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Report of the centralized in-depth review of the fourth national communication of Spain

According to decision 4/CP.8, Parties included in Annex I to the Convention are requested to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, a fourth national communication by 1 January 2006. This report presents the results of the in-depth review of the fourth national communication of Spain conducted by an expert review team in accordance with relevant provisions of the Convention and Article 8 of the Kyoto Protocol.

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I. Introduction and summary

A. Introduction

1. Spain has been a Party to the Convention since 1993 and to its Kyoto Protocol since 2002. Within the burden-sharing agreement of the European Union (EU) for meeting commitments under the Kyoto Protocol, Spain committed itself to limiting the growth in its greenhouse gas (GHG) emissions to 15 per cent in relation to the 1990 level during the first commitment period from 2008 to 2012.

2. This report covers the centralized in-depth review (IDR) of the fourth national communication (NC4) of Spain, coordinated by the UNFCCC secretariat, in accordance with decision 7/CP.11. The review took place from 12 to 17 May 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Marko Aunedi (Croatia), Mr. Daniel Bouille (Argentina), Mr. Mustafa Coskun (Turkey), Mr. Javier Gonzales (Bolivia), Mr. Bernd Gugele (European Community), Ms. Ashley King (United States of America) and Mr. Daniel Martino (Uruguay). Mr. Gugele and Mr. Martino were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each part of the NC4. The ERT also evaluated the information contained in Spain's report demonstrating progress (RDP) in achieving its commitments under the Kyoto Protocol, and the supplementary information provided by Spain under Article 7, paragraph 2, of the Kyoto Protocol.

4. 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, in this final version of the report.

B. Summary

5. The ERT noted that Spain's NC4 complies in general with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications" (hereinafter referred to as the UNFCCC reporting guidelines). As required by decisions 22/CP.7 and 25/CP.8, the RDP provides information on the progress made by Spain in achieving its commitments under the Kyoto Protocol. Supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol[1] is provided in both the NC4 and the RDP. The ERT commended Spain for its coherent and consistent reporting.

1. Completeness

6. The ERT noted that the NC4 covers all the sections required by the UNFCCC reporting guidelines. The ERT also noted that Spain's RDP contains all the parts stipulated by decisions 22/CP.7 and 25/CP.8. Furthermore, the ERT noted that Spain has provided the supplementary information required under Article 7, paragraph 2, except for a description of its national registry.

2. Timeliness

7. The NC4 was submitted on 23 March 2006 and the RDP on 21 April 2006. Decision 4/CP.8 requested Parties to submit their NC4 by 1 January 2006; decision 22/CP.7 set the same date for Parties to submit their RDP.

[1] Decision 15/CMP.1, annex, chapter II.

3. Transparency

8. The ERT acknowledged that Spain's NC4 is well structured and concise. The NC4 provides clear information on most aspects of implementation. However, the ERT noted that, in particular, the projections of emissions under the 'with additional measures' scenario are not fully transparent. The ERT concluded that this lack of transparency may be associated with the rapid development of additional policies and measures (PaMs). In this report, the ERT formulates a number of recommendations, for example to provide detailed information on the assistance provided by Spain for the purpose of technology transfer, that could help Spain to increase the transparency of its reporting. The review team noted that the information contained in the NC4 is generally consistent with that contained in the RDP.

II. Technical assessment of the reviewed elements

A. National circumstances relevant to greenhouse gas emissions and removals

9. In its NC4, Spain has provided a description of its national circumstances, of how these national circumstances affect GHG emissions and removals in Spain, and how national circumstances and changes in national circumstances affect GHG emissions and removals over time. The ERT noted that the main drivers of emission trends in Spain include demographic developments, overall economic activity and increased energy demand, traffic volume and distances covered by road transport (supported by the development of road infrastructures and the increase in the number of private vehicles), changes in primary energy use and annual variation in precipitation. Table 1 illustrates Spain's national circumstances by providing some indicators relevant to GHG emissions and removals.

Table 1. Indicators relevant to greenhouse gas emissions and removals for Spain

	1990	1995	2000	2006	Change 1990–2000 (%)	Change 2000–2006 (%)	Change 1990–2006 (%)
Population (million)	39.01	39.39	40.26	43.40	3.2	7.8	11.3
GDP (2000 USD billion using PPP)	650.69	701.21	857.48	1006.95	31.8	17.4	54.8
TPES (Mtoe)	91.20	102.86	124.64	144.94	36.7	16.3	58.9
GDP per capita (2000 USD thousand using PPP)	16.68	17.80	21.30	23.20	27.7	8.9	39.1
TPES per capita (toe)	2.34	2.61	3.10	3.34	32.4	7.9	42.9
GHG emissions without LULUCF (Tg CO_2 eq)	287.69	318.78	384.98	433.34	33.8	12.6	50.6
GHG emissions with LULUCF (Tg CO_2 eq)	260.76	290.71	353.14	400.43	35.4	13.4	53.6
CO_2 emissions per capita (Mg)	5.86	6.49	7.64	8.29	30.5	8.4	41.5
CO_2 emissions per GDP unit (kg per 2000 USD using PPP)	0.35	0.36	0.36	0.36	2.2	–0.5	1.7
GHG emissions per capita (Mg CO_2 eq)	7.37	8.09	9.56	9.98	29.7	4.4	35.4
GHG emissions per GDP unit (kg CO_2 eq per 2000 USD using PPP)	0.44	0.45	0.45	0.43	1.5	–4.1	–2.7

Data sources: (1) GHG emissions data: Spain's 2008 inventory submission; (2) population, GDP and TPES data: International Energy Agency.
Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.
Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

10. Spain has provided a summary of information on GHG emission trends for the period 1990–2004. This information is consistent with Spain's 2006 national GHG inventory submission. Summary tables, including trend tables for emissions in carbon dioxide equivalent (CO_2 eq) (given in the common reporting format), are provided in an annex to the NC4.

11. Total GHG emissions excluding emissions and removals from land use, land-use change and forestry (LULUCF) increased by 50.6 per cent between the base year and 2006, and total GHG emissions including net emissions or removals from LULUCF increased by 53.6 per cent (see table 2). This was mainly attributed to CO_2 emissions, which increased by 57.4 per cent over this period. Emissions of methane (CH_4) increased by 33.8 per cent, while emissions of nitrous oxide (N_2O) increased by 8.2 per cent. A major part of these increases was experienced during the period 1996–2005, when CO_2 emissions grew by 51.5 per cent. Emissions of fluorinated gases accounted for 1.2 per cent of total GHG emissions in 1990 and 1.4 per cent in 2006. Table 2 provides an overview of GHG emissions by sector from the base year to 2006 (see also discussion of sectoral trends in chapter II B below).

