12 384.34			62.8
Other	NA	NA	NA	NA	NA	NA	NA	NA			
<b>Total (with LULUCF)</b>	<b>264 512.68</b>	<b>264 512.68</b>	<b>293 962.94</b>	<b>354 896.82</b>	<b>353 820.03</b>	<b>371 538.81</b>	<b>379 065.42</b>	<b>398 182.29</b>			<b>50.5</b>
<b>Total (without LULUCF)</b>	<b>287 539.94</b>	<b>287 539.94</b>	<b>318 710.30</b>	<b>385 116.68</b>	<b>385 580.15</b>	<b>402 961.48</b>	<b>409 299.65</b>	<b>428 724.82</b>			<b>49.1</b>

Note: BY = Base year; LULUCF = Land use, land-use change and forestry; NA = Not applicable.

<sup>a</sup> Spain submitted revised estimates for all years of the 1990–2004 time series in the course of the initial review on 8 June 2007. These estimates differ from Spain's GHG inventory submitted in 2006.

#### D. Key categories

6. Spain has reported a key category tier 1 analysis, both level and trend assessment, for all years of the time series and also applied a qualitative approach in determining its key categories. Spain has not yet included the LULUCF sector in its key category analysis as the estimates in this sector are not yet complete. Spain is planning to implement a tier 2 analysis in 2008. The ERT encourages Spain to continue with these planned improvements. Spain should include the LULUCF sector in its key category assessment when the estimation of the category forest land is completed, and further subcategories should be added when the estimation of other LULUCF categories is finalized.

7. The key category analyses performed by the Party and the secretariat<sup>2</sup> produced somewhat different results due to different levels of disaggregation of categories in the key category assessment. Spain used a higher level of disaggregation for fuel combustion activities for certain plant types and fuel types in transport, which provides more useful results for the prioritization of resources and identification of improvements than the standardized procedure and is therefore in line with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). The key category analysis is used for the prioritization of resources within the quality assurance/quality control (QA/QC) plan and for the identification of improvements.

#### E. Main findings

8. The inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). However, the estimation for the LULUCF sector is not yet complete. The only category estimated is forest land, and therefore only CRF table 5.A has been filled in for the LULUCF sector.

9. During the in-country review the Party and the ERT agreed on some changes to be made for some categories in the energy (see paras. 30 and 44), agriculture (see paras. 59, 70 and 72) and waste (see paras. 83 and 88) sectors, which are reflected in Spain's resubmitted CRF tables for the years 1990–2004. For the year 2004 these revisions resulted in an increase of estimated total GHG emissions, from 427,904.58 Gg CO<sub>2</sub> equivalent as originally reported to 428,724.82 Gg CO<sub>2</sub> equivalent in the revised submission.

#### F. Cross-cutting topics

##### 1. Completeness

10. The inventory is complete in terms of years and geographic coverage. Spain has provided inventory data for the years 1990–2004 covering all source and sink categories, except for the LULUCF categories other than forest land and non-CO<sub>2</sub> GHGs from LULUCF, and has included most of the required tables; however, tables 5.B–5.F and 5(I)–5(V) for LULUCF, table 7 (key categories) and table 8(b) (explanations for recalculations) have not been provided. The notation keys are used throughout the tables. CRF table 9 (completeness) has mostly not been filled in. Explanations for key

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<sup>2</sup> The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for the base year or base year period as well as the latest inventory year. Key categories according to the tier 1 trend assessment were also identified. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

categories and recalculations are provided in the NIR. Spain should complete the reporting of the CRF tables, in particular tables 9 (completeness) and 8(b) (recalculations), in its next inventory submission.

## 2. Transparency

11. The transparency of the NIR has improved considerably in recent years and Spain has implemented many of the suggestions provided in previous reviews. An additional methodological document exists in Spanish, structured according to the air pollutants inventory (i.e. using the CORINAIR Selected Nomenclature for Air Pollution (SNAP) codes), which provides more detailed and disaggregated information on the emission estimation and the coverage of individual categories, which further increases transparency (this document is hereinafter referred to as the methodological background document).

12. However, for most sectors the sources of information are not clearly referenced in the NIR and there is no list of references. The exact references are contained in the underlying methodological background document that was made available to the ERT. Spain should add the references of the sources of activity data (AD), emission factors (EFs) and other parameters, and provide a list of references in the NIR (either in each sector or at the end of the document). The transparency of its reporting could be improved if the NIR included a more detailed explanation of the main forces driving the emission trends, in particular when there are large inter-annual differences (e.g. in industrial processes).

## 3. Recalculations and time-series consistency

13. Spain provided recalculated estimates (tables 8(a)) for the years 1990–2003. The effect of the recalculations for the year 2003 (as reported in the CRF tables) was an increase by 1.71 per cent in CO<sub>2</sub> equivalent emissions (excluding LULUCF). Although table 8(b) lists the categories in which changes have occurred, it does not indicate the reasons for the recalculations. The reasons for the recalculations are explained in the sectoral chapters and in chapter 10.4 of the NIR. The major changes include:

- (a) The improvement of the CO<sub>2</sub> EFs for solid fuels in the energy sector, as recommended in previous reviews;
- (b) The use of higher-tier methods for the main livestock categories within enteric fermentation in order to comply with the IPCC good practice guidance.

14. In general, Spain has provided consistent time series in accordance with the IPCC good practice guidance, and methodological improvements have been applied across the entire time series. A number of strong time-series fluctuations, in particular related to 1990 emissions, which are high, were investigated in detail by the Party in the course of the review and could be explained as being due to data from individual plants and specific circumstances for these years (e.g. for flaring of gases in the iron and steel industry). However, QA activities for consumption of liquid fuels conducted by the inventory agency identified considerable inconsistencies across different data sources; it is therefore important that Spain improves the quality of the liquid fuel consumption data reported to the International Energy Agency (IEA) and the Statistical Office of the European Commission (Eurostat) and reassesses the time series based on the results obtained from the QA activities.

## 4. Uncertainties

15. Spain has provided a tier 1 uncertainty analysis for each category and for the inventory in total, following the IPCC good practice guidance. The LULUCF sector is not included in the uncertainty analysis.

