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**Report of the individual review of the annual submission of
the United Kingdom of Great Britain and Northern Ireland
submitted in 2011***

* In the symbol for this document, 2011 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2011 annual submission of the United Kingdom of Great Britain and Northern Ireland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 19 to 24 September 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Takeshi Enoki (Japan) and Mr. Dennis Rudov (Belarus); energy – Mr. Tomas Gustafsson (Sweden), Ms. Agnieszka Janowska (European Union) and Ms. Inga Valuntiene (Lithuania); industrial processes – Mr. Kiyoto Tanabe (Japan) and Mr. Hongwei Yang (China); agriculture – Ms. Britta Hoem (Norway) and Ms. Tajda Mekinda-Majaron (Slovenia); land use, land-use change and forestry (LULUCF) – Mr. Kevin Black (Ireland) and Mr. Robert de Ligt (Australia); and waste – Ms. Sirinthornthep Towprayoon (Thailand) and Ms. Medea Inashvili (Georgia). Mr. Tanabe and Mr. Yang were the lead reviewers. The review was coordinated by Ms. Sevdalina Todorova-Brankova and Ms. Astrid Olsson (UNFCCC secretariat).

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

B. Emission profiles and trends

3. In 2009, the main greenhouse gas (GHG) in the United Kingdom was carbon dioxide (CO₂), accounting for 84.3 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by methane (CH₄) (7.7 per cent) and nitrous oxide (N₂O) (6.0 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 2.0 per cent of the overall GHG emissions in the country. The energy sector accounted for 84.9 per cent of total GHG emissions, followed by the agriculture sector (7.9 per cent), the industrial processes sector (4.0 per cent), and the waste sector (3.2 per cent). Total GHG emissions amounted to 570,066.41 Gg CO₂ eq and decreased by 27.2 per cent between 1990 and 2009. There was a decrease in emissions (by 8.7 per cent) in 2009 compared with 2008. The energy sector and the industrial processes sector were the main contributors to the decrease. In the national inventory report (NIR) the United Kingdom explains that the decrease was caused by a reduction in fuel and electricity demand due to the economic crisis.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO₂, CH₄ and N₂O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector, and also do not include the emissions from deforestation that were included in the United Kingdom’s initial report under the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned

¹ In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO₂ eq excluding LULUCF, unless otherwise specified.

amount. Data shown in these tables do not include estimates for a number of categories in the agriculture sector (see chapter II.G) which have been adjusted by the expert review team (ERT) in line with the procedures set out in the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1). These tables are based on data submitted by the Party on 15 April 2011; however, final adjusted estimates and the difference when compared with the values included in the 15 April 2011 submission are provided in the footnotes.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2009^a

		<i>Gg CO₂eq</i>								<i>Change</i>	
		<i>Greenhouse gas</i>	<i>Base year^d</i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2007</i>	<i>2008</i>	<i>2009^b</i>	<i>Base year–2009</i> (%)
Annex A sources		CO ₂	587 988.30	587 988.30	550 648.24	551 368.16	555 313.16	544 146.07	531 827.84	480 553.27	-18.3
		CH ₄	110 581.67	110 581.67	90 353.68	66 943.81	48 823.32	45 906.58	44 672.98	43 807.53	-60.4
		N ₂ O	66 999.44	66 999.44	55 514.85	44 161.25	38 853.39	36 555.37	35 808.33	33 969.50	-49.3
		HFCs	15 457.72	11 385.62	15 457.72	8 739.33	10 265.02	10 572.04	10 853.62	10 927.21	-29.3
		PFCs	462.03	1 401.60	462.03	466.43	261.46	221.05	208.51	147.10	-68.2
		SF ₆	1 239.30	1 029.95	1 239.30	1 798.48	1 110.38	793.21	711.77	661.81	-46.6
KP-LULUCF	Article 3.3 ^c	CO ₂							-2 079.42	-2 195.03	
		CH ₄							0.81	0.82	
		N ₂ O							0.01	0.01	
	Article 3.4 ^d	CO ₂	NA						-10 726.88	-9 808.36	NA
		CH ₄	NA						0.70	0.45	NA
		N ₂ O	NA						0.00	0.00	NA

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

^a “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

^b The table does not reflect the adjusted estimates for categories in the agriculture sector (see chapter II.G) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the Party’s 15 April 2011 submission that were subject to these adjustments. The adjustments result in an increase of total greenhouse gas (GHG) emissions for 2009 of 2,084.74 Gg CO₂ eq.

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

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

Table 2

Greenhouse gas emissions by sector and activity, base year to 2009^a

	Sector	Base year ^a	Gg CO ₂ eq						Change	
			1990	1995	2000	2005	2007	2008	2009 ^b	Base year– 2009 (%)
Annex A	Energy	608 883.46	608 883.46	565 864.45	558 773.24	557 405.84	543 950.06	531 766.98	484 187.68	–20.5
	Industrial processes	57 366.06	54 024.17	46 443.70	30 956.76	28 639.55	28 991.21	28 141.04	22 716.05	–60.4
	Solvent and other product use	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NA
	Agriculture	57 329.60	57 329.60	55 067.80	52 070.94	48 429.27	46 024.64	45 546.23	45 041.26	–21.4
	Waste	59 149.35	59 149.35	46 299.86	31 676.53	20 152.07	19 228.42	18 628.80	18 121.43	–69.4
	LULUCF	NA	3 921.70	2 453.12	422.46	–2 958.23	–3 524.42	–3 962.17	–4 079.14	NA
	Total (with LULUCF)	NA	783 308.27	716 128.93	673 899.92	651 668.50	634 669.90	620 120.88	565 987.28	NA
	Total (without LULUCF)	782 728.46	779 386.57	713 675.82	673 477.46	654 626.73	638 194.32	624 083.05	570 066.41	–27.2
	Other ^b	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3 ^c	Afforestation and reforestation						–2 694.75	–2 823.01	
		Deforestation						635.47	648.07	
		Total (3.3)						–2 059.28	–2 174.94	
	Article 3.4 ^d	Forest management						–10 710.65	–9 797.92	
		Cropland management	NA					NA	NA	NA
		Grazing land management	NA					NA	NA	NA
		Revegetation	NA					NA	NA	NA
		Total (3.4)	NA						–10 710.65	–9 797.92

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

^a “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs and SF₆. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

^b The table does not reflect the adjusted estimates for categories in the agriculture sector (see chapter II.G) after adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the 15 April 2011 submission that was subject to these adjustments. The adjustments result in an increase of total greenhouse gas (GHG) emissions for 2009 of 2,084.74 Gg CO₂ eq.

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

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

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

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

Table 3

Information to be included in the compilation and accounting database in t CO₂ eq

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>	<i>Accounting quantity^c</i>
Commitment period reserve	3 070 872 567			3 070 872 567	
Annex A emissions for current inventory year					
CO ₂	480 553 269			480 553 269	
CH ₄	43 807 525			43 807 525	
N ₂ O	33 969 504		2 084 737	36 054 241	
HFCs	10 927 214			10 927 214	
PFCs	147 097			147 097	
SF ₆	661 805			661 805	
Total Annex A sources	570 066 414		572 151 151	572 151 151	
Activities under Article 3, paragraph 3, for current inventory year					
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	-2 823 007			-2 823 007	
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NO			NO	
3.3 Deforestation for current year of commitment period as reported	648 069			648 069	
Activities under Article 3, paragraph 4, for current inventory year^d					
3.4 Forest management for current year of commitment period	-9 797 919			-9 797 919	
3.4 Cropland management for current year of commitment period					
3.4 Cropland management for base year					
3.4 Grazing land management for current year of commitment period					
3.4 Grazing land management for base year					
3.4 Revegetation for current year of commitment period					
3.4 Revegetation in base year					

Abbreviations: NA = not applicable, NO = not occurring.

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

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

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

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

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2011 annual inventory submission was submitted on 15 April 2010; it contains a complete set of common reporting format (CRF) tables for the period 1990–2009 and an NIR. The United Kingdom also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 20 April 2011. The annual submission was submitted in accordance with decision 15/CMP.1.

7. The United Kingdom officially submitted additional information relating to some methodological problems in the agriculture sector on 7 November 2011 in response to the list of potential problems and further questions raised by the ERT during the review. However, the United Kingdom did not submit revised emission estimates in response to the list of potential problems and further questions raised by the ERT during the review.

8. Where necessary, the ERT also used the previous years' submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.²

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

Completeness of inventory

10. The United Kingdom has submitted an NIR and a full set of CRF tables for the period 1990–2009, which are complete in terms of sectors and gases, and generally complete in terms of geographical coverage and categories. The activity data (AD) and emissions from some territories (under deforestation (see para. 140) and the waste sector (see para. 95) need to be added to the next annual submission to ensure the complete geographical coverage of the inventory. In a few cases the notation key “not estimated” (“NE”) is used (e.g. all emissions from gaseous fuels under road transportation and solid fuels under navigation, and non-CO₂ emissions from lubricants under transportation). During the review, the ERT received clarifications from the United Kingdom and concluded that for categories where default emission factors (EFs) exist the notation keys should be “included elsewhere” (“IE”) or “not occurring” (“NO”) (see para. 37). The ERT recommends that, in its next annual submission, the United Kingdom revise the notation keys used in the CRF tables and provide explanatory information in CRF table 9(a).

² The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

11. The United Kingdom does not report emissions from some other categories for which the Intergovernmental Panel of Climate Change (IPCC) does not provide default methodologies in either the Revised 1996 IPCC Guidelines or the IPCC good practice guidance (e.g. solvent and other product use) or which are non-mandatory LULUCF categories. The ERT encourages the United Kingdom to report, in its future annual submissions, emission estimates for those categories not yet addressed (such as CO₂ and N₂O from solvents and other products use, CH₄ from aluminium production, and N₂O from harvested wood products).

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

Overview

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

13. The Party described the changes of the institutional arrangements since the previous annual submission, which are minor and are limited to the changes in the names of organizations and areas of responsibilities. Some additional changes related to the involvement of additional data providers were reflected in annex 3 of the NIR without being specified in the main body of the report. More detailed discussion of these changes is provided in chapter II.H.3 of this report.

Inventory planning

14. The NIR described the national system and institutional arrangements for the preparation of the inventory. The designated single national entity with overall responsibility for the national inventory is the Department of Energy and Climate Change (DECC). The national inventory agency under contract to DECC is AEA Technology plc (AEA). AEA is responsible for the inventory compilation, development, quality management, documentation, archiving and reporting, as well as for NIR and CRF submissions. AEA is directly responsible for producing the emissions estimates for the energy, industrial processes, solvent and other product use, and waste sectors. Agriculture sector emissions estimates are provided by North Wyke Research, under contract to the Department for Environment, Food and Rural Affairs (DEFRA), and the LULUCF sector is managed by the United Kingdom Centre for Ecology and Hydrology (CEH), under a separate contract to the Climate, Energy, Science and Analysis (CESA) Division of DECC. The National Inventory Steering Committee (NISC) has to consider and approve the national inventory prior to submission to the UNFCCC.

15. As indicated in the United Kingdom's previous submissions, DECC was working to introduce data supply agreements (DSAs) with key data suppliers in order to formalize the acquisition of the data and ensure the delivery of quality and timely data for the inventory. The 2011 NIR reports that the first of such DSA was signed with the Department for Transport on 12 April 2011. During the review, the United Kingdom informed the ERT that DSAs are currently being discussed with environmental regulators such as the Environment Agency, the Scottish Environmental Protection Agency and the Northern Ireland Environment Agency. The ERT commends the Party for this improvement and encourages the United Kingdom to provide information on this matter in its next annual submission.

16. The ERT notes that a number of recommendations from the previous annual review report have been implemented by the United Kingdom, for example: the calculation of CH₄ and N₂O emissions from the use of liquefied petroleum gas (LPG) for road transportation; and the inclusion of the methane correction factors and fractional parameters in the CRF

tables. However, many other recommendations have not been taken into account by the Party in its 2011 submission (as discussed in the sectoral chapters below) and particularly the recommendation that the NIR should include either more detail on the actions taken to address the recommendations or clear time frames for undertaking such actions in the future. The ERT therefore reiterates the previous recommendation that the Party use the recommendations made in the review reports to prioritize and implement planned improvements to its inventory.

Inventory preparation

Key categories

17. The United Kingdom has reported a key category tier 2 analysis, both level and trend assessment, as part of its 2011 submission. The United Kingdom did not implement a tier 1 analysis. The key category analysis performed by the Party and that performed by the secretariat³ produced different results because the United Kingdom used a tier 2 analysis. The United Kingdom has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The United Kingdom uses the key category analysis to plan improvements to its inventory.