12. The observed trends in emissions are driven by increases in population, mostly as a result of immigration, increases in the per capita use of energy, and increases in the per capita income. In addition, the adoption of a decentralized administration model implied an increase in the construction of infrastructure, which brought about increased GHG emissions. In spite of the large increase in total emissions, the current level of emissions per capita or per unit product of Spain remain at or below the average for European countries.

Table 2. Greenhouse gas emissions by sector in Spain, 1990–2006

	GHG emissions (Tg CO_2 eq)					Change (%)		Shares[a] by sector (%)	
	1990	1995	2000	2005	2006	1990–2006	2005–2006	1990	2006
1. Energy	212.56	241.07	289.49	347.56	338.28	59.1	–2.7	73.9	78.1
A1. Energy industries	77.69	86.81	105.72	126.06	117.18	50.8	–7.0	27.0	27.0
A2. Manufacturing industries and construction	46.73	53.65	58.51	71.72	70.64	51.2	–1.5	16.2	16.3
A3. Transport	57.53	67.02	86.98	105.56	108.62	88.8	2.9	20.0	25.1
A4.– A5. Other	26.40	29.38	34.02	40.13	37.90	43.6	–5.6	9.2	8.7
B. Fugitive emissions	4.21	4.20	4.25	4.09	3.95	-6.3	–3.4	1.5	0.9
2. Industrial processes	26.31	27.42	34.68	34.34	35.09	33.4	2.2	9.1	8.1
3. Solvent and other product use	1.39	1.34	1.67	1.48	1.51	9.0	2.5	0.5	0.3
4. Agriculture	40.33	39.88	47.76	44.88	46.18	14.5	2.9	14.0	10.7
5. LULUCF	–26.93	–28.06	–31.84	–32.99	–32.91	22.2	–0.2	–9.4	–7.6
6. Waste	7.09	9.07	11.38	12.63	12.27	73.0	–2.9	2.5	2.8
7. Other	NA	NA	NA	NA	NA				
GHG total with LULUCF	260.76	290.71	353.14	407.90	400.43	53.6	–1.8	90.6	92.4
GHG total without LULUCF	287.69	318.78	384.98	440.89	433.34	50.6	–1.7	100.0	100.0

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

Note: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

[a] The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

B. Policies and measures

13. As required by the UNFCCC reporting guidelines, Spain has provided in its NC4 well-organized information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention and its Kyoto Protocol. Each sector has its own textual description of the principal PaMs, supplemented by summary tables on PaMs by sector. Spain has also provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals consistent with the objective of the Convention. Table 3 provides a summary of the reported information on the PaMs of Spain.

Table 3. Summary of information on policies and measures

Major policies and measures	Examples/comments
Framework policies and cross-sectoral measures	
Emissions trading	European Union (EU) emissions trading scheme from 2005
Support of research and development	Programmes to support innovation and technology development (PITMA, PATI, ATYCA, PROFIT)
Other	Establishment of the National Council on Climate Change (1992), the National Office for Climate Change (2001), the Inter-ministerial Group on Climate Change (2004), and the Commission for Climate Change Policy Coordination (2005); regional actions/initiatives
Policies and measure by sector	
Energy	
Energy sector liberalization	Law on the electricity sector (1997)
Renewable energy sources	Plan on renewable energies 2005–2010
Energy efficiency improvements	Building codes and regulations; energy certification of buildings; labelling of energy equipment
Other	National energy plan; planning for the electricity and gas sectors; energy strategy for 2004–2012 (2003)
Transport	
Agreements/partnerships	European Commission agreements with: European Automobile Manufacturers Association (1999), Korea Automobile Manufacturers Association (2000), Japan Automobile Manufacturers Association (2000)
Integrated transport planning	Plan for transport infrastructures 2000–2007; law on the railway sector; strategic plan for infrastructures and transport 2005–2020
Industry	
Pollution prevention and control	EU directive on integrated pollution prevention and control
Agriculture	Common Agricultural Policy (CAP) of the EU; national measures to supplement CAP
Waste management	Law on waste; national plan on municipal waste and related national programmes
Forestry	Spanish forestry strategy; Spanish forestry plan 2002–2032

1. Policy framework and cross-sectoral measures

14. The preparation, assessment and following-up of Spain's sustainable development strategy are performed by the Inter-ministerial Group for a Sustainable Development Strategy, which is coordinated by the Ministry of the Environment. This group works with the relevant agencies of the State General Administration. In relation to the climate change and clean energy strategy, the legal framework attributes functions to two participation and coordination bodies: the National Council on Climate Change, whose functions include the preparation, assessment and following-up of the Spanish climate change strategy; and the Commission for Climate Change Policy Coordination, which regulates GHG emissions trading, working as a coordination and cooperation agency between the State General Administration and the Autonomous Communities. The General Directorate of the National Office for Climate Change is the body of the State General Administration in charge of formulating the national policy in matters of climate change; it is also responsible for proposing relevant regulations and developing the administrative planning instruments that enable the fulfilment of the objectives established by the national policy. In 2007, the National Council on Climate Change adopted a number of new plans to ensure that its Kyoto Protocol target is met, including the national strategy for climate change and clean energy, the Government's urgent measures concerning the Spanish strategy for climate change and clean energy, the Government's strategic plan scenario related to manufacturing industries and construction, and the Spanish "E4 and E4+" strategic Plan.

2. Policies and measures in the energy sector

15. The energy sector shows a predominant contribution to GHG emissions, and its share of total emissions increased from 73.9 per cent in 1990 to 78.1 per cent in 2006. While total emissions (without LULUCF) increased by 50.6 per cent, those from the energy sector increased by 59.1 per cent (an increase of 125.72 Tg CO_2 eq). The main drivers of this trend were increases in emissions from transport (88.8 per cent), the energy industry and energy use in manufacturing industries and construction

(24 per cent), which together explain more than 90 per cent of the increment. Between 1995 and 2003 the number of registered passenger cars increased by 24.4 per cent.