16. The information sources for the uncertainty estimates were the IPCC good practice guidance, analysis and data comparisons of the inventory compilers, and expert judgements collected from data

providers. A standardized questionnaire is used to collect and document the information collected on uncertainties from data providers. The total uncertainty of the GHG inventory is estimated at 3–3.5 per cent for the trend and 6–7 per cent for the level of GHG emissions. Further work on a tier 2 uncertainty assessment is planned for the future and the ERT encourages these plans. The ERT also recommends Spain to include the LULUCF sector in its future uncertainty analysis.

#### 5. Verification and quality assurance/quality control approaches

17. Spain has elaborated and implemented a QA/QC plan in accordance with the IPCC good practice guidance. This includes general QC procedures (tier 1) as well as source/sink category-specific QC procedures (tier 2) for key categories, for categories that have been recalculated following methodological changes, and for categories for which higher-tier methods are used. Eleven distinct tier 1 QC checks are performed for all categories and registered in an electronic quality control register. A number of the questionnaires used for data collection include consistency checks, and automatic AD checks based on statistical methods are performed to detect outliers or inconsistent time series. The correct conversion of units is a feature that has been incorporated in the database system.

18. The Ministry of Industry, Tourism and Trade provided useful clarifications during the review on the QA/QC procedures implemented for key energy data on production and consumption of coal and gas. However, no information on existing QA/QC activities for liquid fuel consumption data as reported to international statistics (IEA and Eurostat) could be obtained during the review. The ERT recommends that QA/QC activities for data on liquid fuel consumption be improved, taking into account the work conducted by the inventory agency as part of the quality assurance of the GHG inventory. For the waste sector, the ERT noted a lack of QA/QC procedures (see para. 82). No information was available on QC activities conducted for waste data collected in national statistics and on the quality of reporting from landfills. The ERT recommends Spain to complete the descriptions of QC activities run by outside data providers for all sectors and to include this information in the documentation of its QA/QC activities.

19. Specific QA procedures were implemented for the inventory of the agriculture sector, where experts from the University of Lérida and the Polytechnical University of Valencia reviewed the estimation methods and EFs used for GHG emissions related to livestock. The Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), an organization focused on research on energy, environment and technology, has been contracted to conduct an independent review for the energy sector of the GHG inventory in 2007–2008; however, results were not yet available at the time of the in-country visit. Under the European Community (EC) Directive on national emissions ceilings, the International Institute for Applied Systems Analysis (IIASA) in Austria reviewed the Spanish inventory of air pollutants, which is largely based on the same AD as the inventory of GHG emissions. A formal working group on inventories of air pollution has been established with the autonomous regions (Comunidades Autónomas) with the objective of harmonizing the regional and national inventories. This process may lead to the addition of further QA activities in the future. The ERT recommends that Spain report on progress and on the results of these ongoing activities in the NIR of its future submissions.

20. Spain does not use the data collected from operators under the European Union (EU) emissions trading scheme (ETS) for purposes of quality assurance. As the EU ETS covers the same sectors as the plant-specific questionnaires used for the inventory, a comparison of the emission estimates, AD and EFs with the ETS data would offer a unique opportunity to cross-check the AD and EFs reported by plants and associations. The major barriers to using the EU ETS data are (a) the fact that these data are collected by the regional authorities in different formats and are presently not available at the level of national ministries, and (b) the confidentiality of the data reported. The ERT suggests that in the working group that has been set up with the autonomous regions, Spain address the use of the ETS data for QA of the GHG inventory and establish legal and procedural arrangements to enable a comparison of the AD and EFs reported under the EU ETS with the plant-specific data reported to the designated national entity.

## 6. Follow-up to previous reviews

21. Following the recommendations of earlier reviews, Spain undertook a number of revisions that resulted in major improvements and recalculations, in particular in the agriculture sector, which are still ongoing. In the waste sector as well, the recalculations undertaken have significantly improved the inventory compared to the last in-country review. The level of detail of methodological descriptions in the NIR has improved in response to recommendations from earlier reviews for a number of categories (e.g. in the industrial processes sector).

### **G. Areas for further improvement**

#### 1. Identified by the Party

22. In its response to the issues raised during the review, Spain indicated that it is working to improve cross-cutting areas related to the following aspects. It intends to:

- (a) Implement a tier 2 key category and uncertainty analysis in 2008;
- (b) Start a more intensive cooperation process with the formal working groups composed of ministerial focal points and the Directorate-General for Quality and Environmental Evaluation of the Ministry of Environment;
- (c) Complete its estimations in the LULUCF sector;
- (d) Conduct QA procedures for the energy sector and for quality control procedures;
- (e) Fully implement the documentation system for QC checks and planned improvements.

#### 2. Identified by the ERT

23. The ERT identified the following cross-cutting issues for improvement. The Party should:

- (a) Improve the institutional cooperation and administrative arrangements in relation to the reporting of consumption of liquid fuels in different sectors, and resolve and explain the time-series inconsistencies in the data for some major liquid fuels;
- (b) Improve the institutional cooperation between the inventory compilers and other ministries/departments in the agriculture and LULUCF sectors in the formal working group on LULUCF and agriculture, and assign clear responsibilities for the estimation of the missing categories and for the corresponding CRF tables in the LULUCF sector. Spain should also improve its land-use classification as well as its data for the estimation of emissions and removals from agricultural land uses;
- (c) Encourage the participation of the autonomous regions in the formal working groups, and develop legal arrangements to enable a comparison of installation-specific AD and EFs reported under the EU ETS with the plant-specific data reported to the inventory agency;
- (d) Provide references and a list of references in the NIR.

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



## II. Energy

### A. Sector overview

25. In 2004, the energy sector accounted for 78.0 per cent of total national GHG emissions. These emissions increased by 57.4 per cent over the period 1990–2004. The most important categories are energy industries, with 27.0 per cent of total national emissions, transport, with 23.8 per cent, and manufacturing industries and construction, with 17.1 per cent. Emissions from these categories increased by 49.2 per cent, 77.2 per cent and 56.8 per cent, respectively, over the period 1990–2004.

26. The NIR is very transparent for the energy sector. It includes sections discussing the AD, EFs, estimation algorithms, completeness, transparency, the consistency of the time series, methodologies, uncertainties, QA/QC, recalculations and planned improvements for each category analysed.

27. The Party performed a key category analysis using a tier 1 method. It is more disaggregated than the one performed by the secretariat and identified 13 key categories on the level assessment and 13 on the trend assessment, accounting for 76 per cent of total national GHG emissions in 2004.

