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

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

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I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of Italy, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 24 to 29 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Yuriko Hayabuchi (Japan) and Mr. Leif Hockstad (United States of America); energy – Mr. Liu Qiang (China), Mr. Anand Sookun (Mauritius) and Ms. Kennie Tsui (New Zealand); industrial processes – Ms. Sohyang Lee (Republic of Korea), Mr. Kakhberi Mdivani (Georgia) and Ms. Kristina Saarinen (Finland); agriculture – Ms. Britta Maria Hoem (Norway) and Mr. Pa Ousman Jarju (Gambia); land use, land-use change and forestry (LULUCF) – Ms. Cristina Garcia-Diaz (Spain), Ms. Rosa Maria Rivas Palma (New Zealand) and Mr. Harry Vreuls (Netherlands); and waste – Mr. Takefumi Oda (Japan) and Ms. Mayra Rocha (Brazil). Ms. Lee and Ms. Saarinen were the lead reviewers. The review was coordinated by Ms. Lisa Hanle 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), a draft version of this report was communicated to the Government of Italy, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2010, the main greenhouse gas (GHG) in Italy was carbon dioxide (CO₂), accounting for 85.0 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by methane (CH₄) (7.5 per cent) and nitrous oxide (N₂O) (5.4 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 2.1 per cent of the overall GHG emissions in the country. The energy sector accounted for 82.9 per cent of total GHG emissions, followed by the agriculture sector (6.7 per cent), the industrial processes sector (6.4 per cent), the waste sector (3.6 per cent) and the solvent and other product use sector (0.3 per cent). Total GHG emissions amounted to 501,317.66 Gg CO₂ eq and decreased by 3.5 per cent between the base year² and 2010.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO₂, CH₄ and N₂O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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

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

² “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year^a to 2010

		<i>Gg CO₂eq</i>								<i>Change</i>		
		<i>Greenhouse gas</i>	<i>Base year^a</i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Base year –2010 (%)</i>	
Annex A sources		CO ₂	435 011.53	435 011.53	445 150.76	462 485.09	488 162.90	463 962.15	415 434.48	426 086.64	–2.1	
		CH ₄	43 695.15	43 695.15	44 290.15	45 799.42	41 254.65	38 427.71	38 258.73	37 554.06	–14.1	
		N ₂ O	37 368.25	37 368.25	39 933.45	39 589.16	37 750.51	29 750.43	28 210.51	27 217.50	–27.2	
		HFCs	351.00	351.00	671.29	1 985.67	5 400.56	7 512.98	8 163.94	8 755.35	2 394.4	
		PFCs	2 486.74	2 486.74	1 266.38	1 217.43	1 715.00	1 500.59	1 062.81	1 330.83	–46.5	
		SF ₆	332.92	332.92	601.45	493.43	465.39	435.53	398.02	373.27	12.1	
KP-LULUCF	Article 3.3 ^b	CO ₂						–5 712.22	–6 299.15	–6 327.88		
		CH ₄						20.37	20.59	12.99		
		N ₂ O						0.12	0.13	0.23		
	Article 3.4 ^c	CO ₂	NA						–36 852.57	–34 496.08	–36 245.36	NA
		CH ₄	NA						47.53	48.04	30.31	NA
		N ₂ O	NA						0.23	0.24	0.15	NA