16. ***Manufacturing industries and construction.*** In terms of energy efficiency, actions have to be defined by the Ministry of Industry, Tourism and Trade in collaboration with the relevant departments of the State General Administration. Key PaMs in manufacturing industries and construction, as reported in the NC4 and the supplementary documentation (see list of documents in the annex to this report), include a voluntary agreement for the manufacturing sector, energy audits, investment support through public subsidies (a single measure with an estimated reduction of 27 Mt CO_2 eq during the period 2008–2012) and an energy efficiency assessment of any new investment project. The ERT noted that additional investment is foreseen for only one of these measures. In the context of the centralized review the ERT was unable to allocate the remaining estimated effects of PaMs in this sector (around 30 Mt CO_2 eq). The ERT encourages the Party to increase transparency of its reporting on PaMs, particularly with regard to their estimated mitigation effects, in its future national communications.

17. ***Transport.*** Key PaMs in transport include promoting public transport, public awareness-raising, modal shift measures, replacing old cars and trucks and providing public information (car labelling). More than 70 per cent of the estimated mitigation effect is allocated to modal shift measures (16 Mt CO_2 eq), improving and developing railways (13 Mt CO_2 eq), infrastructure management (27 Mt CO_2 eq) and replacing old cars (13 Mt CO_2 eq).

18. ***Energy use in other sectors.*** Improving the efficiency of lighting in old buildings is reported as the most important measure within the building sector (estimated effect of almost 18 Mt CO_2 eq during 2008–2012), supplemented by measures to raise standards for thermal isolation of new buildings and by a new regulation in Spain's Technical Code of Building.

19. ***Energy industries.*** The ERT noted that, within the energy industries sector, no specific measures are defined for oil refineries and power generation, for the promotion of cogeneration through changes in the regulatory framework or for the special promotion of small power producers. Therefore, just six measures concerning energy use in the industry, transport and buildings sectors are expected to deliver almost 50 per cent of the total effect of PaMs in the energy sector (238.1 Mt CO_2 eq). Implementation of the Government's urgent measures concerning the Spanish strategy for climate change and clean energy is estimated to provide emission reductions of about 32 Mt CO_2 eq during 2008–2012. In addition, the ERT noted that an update of the Government's strategic plan scenario related to manufacturing industries and construction shows an additional mitigation effect of 3.4 Mt CO_2 eq, without any additional investment or mitigation action.

20. The ERT noted that meeting the objectives of the Government's "E4 and E4+" strategic plan poses a challenge to Spain, given that energy efficiency increased between 2000 and 2005 and is now projected to decrease. The ERT observed that thorough implementation of the PaMs presented by Spain is critical to achieving the estimated mitigation effects.

21. The ERT found that many key measures are based on 'soft' policies, where estimating mitigation effects involves greater uncertainty than is the case where measures that are based on 'hard' policies are concerned. For example, it is not clear how the most important policy in transport (infrastructure management) was estimated to lead to emission reductions of 8 Mt CO_2 eq in 2008–2012, given that the main measures foreseen under this policy are a study for road pricing, the development of proposals for intermodality, information campaigns, pilot projects and speed limit controls.

22. In addition, the ERT noted with concern that the response time between the implementation of certain measures and the production of their mitigation effects has not been factored into the estimation of effects for the first commitment period. Energy audits, environmental assessments for new

investment, and industrial labelling require some enabling activities, laboratories, audit capacities, regulations, legal frameworks, etc). In the context of the centralized review, the ERT concluded that the total effect of PaMs in the energy sector for the period 2008–2012 could be judged as an optimistic estimate, given the limited time for implementation and taking into account the national circumstances. The ERT encourages Spain to use more sophisticated methodologies for the estimation of mitigation effects of PaMs in future national communications.

3. Policies and measures in other sectors

23. Between 1990 and 2006, GHG emissions from industrial processes (including solvent and other product use), agriculture and waste increased by 23.6 per cent (17,720 Gg CO_2 eq), and currently constitute about 21 per cent of total GHG emissions. The growth was mainly driven by increases in emissions from, in decreasing order of magnitude, mineral products (cement and lime production), consumption of fluorinated gases, manure management, solid waste disposal on land, enteric fermentation and wastewater handling; and by a decrease in emissions from the production of halocarbons and sulphur hexafluoride and the chemical industry. The observed increase in emissions was partly compensated for by an increase of net removals in the forestry sector (from 26,930 Gg CO_2 eq in 1990 to 32,910 Gg CO_2 eq in 2006).

24. The observed increase in emissions from non-energy sources was more or less equally distributed among the sectors. The main driver for increases in the industrial products sector is the construction of infrastructure (cement production, lime production, limestone and dolomite use) associated with the large increase in population and the adoption of a decentralized administration model following the enactment of the Spanish Constitution of 1978. In the agriculture sector the growth in emissions is associated with the adoption of more intensive production systems implying higher emissions from manure management, and with increased livestock population. Emissions in the waste sector increased by 72.8 per cent, the largest for any individual sector, driven primarily by an increased rate of waste collection and disposal on landfills, and somewhat compensated for by improved recycling.

25. ***Industrial processes.*** Large increases in emissions from cement and lime production and fluorinated gas consumption offset significant decreases from the chemical industry. The ERT noted that Spain reported no PaMs targeting GHG emissions from industrial processes. However, a number of non-climate specific PaMs have been proposed to mitigate emissions from these sources, including the environmental permitting requirement, the adoption of best available technologies and the enforcement of transparent reporting. The evolution of emissions from this sector, as indicated by the latest GHG inventory submitted by the Party shows an increase of 25 per cent from 1990 to 2006. This is a close match with the projected 2005 value for the 'with measures' scenario (24 per cent increase), while projected increase under the 'without measures' scenario is 34 per cent. However, the 'with measures' scenario projects a lower rate in the increase in emissions after 2005, reaching a level of 29 per cent above the base year by 2010, but no explanations are given for this.

26. ***Agriculture.*** The main sources of emissions from this sector are N_2O from soils (42 per cent), CH_4 from enteric fermentation (28 per cent) and CH_4 and N_2O from manure management (27 per cent). The measures for climate change mitigation in agriculture described by Spain in its RDP and its NC4 are mostly non-climate specific, and seem to correspond more to sectoral policies than to an objective of reducing GHG emissions. In addition, the ERT noted that several measures (e.g. promotion of the use of biomass as an energy feedstock, substitution of nitrogen (N) fertilizers by compost) that should be allocated to other sectors (i.e. industrial processes and waste). The ERT encourages the Party to use more sophisticated methodologies for the estimation of the mitigation effects of PaMs in future national communications.