28. The NIR explains the emission trends at a rather aggregated level which is in line with the level of disaggregation used for the key category assessment for manufacturing industries and construction and other sectors. However, the explanations at this aggregate level do not provide a sufficient explanation of each of these categories. The ERT encourages Spain to provide a more detailed explanation of the emission trends for the subcategories under manufacturing industries and construction and other sectors, for example, explaining the emission trend for the residential sector separately from the trend for commercial/institutional fuel combustion.

29. QA/QC activities are implemented in the energy sector for data processing and for the data collected by means of questionnaires. Many different ways of cross-checking data with other data sources, for example, plant-specific AD with aggregated data taken from the industrial associations or national statistics, are used to check the reliability of the data provided by plants and associations.

30. For civil aviation, the ERT noted that jet kerosene consumption reported to the IEA for the year 1990 is 19.4 per cent lower than the figure reported in the CRF while for 2004 the difference is less than 1 per cent. This could be due to an error in the estimation algorithm, as Spain explained during the review. The ERT recommended Spain to further investigate the reason for this discrepancy and to correct the CO<sub>2</sub> emission estimate for civil aviation accordingly, if necessary. During the review Spain was able to explain the discrepancy in the fuel consumption data. However, Spain found an error for the CO<sub>2</sub> EF used in the module of calculation of landing and take-off emissions at airports and corrected this EF accordingly. The corrected EF for CO<sub>2</sub> (72.65 kg CO<sub>2</sub>/GJ) is slightly lower than the one originally used (72.75 kg CO<sub>2</sub>/GJ). As recommended by the ERT, Spain provided revised estimates to correct for the error identified, resulting in a slightly lower estimate of CO<sub>2</sub> emissions for the entire time series (see para. 44).

31. Considerable inconsistencies were found in the data on liquid fuel consumption for maritime and agriculture sources when the IEA and Eurostat energy balances data were compared with bottom-up data balance compiled for the inventory, and it was not possible at this stage to clarify them with the Ministry of Industry, Tourism and Trade as the information the ministry uses to compile the energy balance is mainly based on information from the supply side. The ERT urges Spain to increase the cooperation between the ministry and the inventory compilers in this area and to clarify the sources of the data used for the reporting of liquid fuel consumption for domestic and international navigation, fishing and agricultural uses, and residential as well as non-energy fuel use, to the IEA and Eurostat, and to report on progress in its next inventory submission.

## **B. Reference and sectoral approaches**

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

32. CO<sub>2</sub> emissions from fuel combustion have been calculated using both the reference approach and the sectoral approach. The differences identified along the time series are never higher than 2 per cent and the NIR explains the reasons for them.

### **2. International bunker fuels**

33. For international bunker fuels consumption Spain uses the information from the IEA, which is provided to the IEA by the Ministry of Industry, Tourism and Trade. For marine bunkers, as far as national ships are concerned, that information was checked against the corresponding information given by other information providers (mainly Puertos del Estado, the national ports authority, and the Asociación de Navieros Españoles (ANAVE), the national merchant marine association). These two institutions, in cooperation, provided data for the years 1992–2002 (which were later extrapolated to the remaining years of the inventory period) on fuel consumption for each nationally-registered vessel, and ANAVE established the split of maritime fuel consumption into national and international fuel consumption. Comparison of the two data sources (IEA and ANAVE) shows small discrepancies for the year 1990, but rather large discrepancies for more recent years. The ERT encourages Spain to carry out additional studies to clarify these inconsistencies in the data for liquid fuel consumption in cooperation with the Ministry of Industry, Tourism and Trade and to use other information for international transportation to reduce the uncertainty in the activity data for international bunkers, in particular marine bunkers.

34. For maritime fuel consumption there are also uncertainties relating to the allocation of gas oil and fuel oil consumption to the different sectors, that is, to the maritime and other sectors (such as the agriculture sector), which could affect the split between national and international fuel consumption and hence the estimate of total national GHG emissions (see also para. 45).

### **3. Feedstocks and non-energy use of fuels**

35. Spain was not able to explain to the ERT in a transparent way how the fuel quantities reported under non-energy fuel use in the national energy balance are compiled and which exact data sources were used. The ERT was therefore not able to assess the estimation of non-energy fuel use and related double counting of emissions. The ERT recommends Spain to improve the information on non-energy fuel use by undertaking a study on this issue with relevant industries and with the Ministry of Industry, Tourism and Trade, and to report on progress in its future annual inventory submissions. Such an investigation may also resolve some of the discrepancies that were detected relating to liquid fuel consumption.

36. Specifically with regard to carbon stored in petroleum coke, the ERT noted that there appears to be an error in the value reported in the reference approach (CRF table 1.A(b)). The value reported corresponds to non-emitted Gg of CO<sub>2</sub> from petroleum coke rather than to carbon stored in the unit of Gg C (see also the data reported for coke under “other” in table 1.A(d) on feedstocks and non-energy use of fuels). As a result of this error, total emissions calculated by the reference approach in the year 2004 appear to be underestimated by 4,764 tonnes CO<sub>2</sub>. This does not, however, affect total emissions from the energy sector. The ERT requested Spain to correct the figures for carbon stored in petroleum coke in CRF table 1.A(b).

37. Spain reports that it uses default carbon (C) storage ratios. The quantities of feedstock fuels reported are large and the total quantity of CO<sub>2</sub> not emitted has a high level of uncertainty. The use of plant-specific data on C stored would improve the estimates significantly. Spain should develop country-specific storage ratios.

### C. Key categories

#### 1. Energy industries – public electricity and heat production: liquid/solid/gaseous and other fuels – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

38. This category accounted for 23.5 per cent of total national GHG emissions in 2004. CO<sub>2</sub> emissions from solid fuels were the main key category in Spain for the year 2004. Information about fuel consumption and technical specifications for this source are obtained directly from thermal plants by means of questionnaire. In addition, for the years 1990–1993, data on fuel consumption and emission estimates were provided by OFICO (an official institution which, at that time, was the authoritative body for this information). The emission calculations are in line with the IPCC good practice guidance. The NIR is very clear and detailed for this source category, including the uncertainty analysis, QA/QC activities and a detailed report about recalculations. Further improvements are planned for checking fuel technical specifications.

#### 2. Road transportation: gasoline, diesel oil, liquefied petroleum gas – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

39. Road transportation accounted for 21.7 per cent of total national GHG emissions in 2004. These emissions have increased by 81 per cent since 1990. Activity data are obtained from national statistics and emissions are calculated using the COPERT III model. Further improvements are planned for the calculation of the composition and the size of the vehicle fleet.