18. Despite the recommendation in the previous review report, the United Kingdom did not conduct a thorough qualitative analysis to ensure that categories which are particularly significant in terms of level or trend are identified as key. As a result, some of those categories were not identified as key by the United Kingdom (e.g. fugitive emissions from oil and natural gas). The ERT reiterates the recommendation in the previous review report that the Party conduct a qualitative analysis in addition to the applied key category analysis.

19. The United Kingdom has performed a key category analysis for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. Information on the results and the applied approach for key category identification is presented in the NIR and in the CRF table NIR 3.

Uncertainties

20. The NIR states that IPCC tier 1 and tier 2 uncertainty analyses have been performed and the results of these analyses are presented at a summary level and at the individual category level, both including and excluding the LULUCF sector, and used to prioritize the use of resources involved in inventory preparation. Uncertainty analyses have been performed for AD, EFs and emissions and these are well described in the NIR and its annex 7. The results for the overall uncertainty of the inventory in 2009 for the different tiers are similar (19 per cent (excluding and including LULUCF) by tier 1 and 17 per cent (including LULUCF) by tier 2) and are 3 per cent higher than the 2010 submission (i.e. 2008 data). In response to a question raised by ERT during the review, the United Kingdom explained that

³ The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

this difference is due to the revision of a number of input uncertainty values and the correction of an error in the model. The ERT recommends that the Party include explanatory information in the NIR of its next annual submission. The uncertainty in the trend in emissions expressed as the fall between 1990 and 2009 is –28 per cent for tier 2, with 95 per cent of the values found to lie within the range –25 per cent to –31 per cent. The category with the major contribution to the overall uncertainty is agricultural soils. The values according to tier 1 analysis are 2.4 and 2.5 per cent with and without LULUCF, respectively.

Recalculations and time-series consistency

21. The ERT noted that recalculations reported by the Party of the time series from the base year to 2008 have been undertaken to take into account a review or change of methodologies and revisions or additions of new AD and EFs (relevant to all sectors). The major changes, and the magnitude of the impact, include an increase in estimated total GHG emissions in the base year (0.7 per cent) and a decrease in 2008 (1.5 per cent). The rationale for these recalculations is provided in chapter 10 of the NIR and in CRF table 8(b).

22. The ERT notes that the description of recalculations was not consistent and transparent across the sectors (see paras. 40, 70 and 98), with the exception of LULUCF. For example, the recalculations performed due to the revision of AD for peat use in the energy sector were not mentioned in chapter 10 of the NIR. Moreover, the ERT notes that there is insufficient justification for the underlying assumptions for the recalculations that led to a decrease of emissions in the energy and waste sectors. Also the NIR does not contain a convincing description of how the performed changes and the new AD improve the quality of the inventory. The ERT therefore expands the recommendation of the previous review report that the Party improve the description of recalculations by providing clear explanations and justifications for the changes made in methodologies, assumptions, data, and parameters. Furthermore, the ERT recommends that the Party ensure that any recalculation performed leads to a real improvement of the inventory and also recommends that the NIR provide clear quantitative information on the impact of the various revisions and recalculations over the time series at a disaggregated level.

Verification and quality assurance/quality control approaches

23. The United Kingdom has established the quality assurance and quality control (QA/QC) plan and procedures in accordance with IPCC good practice guidance. Summary information on the QA/QC system and procedures is provided in section 1.6 of the NIR. Additional information on tier 2 QC activities in individual sectors is provided in appropriate paragraphs of the sectoral chapters of the NIR. AEA is responsible for coordinating inventory-wide QA/QC activities, as well as for recording and archiving all related information. The NIR reports information on bilateral and peer reviews, the last of which was performed in 2010 for emissions of fluorinated gases (F-gases) in cooperation with inventory teams from Austria and Germany.

24. Despite the described QC activities, the ERT noted a number of omissions and mistakes in the submission. For example: emissions from aviation fuel consumption (cruise) are explained, but there is no explanation for landing and take-off (LTO) emissions (see para. 42); there are erroneous entries in the CRF tables which do not correspond with the data in the original spreadsheet in the energy sector (see para. 45); there are missing HFC emissions in table 2(II).E in the industrial processes sector (see para. 63); incorrect data for CH₄ producing potential for dairy cattle in the agriculture sector (see para. 73); and there are some inaccuracies in the calculation formula and the description of the parameters under it in the waste sector (see para. 96). The ERT reiterates the recommendation from

the previous review report that the United Kingdom strengthen QC at the stage of inventory compilation.

Transparency

25. The United Kingdom inventory report is generally transparent in its description of general issues, such as the national system and institutional arrangements, key category analysis, uncertainty analysis and QA/QC activities. However, the reiterated recommendation of the previous review report concerning the extension of the discussion on completeness in the main body of the NIR remained unaddressed, and a table with an assessment of completeness is presented only in annex 5 to the NIR.

26. The ERT notes that there are difficulties with transparency across all sectors regarding the description of underlying assumptions for recalculations and for the choice of EFs, AD and methodologies, as well as a lack of sufficient justification for the changes in these parameters. The ERT recommends that the United Kingdom provide clear and concise information on the aforementioned issues in its next annual submission in order to improve the transparency of the reporting. In addition, there is a lack of transparency and consistency in the inventory regarding the presentation of data relating to emissions from Crown Dependencies (CDs) and Overseas Territories (OTs) within the sectors both in the CRF tables (e.g. for waste incineration) and in the NIR. The ERT noted that those emissions are either separately reported under other (at sectoral or category level), or not specifically mentioned, and so are assumed to be included in the category estimates. In addition, there is no information on the AD used for the CDs and OTs, even when those emissions are separately reported in the CRF tables. The ERT reiterates the recommendations of the previous review report that the United Kingdom report these emissions under the relevant categories in the CRF and include further quantitative and qualitative information in the NIR on the inclusion and calculation of those emissions.

27. The ERT welcomes the Party's efforts to provide more information regarding the inventory. However, the numerous cross-references and the extensive volume of annexes to the NIR makes it difficult to analyse and compare this information. The ERT encourages the United Kingdom to consider the possibility of reducing the quantity of annexes, for example, by summarizing the most important information and including it in the body of the NIR and by omitting some of the information that might not be significant enough to warrant being presented in every submission and instead replacing it with year-specific information (e.g. annual energy balance).

Inventory management

28. The United Kingdom has a centralized archiving system, maintained by AEA, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements.

3. Follow-up to previous reviews

29. The ERT found that the United Kingdom did implement, in its 2011 annual submission, some of the recommendations made in the previous review report, such as:

(a) Improved the transparency (by using disaggregated reporting of the fugitive emissions from oil and natural gas (in the energy sector), by including more relevant information on AD and EFs (in the agriculture sector), by reporting emissions/removals from the OTs and CDs under relevant land-use categories (in the LULUCF sector) and by

updating or justifying the constant amount of landfilled waste from commercial and industrial sources (in the waste sector));

- (b) Partly corrected the use of notation keys and data input errors;
- (c) Worked towards the conclusion of formal DSAs with data providers (see para. 15);
- (d) Allocated fuel consumption for and emissions from direct flights between the United Kingdom and its OTs under domestic aviation;
- (e) Included better explanations of the nature and extent of changes in the national registry, including test plans and test results in the case of upgrades of the version of the software used;
- (f) Estimated and reported N₂O emissions from the disturbance associated with land-use conversion to cropland.

30. The main recommendations made in previous review reports which have not been implemented by the United Kingdom in its 2011 annual submission include:

- (a) Including, in the main body of the NIR, a complete discussion on completeness;
- (b) Allocating emissions from fuels used in manufacturing industries and construction to the appropriate subcategories;
- (c) Reporting emissions of F-gases by species;
- (d) Improving the reporting on the OTs and CDs by including information on the methods and data used for estimating their emissions and consistent reporting across categories and sectors;
- (e) Undertaking a qualitative analysis to ensure that categories which are particularly significant in level or trend are identified as key categories;
- (f) Including information on the time frame for addressing the recommendations of the review activities;
- (g) Estimating emissions from wildfires on deforestation lands or provide evidence that wildfires do not occur.

31. The ERT noted that, in accordance with paragraph 4 in the annex to decision 15/CMP.1 each Party included in Annex I shall describe in its annual inventory any steps taken to improve estimates in areas that were previously adjusted. The United Kingdom has not provided any clear information in the NIR with this regard, although the ERT has detected recalculations for the categories previously adjusted. During the review, the United Kingdom provided the ERT with detailed information on each adjustment. The ERT recommends that such information be included within the NIR whenever adjustments are applied to the inventory.

4. Areas for further improvement

Identified by the Party

32. The 2011 NIR identifies several areas for improvement. The United Kingdom indicated that it is working to introduce the following improvements in future submissions:

- (a) Finalize the formal DSAs with relevant organizations;
- (b) Analyse the various additional datasets, such as the Phase III European Union emissions trading scheme (EU ETS) baseline data and new datasets from environmental

regulators from new policy initiatives in the United Kingdom to improve sector-specific estimates;

(c) Review the category-specific data sources and methodologies to improve the completeness and transparency of reporting such category-specific emissions as railways, inland navigation, CH₄ emissions from operating and abandoned coal mines;

(d) Review the time series of energy statistics and inventory agency data management systems in order to report emissions from manufacturing industries and construction separately, by industry;

(e) Develop and publish new inventory method summaries and user guidance notes, to improve the accessibility of United Kingdom GHG inventory materials to a wider non-technical audience in the United Kingdom, predominantly aimed at improving communications with departmental policy leads.

33. The ERT commends the United Kingdom for its efforts to improve the inventory and encourages the Party to give an indication in the NIR of when the results will be implemented in the annual submissions.

Identified by the expert review team

34. During the review, the ERT identified cross-cutting issues for improvement. These are listed in paragraph 171 below.

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

B. Energy

1. Sector overview

36. The energy sector is the main sector in the GHG inventory of the Party. In 2009, emissions from the energy sector amounted to 484,187.68 CO₂ eq, or 84.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 20.5 per cent. The key drivers for the fall in emissions are the switch from solid fuels to gaseous fuel and the economic crisis in the recent years. Within the sector, 37.7 per cent of the emissions were from energy industries, followed by 24.9 per cent from transport, 20.0 per cent from other sectors and 14.2 per cent from manufacturing industries and construction. Fugitive emissions from fuels accounted for 2.7 per cent and other accounted for 0.5 per cent.

37. The inventory for the energy sector is generally complete. However, the ERT noted that gaseous fuels in road transportation and solid fuels in domestic navigation are reported as “NE”. During the previous review, the Party had explained that gaseous fuels were “IE”; however, no change in the notation key has been made and there is no explanation for the “NE” notation key in CRF table 9. In response to questions raised by the ERT during the review the Party explained that emissions from solid fuels under domestic navigation should be reported as “NO”. The ERT recommends that the United Kingdom use the appropriate notation keys in its next annual submission.

38. The reporting on the energy sector is generally transparent and the ERT noted that the United Kingdom has introduced improvements to increase transparency, such as using disaggregated reporting of the fugitive emissions from oil and natural gas. However, the transparency issues linked to the reporting on emissions from manufacturing industries and construction (as discussed in para. 51) and on feedstocks and non-energy use of fuels (see para. 49), which had been commented on in previous review reports were not fully resolved in the 2011 submission. The ERT encourages the United Kingdom to continue its efforts to

increase the transparency of its reporting and recommends that the Party address the pending recommendations regarding these issues in its next annual submission.

39. The Party has made recalculations for the energy sector between the 2010 and 2011 submissions in response to the 2010 annual review report, in order to lift applied adjustments, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the energy sector is a decrease in emissions of 0.8 per cent for 2008. The main recalculation took place in the transport category, and estimates of emissions for navigation (coastal shipping) decreased by 3,784.22 Gg CO₂ eq or 70.1 per cent due to a change in the methodology which is now based on detailed shipping movement data instead of estimates from national energy statistics (see para. 48).

40. However, recalculations have affected all gases and all categories. The information on the impact of recalculations is presented in the corresponding chapters in the NIR, as well as summarized in tables 10.1 and 10.2 of the NIR. The ERT welcomes the Party's provision of aggregated data on all the recalculations as well as the provision of a comparison with the previous year's submission. However, the ERT noted that information provided in the tables does not fully correspond to the information provided in the sectoral chapters. For example, section 3.2.9.6.1 of the NIR explains that the AD for peat use was revised leading to a decrease of emissions, but this information is not provided in table 10.1 of the NIR. In addition, the ERT noted that some recalculations are not transparently described in the CRF tables or in the NIR (e.g. revisions to natural gas statistics, changes in the amount of fuel oil allocated to power stations). The ERT was not completely convinced that the recalculations improve the accuracy of the inventory and was unable to check all the background information during the review and the rationale for the revised data in all instances. The ERT recommends that, in its next annual submission, the United Kingdom ensure and justify that any recalculation performed leads to an improvement of the inventory and strongly recommends that the Party improve the transparency of reporting on recalculations, presenting changes in methods and/or AD and/or EFs in the 2011 submission relative to the 2010 submission, together with any further recalculations for 2012 submission.