27. Spain outlined several prospective measures that could reduce emissions in the sector (e.g. carbon sequestration in agricultural soils or in agroforestry systems, reduced use of N fertilizers, improved digestibility of pastures for reducing CH_4 emissions from enteric fermentation) but they are still at a very early stage of assessment, and no quantified estimates were given. The actual emissions in the agriculture sector in 2006, as shown in the latest national inventory report, are consistent with the 2005 estimate for the 'with measures' scenario (increases of 15 per cent and 17 per cent, respectively, in relation to the 1990 level). However, the same scenario projects a reduction in emissions by 2010 to 7 per cent above the 1990 level. The magnitude of this reduction (more than 5,000 Gg CO_2 eq in 2010) is greater than the total effect of the sectoral PaMs described in the NC4 (2,750 Gg CO_2 eq in 2010).

28. ***Forestry.*** The forestry sector plays a key role in the Spanish strategy for compliance with the Kyoto Protocol, with a contribution in the first commitment period estimated at an equivalent of 2 per cent of the base year emissions. The Spanish forestry plan implemented in 2002–2003, with the multifunctionality of forests as one of its basic principles, has allocated EUR 2.2 billion for the promotion of 150 actions during the period 2002–2008. These actions include increasing the area of forests, protecting forests and increasing CO_2 removals through forest management. The forestry plan aims at the afforestation or reforestation of 3.8 million hectares over a period of 30 years, leading to an estimated net removal of 200 Tg CO_2 during that period. Spain has elected to account for its forest management activities under Article 3, paragraph 4, of the Kyoto Protocol during the first commitment period; the NC4 states that practices designed for enhancing carbon sinks in forests, covering an area of 1.3 million hectares, will produce a net removal of 25 Tg CO_2 over 30 years. The ERT noted that Spain has implemented an effective set of PaMs in the forestry sector, and reminds the Party of the need to follow the provisions of decision 16/CMP.1, in particular the clear identification of land units subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, in order to be able to account for carbon sinks.

29. ***Waste.*** The waste sector had the largest proportional increase in emissions of any sector (5.2 Tg CO_2 eq, or 73 per cent during the period 1990–2006). The PaMs indicated by Spain in its NC4 do not have GHG emission reduction as a primary objective, but would nonetheless lead to some reductions. The 'with measures' scenario projects an increase in emissions of 14 per cent by 2005 in relation to 1990, and a decrease of emissions in the period 2005–2010, reaching a level of 2 per cent below the base year. This scenario is not consistent with the actual evolution of emissions as reported in the latest inventory submission of Spain, which shows that emissions in 2006 were 73 per cent above those in 1990. The achievement of the target estimated by the 'with measures' scenario would require a reduction in emissions by 43 per cent of the 2006 levels in only four years. The ERT encourages Spain to make urgent efforts to design a set of PaMs specifically for reducing GHG emissions in the waste sector and to implement the necessary monitoring procedures. It also encourages the Party to use more sophisticated methodologies for the estimation of mitigation effects of PaMs in future national communications.

C. Projections and the total effect of policies and measures

1. Projections

30. In its NC4, Spain has provided GHG emission projections which include a 'with measures' and a 'without measures' scenario up to 2020. The projected emission trends are presented relative to actual inventory data for the period 1990–2000, since 2000 was the last year for which sufficiently detailed information existed for developing the scenarios. Projections are presented on a sectoral basis, using the same sectoral categories used in the PaMs section, and on a gas-by-gas basis for all six relevant GHGs. In addition, the projections were provided in an aggregated format for each sector as well as for a national total, using global warming potential values. Emission projections related to fuel sold to ships and aircraft engaged in international transport (para. 36 of the UNFCCC reporting guidelines) are not

reported separately. The ERT noted that Spain did not include a 'with additional measures' projection, which is consistent with the very limited number of additional measures reported in the NC4. The ERT recommends that emission projections related to fuel sold to ships and aircraft engaged in international transport be included in the information on projection in its next national communication, as required by the UNFCCC reporting guidelines.

31. The emission projections in the NC4 were calculated using the SEP (Spain's Emission Projections) model, developed by the General Direction for the Evaluation and Quality of the Environment together with the Polytechnic University of Madrid. The model is based on the methodology developed by the European Environment Agency (EEA) and the United States Environmental Protection Agency, and its basic features are presented in the NC4 text. The projections for each activity were carried out using the methodology specific to that activity; however, the ERT noted that these specific methodologies were not elaborated in the document. The two projection scenarios considered were: (a) business as usual (or 'without measures'), which represents future emissions in cases where historical trends continue, without implementing reduction measures; and (b) baseline (or 'with measures'), which assumes the implementation of official sectoral plans and measures. Information on input assumptions and parameters was not provided.

32. Because of the urgency to act in order to curb its GHG emissions, Spain produced an updated set of projection scenarios within its communication under EU decision 280/2004/EC, submitted in December 2007. This document included three emission scenarios ('without measures', 'with measures' and 'with additional measures') for the period 2005–2020, with a revised set of incorporated PaMs; the 'without measures' scenario was obtained in a similar way to that in the NC4. Unfortunately, the level of detail of reporting in the NC4 was not maintained, so that the emission levels were presented graphically in charts, with only the effects (i.e. differences between scenarios) being reported in tabular format (the only exception being the total aggregate emissions). The sectoral representation was also greatly simplified, so that the transport sector was not reported separately, but as a part of the energy sector. In addition, the list of PaMs included in the scenarios does not provide any information on individual effects, and it is difficult to establish a clear link between scenarios and the effects of individual PaMs. Similarly to the NC4, no details on the input parameter assumptions were reported. Table 4 and the figure provide a summary of the updated information on GHG emission projections for Spain.

Table 4. Summary of greenhouse gas emission projections for Spain

	Greenhouse gas emissions (Tg CO_2 eq per year)	Changes in relation to base year level (%)
Inventory data 1990[a]	287.7	NA
Inventory data 2006[a]	433.3	49.5
Kyoto Protocol base year[a]	289.9	NA
Kyoto Protocol target[a]	333.4	15.0
'With measures' projections for 2010[b]	440.2	51.8
'With additional measures' projections for 2010[b]	412.4	42.2

Abbreviation: NA = not available.