#### 3. Manufacturing industries and construction: liquid/solid/gaseous fuels, biomass – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

40. This subsector accounted for 17.1 per cent of total national GHG emissions in 2004. The structure of fuel use has changed significantly since 1990, with an increased share of gaseous fuels, a relative decline in the share of liquid fuels and an absolute decline in the share of solid fuels.

41. Information on activity data is provided by sectoral associations and by means of plant-specific questionnaires covering the major installations. The emission calculations are in line with the IPCC good practice guidance. The NIR is very clear and detailed for this category, including EFs for different technologies, fuel consumption per fuel category, uncertainty analysis, QA/QC and detailed reporting of recalculations. Further improvements are planned in many areas of this category.

#### 4. Other sectors: liquid/solid/gaseous fuels, biomass – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

42. This category accounted for 9.2 per cent of total national GHG emissions in 2004. In the NIR it is presented within the same paragraph (3.5) as manufacturing industries and construction; nevertheless the analysis for the category other sectors is clearly differentiated as regards fuel consumption (broken down by fuel type) and emission factors (broken down by fuel type for each installation class and source category (industrial or other sectors)). The other sectors include important subsectors: the residential sector (4.7 per cent of total national emissions); agriculture/forestry/fisheries (2.3 per cent of total national emissions); and commercial/institutional (2.1 per cent of total national emissions). These sectors make important individual contributions and have different characteristics and specificities. The ERT recommends Spain to expand the description of the individual contributing sources for this category in the NIR, drawing on the more detailed methodological background document.

#### 5. Energy industries – petroleum refining: liquid/gaseous fuels – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

43. This category accounted for 3.2 per cent of total national GHG emissions in 2004. Information about fuel consumption and its technical specifications are obtained directly from the 10 refineries in the country. The emission calculations are in line with the IPCC good practice guidance. The NIR is very clear and detailed for this category, including regarding methodology, uncertainty analysis, time-series consistency and QA/QC, and detailed reporting of recalculations. Further improvements are planned for checking fuel technical specifications.

#### 6. Civil aviation: jet kerosene – CO<sub>2</sub>

44. Civil aviation accounted for 1.4 per cent of total national GHG emissions in 2004. In explaining the differences between the national consumption data and the IEA data, Spain demonstrated that the comparison between the two data sets was incomplete for the IEA data. During the review, Spain informed the ERT that the 2006 inventory contained an error in the estimation algorithm for the CO<sub>2</sub> EF. This error was corrected during the review – from 72.75 kg CO<sub>2</sub>/GJ to 72.65 kg CO<sub>2</sub>/GJ – and a revised estimate for CO<sub>2</sub> emissions from civil aviation was provided, resulting in a slightly lower estimate of CO<sub>2</sub> emissions for the entire time series. For the year 2004, this resulted in a decrease in the estimate of CO<sub>2</sub> emissions from civil aviation from 5,889.9 Gg CO<sub>2</sub> to 5,846.4 Gg CO<sub>2</sub> in the revised submission.

#### 7. Navigation: liquid fuels – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

45. Data for fuel consumption for this source (which accounted for 0.6 per cent of total national GHG emissions in 2004) come from the IEA, Puertos del Estado and ANAVE. For the year 2004 the data for fuel consumption for internal national navigation were based exclusively on ANAVE's estimates because the annual questionnaire on oil consumption did not provide information on the sectoral breakdown of the final energy demand for that year. The split of fuel consumed by the national maritime fleet into national and international fuel consumption was established by experts from ANAVE. There are also uncertainties relating to the allocation of gas oil and fuel oil consumption to the different sectors, that is, to the maritime and other sectors (such as the agriculture sector), which could affect the split between national and international fuel consumption and hence the estimate of total national GHG emissions (see also para. 34). The ERT encourages Spain to pursue the plan it is already developing, involving ANAVE and Puertos del Estado, in order to solve this problem.

### **III. Industrial processes and solvent and other product use**

#### **A. Sector overview**

46. In 2004, the industrial processes and solvent and other product use sectors accounted for 8.0 per cent (7.6 per cent and 0.4 per cent, respectively) of total national GHG emissions. Emissions from the two sectors increased by 27.5 per cent and 9.0 per cent, respectively, between 1990 and 2004.

47. The CRF includes estimates of all gases and sources in the industrial processes sector, as recommended by the Revised 1996 IPCC Guidelines. The emission estimates are consistent across the time series, and EFs are used in a consistent way and are comparable with those reported by other Parties. The methodologies used are reported in detail as well as AD and EFs. Basic data for the sector are available at a highly disaggregated level and in most cases are collected on a plant-by-plant basis. A few members of the ERT were given access to confidential information for production of soda ash and of halocarbons and SF<sub>6</sub>, after the plants concerned had agreed to give access to it, which facilitated the review of these estimates and hence contributed to their transparency. Transparency could, however, be improved by including in the NIR a more detailed explanation of the main forces driving the emission trends, particularly when there are large inter-annual fluctuations. In some cases the notation keys have not been used in the appropriate way. For HFCs, PFCs and SF<sub>6</sub>, Spain has reported actual emissions. Estimates for potential emissions of these gases are not provided, mainly because of the current lack of information on imports and exports per gas. Spain is encouraged to continue its efforts to collect reliable data to help in the estimation of potential emissions of fluorinated gases (F-gases) and to improve the use of the notation keys in line with the definition in the UNFCCC "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

48. The general QA/QC procedures that are used for the inventory as a whole are applied in the sector. QA/QC should be improved in this sector by systematically comparing the basic information collected for the inventory with that collected and reported within the framework of the EC directives on

the EU ETS, the European Pollutant Emission Register (EPER) registry, the limitation of emissions of certain pollutants into the air from large combustion plants (LCP) directive, or statistical production data (PRODCOM).

## **B. Key categories**

### **1. Cement production – CO<sub>2</sub>**

49. Cement production is a key category on both level and trend assessment. Activity data and the main information on EFs are provided by the main industrial association (OFICEMEN). The methodology is well explained in the NIR. In response to the recommendations of the 2005 review report, Spain has verified the average EF supplied by the industrial association by collecting basic data from some plants for different years and has recalculated the average EF on the basis of these data. The ERT acknowledges the efforts made by Spain to review and improve the information used to estimate emissions. The QA/QC activities developed in the sector were explained during the review but they are not reported in the NIR. To improve transparency, the ERT suggests that Spain report in the NIR the QA/QC activities developed for the sector, such as the comparison with other databases and the ratio between clinker and cement production data. The ERT also suggests that Spain report in the NIR more detailed explanations of the emission trends, comparing production and emission data with energy and economic data for the sector. The ETS data could improve both the emission estimates and the uncertainty analysis for the most recent and future years. The ERT noted that it would be useful for Spain to use the ETS data in a systematic way to improve its emission estimates.