41. Some further transparency issues are linked to the fact that, in the NIR, the reporting unit of the CO₂ EFs are presented in the unit kg carbon/tonne (g/GJ gross for "gaseous" fuels) which hinders a comparison between the CRF reported data and the EFs of other Parties. The ERT encourages the Party to provide the CO₂ EF in t/TJ net as additional information in the NIR in its next annual submission to enhance the transparency and comparability of its reporting.

42. In addition, the ERT noted some omissions and mistakes in the reporting. For example, in section A3.3.5.1.8 of the NIR information on emissions from fuel consumption in cruise is clearly described, but there is no explanation for LTO emissions estimations. The heading of table A.3.3.9 in the NIR indicates CO₂ instead of carbon. In the NIR (page 399), there is a reference to a CD-ROM with data on fuel combustion. In response to a request from the ERT, the Party stated that the CD-ROM does not currently form part of the electronic submission but the Party is planning to include it in the next annual submission. The data included on the CD-ROM are fuel consumption data, gross calorific values for fuels and the carbon EFs used in the calculations. The ERT encourages the Party to present this background data in its next annual submission as this would increase the transparency and the comparability of the inventory. The ERT further encourages the United Kingdom to improve its QA/QC checks before submitting the NIR.

43. The Party has taken into account some of the recommendations in the previous review report, and has also improved calculations in relation to the adjustments as well as calculated emissions of CH₄ and N₂O from the use of LPG for road transportation.

However, some of the recommendations have not been taken into account and are reiterated in the paragraphs below.

2. Reference and sectoral approaches

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

44. The CO₂ emission estimates for 2009 calculated using the reference approach were 1.36 per cent higher than the estimates calculated using the sectoral approach. The United Kingdom provides general explanations for the differences in the NIR and the CRF tables. The ERT encourages the Party to further elaborate qualitative and quantitative analysis of the difference.

45. The previous review report noted that the apparent energy consumption in the reference approach and the apparent energy consumption (excluding feedstocks and non-energy use of fuels) reported in CRF table 1.A(c) are almost identical, even though a significant fuel consumption is listed for non-energy purposes in CRF table 1.A(d). The values are updated in the 2011 submission, but the ERT notes that there are a number of inconsistencies in the reported data. Thus the apparent energy consumption of liquid fuels (excluding international bunkers) amounts to 2,648.59 PJ, while the apparent energy consumption (excluding non-energy use of fuels and feedstocks) is higher (3,217.13 PJ), although the liquid fuels are reported as a feedstock. In response to questions raised by the ERT during the review, the Party explained that there appears to be a number of entries in the CRF tables generated by the CRF Reporter software that do not match the data in the original spreadsheet for the IPCC reference approach. The ERT recommends that the United Kingdom: improve the accuracy of its reporting and correct errors in its next annual submission; improve the QC before the submission of the CRF tables; and ensure that the next NIR explains all the changes (including the correction of technical mistakes) to the reference and sectoral approaches compared with the 2011 submission.

46. In the reference approach CRF table 1.A(b), the oxidation factor for colliery CH₄ is reported as “not applicable” (“NA”). In response to a question raised during the previous review the Party indicated that the fraction should be 1. This was corrected for 2008 but not corrected in the CRF for 2009. The ERT recommends that the United Kingdom correct the value in the CRF tables for the entire time series.

International bunker fuels

47. Following the adjustment from the previous review, the Party has implemented some improvements and reallocated fuels from international to domestic aviation for all direct flights between the United Kingdom and its OTs (see para. 54).

48. A reallocation of shipping emissions between international and domestic navigation based on new port movement data was performed, leading to a decrease of fuel allocated to domestic navigation and to an increase for international navigation. Detailed shipping movement data for different vessel types, fuels and journeys has been used to estimate domestic (coastal) shipping emissions. The international marine emissions are derived by the difference between total fuel consumption statistics for marine fuels and fuel consumption by domestic shipping. The new approach is described in annex 3 to the NIR. The ERT encourages the Party to further assess the conformity of bunker definitions between the inventory and national and international statistics, and to provide an explanation on the differences in its next annual submission.

Feedstocks and non-energy use of fuels

49. Previous review reports have identified that several fuels used as feedstocks for non-energy purposes are reported in CRF table 1.A(d), while the section in the NIR regarding feedstocks and non-energy use of fuels explains only the use of natural gas as a feedstock for the production of NH₃, methanol and acetic acid. The ERT commends the United Kingdom for the inclusion of additional explanations on fuels used as feedstocks in the 2011 NIR (annex A3.3.9). However, the ERT noted that this additional information includes circular cross-references (e.g. chapter 3.2.3 gives reference to chapter 4.9.1 of the NIR and annex 3.3.9, while annex 3.3.9 gives references back to NIR chapter 3 and chapter 4) and that the additional information is not fully transparent. The ERT recommends that the Party further improve the quality of the documentation and improve the transparency of the NIR and reiterates the recommendation of the previous review report that additional information be reported in CRF table 1.A(d) indicating from which categories in the energy sector carbon stored is subtracted and where the associated CO₂ emissions are allocated.

50. The ERT noted some inconsistencies between CRF table 1.A(b) and 1.A(d), as there is carbon stored for other oil reported in table 1.A(b) and no values reported in table 1.A(d). In response to questions raised by the ERT during the review, the Party explained that the data in table 1.A(d) has information missing for two other fuels that are partly used as feedstocks in the United Kingdom. In 2009, there should also be lines for petroleum coke (903 TJ) and other oil (28,922 TJ) which includes industrial spirit, white spirit and petroleum waxes. The ERT recommends that, in its next annual submission, the Party report all data used as feedstocks and non-energy use of fuels in the CRF tables and ensure consistency between the data reported in table 1.A(d) and 1.A(b) and in the NIR.

3. Key categories

Stationary combustion: all fuels – CO₂, CH₄ and N₂O⁴

51. The United Kingdom has reported all emissions from fuels used in manufacturing industries and construction under the category other (manufacturing industries and construction), except for emissions from iron and steel. This significantly reduces comparability and transparency of the inventory. Given that the United Kingdom's energy statistics are disaggregated according to the same categories as required in the CRF tables, previous review reports have identified that the Party should have the institutional arrangements and/or capacity to report these emissions under the appropriate subcategories. Previous review reports have recommended that the United Kingdom allocate these emissions to the appropriate subcategories and the Party was planning to implement this recommendation for the 2010 submission. The Party explained in its 2011 submission that the United Kingdom energy statistics do not provide a consistent time series at a level of detail that enables it to disaggregate the data back to 1990. This issue is a high priority item on the United Kingdom's improvement programme, and work is ongoing in consultation with the United Kingdom energy statistics team at DECC, in order to derive a "best estimate" of the detailed energy breakdown that is needed to underpin estimates back to 1990. The Party expects to be able to report at a more detailed level within the next annual submission. The present ERT therefore reiterates the recommendation of previous review reports, as set out above, and strongly recommends that the United Kingdom allocate these emissions to different subcategories in its next annual submission.

⁴ Not all emissions related to all gases and fuels under this category are key categories, particularly CH₄ emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

4. Non-key categories

Stationary combustion: other fuels – CO₂, CH₄ and N₂O

52. The CO₂ EF used by the Party for combustion of municipal solid waste (MSW) was developed in 1993. The ERT considers that the composition of the waste has probably changed over time. The Party itself notes, in the NIR, that the CO₂ EF used for combustion of MSW is considered to be in need of improvement and this improvement is planned for the 2012 annual submission. The ERT reiterates the recommendation of previous review reports that the United Kingdom report and document revised emission estimates in its next annual submission.

53. Emissions from the incineration of MSW for heat generation are currently reported under other sectors, which is not in accordance with the IPCC good practice guidance. The ERT reiterates the recommendation of previous review reports that the United Kingdom reallocate these emissions to the category public electricity and heat production in its next annual submission.

Civil aviation: liquid fuels – CO₂, CH₄ and N₂O

54. Previous ERTs have noted that the geographical coverage of civil aviation estimates leads to an underestimation of the emissions from domestic aviation reported under the energy sector. Since the Party did not officially submit revised estimates as requested by the previous ERT, an adjustment was calculated and applied for this category. For its 2011 submission, the Party has recalculated the full time series (1990–2009) including the emissions for flights between the United Kingdom and the OTs under civil aviation. The ERT noted, however, that the CO₂ emissions from civil aviation in 2008 in the 2011 submission (2,363.65 Gg) are lower than those in the submission 2010 (adjusted value 2,416.37 Gg). In response to questions raised by the ERT during the review, the Party explained that this discrepancy has occurred because preliminary values were used for the 2008 inventory (in the 2010 submission) and also stated that the values were revised in the current submission. This change is not indicated in the CRF table 8(b). The ERT recommends that, where any recalculations are made, the Party present both the previous and actual value of the AD in the NIR, together with the justification and impacts of the various recalculations. In addition, all the information should be included in CRF table 8(b), preferably at the level at which the recalculation takes place.

Natural gas: other leakage – CH₄

55. In the Party's previous submission, CH₄ emissions from other leakage were reported as "NE". Since the Party did not submit estimates for these emissions as requested by the ERT, an adjustment was calculated and applied for this category in the 2010 review. The adjustment was made by multiplying AD (the proportion of houses in Great Britain with gas-fired central heating in 2006), multiplied by the EF (Gg CH₄/million domestic gas boilers), resulting in CH₄ emissions from other leakage of 26.48 Gg CO₂ eq in 2008. The 2011 NIR states that consultation with the gas network operators confirmed that the scope of the network leakage model used by each operator did not include estimates of gas leakage downstream from the gas meter, i.e. at the point of use. Therefore, new estimates have been derived for gas leakage at the point of use, using data on the number of gas appliances in the United Kingdom in the commercial and domestic sectors. The new estimates have replaced the adjustment made by the previous ERT, and amount to 19.33 Gg CO₂ eq in 2008. Although the methodology is explained in the NIR (annex 3), the ERT notes that the AD are not transparently presented and the Party has not mentioned in the NIR that the category was previously adjusted. The ERT, therefore, encourages the

Party to increase the transparency of its reporting and follow the reporting requirement under paragraph 4 in the annex to decision 15/CMP.1.

C. Industrial processes and solvent and other product use

1. Sector overview

56. In 2009, emissions from the industrial processes sector amounted to 22,716.05 Gg CO₂ eq, or 4.0 per cent of total GHG emissions, and emissions from the solvent and other product use sector have been reported as “NO” or “NE”. Since the base year, emissions have decreased by 60.4 per cent in the industrial processes sector. The key driver for the fall in emissions in the industrial processes sector is a decline in N₂O emissions from adipic acid production since 1999 due to the installation of N₂O abatement system in the production process. The decrease in emissions from production of halocarbons and SF₆ is more or less offset by the increase in emissions from consumption of halocarbons and SF₆. Within the industrial processes sector, 50.5 per cent of the emissions were from consumption of halocarbons and SF₆, followed by 25.6 per cent from mineral products. Chemical industry accounted for 17.5 per cent and metal production accounted for 6.0 per cent. The remaining 0.5 per cent were from production of halocarbons and SF₆.

57. The United Kingdom has made recalculations for the industrial processes sector between the 2010 and 2011 submissions in order to lift applied adjustments and reflect changes in AD for some categories. The impact of these recalculations on the industrial processes sector is a decrease in emissions of 2.4 per cent for 2008. The main recalculations took place in the following categories:

(a) Consumption of halocarbons and SF₆ (HFCs) due to an update in the model used and following the adjustment made during the 2010 review;

(b) Mineral products (CO₂ emissions from lime production) due to an update of the AD for 2008.

58. The recalculations are justified in the NIR and explained in the CRF and the NIR. They are consistently applied across the time series.

59. The inventory for the industrial processes and solvent and other product use sectors is complete for the categories for which there are default IPCC methodologies.

60. There were several issues linked to transparency already included in the previous review report. The ERT noted improvements following the recommendations in the previous review report, such as the provision of further information on the AD of lime production and an improvement in the way F-gases are reported in the 2011 submission (where CRF tables 2(II) and 2(II).F are filled in per chemical rather than for an unspecified mix of HFCs). The ERT commends the Party for these improvements.

61. However, the ERT noted that there is no improvement in the CRF tables with regards to the country-specific categories reported under the category other (consumption of halocarbons and SF₆) in table 2(II) that are not reported in table 2(II).F. The transparency of reporting is hindered by the confidentiality linked to the AD for production of cement, ammonia and glass, for which the trend information is difficult to verify (see paras. 62 and 68).