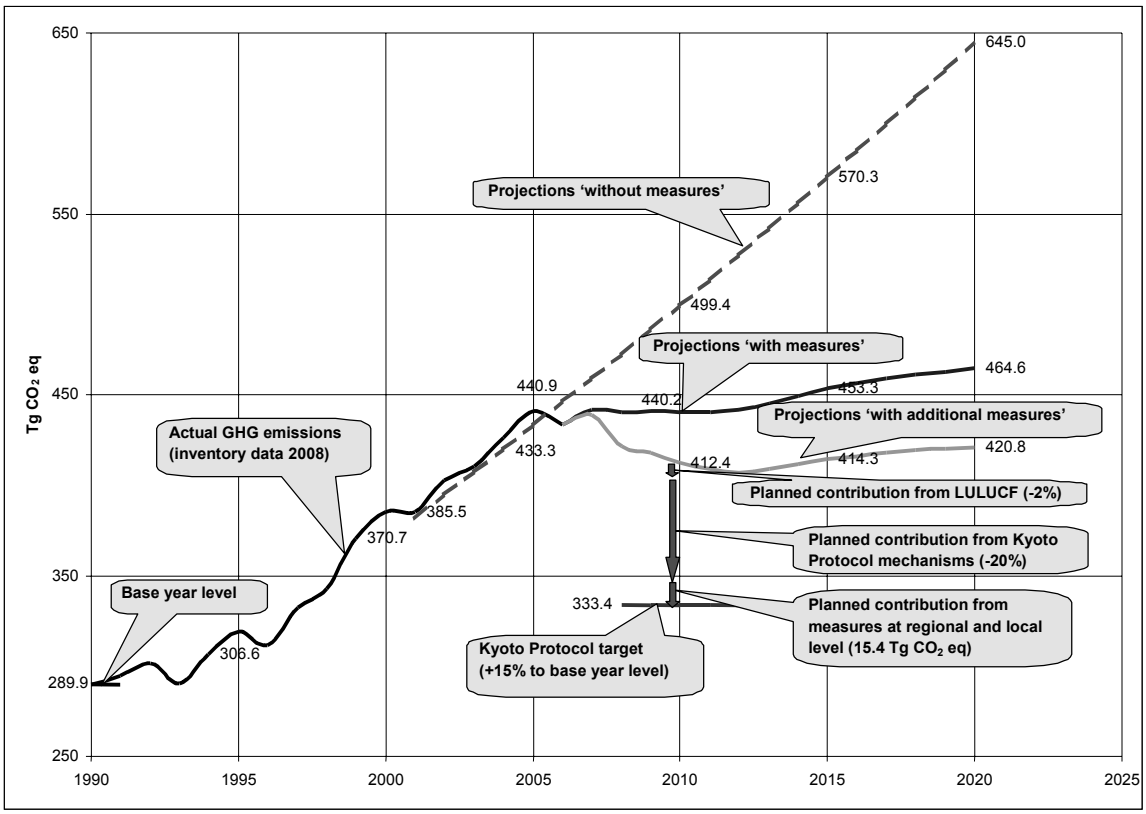
[a] Data source: Spain's 2008 greenhouse gas (GHG) inventory submission; inventory data is without land use, land-use change and forestry (LULUCF). Base year is 1990 for CO_2, CH_4 and N_2O and 1995 for hydro fluorocarbons, perfluorocarbons and SF_6.

[b] Data source: Spain's communication under European Union decision 280/2004/EC (December 2007); the projections are for GHG emissions without LULUCF.

33. The GHG emissions in Spain grew steadily between 1990 and 2006 (at an annual rate of around 2.6 per cent), mainly as a result of growth in economic activity (gross domestic product (GDP) increased on average by 3.7 per cent a year between 1995 and 2005). The greatest increases in emissions were recorded in road transport (89 per cent growth in CO_2 emissions between 1990 and 2006), the energy industry (50 per cent) and manufacturing industries (51 per cent). It is clear that with continued

historical trends Spain would be far from meeting its Kyoto Protocol target between 2008 and 2012 (15 per cent above the base year) through domestic measures alone. The ERT noted that meeting the target through domestic measures alone would require the implementation of drastic measures to revert these trends in a short period of time, especially if recent economic trends are to be maintained (see table 1).[2] Even if the full estimated effect of all the PaMs from both the 'with measures' and 'with additional measures' scenarios were achieved, the remaining distance to the target would still amount to 79 Tg CO_2 eq.

Greenhouse gas emission projections



Data source: Spain's communication under European Union decision 280/2004/EC (December 2007); the emissions are without land use, land-use change and forestry.
Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

2. Total effect of policies and measures

34. In its NC4, Spain presents only the estimated total effect of implemented and adopted PaMs (no additional measures were included in the analysis), compared with a situation without such PaMs, presented in terms of GHG emissions avoided or sequestered, by gas (on a CO_2 eq basis), until 2020. The comparison of this effect with the estimated effects of individual PaMs was not possible, since the latter were reported only for 2005–2007.

35. Table 5 provides updated information on the total effect of PaMs as reported in Spain's communication under EU decision 280/2004/EC. The effects were reported by sector and by gas, but the list of sectors did not include transport, which was integrated into the energy sector. The figures imply

[2] The National Council on Climate Change approved the urgent measures concerning the Spanish strategy for climate change and clean energy on 20 July 2007. Its emission reduction effect, in addition to the "E4" plan, is estimated at around 12 Gg CO_2 eq annually between 2008 and 2012. However, it is not clear how measures from the plan are reflected in GHG projections reported in Spain's communication under EU decision 280/2004/EC.

that additional measures in the energy sector (which here includes both transport and industrial combustion) account for the majority of expected emission reductions.