### **2. Consumption of halocarbons and SF<sub>6</sub> – HFCs, PFCs and SF<sub>6</sub>**

50. In 2004, CO<sub>2</sub> equivalent emissions from this category amounted to 4,170.3 Gg, less than 1 per cent of total national emissions. This is a key category on both level and trend assessment. The NIR provides a methodology for each activity that involves consumption of these gases. Information on the consumption of halocarbons and SF<sub>6</sub> in semiconductor manufacturing is currently lacking, although, according to the main company which distributes F-gases in Spain, such SF<sub>6</sub> consumption does not occur. Spain is encouraged to continue the improvements it plans, looking for other sources of information for emissions from semiconductor manufacturing involving the other ministries and industry contacts.

### **3. Iron and steel production – CO<sub>2</sub>**

51. Emissions from the combustion of fossil fuels in external units, such as blast furnaces cowpers and sinter furnaces burners, are reported under the energy sector, while the emissions originating from the internal processes where carbon can act as a fuel and a reduction agent are allocated under the industrial processes sector, having been estimated as the net difference between flows of inputs and outputs in such processes. Incineration of waste gases from iron and steel industry should also be reported under this sector, as explained in detail in the section on the waste sector below. The Party is encouraged to report clearly in the NIR on this allocation in order to give assurance that there is no omission or double counting between the industrial processes, energy and waste sectors.

### **4. Limestone and dolomite use – CO<sub>2</sub>**

52. Spain reports in the NIR that CO<sub>2</sub> emissions from limestone and dolomite consumption come from the manufacturing frits of glass, brick and tiles, magnesium production, and the use of limestone for environmental pollution control purposes in energy production plants. The NIR reports in detail the methodology, AD and EFs used to estimate emissions.

### **5. Nitric acid production – N<sub>2</sub>O**

53. In the previous review, the ERT recommended that Spain establish direct contact with the production plants in order to verify the country-specific average EF of 7 kg per tonne of production,

which is supplied by the Chemical Industry Association; Spain reports in the NIR that it plans to make this improvement. Spain is encouraged to collect information from the plants to verify the average EF for this key category.

#### 6. Production of halocarbons and SF<sub>6</sub> – HFC-23

54. In response to the comments of the previous (2005) review, Spain reports in the NIR detailed information regarding the methodology used and the emission trend in this key category.

### **IV. Agriculture**

#### **A. Sector overview**

55. The GHG inventory reported in 2006 contains emission estimates for all categories and all the CRF tables have been filled in. In 2004, the agriculture sector accounted for 11.1 per cent of total national GHG emissions. Between 1990 and 2004, emissions from the sector increased by 17.8 per cent.

56. Spain is undertaking improvements in the estimation methods used in the agriculture sector. A number of improvements have already been implemented, including in the institutional arrangements, and have resulted in new AD for animals and crops and national EFs based on national studies and reviews of relevant literature, but these improvements were not yet fully implemented at the time of the review. Spain is planning additional national studies to obtain specific national information, such as studies on different breeds of cattle and the percentage shares of the different animal waste management systems (AWMS) used. These future changes in the methodology which the inventory agency plans may change the emission estimates for all years of the time series. The improvements implemented so far have resulted in an increase in the estimates of emissions for all years.

57. The new methods used by Spain to obtain AD have resulted in more reliable estimates for the agriculture sector. Spain has implemented a new QA/QC procedure to analyse and verify what national information can be used for estimating emissions, which has enabled it to identify and prioritize new studies for the future. This QA/QC procedure also permitted verification of overlaps with other sectors, such as LULUCF and waste.

58. As regards recalculations in the agriculture sector, only the quantitative results have been provided, but no explanations are given for emission trends where these are affected by changes of methodology or recalculations. The recalculations undertaken for the 2006 submission (including those undertaken for the revised submission after the in-country visit) increased the estimate of emissions from the sector in the year 2003 by 9.2 per cent compared with the 2005 submission (for the year 2003 inventory originally submitted as part of the 2006 submission, this difference was 7.9 per cent). The main categories responsible for this change were manure management and agricultural soils. The ERT recommends Spain to improve its reporting of major recalculations by explaining how methodological changes impact on the trend in emissions.

59. The ERT noted that the coverage of crops in the estimates of emissions from crop residues of agricultural soils and field burning of agricultural residues is not fully complete, although it recognizes that Spain has applied the estimating procedure to a very extensive list of crops (in fact a much more extensive list than the one provided in table 4.16 of the IPCC good practice guidance). During the review Spain provided additional information, including tables, in particular on crops (including on the cultivation of grapes and olives), which is not included in the NIR and which helped to clarify the estimates of emissions from crop residues of agricultural soils and field burning of agricultural residues (see also paras. 70 and 72). In addition, Spain has already used this information to revise its emission estimates for N<sub>2</sub>O from agricultural soils and N<sub>2</sub>O and CH<sub>4</sub> from field burning of agricultural residues, and included these estimates in its revised inventory that it resubmitted after the in-country visit. For the year 2004, these revisions increased the estimates of total GHG emissions from the agriculture sector,

from 46,918.39 Gg CO<sub>2</sub> equivalent as initially reported to 47,497.21 Gg CO<sub>2</sub> equivalent. The ERT encourages Spain to include this new information, including references to the sources of these data and information, in its next submission in order to enhance the transparency of the NIR.

60. The ERT recommends Spain to continue to implement the improvements suggested in the NIR for the entire time series.

## **B. Key categories**

### **1. Enteric fermentation – CH<sub>4</sub>**

61. Enteric fermentation is the main source of CH<sub>4</sub> emissions (contributing 36.6 per cent to total national CH<sub>4</sub> emissions in 2004). CH<sub>4</sub> emissions from enteric fermentation increased by 16.4 per cent between 1990 and 2004. The main driver for this is the increase in the numbers of cattle.

62. A tier 2 methodology has been used for the main livestock categories (cattle and sheep), and for the other animal types tier 1 (including default EFs) has been used in line with the IPCC good practice guidance.