2. Key categories

Cement production – CO₂

62. Following the recommendations of the previous review report, the Party has identified CO₂ emissions from cement production as a key category in its 2011 submission. The United Kingdom mentioned in the NIR that the emission estimates were based on plant-specific data since 2005 for the existing 13 cement plants, and that the EFs for 2005 have been applied to the early years to improve time-series consistency and accuracy. However, as both AD and EFs are reported as confidential in the CRF tables and in the NIR to protect the commercial sensitivity of the single cement production plant in Northern Ireland, the ERT considers it is not clear whether the decrease of CO₂ emission from this category (by 28.5 per cent between 2008 and 2009) was caused by a decline in AD or EFs. During the review, based on the aggregated clinker production figures provided by the United Kingdom, the ERT concluded that the decline in emissions in recent years was a result of a decline in clinker production, while the implied emission factors (IEFs) remain quite stable across the whole time series. The ERT recommends therefore that the United Kingdom explain the trend of cement production in its next annual submission.

Production of halocarbons and SF₆ – HFCs

63. The ERT noted that the information reported in CRF table 2(II) is inconsistent with that in CRF table 2(II).E. In table 2(II).E HFC-23 emissions from production of HCFC-22 have been reported as “IE” with a reference to the energy sector (oil and gas flaring) for emissions and other (by-product emissions)(2.E.1) for AD with no figures reported for those in the relevant categories, while in table 2(II) there are emissions reported under the category other (by-product emissions). In response to questions raised by the ERT during the review, the United Kingdom responded that the reference to the energy sector is an error that will be corrected in its next annual submission and the missing value in table 2(II).E is a technical mistake and the relevant emissions are included in the total. The ERT recommends that the United Kingdom correct the errors, improve QC for the sector and appropriately report these emissions in the CRF tables for its next annual submission.

Consumption of halocarbons and SF₆ – HFCs

64. As pointed out in the previous review report, the estimates for this category are model-based and the description in the NIR of the EFs used is not transparent, in that it does not provide the basic EF values, the data source of and rationale for the selected EF values, and does not explain their trends over time. The ERT noted the United Kingdom’s ongoing research project, aiming at reviewing and updating the assumptions used to estimate emissions from refrigeration and air-conditioning units through a thorough consultation with United Kingdom stakeholders, literature review and considering international best practice, and recalibrating the model using a bottom-up approach on refrigerant capacity for each subcategory as well as incorporating sales data. The ERT recommends that the United Kingdom provide the necessary information of the model in the NIR of its next submission to ensure transparency of the emission estimates.

65. The 2009 potential/actual emissions ratios (840.59 and 6,444.88) for HFCs and PFCs respectively were very high, which suggested to the ERT the possibility of an underestimation in actual emissions and/or overestimation in potential emissions. In response to questions raised by the ERT, the United Kingdom stated that the estimates of potential emissions are probably not in line with the actual emissions. It further stated that it will include this in its improvement plan and expand the explanation in its next annual submission. The ERT welcomes the approach taken by the Party and encourages the United

Kingdom to investigate the reasons for the differences and report on them in the next annual submission.

3. Non-key categories

Lime stone and dolomite use – CO₂

66. The United Kingdom reported CO₂ emissions from the flue gas desulphurization processes at thermal power stations, which has resulted in higher IEFs than other Parties. The United Kingdom explained that this is because the estimated emissions include emissions from flue gas desulphurization at power stations, but the gypsum produced is excluded from the AD. The ERT recommends that the United Kingdom update the AD value used and improve the comparability of the IEF with other reporting Parties for the next submission.

Soda ash production and use – CO₂

67. The Party's recalculation for CO₂ emissions from soda ash use for glass production, which resulted in a 3.96 per cent decline in 2008 and a 0.32 per cent increase in the base year, is not justifiable using the information contained in the NIR and CRF table 8(b). In response to questions raised by the ERT during the review, the United Kingdom explained that the recalculation is due to a revision to the AD provided by British Glass to reflect the inclusion of new data on the use of Calumite for container glass production, as well as revisions to the assumptions made about plant capacities for sites manufacturing other types of glass. The impact of these revisions is not uniform across the time series and, therefore, the magnitude and sign of the recalculation are also not uniform. While verifying the soda-lime glass production figures provided to the ERT during the review, the ERT identified that the IEFs (in terms of CO₂ emissions per tonne soda-lime glass and per tonne soda ash use) remain constant for the whole time series. The ERT recommends that the United Kingdom include more comprehensive information in the NIR of its next annual submission to justify the recalculations and provide qualitative and quantitative information on the impact of various revisions on the estimates.

Ammonia production – CO₂

68. There are only a very small number of sites and operators in the category, so the Party has treated the ammonia production data as commercially sensitive and these have not been published within the NIR or CRF. Instead, the United Kingdom reported CO₂ emissions based on natural gas consumption (PJ). This appears to have resulted in very high IEFs that are not comparable with those of other reporting Parties. However, when verifying the IEFs based on the rough estimates of the confidential ammonia production provided by the United Kingdom during the review, the ERT concluded that the IEFs are within the range of the other reporting Parties.

D. Agriculture

1. Sector overview

69. In 2009, emissions from the agriculture sector amounted to 45,041.26 Gg CO₂ eq,⁵ or 7.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 21.4 per cent. The key drivers for the fall in emissions are the decrease in livestock numbers and the reduced use of synthetic fertilizer, owing to changes in agricultural practices. Within the sector, 55.3 per cent of the emissions were from agricultural soils,

⁵ These values are as reported by the Party. The adjusted values are presented in section II.G.

followed by 33.9 per cent from enteric fermentation and 10.7 per cent from manure management. The remaining 0.1 per cent were from other, which includes N₂O emissions from manure management in the CDs and OTs.

70. The United Kingdom has made recalculations for the agriculture sector between the 2010 and 2011 submissions for the entire time series in order to lift applied adjustments and following changes in the methods. The impact of these recalculations on the agriculture sector is an increase in the estimate of the sectoral emissions of 1,683.92 Gg CO₂ eq (3.0 per cent) for 1990 and an increase of 1,715.01 Gg CO₂ eq (3.9 per cent) for 2008. The main recalculations took place in agricultural soils due to a correction to the method used for calculating nitrogen (N) leaching and run-off and due to the inclusion of N from sewage sludge applied. These recalculations are not well documented in the NIR. The ERT recommends that the United Kingdom improve the transparency of its reporting on recalculations in its next annual submission.

71. The inventory for the agriculture sector is generally complete in terms of categories and gases covered; rice cultivation and savanna burning do not occur in the country and the field burning of agricultural residues has not occurred since 1994. With regard to geographical coverage, emissions from the CDs and OTs are reported, although the N₂O emissions are reported in an aggregated manner (under the category other (agriculture)). The ERT therefore reiterates the recommendation of the previous review report that the Party report these emissions under the relevant categories: manure management and agricultural soils. During the review, the ERT identified some methodological issues that potentially underestimate the emission estimates reported by the United Kingdom: CH₄ emissions from enteric fermentation and manure management from sheep; N₂O emissions from manure management; and N₂O emissions from agricultural soils. In response to the list of potential problems and further questions raised by the ERT during the review week, the United Kingdom submitted (on 7 November 2011) more information on the first issues while for the N₂O emissions from agricultural soils the ERT concluded that the emissions are underestimated and initiated an adjustment procedure (see chapter II.G of this report).

72. The ERT noted that, following a recommendation from the previous review report, the Party has included in the NIR background tables with AD, EFs and parameters used. Nevertheless, the ERT recommends that the Party further enhance the transparency of its NIR by including in its next annual submission the following: justifications for EFs which differ from the IPCC defaults; a description of trends of AD, country-specific parameters, EFs and emissions; a description of animal waste management systems (AWMS) reported as "other"; and corrects all errors in the methodology descriptions relating to the N₂O emissions from manure management and application to soils. In addition, the ERT recommends that, as well as the disaggregated reporting of the N₂O emissions from the CDs and OTs, the Party include, in the NIR, information on the EFs and parameters used to estimate N₂O emissions from manure management and from agricultural soils for these territories.

73. The ERT noted that the United Kingdom has implemented some of the recommendations of the previous review report (e.g. the fractional parameters have been included in the CRF tables). However, the ERT noted that most of the recommendations of the previous review report were not implemented and reiterates the recommendation that the United Kingdom improve its QC checks on the CRF tables prior to their submission, because many mistakes which had been identified during the previous review have not been corrected (e.g. incorrect CH₄ producing potential for dairy cattle, the N₂O IEF for all AWMS used and the values for Frac_{FUEL}) and because of the incomplete tables (e.g. typical animal mass and pregnancy parameters). Most of the other pending recommendations are reiterated within the category-specific sections below.

2. Key categories

Enteric fermentation – CH₄

74. Emissions from cattle are estimated using the IPCC tier 2 method while for other animals the tier 1 approach has been used. The United Kingdom uses the highest digestibility value (75 per cent) from the range provided in the IPCC good practice guidance. Following the recommendation of the previous review report, the United Kingdom provided in its 2011 submission the complete time series of the parameters used in the tier 2 approach with references for country-specific assumptions and more information on data collection. However, the justification for the use of county-specific parameters such as the digestibility value, has not been provided and the ERT reiterates the recommendation from the previous review report that the Party provide more information on all country-specific parameters in the next NIR.

75. The 2009 CH₄ IEF for sheep (4.65 kg/head/year) is the second lowest of reporting Parties. The main reason is the large proportion of lambs, for which the United Kingdom assumes that the EF is 40 per cent of that for adult sheep. Further, the United Kingdom considers that only breeding sheep are alive for the entire year while the other sheep and lambs are alive for six months only. This assumption is based on the study by Smith and Frost from 2000.⁶ The ERT concludes that the above-mentioned study does not provide enough justification for this assumption. During the review, in response to a request from the ERT, the Party provided data on the sheep population based on the December survey in addition to the data from the June survey, which has been used in the 2011 submission. The ERT notes that there are inconsistencies between the data in the December survey provided to the ERT and data reported to Eurostat. The December population of sheep reported to Eurostat is 21 million while in the data provided to the ERT the sheep population is reported to be 13 million. The ERT considers that the assumption that lambs and other sheep are alive for six months only could lead to an underestimation of emissions. In response to the list of potential problems and further questions raised by the ERT during the review week the United Kingdom provided more information on the lamb population. The ERT concluded that it is not necessary to apply an adjustment for this category; however, the information provided by the Party is still not sufficient. The ERT therefore strongly recommends that, in its next annual submission, the United Kingdom provide a more detailed justification for the use of 0.5 year for the lifespan of lamb including the animal population data from the different surveys.

Manure management – N₂O

76. Tier 1 methods are used to estimate N₂O emissions from manure management for all animal categories, although the Party had already indicated its intention to use tier 2 methods for its 2010 submission. As this category is identified as a key category, the ERT reiterates the recommendation of the previous review report that the United Kingdom implement tier 2 methods, giving priority to cattle, swine and sheep.

77. The United Kingdom assumes that 20 per cent of N in AWMS volatilizes as nitrogen oxides (NO_x) and NH₃ at different stages of the manure handling process prior to major N₂O losses. This is not in line with the IPCC methodology. Although the N excretion values as reported in CRF table 4.B.(b) are reduced by 20 per cent, the N₂O IEF is higher, which indicates that the N₂O emissions are correct. However, the United Kingdom did not account for the N₂O from the treatment of poultry manure used for fuel. The ERT therefore

⁶ Smith, KA and Frost, JP. 2000. Nitrogen excretion by farm livestock with respect to land spreading requirements and controlling nitrogen losses to ground and surface waters. Part 1: Cattle and sheep. *Bioresource Technology*, 71, 173–181.

concluded that this could lead to an underestimation of emissions. Although the Party responded to the list of potential problems and further questions raised by the ERT during the review week, the ERT considered that this response was insufficient, and therefore conducted independent research which further suggested to the ERT that the N₂O emissions from manure management are not underestimated. Nevertheless, the ERT strongly recommends that, in its next annual submission, the United Kingdom correct the N excretion values in CRF table 4.B(b) and include more information in the NIR in order to justify that N₂O emissions from the treatment of manure which is burned as a fuel do not occur.

78. The United Kingdom used a constant N excretion rate for beef cattle across the time series. The previous review report recommended that the Party revise its N excretion rates on the basis of the average body weight of these animals. During the review, the Party explained that a time series of body weights for non-dairy cattle will be incorporated in the next annual submission. The ERT, therefore, reiterates the recommendations of the previous review report that the Party use the estimated changes in weight over time for the non-dairy cattle to determine the N excretion rates.