Table 5. Projected effects of planned, implemented and adopted policies and measures in 2010

Sector	Effect of implemented and adopted measures (Tg CO_2 eq)	Relative value (% of base year emissions)	Effect of additional measures (Tg CO_2 eq)	Relative value (% of base year emissions)
Energy (including transport)	36.2	10.9	23.6	7.1
Industrial processes	9.4	2.8	0.1	0.0
Solvent use	0.5	0.1	NR	NR
Agriculture	11.1	3.3	2.0	0.6
Waste management	2.0	0.6	2.1	0.6
Total	**59.1**	**17.7**	**27.8**	**8.3**

Data source: Spain's communication under European Union decision 280/2004/EC.
Abbreviation: NR = not reported.
Note: The total effect of implemented and adopted policies and measures (PaMs) is defined as the difference between the 'without measures' and 'with measures' scenarios; the total effect of planned PaMs is defined as the difference between the 'with measures' and 'with additional measures' scenarios.

36. The estimated mitigation effects of both implemented and planned PaMs amount to 87 Tg CO_2 eq in 2010. The implemented and adopted measures listed in the Spain's communication under EU decision 280/2004/EC include the national allocation plan for 2005–2007 and 2008–2012, as well as action plans from the "E4" strategy. The ERT noted that these results indicate that substantial actions at the international level might be necessary to achieve the Kyoto Protocol target. Spain's submission to the EEA monitoring mechanism (EEA, 2007) and the Spanish strategy for climate change and clean energy envisage the use of carbon sinks amounting to 5.8 Tg CO_2 eq, and Kyoto mechanisms amounting to 58 Tg CO_2 eq annually to reduce the gap between its emissions and the target (out of which 31.8 Tg CO_2 eq is to be acquired on the carbon market by the State Administration and the remaining part by the private sector). The ERT noted that this still leaves a gap of around 15 Tg CO_2 eq not accounted for by any measures. In the context of the centralized review, the Party informed the ERT that this would be addressed through activities at the level of local authorities.

37. The ERT encourages the Party to establish a clear link between the PaMs and their quantified effects on one hand, and the total effect of PaMs as reflected in the projection scenarios on the other.

D. Vulnerability assessment, climate change impacts and adaptation measures

38. In its NC4, Spain has provided the required information on the expected impacts of climate change on the country and on vulnerable sectors. Spain has provided detailed information on adaptation plans, especially those relating to integrated coastal zone management, water resources and agriculture, as well as on activities leading to the promotion of cooperation with developing countries, in particular those in Latin America.

39. The main impacts and vulnerabilities identified by Spain are: changes in terrestrial and marine ecosystems, availability and quality of water, increased soil erosion which might lead to increased forest sector vulnerability, increased risk of fire hazards and reduced agricultural yield. The NC4 emphasizes the impacts of climate change on particular sectors of the economy and the actions taken or planned to promote adaptation, in particular concerning the integrated management of coastal areas, water resources and biodiversity. Spain has also provided detailed information on activities being carried out in collaboration with developing countries in the context of the Ibero-American Network of Climate Change Offices (RIOCC). Table 6 summarizes the information on vulnerability and adaptation to climate change presented in the NC4.

40. As indicated in table 6, Spain has identified particularly vulnerable ecosystems and sectors; these are integrated in its national plan of adaptation and reported in detail in its NC4.

Table 6. Summary of information on vulnerability and adaptation to climate change

Vulnerable area	Examples/comments/adaptation measures reported
Biodiversity and natural ecosystems	***Vulnerability***: Most vulnerable are semi-arid terrestrial ecosystems, mountainous and relictual ecosystems, lakes and rivers in mountain regions, coastal wetlands and ecosystems that rely on groundwater. Climate change will reduce productivity in marine ecosystems; most vulnerable marine ecosystems are coral reefs and algae ecosystems in coastal areas ***Adaptation***: Further studies are being carried out to evaluate the more vulnerable ecosystems and their adaptive capacity in the twenty-first century
Water resources	***Vulnerability***: Decreased precipitation will result in decreased water availability. By 2060 an increase in temperature of about 2.5 °C and a reduction in rainfall of about 8 per cent will result in a reduction of available water resources of about 17 to 22 per cent ***Adaptation***: Further studies to assess the vulnerability of water resources, in particular irrigation systems
Forestry sector	***Vulnerability***: Increased forest vulnerability and reduced forest productivity resulting from the increased temperatures and decreased rainfall. Increase in forest plagues and diseases and forest fires ***Adaptation***: Adaptive forest management
Agriculture sector	***Vulnerability***: Two opposing effects are mentioned: the negative effect of temperature increase and rainfall reduction might lead to the need for enhanced irrigation and pest management; and the positive effect of temperature increase for winter crops and increasing CO_2 fertilization ***Adaptation***: Improvement of agricultural practices and changes in crops
Coastal zones	***Vulnerability***: Deltas and beaches, in particular those at low elevations such as the Ebro delta, are most vulnerable to sea level rise ***Adaptation***: Further studies to identify the most vulnerable coastal zones and evaluate their environmental value
Human health	***Vulnerability***: Increased mortality from extreme temperatures; indirect impacts associated with the deterioration of air quality; expansion of vector-borne diseases
Infrastructure and physical planning	***Vulnerability***: Increased risk of flooding can have consequences for infrastructures
Economy	***Vulnerability***: The power generation sector may be affected by lower water availability for hydropower and increased electricity demand as a result of an increase in temperature. Tourism infrastructure and dynamic affected ***Adaptation***: Insurance schemes are being discussed; an increase in premiums is possible due to increasing risk exposure

E. Financial resources and transfer of technology

1. Financial resources

41. In its NC4, Spain has provided details of measures taken to give effect to its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention. It indicates what financial resources it has provided pursuant to Article 4, paragraph 3. Spain has also provided information on the funding it has made available to developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to those adverse effects. Furthermore, Spain has provided information on other financial resources related to the implementation of the Convention provided through bilateral, regional and other multilateral channels. Table 7 provides a summary of information on financial resources.

42. The ERT noted that Spain did not provide the following reporting elements required by the UNFCCC reporting guidelines: detailed information on the assistance provided for the purpose of technology transfer; a clear indication of what "new and additional" financial resources it has provided pursuant to Article 4, paragraph 3, with a clarification of how it has determined such resources as being "new and additional" in its NC4. The ERT recommends that the Party follow the UNFCCC reporting

guidelines more closely and provide the above-mentioned information in its next national communication.