63. The AD used come from the official *Anuario de Estadística Agroalimentaria* and *Boletines Mensuales de Estadística Agraria* from the Ministry of Agriculture, Fisheries and Food.

64. The ERT recommends Spain to continue the studies to obtain national information about enteric fermentation in the different types of animal.

### **2. Manure management – CH<sub>4</sub>**

65. Emissions from this source increased by 42.8 per cent between 1990 and 2004 (according to the resubmission), mainly due to an increase in nitrogen (N) excretion per AWMS for non-dairy cattle and swine. A tier 2 methodology has been used for the main sources (swine and cattle), while for the other animal types tier 1 has been used in line with the IPCC good practice guidance.

66. Spain has used the default IPCC parameters for maximum methane producing capacity (Bo) and equation 4.16 of the IPCC good practice guidance for volatile solids excretion (VS) for cattle. It has used a linear function to calculate VS from swine, based on the IPCC default data according to animal weight. The original IPCC methane conversion factor (MCF) stepped function, based on temperature ranges given by the IPCC good practice guidance, has been smoothed out based on continuous temperature variation. The ERT considers this as an appropriate method given the national circumstances of Spain. For the remaining animal types Spain has used basically tier 1 methods, but with the EF functions smoothed out in the same way as the temperature ranges.

67. The ERT recommends Spain to continue the studies to obtain national information about the allocation of animal manure to different AWMS.

### **3. Manure management – N<sub>2</sub>O**

68. Spain has used equation 4.18 of the IPCC good practice guidance with national parameters, developed by national studies of manure management systems, and the same national classification system as was used for CH<sub>4</sub> from manure management.

### **4. Agricultural soils – N<sub>2</sub>O**

69. The emission estimates for this category currently do not include all crops. This will lead to future recalculations, which could increase the estimates of emissions for all years of the time series. The same AD as are used for estimating this category are also used to estimate emissions from field

burning of agricultural residues (see paras. 71 and 72 below). Spain is encouraged to include all relevant crops in its estimates for N<sub>2</sub>O emissions from soils.

70. During and after the review, Spain provided new national information and data on the cultivation, including cultivated areas, of grapes and olives, which represent a significant portion of the total cultivated lands in Spain. The inclusion of data on these crops in the category direct emissions from soils – crop residues led to an increase in the 2004 estimate for N<sub>2</sub>O emissions from agricultural soils from 67.9 Gg N<sub>2</sub>O as originally reported to 68.0 Gg N<sub>2</sub>O in Spain's revised resubmitted GHG inventory.

### **C. Non-key categories**

#### Field burning of agricultural residues – CH<sub>4</sub>, N<sub>2</sub>O

71. Spain has compiled and reviewed information from existing studies to obtain national information required to estimate emissions from field burning of agricultural residues. This national information was used to recalculate the entire time series, and the emission estimates for this category are now considered to be almost complete.

72. During the review Spain provided new data on the cultivation of grapes and olives (see also para. 70), which it used to revise its estimates from this category after the review. The consideration of these data for estimating CH<sub>4</sub> and N<sub>2</sub>O emissions from burning of residues in vineyards and olive groves increased the 2004 estimates of CH<sub>4</sub> and N<sub>2</sub>O emissions from field burning of agricultural residues by 533.0 Gg CO<sub>2</sub> equivalent compared to the estimate initially reported (i.e. from 13.6 Gg CO<sub>2</sub> equivalent to 546.6 Gg CO<sub>2</sub> equivalent in the revised resubmission). In the 2005 submission the N<sub>2</sub>O emissions were estimated using a national methodology to calculate the N contained in the burnt residues. In the 2006 submission the IPCC good practice guidance approach has been followed to calculate the N present in the burnt residues.

## **V. Land use, land-use change and forestry**

### **A. Sector overview**

73. In 2004, the LULUCF sector in Spain constituted a net sink of 30,542.53 Gg CO<sub>2</sub> equivalent. Over the period 1990–2004 removals from the sector increased by 32.6 per cent and the area of forest land remaining forest land increased by 14.6 per cent due to afforestation and reforestation activities and natural regeneration occurring in croplands and grasslands. All removals were due to biomass growth in forest land, while emissions arose from wood harvest and fuelwood collection.

74. CO<sub>2</sub> emissions and removals estimates are provided only for the category forest land. No information or data are provided on sources and sinks in any of the other land-use categories, or for non-CO<sub>2</sub> emissions. Spain informed the ERT that emissions and removals from the land-use categories cropland, grassland, wetlands, settlements and other land are not reported because the data requested in the IPCC good practice guidance for LULUCF for calculations by the tier 1 method were not available. The ERT recommends that Spain provide estimates for all relevant categories of the LULUCF sector and complete all the CRF tables for all other land-use categories in its future submissions for the sake of completeness and consistency.

75. The ERT noted that the official data on the areas of land use and land-use change for the forest land category presented inconsistencies which are due to the use of different sources of activity data. The sources are mainly the second and third National Forest Inventory (NFI2 and NFI3) – covering the years 1986–1995 and 1997–2006, respectively – and data and maps from the Ministry of Agriculture, Fisheries and Food. The ERT recommends Spain to strengthen its institutional arrangements in order to standardize the definitions and official data on the areas of land use and land-use change, and to develop a matrix of land-use change among the different land-use categories, including for agriculture, in order to



be able to report GHG inventories under the Convention and under the Kyoto Protocol. Spain informed the ERT that it is developing a National Geographical System to account for LULUCF activities under the Kyoto Protocol, and that it is expected to be operational in 2009.

76. Neither QA/QC procedures for the LULUCF sector nor estimates of uncertainty are reported in the NIR, nor is a LULUCF key category analysis. Spain informed the ERT that QA/QC procedures, uncertainty assessment and a key category analysis will be considered for the LULUCF sector in its future submissions.

## **B. Key categories**

### Forest land – CO<sub>2</sub>

77. The NIR (page 7.9) reports that most of the biomass expansion factors (BEFs) for commercial volume (mainly from native species) are country-specific (table 7.2.11) and that default values from the IPCC good practice guidance for LULUCF were applied for those species for which a country-specific value is not available. The same applies to wood density (D). Spain has used a country-specific BEF multiplied by D, which is named BEFD, developed by the Centro de Investigación Ecológica y Aplicaciones Forestales. The root to shoot ratio (R) used is a default value for coniferous and broadleaf species.