Agricultural soils – N₂O

79. In the United Kingdom inventory the amount of N which has been emitted as N₂O during storage has been subtracted from the N in the manure applied to soils. The amount of N which has been emitted as NO_x and NH₃ has been subtracted from the manure applied to soils during grazing. This methodology is based on the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) and is not in line with the IPCC good practice guidance, which does not suggest any subtraction of N. The amount of N in the manure applied to soil as reported by the United Kingdom is lower than the amount calculated according to the IPCC good practice guidance methodology, resulting in an underestimation of N₂O emissions. The same value of N has been used in the manure applied to the agricultural soils in the category indirect emissions, which means that the emissions of N₂O from atmospheric deposition and from nitrogen leaching and run-off are also underestimated. The ERT recommended that the United Kingdom recalculate N₂O emissions for the entire time series 1990–2009 following the methodology from the IPCC good practice guidance. However, the United Kingdom chose not to submit the revised estimates. Therefore, the ERT considers the potential problem unresolved and has calculated and applied adjustments to four subcategories: animal manure applied to soils; pasture, range and paddock manure; atmospheric deposition; and nitrogen leaching and run-off (see chapter II.G). The ERT strongly recommends that the United Kingdom revise the entire time series for the above-mentioned categories in line with the IPCC good practice guidance, in its next annual submission.

80. Emissions from N fixation on grassland are reported under a separate category, “improved grassland”, using a constant fixation rate of 4 kg/ha/year but the ERT notes that there is not enough information included in the NIR to justify the use of this country-specific parameter. Therefore, the ERT reiterates the recommendation of the previous review report that the United Kingdom provide more information on this subcategory in its next annual submission.

3. Non-key categories

Manure management – CH₄

81. The tier 1 method is used to estimate CH₄ emissions from manure management for all animal categories, except for cattle, sheep and deer. The ERT repeats the encouragement of the previous review report that the Party prioritize improvements to the swine category,

which has the second highest share of the CH₄ emissions from manure management. The CH₄ emissions from sheep have been estimated using the same assumptions as under enteric fermentation and the same recommendation applies to that category (see para. 75).

E. Land use, land-use change and forestry

1. Sector overview

82. In 2009, net removals from the LULUCF sector amounted to 4,079.14 Gg CO₂ eq. In 1990, the LULUCF sector was a net source of 3,921.70 Gg CO₂ eq but has become a net sink since 2001. The key driver for the fall in emissions is a decrease in emissions from cropland (mainly due to decreasing soil carbon emissions resulting from a reduced rate of grassland converted to cropland) as well as an increase in the removals from grassland over the period 1990 to 2009. Within the sector in 2009, emissions of 13,352.73 Gg CO₂ eq were from cropland, followed by removals of 12,670.30 Gg CO₂ eq from forest land, 8,659.14 Gg CO₂ eq from grassland and emissions 6,060.72 Gg CO₂ eq from settlements. Other (harvested wood products) accounted for removals of 2,445.69 Gg and wetlands accounted for emissions of 282.53 Gg CO₂ eq.

83. The Party has made recalculations for the LULUCF sector between the 2010 and 2011 submissions following changes in AD in relation to land-use change for the period 2000 to 2007 due to the availability of the latest Countryside Survey data (2007). This resulted in an update of the previously extrapolated land-use change estimates, which were based on AD from 1990 to 1998. The impact of these recalculations on the LULUCF sector is an increase in net removals of 104.0 per cent for 2008. The main recalculations took place in the following categories:

(a) Cropland (a decrease in emissions of 11.3 per cent) due to updated AD, which resulted in a smaller area of land-use change to cropland;

(b) Grassland (an increase in removals of 6.1 per cent) due to the reallocation of emissions from peat extraction under wetlands and updated AD, which resulted in a larger area of land-use change to grassland.

84. The recalculations for each land-use category are generally clearly explained in the category-specific recalculation sections of the NIR, and justifications are provided in these sections with references to more detailed discussion of the factors elsewhere in the NIR.

85. The inventory for the LULUCF sector is generally complete, incorporating estimates for the mandatory categories. The notation key "NE" is still used for emissions from wildfires and non-CO₂ emissions from drainage of soils (forest land and flooded lands). The data entry cells for CO₂ emissions from lime application on grassland for OTs and CDs are left blank. The ERT encourages the Party to increase its efforts to improve the completeness of its inventory in these instances. In response to a recommendation in the previous review report, emission estimates of N₂O emissions from the disturbance of soils associated with forest land and grassland conversion to cropland has been included in the submission using a tier 1 method. With regard to geographical coverage, in response to a recommendation from the previous review report, the Party reported emissions/removals from the OTs and CDs, which were previously reported under sector 7 (other), under the relevant land use categories for the 2011 submission.

86. The Party's submission is generally transparent, with methodologies and data generally well-documented within the NIR. Much of the detailed discussion of the LULUCF methodology is provided by the Party in a separate annex to the NIR. Additional information on the inventory, including the complete set of land-use transition matrices, is provided by the Party at a separate website (<<http://ecosystemghg.ceh.ac.uk>>) which

appeared to be out of date at the time of the review. The ERT recommends that the Party include in its submission a complete set of documents, including annexes, and a full set of annual land-use transition matrices within the NIR in its next annual submission.

87. The United Kingdom presents a series of land-use change estimates (tables A3.7.7 to A3.7.10) based on the Countryside Survey data that are used by the Party to estimate soil carbon stock changes under land-use change. The land-use change matrices present statistics for forest land converted to other land uses and land converted to forest land that are inconsistent with the data used by the Party to report areas of afforestation/reforestation and deforestation under Article 3, paragraph 3, of the Kyoto Protocol. The Party provided further information during the review indicating that the woodland definition used by the Countryside Survey is different from that used for the inventory. The ERT, therefore, recommends that the Party describe and justify in the NIR the key differences between the Countryside Survey and the forest definition used in the inventory, and quantify the differences in estimates between the woodland land-use changes from the Countryside Survey and the values reported in CRF table NIR 2.

88. During the review, the ERT identified that in some instances the required comments where “IE” is used were incorrect (e.g. the incorrect allocation of dead organic matter for forest land converted to cropland). The ERT recommends that the United Kingdom use notation keys in the CRF tables consistent with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines).

89. The Party has taken steps to address most of the recommendations for LULUCF in the previous review report. In response to recommendations from earlier review reports, the Party reported forest land subcategories for the first time using a 20 year period after which converted lands are moved to the land remaining categories and the Party indicated its intention to report all land categories using the 20 year period. The ERT welcomes these intention and reiterates the recommendation of the previous review report that the Party report all land categories using the 20 year period after which converted lands are moved to land remaining categories. Other key recommendations that are still outstanding have been reiterated in the sections below.

2. Key categories

Land converted to forest land – CO₂

90. The tier 3 model used by the United Kingdom separately reports gains and losses in above-ground biomass. The losses reported for above-ground biomass are larger than might be expected using lower tier methods. The ERT therefore reiterates the recommendation of the previous review report that the Party provide further information in the NIR explaining the driving factors behind the reported losses.

Land converted to cropland – CO₂

91. The United Kingdom reported for the first time emissions from forest land converted to cropland, including N₂O emissions from soil disturbance associated with land conversion to cropland using new AD from the Countryside Survey. The ERT welcomes the Party’s utilization of new AD to improve the completeness of its inventory.

3. Non-key categories

Wetlands remaining wetlands – CO₂

92. The Party separately reported emissions from wetlands remaining wetlands for the 2011 inventory submission which were previously reported under grasslands. The ERT identified that the area of wetlands remaining wetlands has decreased by approximately 5.3 kha between 1990 and 2009, but no separate estimates are reported for wetlands converted to other land uses (reported to be included under wetlands remaining wetlands). In response to questions raised by the ERT during the review, the Party indicated that spatially explicit AD are being developed for the wetlands category and will be used to report areas of wetlands converted to other land uses in the next annual submission. The ERT recommends that the Party report emissions for wetlands converted to other land use categories in its next annual submission.

Biomass burning – CH₄ and N₂O

93. Emissions from wildfires and controlled burning of cropland and grassland are reported as “NE”. The Party indicated during the review that it intends to investigate whether remote sensing could be used to produce AD for biomass burning on cropland and grassland. The ERT recommends that the Party report the outcome of the investigation and provide emission estimates for biomass burning on cropland and grassland in its next annual submission.

F. Waste

1. Sector overview

94. In 2009, emissions from the waste sector amounted to 18,121.43 Gg CO₂ eq, or 3.2 per cent of total GHG emissions. Since the base year, emissions have decreased by 69.4 per cent, steadily decreasing both as an absolute value and as the share in the national total. The key driver for the fall in emissions is the country’s policy on waste, which focuses on a reduction in waste sent to landfill and landfill gas recovery. CH₄ and N₂O emissions from wastewater handling are demonstrating the opposite trend, having increased except for the last reported year (2009). Within the sector, 88.6 per cent of the emissions were from solid waste disposal on land, followed by 9.5 per cent from wastewater handling. The remaining 1.9 per cent were from waste incineration.

95. The inventory for the sector is complete in terms of gases and mandatory IPCC categories. However, as indicated by the Party in the NIR (annex A3.9, p. 559) no data were available for some OTs and it was not possible to estimate emissions for them. The ERT recommends that the Party further improve the completeness of its reporting with respect to the OTs in its next annual submission.

96. The ERT noted some lack of transparency in the inventory regarding the presentation of OTs and CDs in the CRF tables for waste incineration and the descriptions of categories in the NIR. Thus for OT and CDs emissions are still reported either separately under other (solid waste disposal on land) and other (wastewater handling) or included in the estimates and no AD are provided for them when they are separately reported. The ERT also noted some inaccuracies in the formula for specific CH₄ potential (formula 3 in the NIR), missing values for methane correction factor and F (fraction by volume of CH₄ in landfill gas) in the formula and poor description of the parameters used in the NIR. The NIR is unclear regarding whether there are any unmanaged landfills in the country. The ERT reiterates the recommendation of the previous review report that the United Kingdom improve the transparency of the inventory by providing information on OTs and CDs in all CRF tables and in the NIR, by providing all the necessary data in the NIR with respect of

all issues and parameters used in the calculation of emissions from the category and by enhancing QA/QC procedures to ensure accuracy and consistency throughout the CRF tables and NIR in the next submission.

97. The Party has made substantial recalculations for the waste sector between the 2010 and 2011 submissions in response to the 2010 annual review report, following changes in AD and changes in the methodological approach. The impact of these recalculations on the waste sector is a decrease in emissions by 18.4 per cent for 2008 and affects all categories. The main recalculations took place in solid waste disposal on land (CH₄). However, the ERT noted a significant lack of transparency in the justification of the recalculations in the sector and is particularly concerned about the revision of the AD and EFs for solid waste disposal on land (see para. 100).

98. The ERT commends the Party for improving its reporting on sectoral policy in the NIR and for its efforts to address the recommendation of previous review reports regarding updating or justification of the constant amount of landfilled waste from commercial and industrial sources.

2. Key categories

Solid waste disposal on land – CH₄

99. The Party estimates CH₄ emissions from solid waste disposal on land using the IPCC first order decay model, which is modified according to the country-specific conditions. The collected AD are scaled up for the whole United Kingdom. Country-specific EFs are based on research studies. For the 2011 submission, the United Kingdom updated its AD as recommended by the previous review report and calculated country-specific degradable organic carbon values for local authority-controlled waste and for commercial and industrial waste and made a recalculation of the whole time series. The ERT commends the United Kingdom for its efforts in data collection and determining country-specific EFs.

100. However, the recalculations made using the new AD and EFs led to a significant decrease of the 2008 emissions from the sector and the ERT noted that the change in values for MSW_F and the default values for degradable organic carbon into the country-specific ones is not properly documented in the NIR and its annex 3. The explanations and references⁷ provided by the consulting company Eunomia Research & Consulting Ltd on the request of the ERT were analysed and the ERT concluded that they are not sufficiently convincing and require further justification. The reasons for questioning the recalculations are: the poor quality of updated data on waste sent to landfill, as acknowledged by the consulting company itself; lack of justification for ‘smoothing’ assumption for dissimilable degradable organic carbon for the years since 1997; and the error made in putting new dissimilable degradable organic carbon values into the model. The ERT strongly recommends that the Party double-check the reliability of the data used in the recalculation and the relevance of the methods used and assumptions made, and either: make recalculations with corrected figures supported, in the NIR, by strong justifications for the changes made in methodologies, assumptions, data and parameters; or keep the previous values and approaches (2010 submission) unchanged until the Party is able to show sufficient evidence for justifying the changes.