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

^a “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

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

	Sector	Gg CO ₂ eq							Change	
		Base year ^c	1990	1995	2000	2005	2008	2009	2010	Base year –2010 (%)
Annex A	Energy	417 833.09	417 833.09	432 460.47	449 669.09	471 868.02	449 325.97	405 510.91	415 726.54	–0.5
	Industrial processes	38 389.92	38 389.92	35 928.88	36 249.03	42 591.89	35 641.87	30 870.66	31 962.93	–16.7
	Solvent and other product use	2 455.02	2 455.02	2 234.94	2 302.43	2 127.50	1 945.89	1 814.59	1 658.22	–32.5
	Agriculture	40 736.72	40 736.72	40 529.50	40 134.30	37 362.03	36 014.32	34 775.46	33 741.17	–17.2
	Waste	19 830.85	19 830.85	20 759.69	23 215.36	20 799.56	18 661.34	18 556.87	18 228.79	–8.1
	LULUCF	NA	–34 484.21	–48 089.02	–43 066.20	–53 575.42	–52 168.11	–55 945.60	–56 530.51	NA
	Total (with LULUCF)	NA	484 761.39	483 824.46	508 504.01	521 173.59	489 421.28	435 582.89	444 787.15	NA
	Total (without LULUCF)	519 245.60	519 245.60	531 913.48	551 570.21	574 749.01	541 589.39	491 528.49	501 317.66	–3.5
	Other ^b	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3 ^c									
	Afforestation and reforestation						–6 079.98	–6 668.39	–6 706.42	
	Deforestation						388.26	389.97	391.75	
	Total (3.3)						–5 691.73	–6 278.42	–6 314.67	
	Article 3.4 ^d									
	Forest management						–36 804.81	–34 447.80	–36 214.91	
	Cropland management	NA					NA	NA	NA	NA
Grazing land management	NA					NA	NA	NA	NA	
Revegetation	NA					NA	NA	NA	NA	
	Total (3.4)	NA					–36 804.81	–34 447.80	–36 214.91	NA

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

^a “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

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

Table 3
**Information to be included in the compilation and accounting database in t CO₂ eq
for the year 2010, including the commitment period reserve**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Commitment period reserve	2 174 650 108			2 174 650 108
Annex A emissions for current inventory year				
CO ₂	426 086 644			426 086 644
CH ₄	37 554 061			37 554 061
N ₂ O	27 217 500			27 217 500
HFCs	8 755 347			8 755 347
PFCs	1 330 834			1 330 834
SF ₆	373 273			373 273
Total Annex A sources	501 317 659			501 317 659
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	-6 706 421			-6 706 421
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA			NA
3.3 Deforestation for current year of commitment period as reported	391 754			391 754
Activities under Article 3, paragraph 4, for current inventory year^c				
3.4 Forest management for current year of commitment period	-36 214 905			-36 214 905
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				

Abbreviation: NA = not applicable.

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

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

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

Table 4
**Information to be included in the compilation and accounting database in t CO₂ eq
for the year 2009**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2009				
CO ₂	415 434 484			415 434 484
CH ₄	38 258 729			38 258 729
N ₂ O	28 210 514			28 210 514
HFCs	8 163 938			8 163 938
PFCs	1 062 811			1 062 811
SF ₆	398 018			398 018
Total Annex A sources	491 528 493			491 528 493
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	-6 668 391			-6 668 391
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NA			NA
3.3 Deforestation for 2009 as reported	389 967			389 967
Activities under Article 3, paragraph 4, for 2009^c				
3.4 Forest management for 2009	-34 447 797			-34 447 797
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

Abbreviation: NA = not applicable.

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

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

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

Table 5
**Information to be included in the compilation and accounting database in t CO₂ eq
for the year 2008**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment^a</i>	<i>Final^b</i>
Annex A emissions for 2008				
CO ₂	463 962 155			463 962 155
CH ₄	38 427 710			38 427 710
N ₂ O	29 750 426			29 750 426
HFCs	7 512 979			7 512 979
PFCs	1 500 589			1 500 589
SF ₆	435 535			435 535
Total Annex A sources	541 589 393			541 589 393
Activities under Article 3 paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	-6 079 982			-6 079 982
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NA			NA
3.3 Deforestation for 2008 as reported	388 256			388 256
Activities under Article 3, paragraph 4, for 2008^c				
3.4 Forest management for 2008	-36 804 806			-36 804 806
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

Abbreviation: NA = not applicable.

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

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

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

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 11 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Italy also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 11 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. The expert review team (ERT) also used the previous year's submission during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.³

8. During the review, Italy provided the ERT with additional information. The documents concerned are not part of the annual submission. The full list of materials used during the review is provided in annex I to this report.

Completeness of inventory

9. The inventory submission covers all mandatory⁴ source and sink categories and GHGs for the period 1990–2010 and is complete in terms of years and geographical coverage.