78. For estimating carbon stock changes, all forest land is assumed to be managed. Only emissions and removals from living above- and below-ground biomass are estimated according to the tier 1 method of the IPCC good practice guidance for LULUCF. Spain informed the ERT that soil organic carbon is being investigated and will be reported in its future submissions, while dead organic matter is considered constant under the tier 1 method. The ERT recommends Spain to estimate carbon stock changes in all forest carbon pools unless Spain can demonstrate that a pool is not a source. If the tier 1 method is used, improved justification should be provided as to why the dead organic matter pool is considered not to be a source.

79. In the NIR, carbon loss from fuelwood collection is reported and a methodology is provided. However, in the current carbon estimation, only D and wood carbon content are applied in calculating dry matter volume, and no BEF is applied. The ERT recommends Spain to reconsider this since the same criteria as those used for the carbon calculation of commercial harvest should be used where a biomass expansion factor is applied.

## **C. Non-key categories**

### Biomass burning – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

80. In its NIR, Spain states that emissions from forest fires are not reported because no land-use change happens as a result, but it remarks that it is evaluating the possibility of including emissions from forest fires. The ERT recommends Spain to include CO<sub>2</sub> and non-CO<sub>2</sub> emissions from forest fires in its future submissions, as recommended in the IPCC good practice guidance for LULUCF, since data on the area of forest fires are available.

## **VI. Waste**

### **A. Sector overview**

81. In 2004, the waste sector accounted for 2.9 per cent of total national GHG emissions. Between 1990 and 2004, emissions from the sector increased by 62.8 per cent. The largest contributions to emissions in the waste sector came from CH<sub>4</sub> from solid waste disposal sites (SWDS), followed by wastewater handling.

82. Estimates have been provided for all categories for all years of the time series. The recalculations have significantly improved the inventory compared to the last in-country review. The ERT did, however, identify a lack of QC/QA procedures in the waste sector and in the assessment of uncertainties according to the IPCC good practice guidance. For some AD and EFs provided in the CRF and the NIR the Party was not able to provide sufficient background information during the review, for example, for the values for degradable organic carbon from wastewater sludge from treatment plants, and this reduces the transparency of the emission estimates. Spain plans to improve its database and to develop its data acquisition by improving its data-gathering channels and quality controls for this sector, involving the General Sub-directorate for Waste Prevention, the administrative unit competent for waste treatment processes within the Ministry of Environment, more deeply. The ERT strongly recommends better coordination among the relevant institutions in the waste sector. The 2006 NIR presents improved information on emissions from landfills, but the characterization of the solid waste composition needs to be updated, and the data used for gas capture from landfills need to be improved.

83. During the review Spain also presented additionally recalculated estimates for emissions from SWDS (these were already included in Spain's 2007 submission) and these were discussed and agreed upon with the ERT. Spain provided new data and additional information from surveys carried out for managed landfills to support these revised estimates, which constitute a substantial improvement on the data compared to the estimates provided in the original 2006 inventory submission. These revised estimates increased the estimate of total emissions from the SWDS category in 2004, from 7,972.40 Gg CO<sub>2</sub> equivalent as originally reported to 8,404.5 Gg CO<sub>2</sub> equivalent in the revised submission (an increase of 5.4 per cent). In addition, following the in-country-visit, Spain revised its estimates of emissions from waste incineration in that it removed CH<sub>4</sub> and N<sub>2</sub>O emission estimates from "open burning of agricultural wastes" which it had reported under waste incineration in its 2006 inventory as originally submitted (see also para. 88). The revised estimates for both SWDS and waste incineration were included in the revised inventory submission that Spain provided after the in-country review. As a result of these improvements, estimated emissions from the waste sector for 2004 increased from 12,099.46 Gg CO<sub>2</sub> equivalent as originally reported to 12,384.34 Gg CO<sub>2</sub> equivalent in the revised submission (an increase of 2.4 per cent).

## **B. Key categories**

### **1. Solid waste disposal on land – CH<sub>4</sub>**

84. The methodology used for this category, following the tier 2 methods suggested by the IPCC good practice guidance, is appropriate. The EFs have been calculated by combining country-specific data and default factors suggested by the IPCC good practice guidance. The AD come from two sources: specific individualized questionnaires administered to the landfill sites with energy recovery; and the landfill statistics data published in the yearbook *Medio Ambiente en España* for the remaining landfill sites. For uncontrolled landfills, the Party was not able to provide sufficient additional background information during the review to support the assumptions made with regard to the amount of waste burnt and the depths of the landfills. The ERT recommends the Party to improve the factors used and to improve the evidence for the assumptions used in its future submissions. Spain should also improve the data on waste composition and may draw on the data prepared under the new EU regulation on waste statistics for this purpose in future.

### **2. Wastewater handling – CH<sub>4</sub>**

85. The CH<sub>4</sub> emissions from wastewater handling come from domestic and industrial wastewater treatment plants and include the emissions from liquids and sludge. To estimate them, Spain has used the tier 2 methods suggested by the IPCC good practice guidance. The AD are based on expert judgement and statistical data from the sector. The default EF proposed by the IPCC good practice guidance has been used.

### 3. Wastewater handling – N<sub>2</sub>O

86. Spain has followed the default methods provided by the IPCC good practice guidance for estimating N<sub>2</sub>O emissions from human excretion, and the AD and EF<sub>s</sub> were derived using data from the Ministry of Agriculture, Fisheries and Food and with the very final parameter of the EF (namely, kg N<sub>2</sub>O-N/kg sewage N produced) taken from the Revised 1996 IPCC Guidelines.

### 4. Waste incineration – CO<sub>2</sub>

87. The most important contribution to CO<sub>2</sub> emissions in this category comes from flaring in ferrous metallurgy, which in 2004 contributed 71.61 Gg CO<sub>2</sub> to the total of 75.52 Gg CO<sub>2</sub> reported for this category. Spain has allocated emissions from flaring of gases (coke oven gas and blast furnace gas) under waste incineration – flaring in ferrous metallurgy. The ERT believes that this allocation to the waste sector is not appropriate, as the IPCC good practice guidance for the waste sector explains that this category should cover the incineration of municipal solid waste, hazardous waste, clinical waste or sewage sludge in specific waste incineration plants, which does not include flaring of gases. Moreover, the IPCC good practice guidance recommends reporting CO<sub>2</sub> emissions from blast furnace gas in the industrial processes sector. The ERT therefore recommends Spain to report and specify CO<sub>2</sub> emissions from the flaring of blast furnace gas in the industrial processes sector under iron and steel production, subcategory other (2.C.1.5).