101. The United Kingdom calculates CH₄ recovery values using the figures of gas utilized for energy and the total available flaring capacity of the landfills. The previous

⁷ “Methane from Landfill Workshop”, DEFRA, Mary Sumner House, 24 Tufton Street, London, 30 November and 1 December 2010; and Environment Agency. 2011. *Estimation of Lifetime Collection Efficiency using GasSim*.

review report noted that the CH₄ recovery rate was increasing, reaching 71 per cent in 2008. For the year 2009 it was raised to 75 per cent. The NIR justifies the value by reference to the permit conditions for landfill operators, who are targeting to collect at least 85 per cent of CH₄ from the sites receiving biodegradable waste. On the request of the ERT the Party provided additional documentation and explanation on the issue, demonstrating that landfill operators are asked to conduct a survey on the flaring process, enabling the Party to calculate the recovered CH₄ values based on the survey data. The ERT reiterates the recommendation of the previous review reports that the United Kingdom collect the survey data and update AD in order to avoid a possible overestimation of recovered CH₄, and provide detailed information on the data in its next annual submission.

Wastewater handling – N₂O

102. The IPCC default methodology was used for estimating N₂O emissions from human sewage. Previous review reports had identified an inconsistency in the AD time series due to changes in the method used for estimating per capita protein consumption, and reiterated the recommendation that the Party include explanations and justifications for using these values or revise the value and update the emission estimates. The United Kingdom has revised protein consumption based on data from a recent survey entitled *Expenditure and Food Survey*.⁸ Although still below the values published by the United Nations Food and Agriculture Organization (FAO), the new values recalculated for the entire time series are consistent with those of other Parties. The change resulted in an increase in emissions for 2008 by 10.1 per cent compared with the 2010 submission. The ERT recommends that the Party further explore and periodically update the country-specific protein consumption value and improve the description of the category in its next annual submission.

3. Non-key categories

Wastewater handling –CH₄

103. The CH₄ emissions from domestic and commercial wastewater handling are estimated together for wastewater and sludge. This is consistent with the Revised 1996 IPCC Guidelines. As recommended in the previous review report, the United Kingdom changed the notation key “NE” to “IE” for industrial wastewater, as it treats both domestic and commercial and industrial wastewater together.

104. The United Kingdom gathered new data on CH₄ emissions for 2008 from several water companies using a recently developed spreadsheet tool. Data for 2008 gathered in 2010 from six out of a total of 12 water companies was used to develop Party-wide EFs, applied across all years. However, the limited number of data providers and the estimated decrease of the CH₄ emissions for 2008 (by 55.9 per cent compared with the previous submission) raise questions regarding the accuracy of the estimates. The ERT, therefore, strongly recommends that the Party provide justification, description and references for this change in its next annual submission and ensure that the applied EFs are representative for the industrial activity and emissions from all over the United Kingdom.

Waste incineration – CO₂, CH₄ and N₂O

105. The United Kingdom estimates emissions from incineration of MSW, hospital, chemical waste, sewage sludge and accidental fires from vehicles, using default and country-specific EFs from the IPCC good practice guidance, the *EMEP/CORINAIR Emission Inventory Guidebook* and other literature. CO₂ and N₂O emissions from chemical waste incineration are reported as “NE”. Emissions from biogenic MSW incineration are

⁸ Defra (2009), Expenditure and Food Survey Report.

reported in the energy sector. The subcategory MSW burning under waste incineration represents only the part of the MSW that is incinerated without energy recovery. The ERT noted that data for the OTs and CDs are not separately reflected in CRF table 6.C and that the information on their inclusion in the NIR is insufficient. The ERT recommends that, in its next annual submission, the Party report on data for the OTs and CDs in the CRF tables, with distinct AD and emissions, and improve the transparency of the reporting in the NIR on the geographical coverage for each reported category.

G. Adjustments

106. The ERT identified underestimations in the emission estimates and recommended four adjustments in the agriculture sector for 2009. In accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1), the adjustments to the agriculture sector were prepared by the ERT in consultation with the United Kingdom. In accordance with the Article 8 review guidelines, the ERT officially notified the United Kingdom of the calculated adjustments.

107. The underestimations leading to adjustments in the agricultural sector in 2009 are for the category N₂O emissions from agricultural soils and include: animal manure applied to soils (4.D.1.2); pasture, range and paddock manure (4.D.2); and indirect emissions (atmospheric deposition (4.D.3.1) and nitrogen leaching and run-off (4.D.3.2)).

108. The adjusted estimate for GHG emissions from the agriculture sector in 2009 amounts to 47,125.96 Gg CO₂ eq, compared with 45,041.26 Gg CO₂ eq as originally reported by the United Kingdom in its 2011 annual submission. The calculation and application of the adjustments leads to an increase in estimated total GHG emissions from Annex A sources by 0.4 per cent (2,084.74 Gg CO₂ eq), from 570,066.41 Gg CO₂ eq as reported by the United Kingdom to 572,151.15 Gg CO₂ eq as calculated by the ERT.

109. In its response to the draft annual review report, the United Kingdom notified the secretariat of its intention to accept the calculated adjustments.

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

1. Agricultural soils/Animal manure applied to soils – N₂O

The original estimate

111. In the United Kingdom inventory, following the 2006 IPCC Guidelines, the amount of N which was emitted as N₂O during storage has been subtracted from the N in manure applied to soils. This reduced amount is then further reduced by N from grazing animals and by N from manure burned as a fuel and then corrected for volatilization. N₂O emissions from the category animal manure applied to soils (7.21 Gg) are included in the emissions from agricultural soils which is key category according to level and trend (from the Party's key category analysis) or in the direct soil emissions, which is key category according to the level only (from the secretariat's key category analysis).

The underlying problem

112. The methodology described in the NIR and used by the United Kingdom is not in line with the IPCC good practice guidance, which does not suggest any subtraction of N which has been emitted as N₂O. The amount of N in manure applied to soils as reported by

the United Kingdom is lower than the amount calculated according to the methodology described in the IPCC good practice guidance and, therefore, results in an underestimation of N₂O emissions.

The rationale for adjustment

113. The rationale for the adjustment is the fact that the estimate is prepared in a way that is not consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance and leads to an underestimation of the emissions in the latest reported year.

The recommendation to the Party

114. The ERT recommended that the United Kingdom recalculate emissions from animal manure applied to soils using equation 4.23 from the IPCC good practice guidance. There, the total amount of N in animal manure means total of N from all animal types and all manure management systems without reduction for N which was emitted as N₂O during storage.

115. In the Party's preliminary response to the list of potential problems and further questions from the ERT the United Kingdom explained that it is following the 2006 IPCC Guidelines. The ERT concluded that the United Kingdom should amend its approach to follow the IPCC good practice guidance, rather than the 2006 IPCC Guidelines. The ERT again recommended that the United Kingdom provide revised N₂O emissions for the entire time series 1990–2009 following the methodology from the IPCC good practice guidance and submit the revised inventory to the UNFCCC secretariat by 7 November. On the due date the revised estimates were not submitted, but the United Kingdom agreed to switch to the method given in the IPCC good practice guidance in its next annual submission. According to decision 22/CMP.1 the Party is required to formally submit the CRF tables, including revised estimates, for the 2011 submission in order to remove this underestimate. The United Kingdom has chosen not to submit the revised estimates. Therefore, the ERT considered the potential problem unresolved and has calculated an adjustment for this subcategory.

The assumptions, data and methodology used to calculate the adjustment

116. The ERT has used equation 4.23 from the IPCC good practice guidance to calculate N₂O emissions from the animal manure applied to soils. The total amount of N (1,004,620,826 kg N) has been calculated from data provided by the United Kingdom on population for every animal type and every AWMS using the relevant nitrogen excretion rates. This amount is reduced by N from grazing animals ($Frac_{PRP} = 0.526$) and by N from manure burned as a fuel ($Frac_{FUEL} = 0.015$) and then corrected for volatilization ($Frac_{GASM} = 0.2$). The amount of N as reported by the Party was 366,993,070.45 kg N while the ERT estimates this amount to be 368,683,244.45 kg N.

The adjusted estimate

117. Table 4 shows the steps for the calculation of the adjustment.

Table 4
Description of the adjustment(s) calculation for Annex A sources

<i>Parameter/Estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: 4.D.1.2 Animal manure applied to soils			
Party's estimate of: N input from manure applied to soils	366 993 070.05	kg N	CRF table, v1.1, official submission on 15 April 2011
Party's emission estimate from animal manure applied to soils – N ₂ O	7.21	Gg N ₂ O	CRF table, v1.1, official submission on 15 April 2011
Input data/parameter for calculation of adjustment	368 683 244.45	kg N	ERT calculation
Calculated estimate for animal manure applied to soils – N ₂ O	7.24	Gg N ₂ O	ERT calculation
Conservativeness factor	1.06		Table 2 of appendix III of the technical guidance on methodologies for adjustments, annexed to decision 20/CMP.1
Adjusted conservative estimate for N input from manure applied to soils	390 804 239.12	kg N	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from animal manure applied to soils	7.68	Gg N ₂ O	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from animal manure applied to soils	2 379.72	Gg CO ₂ eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF) as reported by the Party	570 066.41	Gg CO ₂ eq	CRF table, v1.1, official submission on 15 April 2011
Total aggregated GHG emissions (excluding LULUCF) after application of adjustment	570 211.41	Gg CO ₂ eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	144.99	Gg CO ₂ eq	ERT calculation
	0.025	%	ERT calculation

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

118. The ERT applied a conservativeness factor of 1.06 (agriculture, agricultural soils, N₂O from manure, AD, table 2 of appendix III contained in the technical guidance for adjustments, annexed to decision 20/CMP.1) to estimate N input from manure applied to soils. The ERT, therefore, considers that the resulting value is conservative.

2. Agricultural soils/Pasture, range and paddock manure – N₂O

The original estimate

119. In the United Kingdom inventory, the amount of N which has been emitted as NO_x and NH₃ has been subtracted from the N in the manure applied to soils during grazing and then multiplied by the IPCC default N₂O EF. N₂O emissions from the category pasture, range and paddock manure (13.29 Gg) are included in the emissions from agricultural soils, which is a key category according to level and trend (from the Party's key category analysis). Based on the secretariat's key category analysis, the pasture, range and paddock manure is a key category according to the level assessment.

The underlying problem

120. The methodology described in the NIR and used by the United Kingdom is not in line with the IPCC good practice guidance, which suggests that all N in manure excreted during grazing should be included in the calculation. The amount of N in manure applied to soils during grazing as reported by the United Kingdom is therefore lower than the amount calculated according to the methodology described in the IPCC good practice guidance and therefore results in an underestimation of N₂O emissions.

The rationale for adjustment

121. The rationale for the adjustment is the fact that the estimate is prepared in a way that is not consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance and leads to an underestimation of the emissions in the latest reported year.

The recommendation to the Party

122. The ERT recommended that the United Kingdom recalculate emissions from pasture, range and paddock manure using equation 4.18 from the IPCC good practice guidance. The total amount of N applied to soils during grazing should be multiplied by the default N₂O EF.

123. In the Party's preliminary response to the list of potential problems and further questions from the ERT the United Kingdom agreed that the approach it used is not consistent with the IPCC good practice guidance but believes that its approach better reflects the mass balance of N in agriculture. The ERT concluded that the United Kingdom should amend its approach to follow the IPCC good practice guidance and again recommended that the United Kingdom provide revised N₂O emissions for the entire time series 1990–2009 following the methodology from the IPCC good practice guidance and submit the revised inventory to the UNFCCC secretariat by 7 November. On the due date the revised estimates were not submitted, but the United Kingdom agreed to switch to the method given in the IPCC good practice guidance in its next annual submission. According to decision 22/CMP.1 the Party is required to formally submit CRF tables, including revised estimates, for the 2011 submission in order to remove this underestimate. The United Kingdom has chosen not to submit the revised estimates. Therefore the ERT considered the potential problem unresolved and has calculated an adjustment for this subcategory.

The assumptions, data and methodology used to calculate the adjustment

124. The ERT has used equation 4.18 from the IPCC good practice guidance to calculate N₂O emissions from pasture, range and paddock manure. The amount of N has been calculated from data provided by the United Kingdom on population of grazing animals for every animal type using the relevant nitrogen excretion rates and with no reduction for the

N that is volatilized as NO_x and NH₃. The amount of N as reported by the Party was 422,928,945 kg N while the ERT estimates this amount to be 528,661,178.96 kg N.