10. The NIR follows the outline set out in the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines) and all CRF tables have been reported for all years.

11. Italy has also provided the KP-LULUCF tables for 2008, 2009 and 2010, including information on activities under Article 3, paragraph 3, of the Kyoto Protocol and on the forest management activity, which was selected by the Party under Article 3, paragraph 4, of the Kyoto Protocol. The reporting of emissions and removals from afforestation and reforestation, deforestation and forest management is in accordance with decisions

³ The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras 5(a), and 6(c) and (k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

⁴ Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) provide methodologies and/or emission factors to estimate GHG emissions.

15/CMP.1 and 16/CMP.1. However, the ERT considers that the decision to include plantations for energy crops under cropland, while including forestry plantations under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, has not been clearly explained in the NIR (see paras. 94, 100, 103 and 117 below).

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.

Inventory planning

13. The NIR describes the national system for the preparation of the inventory. The Institute for Environmental Protection and Research (ISPRA) has overall responsibility for the national inventory, following Legislative Decree 51 of 7 March 2008, which instituted the national system for the Italian inventory. The key functions of ISPRA include the planning, preparation and management of the annual submission. ISPRA is also responsible for: the collection and processing of activity data (AD); all issues related to the selection of methodologies and the implementation of quality assurance/quality control (QA/QC) activities; the preparation of the annual plan for the national system; the performance of the inventory calculations; and the archiving and reporting of the inventory. The Italian Ministry for the Environment, Land and Sea is responsible for officially approving the annual submission.

14. Other agencies are also involved in the preparation of the inventory. These agencies include, among others, the National Statistical System (Sistan), which provides national official statistics and serves the role to ensure that statistics compiled by different statistical offices follow a national plan to ensure the homogeneity of the methods used and comparability of the results for official statistics data. The statistics provided by Sistan include, but are not limited to, the energy balance and the annual report on waste. The Ministry for the Environment, Land and Sea, in agreement with Ministry of Agriculture, Food and Forest Policies, is responsible for the national registry for forest carbon sinks, which is part of the Italian national system and includes information on units of land subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and related carbon stock changes.

Inventory preparation

Key categories

15. Italy has reported key category tier 1 and tier 2 analyses, both level and trend assessment, as part of its 2012 annual submission. The tier 1 key category analysis performed by the Party and that performed by the secretariat⁵ produced similar results. Italy

⁵ The secretariat identified for each Party the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

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

17. Italy has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for 2010.

Uncertainties

18. Italy has provided a tier 1 uncertainty analysis, both for the level and for the trend, which is in accordance with the IPCC good practice guidance. The cumulative uncertainty of the total estimated GHG emissions for 2010 is 3.3 per cent and the trend uncertainty between 1990 and 2010 is 2.6 per cent (excluding LULUCF), in accordance with tier 1. The cumulative uncertainty (including LULUCF) for 2010 is 6.6 per cent, with a trend uncertainty of 5.4 per cent. In addition, the Party has provided a tier 2 uncertainty analysis for key categories for 2010, which is an expanded analysis from that provided in the previous annual submission. The ERT commends Italy for the expanded tier 2 analysis conducted on key categories in the 2012 annual submission. Italy has provided details on its analyses in annex 1 to the NIR.

19. Italy indicates in the NIR that it uses the results of the uncertainty analysis in conjunction with the key category analysis to prioritize improvements to the GHG inventory.

Recalculations and time-series consistency

20. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990 to 2009 have been undertaken to take into account improvements across most sectors. The major changes, and the magnitude of the impact, include the following: an increase in estimated total GHG emissions for the base year (0.02 per cent); and an increase for 2009 (0.1 per cent). The rationale for these recalculations is provided in both the NIR and in CRF table 8(b).

21. In the NIR, Italy explains that recalculations of the base year emission levels are related, primarily, to: the application of the new version of the COPERT IV software and methodology (version 9) to estimate road transportation emissions and an update of the CO₂ emission factor (EF) for residual gas from chemical processes (see para. 34 below); and a recalculation of fugitive emissions from the energy sector to account for the addition of N₂O emissions from flaring in refineries and CO₂ emissions from transmission and distribution of natural gas (see para. 45 below). In the industrial processes sector, revisions resulted from the addition of CO₂ emissions from the use of limestone and dolomite in the pulp and paper industry and in power plants.