Table 7. Summary of information on financial resources

Climate-related aid in bilateral ODA	EUR 28.52 million between 2001 and 2004 in climate change bilateral and regional cooperation
Climate-related support programmes	EUR 1.97 million contributed to the UNFCCC, the Trust Fund for Supplementary Activities, the Least Developed Countries Fund and the IPCC Environmental Protection Guarantee Fund
Contributions to GEF	EUR 12.48 million
Pledge for third GEF replenishment	EUR 21.67 million
Other (bilateral/multilateral)	Spain supports capacity-building and sustainable energy activities in Latin America and the Mediterranean region (the Ibero-American Network of Climate Change Offices (RIOCC) and the Ibero-American Programme on Vulnerability and Adaptation)

Abbreviations: GEF = Global Environment Facility, IPCC = Intergovernmental Panel on Climate Change, ODA = official development assistance.

43. In accordance with Article 4, paragraphs 3, 4 and 5, Spain provides financial resources for capacity-building activities in collaboration with RIOCC. It has provided detailed information on Global Environment Facility (GEF) contributions and GEF replenishment and on bilateral and regional financial contributions related to the implementation of the Convention.

2. Transfer of technology

44. The ERT noted that Spain has not provided the following reporting elements required by the UNFCCC reporting guidelines: details of measures related to the promotion, facilitation and financing of the transfer of, or access to, environmentally sound technologies and how these activities help to meet the commitments of Parties under Article 4, paragraphs 3, 4 and 5 of the Convention; details of its activities for financing access by developing countries to 'hard' or 'soft' environmentally sound technologies (para. 55); and facilitating and supporting development and enhancement of endogenous capacities and technologies of developing countries (para. 56). The ERT encourages Spain to report on technology transfer in its next national communication.

F. Research and systematic observation

45. Spain has provided information on its actions relating to research and systematic observation, and addressed both domestic and international activities in the context of the national climate research plan, the National Meteorology Institute and research projects funded through the European Community.

46. The NC4 provides a summary of information on its activities relating to global climate observing systems, in accordance with the UNFCCC reporting guidelines. It provides information on efforts made with regard to climate change studies, including modelling and prediction, research on the impacts of climate change and adaptation, and research on and development of mitigation and adaptation technologies. It also provides a summary of information on the current status of national plans, programmes and financial support for climate-related research, in particular on ground- and space-based climate observing systems. However, the ERT noted that Spain did not provide the following reporting elements required by the UNFCCC reporting guidelines (para. 58): information on capacity-building activities carried out in developing countries and on the effectiveness and sustainability of capacity-building programmes.

G. Education, training and public awareness

47. In its NC4, Spain has provided information on its actions relating to education, training and public awareness, as required by the UNFCCC reporting guidelines. Spain has reported on the general policy towards education, aspects regarding primary, secondary and higher education, training programmes, involvement of the public and non-governmental organizations, and its participation in international activities and networks. Some activities leading to capacity-building in developing countries are reported in the NC4 in some detail. The ERT encourages Spain to continue reporting on the effectiveness and sustainability of capacity-building programmes in its future national communications.

III. Evaluation of information contained in the report demonstrating progress and of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

A. Information contained in the report demonstrating progress

48. Spain's RDP comprises five chapters, which contain most of the information required by decisions 22/CP.7 and 25/CP.8. The ERT found the information contained in the RDP to be consistent with that provided in the NC4.

49. The RDP provides an adequate description of the legal and institutional framework regarding compliance with commitments under the Convention and its Kyoto Protocol. The Spanish Constitution of 1978 established a decentralized administration model with three territorial levels (State, Autonomous Communities and Provinces), that limits the competence of the State to those issues not explicitly assumed by the Autonomous Communities. This causes regulations to be highly fragmented, and imposes the need for considerable coordination efforts. The National Council on Climate Change was created in 1992 under the Ministry of Public Works, Transportation and Environment, with the main objective of preparing a national climate programme. After the creation of the Ministry for the Environment in 1996, membership of the Council was expanded to include several ministries, the Autonomous Communities, the Federation of Spanish Municipalities and representatives from civil society. The Spanish Climate Change Office was created in 2001 to coordinate actions at the various levels and to serve as the secretariat of the National Council on Climate Change. The climate change strategy was approved by the Council in 2004. Two bodies were created for coordinating efforts at the State level (Inter-ministerial Group on Climate Change) and at the State and autonomous governments interface (Commission for Climate Change Policy Coordination). The ERT noted that Spain did not provide a full description of enforcement and administrative procedures and encourages the Party to do so in its next national communication.

50. The ERT noted that limiting the increase in GHG emissions by 2008–2012 to 15 per cent above 1990 level is very challenging to Spain, given that GDP and energy consumption – the main drivers of emissions – have grown by nearly 55 and 59 per cent, respectively, during the period 1990–2006, causing emissions to increase by 50 per cent. The set of PaMs designed by Spain have the potential to start decoupling the growth in emissions from growth in GDP and energy use. In fact, there has been an incipient decrease in the carbon intensity of the economy since 2005. The ERT encourages the Party to give high priority to the timely implementation of the measures included in the climate change strategy, and to continue with the efforts to develop new additional measures.

51. The ERT acknowledged the substantial efforts undertaken by Spain in implementing measures to reduce its GHG emissions. However, the team noted that even when the most optimistic scenario from the latest projections document is taken into account, a gap of 79 Tg CO_2 eq still remains. According to values submitted through the EEA monitoring mechanism and the contents of the national strategy on

climate change and clean energy, the intended use of carbon sinks and Kyoto Protocol flexible mechanisms totals 63.8 Tg CO_2 eq (22 per cent of base year emissions). This indicates that a significant gap of around 15 Tg CO_2 eq is left, with no measures or instruments reported that could bridge this gap. The ERT therefore concluded that, according to the most recent official information, Spain may need to acquire more international emission allowances than stated among the objectives of its climate change strategy in order to comply with its Kyoto target for 2008–2012.

B. Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

52. Spain has provided most of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in its NC4 and its RDP. This information reflects the steps taken by Spain to implement the relevant provisions of the Kyoto Protocol. The supplementary information is placed in different sections of the NC4 and the RDP. Table 8 provides references to the NC4 and RDP chapters in which supplementary information is provided.

Table 8. Overview of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

Supplementary information	Reference
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	RDP, chapters 2.9.2, 2.9.3, 4.3 NC4
Policies and measures in accordance with Article 2	RDP, chapters 2.2–2.8, 2.9.1, 2.10.1, 4.1, 4.2 NC4, chapter 4
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	RDP, chapters 2.1, 5.2 NC4
Information under Article 10	RDP, chapter 5 NC4, chapter 7
Financial resources	RDP chapters 5.4, 5.5 NC4, chapter 7

Abbreviations: NC4 = fourth national communication, RDP = report demonstrating progress.