The adjusted estimate

125. Table 5 shows the steps for the calculation of the adjustment.

Table 5
Description of the adjustment(s) calculation for Annex A sources

<i>Parameter/Estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: 4.D.2 Pasture, range and paddock manure			
Party's estimate of: N excretion on pasture, range and paddock manure	422 928 945.18	kg N	CRF table, v1.1, official submission on 15 April 2011
Party's emission estimate from Pasture, range and paddock manure – N ₂ O	13.29	Gg N ₂ O	CRF table, v1.1, official submission on 15 April 2011
Input data/parameter for calculation of adjustment	528 661178.98	kg N	ERT calculation
Calculated estimate for pasture, range and paddock manure – N ₂ O	16.62	Gg N ₂ O	ERT calculation
Conservativeness factor	1.06		Table 2 of appendix III of the technical guidance on methodologies for adjustments, annexed to decision 20/CMP.1
Adjusted conservative estimate for N excretion on pasture, range and paddock	560 380 849.71	kg N	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from pasture, range and paddock manure	17.61	Gg N ₂ O	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from pasture, range and paddock manure	5 459.71	Gg CO ₂ eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF) as reported by the Party	570 066.41	Gg CO ₂ eq	CRF table, v1.1, official submission on 15 April 2011
Total aggregated GHG emissions (excluding LULUCF after application of adjustment)	571 405.46	Gg CO ₂ eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	1,339.04 0.23	Gg CO ₂ eq %	ERT calculation ERT calculation

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

126. The ERT applied a conservativeness factor of 1.06 (agriculture, agricultural soils, N₂O from manure, AD, table 2 of appendix III contained in the technical guidance for

adjustments, annexed to decision 20/CMP.1) to estimate N excretion on pasture, range and paddock. The ERT, therefore, considers that the resulting value is conservative.

3. Agricultural soils/Indirect emissions – N₂O

The original estimate

127. In the United Kingdom inventory, following the 2006 IPCC Guidelines, the amount of N which was emitted as N₂O during storage has been subtracted from the N in the manure applied to soils. This reduced amount is then further reduced by N from manure burned as a fuel and together with the N from synthetic fertilizers used in the calculation. N₂O emissions from the category atmospheric deposition (4.77 Gg) and leaching and run-off (24.21 Gg) are included in the emissions from agricultural soils which is a key category according to level and trend (from the Party's key category analysis) or in the indirect soil emissions, which is a key category according to the level only (from the secretariat's key category analysis).

The underlying problem

128. The methodology described in the NIR and used by the United Kingdom is not in line with the IPCC good practice guidance, which does not suggest any subtraction of N which has been emitted as N₂O and no exclusion of N from manure burned as a fuel. The total amount of N in manure applied to soils as reported by the United Kingdom is lower than the amount calculated according to the methodology described in the IPCC good practice guidance and therefore results in an underestimation of N₂O emissions.

The rationale for adjustment

129. The rationale for the adjustment is the fact that the estimate is prepared in a way that is not consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance and leads to an underestimation of the emissions in the latest reported year.

The recommendation to the Party

130. The ERT recommended that the United Kingdom recalculate emissions from atmospheric deposition using equation 4.31 from the IPCC good practice guidance. The amount of applied agricultural N that volatilizes and subsequently deposits on nearby soils should be equal to the total amount of synthetic N fertilizer applied to soils plus the total amount of animal manure N excreted in the country multiplied by appropriate volatilization factors. The volatilized N is then multiplied by IPCC default EF to estimate N₂O emissions.

131. The ERT also recommended that the United Kingdom recalculate emissions from leaching and run-off using equation 4.35 from the IPCC good practice guidance. The amount of N in the synthetic fertilizers and animal manure that is lost through leaching and run-off should be the sum of the total amount of synthetic fertilizer N applied to soils and the total amount of animal N excretion in the country reduced for the amount of animal manure used as a fuel and then multiplied by the fraction of N input that is lost through leaching and run-off. The appropriate IPCC default N₂O EF should be applied to obtain the emissions of N₂O.

132. In the Party's preliminary response to the list of potential problems and further questions from the ERT the United Kingdom explained that it is following the 2006 IPCC Guidelines. The ERT concluded that the United Kingdom should amend its approach to follow the IPCC good practice guidance, rather than the 2006 IPCC Guidelines. The ERT again recommended that the United Kingdom calculate revised N₂O emissions for the entire time series 1990–2009 following the methodology from the IPCC good practice guidance and submit the revised inventory to the UNFCCC secretariat by 7 November. On

due date the revised estimates were not submitted, but the United Kingdom agreed to switch to the method given in the IPCC good practice guidance in its next annual submission. According to decision 22/CMP.1 the Party is required to formally submit the CRF tables, including revised estimates, for the 2011 submission in order to remove this underestimate. The United Kingdom has chosen not to submit the revised estimates. Therefore the ERT considered the potential problem unresolved and has applied an adjustment to this subcategory.

The assumptions, data and methodology used to calculate the adjustment

133. The ERT has used equation 4.31 from the IPCC good practice guidance to calculate N₂O emissions from atmospheric deposition. The amount of N is equal to the total amount of synthetic fertilizer N applied to soils as reported by Party (1,073,692,069 kg N) plus the total amount of animal manure N excreted in the country as calculated for the adjustment for the subcategory animal manure applied to soils and described in paragraph 116 above (1,004,620,826 kg N) multiplied by the appropriate volatilization factors (Frac_{GASF} = 0.1 and Frac_{GASM} = 0.2). The amount of N as reported by the Party was 303,388,437.24 kg N while the ERT estimates this amount to be 308,293,372.15 kg N.

134. The ERT has also used equation 4.35 from the IPCC good practice guidance to calculate N₂O emissions from nitrogen leaching and run-off. The total amount of synthetic fertilizer N applied to soils and the total amount of animal N excretion in the country have been calculated as described in the paragraph 133 above. This sum has been reduced for the animal manure used as a fuel as reported by the Party (15,105,592 kg N) and multiplied by the fraction of N input that is lost through leaching and run-off (Frac_{LEACH} = 0.3). The amount of N as reported by Party was 616,136,466.15 kg N while the ERT estimates this amount to be 618,962,190.92 kg N.

The adjusted estimate

135. Tables 6 and 7 shows the steps for the calculation of the two adjustments.

Table 6
Description of the adjustment(s) calculation for Annex A sources

<i>Parameter/Estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: 4.D.3.1 Atmospheric deposition			
Party's estimate of: volatized N from fertilizers, animal manures and other	303 388 437.24	kg N	CRF table, v1.1, official submission on 15 April 2011
Party's emission estimate from atmospheric deposition – N ₂ O	4.77	Gg N ₂ O	CRF table, v1.1, official submission on 15 April 2011
Input data/parameter for calculation of adjustment	308 293 372.15	kg N	ERT calculation
Calculated estimate for animal manure applied to soils – N ₂ O	4.85	Gg N ₂ O	ERT calculation
Conservativeness factor	1.06		Table 2 of appendix III of the technical guidance on methodologies for adjustments, annexed to decision 20/CMP.1

<i>Parameter/Estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Adjusted conservative estimate for volatilized N from fertilizers, animal manures and other	326 790 974.47	kg N	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from atmospheric deposition	5.14	Gg N ₂ O	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from atmospheric deposition	1 591.94	Gg CO ₂ eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF) as reported by the Party	570 066.41	Gg CO ₂ eq	CRF table, v1.1, official submission on 15 April 2011
Total aggregated GHG emissions (excluding LULUCF after application of adjustment)	570 180.42	Gg CO ₂ eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	114.004	Gg CO ₂ eq	ERT calculation
	0.020	%	ERT calculation

Table 7

Description of the adjustment(s) calculation for Annex A sources

<i>Parameter/Estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
Category: 4.D.3.2 Nitrogen leaching and run-off			
Party's estimate of: N from fertilizers, animal manures and other that is lost through leaching and run-off	616 136 466.15	kg N	CRF table, v1.1, official submission on 15 April 2011
Party's emission estimate from nitrogen leaching and run-off – N ₂ O	24.21	Gg N ₂ O	CRF table, v1.1, official submission on 15 April 2011
Input data/parameter for calculation of adjustment	618 962 190.92	kg N	ERT calculation
Calculated estimate for nitrogen leaching and run-off – N ₂ O	24.32	Gg N ₂ O	ERT calculation
Conservativeness factor	1.06		Table 2 of appendix III of the technical guidance on methodologies for adjustments, annexed to decision 20/CMP.1
Adjusted conservative estimate for N from fertilizers, animal manures and other that is lost through leaching and run-off	656 099 922.38	kg N	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from nitrogen leaching and run-off	25.78	Gg N ₂ O	ERT calculation
Adjusted conservative estimate for N ₂ O emissions from nitrogen leaching	7 990.360	Gg CO ₂ eq	ERT calculation

<i>Parameter/Estimate</i>	<i>Value</i>	<i>Unit</i>	<i>Source</i>
and run-off			
Total aggregated GHG emissions (excluding LULUCF) as reported by the Party	570 066.41	Gg CO ₂ eq	CRF table, v1.1, official submission on 15 April 2011
Total aggregated GHG emissions (excluding LULUCF after application of adjustment)	570 553.11	Gg CO ₂ eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	486.698	Gg CO ₂ eq	ERT calculation
	0.085	%	ERT calculation

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

136. The ERT applied a conservativeness factor of 1.06 (agriculture, agricultural soils, N₂O from manure, AD, table 2 of appendix III) contained in the technical guidance for adjustments, annexed to decision 20/CMP.1) to estimate N from fertilizers, animal manures and other. The ERT, therefore, considers that the resulting value is conservative.

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

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

Overview

137. The United Kingdom provided information relating to KP-LULUCF activities following the annotated outline of the NIR, providing general, land-specific and activity-specific information in line with the requirements of the annex to decision 15/CMP.1.

138. The United Kingdom reported activities under Article 3, paragraph 3, of the Kyoto Protocol and elected forest management under Article 3, paragraph 4, of the Kyoto Protocol. The United Kingdom has elected to account for KP-LULUCF activities at the end of the first commitment period.

139. The United Kingdom reports that the geographical unit used for determining the area of the units of land is the four countries of the United Kingdom. However, the Party does not provide information on the spatial assessment unit. The ERT recommends that the Party also include information in section 11.2.1 of the NIR describing the spatial assessment unit and how it reflects the minimum land area and width requirements defined by the Party's forest definition, and hence the detection of land-use change at the scale consistent with the Party's forest definition.

140. With respect to AD for deforestation, the Party relies upon an incomplete spatial and temporal coverage of deforestation areas. This includes an extrapolation of deforestation rates to estimate deforestation in Scotland for the period 1990 to 1998. Also, the Party has not obtained AD for deforestation in Northern Ireland under Article 3, paragraph 3, of the Kyoto Protocol, which is currently reported as "NO". The Party has indicated in the submission that it will report emissions from deforestation in Northern Ireland in its next annual submission. In response to questions raised by the ERT during the review, the Party provided information that deforestation areas will be re-estimated for the United Kingdom following the completion of a body of work on the National Forest Inventory (NFI) in 2012 and will be used in the 2013 submission. The ERT reiterates the recommendation of the previous review report that the Party report AD and emissions for deforestation in Northern

Ireland and the OTs and CDs in its next annual submission to avoid the possibility of issues being raised in future reviews regarding the national system. In case the NFI work is not finalized in time for the next annual submission, the ERT recommends that the Party use preliminary data, clearly indicating in the NIR that the existing land area matrices are preliminary, and provide detail on the timing of the implementation of the new NFI for updated reporting of deforestation areas.

141. The methods applied by the Party to report carbon stock change emissions include tier 2 and tier 3 methodologies. The tier 3 model, C-Flow, is used to report carbon stock change emissions from afforestation/reforestation activities and also for carbon stock change in soil carbon for deforestation. Carbon stock change emissions from above-ground and below-ground biomass and litter and deadwood are estimated using a tier 2 stock change approach where all emissions occur in the year of deforestation. For forest management, the Party also uses the tier 3 C-Flow model to report emissions from above-ground and below-ground biomass, litter and soil. The Party applies a tier 1 model to estimate N₂O emissions from disturbance associated with land-use conversion to cropland.

142. The Party has made recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions following changes in AD. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

- (a) Afforestation/reforestation removals decreased slightly by 0.28 Gg CO₂ eq;
- (b) Deforestation emissions increased by 20.60 Gg CO₂ eq (3.4 per cent);
- (c) Forest management removals increased by 12.26 Gg CO₂ eq (0.1 per cent).

143. The Party provided an itemised table of recalculations for Article 3, paragraphs 3 and 4, activities in the NIR (table 11.3). The ERT welcomes the transparency provided by the table. The ERT encourages the Party to provide a more detailed explanation of how each factor impacts on emission/removal estimates in its next annual submission.

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

Afforestation and reforestation – all gases

144. The United Kingdom indicated during the review that an updated forest map is available from the NFI. The Party indicated that analysis and reconciliation of the forest map with the previous forest map is ongoing, including a field survey to support interpretation of the maps. The NFI is not due for completion until the end of 2015. The ERT recommends that the Party identify, and utilize in its next annual submission, any NFI information that may be available before the completion of the inventory to improve the accuracy and uncertainty associated with the estimation of afforestation/reforestation AD.