## C. Non-key categories

### Waste incineration – N<sub>2</sub>O and CH<sub>4</sub>

88. Under waste incineration, Spain also reports CH<sub>4</sub> and N<sub>2</sub>O emissions from “open burning of agricultural wastes”, amounting to 147.2 Gg CO<sub>2</sub> equivalent in 2004. The ERT found the amounts of burnt material to be rather large; during the review, however, it was not possible to define precisely the types of residue that are burnt or to confirm that these are agricultural residues (as distinct from forestry residues). The ERT therefore recommended that Spain justify the origin of these residues burnt and, if necessary, reconsider the allocation of these emissions to the appropriate sector of the inventory. In conjunction with its resubmission, Spain informed the ERT that these residues are considered forestry residues and had therefore been removed from the waste sector for all years of the time series. This resulted in a decrease of the estimate of waste incineration emissions, from 233.64 Gg CO<sub>2</sub> equivalent as originally reported to 86.42 Gg CO<sub>2</sub> equivalent in the revised submission (a 63.0 per cent decrease).

## VII. Conclusions and recommendations

89. Spain has submitted a complete set of CRF tables for the years 1990–2004 and an NIR. The inventory is generally in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance and is complete in terms of years, geographic coverage, sectors and gases, except for the LULUCF sector. During the in-country review the Party and the ERT agreed on some changes to be made for some categories in the energy, agriculture and waste sectors, which are reflected in Spain’s resubmitted CRF tables for the years 1990–2004.

90. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of Spain’s information reported as well as to the institutional arrangements in place for the preparation of the inventory. The key recommendations<sup>3</sup> are that Spain:

- (a) Implement further improvements in institutional cooperation and administrative arrangements, in particular in the energy and LULUCF sectors, and strengthen the work of the relevant formal working groups that have been established;

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<sup>3</sup> For a complete list of recommendations, the relevant sections of this report should be consulted.

- (b) In the energy sector: further improve institutional cooperation to resolve and explain the inconsistencies identified in the consumption data for some liquid fuels, and get access to the plant-specific data reported under the EU ETS;
- (c) In the LULUCF and agriculture sectors: further improve institutional cooperation between the relevant ministry departments and institutions contributing to the inventory of these sectors in order to enhance consistency in the data used for the preparation of inventory estimates, for example, by developing a national land-use classification, as already planned. Spain should also provide estimates for the LULUCF categories that are currently not reported;
- (d) Enhance QA/QC in those sectors where some weaknesses have been identified, that is, mainly the waste and LULUCF sectors;
- (e) Encourage the participation of the autonomous regions in the formal working groups and develop legal arrangements to enable the use of the plant-specific data collected under the EU ETS for QA/QC purposes of the GHG inventory;
- (f) Complete the reporting of the CRF tables, in particular the tables related to LULUCF, table 9 (completeness) and table 8(b) (recalculations), in its next submission;
- (g) Include in the NIR the references of the AD and EF sources and the list of references.

Annex**Documents and information used during the review****A. Reference documents**

- IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gp/english/>>.
- IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>>.
- IPCC/OECD/IEA. Revised 1996 IPCC Guidelines for national greenhouse gas inventories, volumes 1–3, 1997. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>>.
- UNFCCC. Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories. FCCC/SBSTA/2004/8. Available at <<http://unfccc.int/resource/docs/2004/sbsta/08.pdf>>.
- UNFCCC. 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>>.
- UNFCCC secretariat. Status report for Spain. 2006. Available at <<http://unfccc.int/resource/docs/2006/asr/esp.pdf>>.
- UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006. Available at <[http://unfccc.int/resource/docs/webdocs/sai/sa\\_2006.pdf](http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf)>.
- UNFCCC secretariat. Spain: Report of the individual review of the greenhouse gas inventory submitted in the year 2005. FCCC/ARR/2005/ESP. Available at <<http://unfccc.int/resource/docs/2006/arr/esp.pdf>>.

**B. Additional information provided by the Party**

Responses to questions during the review were received from various relevant departments through Ms. Ángeles Cristóbal from the Directorate-General for Quality and Environmental Evaluation, Sub-Directorate for Air Quality and Risk Prevention of the Ministry of Environment, including additional background information and documentation, such as on the methodologies and assumptions used as well as on institutional arrangements.

*Anuario estadístico agrario 2004.\**

Calculating Direct GHG Emissions from Primary Aluminium Metal Production, guide to calculation worksheets.

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Estudio de información básica para la determinación de emisiones a la atmósfera producidas por biodegradación de Residuos Sólidos. Prointec INC, November 1999.\*

Ministerio de Agricultura, Pesca y Alimentación and Ministerio de Medio Ambiente. 2006. Guías de mejoras técnicas disponibles (available at

<<http://www.mapa.es/es/ganaderia/pags/IPPC/IPPC.htm#inicio>>):

- del sector porcino;
- del sector de la avicultura de puesta;\*
- del sector de al avicultura de carne.\*

Ministerio de Medio Ambiente and Universidad Politécnica de Valencia. 2006. Methodology to estimate atmospheric emissions from the agrarian sector for the national emissions inventory. October.

Ministerio de Medio Ambiente, Secretaría General para la Prevención de la Contaminación y del Cambio Climático, Dirección General de Calidad y Evaluación Ambiental. Inventarios Nacionales de Emisiones a la Atmósfera 1990–2004 (in electronic format/CD), July 2006:

- Documento Resumen;
- Volumen I: Planteamiento, Metodología General y Síntesis de Resultados;
- Volumen II: Análisis por actividades emisoras de la nomenclatura SNAP.

Sector residuos: additional information in relation to the NIR 2007 (informal document provided for the ERT).

*The Environment in Spain*, Annual, 2003.\*

The following additional supplementary information was provided in conjunction with the resubmission of 8 June 2007 (informal documents provided to the ERT):

- Aclaraciones sobre el inventario (clarifications on the inventory);
- Specific files on specific activities:
  - Aclaraciones Residuos 6A - Suplemento (WORD);
  - Air Traffic - Supplement (EXCEL);
  - Aclaraciones Agricultura - Suplemento (EXCEL);
  - Modelo Cuestionario Vertederos Individualizados (EXCEL).

\* Only consulted during the visit.

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