53. The Party has not provided a definition of supplementarity as required by the reporting guidelines for supplementary information under Article 7, paragraph 2, of the Kyoto Protocol, as contained in the annex to decision 15/CMP.1. From documents provided by the Party during the review, the ERT inferred that Spain's definition of supplementarity suggests that most of the necessary emission reductions have to be achieved domestically. The ERT recommends that Spain provide a definition of supplementarity in its future national communications in the sections on supplementary information under Article 7, paragraph 2, of the Kyoto Protocol.

54. Spain has not reported a description of the national registry, which is one of the elements of the supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol. The ERT noted that Spain has included this description in its initial report under the Kyoto Protocol, which has already been subjected to review by the UNFCCC secretariat.

IV. Conclusions

55. GHG emissions in Spain have increased by 50.6 per cent between 1990 and 2006. This increase was largely driven by increases in population (11 per cent), GDP per capita (39 per cent) and energy consumption (44 per cent). The energy sector was responsible for 78.1 per cent of 2006 emissions and for 87.6 per cent of the observed increment since 1990. Waste was the sector with the largest increase (72.8 per cent). PaMs implemented or planned by Spain focus mainly on the energy sector, and the ERT encourages Spain to strengthen the PaMs in the non-energy sectors. Only six measures in the industry, transport and buildings sectors are estimated to reduce emissions by 238 Tg CO_2 per year. A number of non-climate sectoral policies already implemented or planned to be implemented would also result in reduced emissions.

56. Spain has provided several sets of GHG projections in its NC4, its RDP and several documents received by the ERT during the review. Such GHG projections cover variable periods from 1990 or 2000 to 2020. The ERT noted that due to frequent revisions of climate PaMs undertaken during the time since the submission of its NC4, projections have been modified substantially. Three scenarios are included in the latest document provided by the Party, dated December 2007: (a) baseline ('without measures'); (b) 'with measures' (including the effect of currently implemented and adopted policies and measures); and (c) 'with additional measures'. The projected increases in GHG emissions under the baseline scenario, in relation to the base year, and under the 'with measures' and 'with additional measures' scenarios, are 73.6, 53.0 and 43.3 per cent, respectively. Thus, the projections indicate that, in order to achieve its Kyoto Protocol target (which is a 15 per cent increase), even under the 'with additional measures' scenario, amended by a set of planned urgent measures, plus the planned use of flexibility mechanisms offsetting an equivalent to 20 per cent of 1990 emissions, Spain would need to develop new additional measures and/or to increase its use of flexibility mechanisms.

57. In the course of the IDR, the ERT formulated a number of recommendations relating to the completeness and transparency of Spain's reporting under the Convention and its Kyoto Protocol. The key recommendations[3] are that, in its future national communications, Spain:

- Include emission projections related to fuel sold to ships and aircraft engaged in international transport in the information on projection;
- Provide detailed information on the assistance provided for the purpose of technology transfer;
- Clearly indicate what "new and additional" financial resources it has provided pursuant to Article 4, paragraph 3, of the Convention, with a clarification of how it has defined such resources as being "new and additional";
- Provide a definition of supplementarity in its future national communications in the sections on supplementary information under Article 7, paragraph 2, of the Kyoto Protocol.

[3] The recommendations are given in full in the relevant sections of this report.

Annex

Documents and information used during the review

A. Reference documents

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications". FCCC/CP/1999/7. Available at <http://unfccc.int/resource/docs/cop5/07.pdf>.

"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>.

FCCC/IDR.3/ESP. Report on the in-depth review of the third national communication of Spain. Available at <http://unfccc.int/resource/docs/idr/esp03.pdf>.

FCCC/SBI/2006/INF.2. Synthesis of reports demonstrating progress in accordance with Article 3, paragraph 2, of the Kyoto Protocol. Available at <http://unfccc.int/resource/docs/2006/sbi/eng/inf02.pdf>.

FCCC/SBI/2007/INF.6. Compilation and synthesis of fourth national communications. Available at <http://unfccc.int/resource/docs/2007/sbi/eng/inf06.pdf>.

FCCC/SBI/2007/INF.7. Compilation and synthesis of supplementary information incorporated in fourth national communications submitted in accordance with Article 7, paragraph 2, of the Kyoto Protocol. Available at <http://unfccc.int/resource/docs/2007/sbi/eng/inf07.pdf>.

FCCC/ARR/2006/ESP. Report of the individual review of the greenhouse gas inventory of Spain submitted in 2006. Available at <http://unfccc.int/resource/docs/2007/arr/esp.pdf>.

FCCC/IRR/2007/ESP. Report of the review of the initial report of Spain. Available at <http://unfccc.int/resource/docs/2007/irr/esp.pdf>.

Fourth national communication of Spain. Available at <http://unfccc.int/resource/docs/natc/spanc4.pdf>.

Report demonstrating progress of Spain. Available at <http://unfccc.int/resource/docs/dpr/esp1.pdf>.

2008 GHG inventory submission of Spain. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4303.php>.

EEA (European Environment Agency). 2007. *Greenhouse Gas Emission Trends and Projections in Europe 2007 – Country Profile: Spain*. Available at <http://reports.eea.europa.eu/eea_report_2007_5/en/Spain.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Isabel Lombardero Lasarte (Oficina Española de Cambio Climático, Ministerio de Medio Ambiente y Medio Rural y Marino) including additional material on greenhouse gas emission projections.

Estrategia Española de Cambio Climático y Energía Limpia, Horizonte 2007–2012–2020 (Spanish Climate Change and Clean Energy Strategy, Horizon 2007–2012–2020).

Estrategia de Ahorro y Eficiencia Energética en España 2004–2012, Plan De Acción 2008–2012, Resumen Ejecutivo. (Energy Saving and Efficiency Strategy for Spain 2004–2012, Action Plan 2008–2012, Executive Summary).

Medidas Urgentes de la Estrategia Española de Cambio Climático y Energía Limpia – EECCEL - 20/07/07. (Urgent Measures of the Spanish Strategy for Climate Change and Clean Energy, Summary 20/07/07).

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