145. The United Kingdom reported emissions from wildfires on afforestation/reforestation areas as “IE”, and allocated the emissions under forest management. The ERT reiterates the recommendation of the previous review report that the Party report wildfire emissions separately for afforestation/reforestation and forest management in its next annual submission.

Deforestation – CO₂

146. With respect to the carbon stock change in above-ground and below-ground biomass, litter and deadwood pools, the Party reports an available biomass of 240 t/ha. It was not clear from the NIR whether this biomass relates to all pools or only to the living pools. In response to questions raised by the ERT during the review, the Party explained that the biomass of 240 t/ha is for living biomass pools and indicated that an expansion factor is applied to account for litter and deadwood. The ERT recommends that the Party

provide further information in the NIR of its next annual submission describing how carbon stock changes in all pools are estimated and the sources of information used to determine the carbon stocks in each pool prior to deforestation.

147. Emissions from wildfires on deforested lands are reported as “NE”. The NIR states that no AD on wildfires on non-forested lands are available. The ERT reiterates the recommendation of the previous review report that the United Kingdom provide either evidence that wildfires do not occur or the relevant estimates in its next annual submission.

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

Forest management – CO₂

148. With respect to pre-1920 forests, the United Kingdom assumes that there is no carbon stock change occurring in these forests. The Party indicated during the review that work is under way to reassess this assumption. The ERT notes that the Party recognises in the NIR that some level of active management is occurring in these forests. The ERT recommends that the Party determine whether there are components of pre-1920 forests that are actively managed, and identify whether the actively managed forests are a net source of emissions and should be accounted for under forest management.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

149. The United Kingdom has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.⁹ The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

150. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88(a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1.

151. Information reported by the Party on records of any discrepancies and on any records of non-replacement was found to be consistent with information provided to the secretariat by the ITL.

National registry

152. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1.

⁹ The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party’s SEF tables with corresponding records contained in the ITL.

The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

Calculation of the commitment period reserve

153. The United Kingdom has reported its commitment period reserve in its 2011 annual submission. The United Kingdom reported that its commitment period reserve has not changed since the initial report review (3,070,872,567 t CO₂ eq), as it is based on the assigned amount and not on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

154. The Party reported that there are no changes in its national system since the previous annual submission except for minor changes in institutional arrangements. These are: change of the Northern Ireland regulator from the Environment and Heritage Service to the Northern Ireland Environment Agency; the International Climate Change and Energy (ICCE) programme of DECC is now known as International Energy and Climate Change (IECC); management of the LULUCF inventory contract (with CEH) has now been moved from DECC's International Climate Change and Energy (ICCE) team to DECC's CESA team. In response to questions raised by the ERT during the review week, the Party reported some additional changes in the national system such as the signing a DSA with the Department for Transport (12 April 2011) and discussions of a DSA with the Environment Agency, Scottish Environmental Protection Agency and the Northern Ireland Environment Agency. In addition, annex 3 to the NIR contained information about some methodological changes for the estimation of gas leakages and coastal and international marine emissions based on consultations with gas network operators and Entec data. The ERT recommends that the United Kingdom include any information related to the changes in national system in the relevant paragraph of the NIR of its next annual submission.

155. The ERT concluded that, taking into account the reported changes in the national system, the United Kingdom's national system continues to be in accordance with the requirements of national systems set out in decision 19/CMP.1.

4. Changes to the national registry

156. The United Kingdom has reported changes in its national registry and the NIR provides a description of the changes, including a list of the elements that have been changed such as software changes (upgrade), improved security and a change of data integrity measures. The ERT concluded that, taking into account the confirmed changes in the national registry, the United Kingdom's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

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

157. The United Kingdom reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, in its 2011 annual submission, but it did not identify the changes in its reporting compared with that in its previous annual submission in accordance with decision 15/CMP.1. The ERT recommends that the United Kingdom include such information in its next annual submission.

158. In chapter 15 of the NIR the United Kingdom outlined the key directions of its actions on the minimization of adverse impacts in accordance with Article 3, paragraph 14,

which have not significantly changed compared with the 2010 submission. The key actions are: research/review/analysis; projects from the sustainable development dialogue; capacity-building projects on renewable energy and energy efficiency; other United Kingdom initiatives (e.g. trading, and reform and development of the European Union Common Agricultural Policy); and actions within the European community. In response to previous the encouragement of the previous review report, the United Kingdom provided information regarding its actions in accordance with paragraph 24 of the annex to decision 15/CMP.1 on knowledge sharing and capacity-building in developing countries, such as the establishment of the Climate and Development Knowledge Network and the piloting of the concept of Climate Innovation Centres in developing countries. The ERT commends the United Kingdom for this improvement.

159. During the review week the United Kingdom ensured the ERT that it will also provide information on its activities with regards to paragraph 24 (a–b) of the annex to decision 15/CMP.1 in its next annual submission. The ERT concluded that, the information provided is generally complete and transparent. The ERT encourages the United Kingdom to continue with planned improvements.

III. Conclusions and recommendations

160. The United Kingdom made its annual submission on 15 April 2011. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, and changes to the national system and the national registry and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

161. The ERT concludes that the inventory submission of the United Kingdom has been prepared and reported generally in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2009 and an NIR; these are complete in terms of sectors and gases, and generally complete in terms of geographical coverage and categories, except for non-mandatory categories and some territories not included under deforestation and the waste sector.

162. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. The ERT noted that the United Kingdom reported information required under Article 3, paragraph 14, of the Kyoto Protocol but did not specify the changes that have occurred since the previous annual submission.

163. The Party's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, the ERT concluded that the estimates for the category N₂O emissions from agricultural soils are not fully in line with the IPCC good practice guidance and led to an underestimation of the Party's submission for the commitment period. In accordance with the provisions of decisions 20/CMP.1 and 22/CMP.1, adjustments were calculated and applied for four of the subcategories of the noted category (see chapters II.G and IV of this report).

164. The Party has made recalculations for the inventory between the 2010 and 2011 submissions in response to the 2010 annual review report in order to lift applied adjustments and following changes in AD and EFs. The impact of these recalculations on

the national totals is a decrease in emissions of 1.2 per cent for 2008. The main recalculations took place in the following sectors/categories:

- (a) Manufacturing industries and construction, other sectors, and transport (energy);
- (b) Cropland (LULUCF);
- (c) Agricultural soils (agriculture);
- (d) Solid waste disposal on land (waste).

165. The Party has reported information on activities under Article 3, paragraph 3, of the Kyoto Protocol and elected activities under Article 3, paragraph 4, of the Kyoto Protocol generally in a complete and transparent manner. However, a number of issues with respect to AD for deforestation are outstanding from previous review report recommendations.

166. The Party has made recalculations for the KP-LULUCF activities between the 2010 and 2011 submissions following changes in AD. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

- (a) Afforestation/reforestation removals decreased by 0.28 Gg CO₂ eq;
- (b) Deforestation emissions increased by 20.60 Gg CO₂ eq (3.4 per cent);
- (c) Forest management removals increased by 12.26 Gg CO₂ eq (0.1 per cent).

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

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

169. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

170. The United Kingdom has reported information under chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2011 annual submission. The information was provided on 15 April 2011. The ERT concluded that information reported in 2011 submission continues to be generally complete and transparent.

171. The ERT identifies the following cross-cutting issues for improvement:

- (a) Strengthen the efforts to implement the recommendations of previous review reports, especially those that had already been reiterated from the review before (see para. 30);
- (b) Improve reporting of KP-LULUCF to ensure complete, accurate and unbiased reporting of KP-LULUCF activities on all lands in the United Kingdom (see para. 140);
- (c) Improve the description of recalculations by providing clear documentation and explanations on the justifications used for the changes made in methodologies, assumptions, data and parameters, and also ensure that any recalculation performed leads to a real improvement of the inventory (see para. 22);
- (d) Continue to strengthen QC procedures at the stage of inventory compilation to avoid erroneous entries in CRF tables and mistakes in the text of the NIR (see para. 24);

(e) Improve the transparency of the inventory regarding the presentation of information on OTs and CDs in the CRF (e.g. include distinct AD and emissions from OTs and CDs under waste incineration) and the description of the geographical coverage for each reported category in the NIR (see para. 26);

(f) Continue to improve the consistency and appropriateness of notation keys usage (see para. 10).

172. In the course of the review, the ERT formulated a number of sector-specific recommendations relating to the transparency and accuracy of the information presented in the United Kingdom's annual submission. The key recommendations are that the United Kingdom:

(a) Increase the transparency on reported recalculations in the energy and waste sector as follows: recheck the new data and the changes in the methods, assumptions and parameters used in the estimates and further justify those in the NIR or return to the previous values (e.g. for solid waste disposal on land), until ensuring sufficient evidence to justify the changes; provide justification, description and references for the new EF for CH₄ from wastewater handling and ensure it represents the United Kingdom as a whole;

(b) Improve the information provided on the treatment of feedstocks and non-energy use of fuels in the inventory;

(c) Provide the necessary information on the model used to calculate the actual emissions of HFCs from consumption of halocarbons and SF₆ (e.g. the EFs used in the model and the rationale for the selection of those values);

(d) Follow the methodology described in the IPCC good practice guidance for the calculation of N₂O emissions from agricultural soils;

(e) Improve the transparency of the agriculture sector by including more information on country-specific EFs and other parameters, such as the lifespan of lambs in the NIR;

(f) Ensure that there is a full representation of land areas under deforestation by including Northern Ireland, the OTs and CDs for the entire time series (KP-LULUCF);

(g) Improve the completeness with respect to unaccounted emissions from the OTs under the waste sector;

(h) Collect survey data for CH₄ recovery and update the AD in order to avoid a possible overestimation of recovered CH₄ and provide detailed information on the data.

IV. Adjustments

173. The ERT concludes, based on the review of the 2009 inventory, that for the category N₂O emissions from agricultural soils (specifically: animal manure applied to soils (4.D.1.2), pasture, range and paddock manure (4.D.2), atmospheric deposition (4.D.3.1), and nitrogen leaching and run-off (4.D.3.2)) the methods and AD used are not fully in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance as required by Article 5, paragraph 2, of the Kyoto Protocol. The ERT recommended that the Party submit revised estimates or provide further justifications for its calculations for the identified categories as a way of resolving the identified potential problems. Following the review of the additional information provided by the United Kingdom during and after the review week, the ERT concluded that the Party did not satisfactorily correct the problem through the submission of acceptable revised estimates and decided to calculate and

recommend four adjustments in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1).

174. The United Kingdom, in its communication of 16 April 2012, accepted the calculated adjustments. In accordance with the Article 8 review guidelines, the ERT applied the calculated adjustments.

175. The application of the calculated adjustments by the ERT resulted in a change in the estimate of the 2009 emissions from the agriculture sector, from 45,041.26 Gg CO₂ eq, as originally reported by the United Kingdom, to 47,125.96 Gg CO₂ eq. This in turn resulted in a change in the estimated total emissions of the United Kingdom for 2009, from 570,066.41 Gg CO₂ eq, as originally reported by the United Kingdom, to 572,151.15 Gg CO₂ eq, or 0.4 per cent of the total national emissions.

V. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Helen Champion (United Kingdom Greenhouse Gas Inventory, Department of Energy and Climate Change), including additional material on the methodology and assumptions used.

The following documents¹ were also provided by the United Kingdom:

Entec. 2010. UK Ship Emission Inventory. Final report. Available at <http://uk-air.defra.gov.uk/reports/cat15/1012131459_21897_Final_Report_291110.pdf>.

Eunomia Research & Consulting Ltd. 2011. *Inventory Improvement Project – UK Landfill Methane Emissions Model*. Final report.

Excel sheet named "energy_background_data_uk_2011", containing Fuel consumption data, gross calorific values of fuels and carbon emission factors (2011.01.27).

Roger Sylvester-Bradley et al. 2002. *Management strategies for high yields of cereals and oilseed rape*. HGCA conference 2002: Agronomic intelligence: the basis for profitable production.

¹ Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management systems
CDs	Crown Dependencies
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
DSA	data supply agreements
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading scheme
FAO	United Nations Food and Agriculture Organization
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF
GJ	gigajoule (1 GJ = 10 ⁹ joule)
HFCs	hydrofluorocarbons
IE	included elsewhere
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
KP-LULUCF	Land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kg	kilogram (1 kg = 1,000 grams)
LPG	liquefied petroleum gas
LTO	landing and take-off
LULUCF	land use, land-use change and forestry
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NE	not estimated
NFI	National Forest Inventory
N ₂ O	nitrous oxide
NIR	national inventory report
NO	not occurring
OTs	Overseas Territories
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10 ¹⁵ joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF ₆	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10 ¹² joule)
UNFCCC	United Nations Framework Convention on Climate Change