22. For 2009, recalculations for the energy sector were due to the update of the CO₂ EFs on the basis of data provided under the European Union emissions trading system (EU ETS), in particular for petroleum coke, synthesis gases, derived gases and natural gas. For the industrial processes sector, revisions were due to the update of the CO₂ EFs for cement and glass production and to the addition of tetrafluoromethane (CF₄) emissions as a byproduct from the production of tetrafluoroethylene polymers (see para. 54 below). For the agriculture sector, recalculations included revisions to selected animal populations for

enteric fermentation and manure management (see paras. 60 and 62 below), revisions to account for the amount of biogas recovered (from swine and cattle) and updates of other parameters for agricultural soils (see para. 64 below). For the waste sector, the main recalculation regarded the update of waste incineration emissions on the basis of data collected at the plant level.

23. Recalculations were performed for the LULUCF sector for the entire time series, owing to an update in methodology to derive land-use changes using land-use matrices and the availability of new information on forest fire areas and harvesting.

24. The ERT concludes that the recalculations have been adequately explained in the NIR and in the CRF tables. The ERT considers that the transparency of recalculations has increased with the availability of table 9.1 in the recalculations chapter of the NIR, which summarizes the description of the recalculations as well as provides a cross reference for where more information can be found in the NIR.

Verification and quality assurance/quality control approaches

25. Italy has included in its 2012 annual submission information on its QA/QC procedures, in line with the UNFCCC reporting guidelines. The Party performs category-specific QA/QC procedures across all sectors of the inventory. These procedures are effective in identifying errors and improving the quality of the inventory and are implemented in accordance with the IPCC good practice guidance. Italy has a QA/QC manual and also elaborates a QA/QC plan on an annual basis, which is published on the Internet, including all relevant underlying documentation. Regarding QA, although official independent or public review processes are not held, QA is conducted through sector-specific verification. For example, Italy includes information in the NIR on verification procedures through comparison of plant-specific data and information obtained from the EU ETS. EU ETS data also are used to compare and update EFs used in the industrial processes sector. In response to a recommendation in the previous review report Italy has improved its explanation in the NIR of how EU ETS data have been used.

Transparency

26. Italy's 2012 annual submission is generally transparent; however, the ERT has identified areas where Italy can improve the transparency and comparability of its reporting. Specifically, the ERT recommends that the transparency be improved: in the energy sector, for the AD and EFs used for the various biomass fuels consumed (see para. 33 below) and for the reporting of fugitive emissions (see para. 45 below); in the industrial processes sector, in the reporting on the trends that have an impact on emissions (see paras. 52 and 55 below); and in the waste sector, on the amount of waste recovered for energy purposes (see para. 87 below). In addition, the ERT recommends that Italy improve the transparency of its reporting on the LULUCF sector, especially its reporting on the category forest land remaining forest land (see para. 70 below). The ERT provides additional findings and recommendations in the relevant sector chapters of this report.

Inventory management

27. Italy has a centralized archiving system, 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. ISPRA is responsible for maintaining the archiving system.⁶ During the review, the ERT was provided with the requested additional archived information.

3. Follow-up to previous reviews

28. Although the report of the review of the 2011 annual submission of Italy was published after Italy submitted its 2012 annual submission, the Party did implement some improvements in its 2012 annual submission, consistent with recommendations made in the previous review report. In particular, in the energy sector, Italy now includes a description of the drivers behind the trend in the CO₂ implied emission factor (IEF) for consumption of liquid fuels in petroleum refining (see para. 41 below), which enhances the transparency of the NIR. A significant improvement in relation to the LULUCF sector is the use of the IPCC good practice guidance for LULUCF default land-use transition period of 20 years in the estimation of carbon stock changes in mineral soils (see para. 67 below).

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

29. During the review, the ERT identified several issues for improvement. These are listed in table 6 below.

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

B. Energy

1. Sector overview

31. The energy sector is the main sector in the GHG inventory of Italy. In 2010, emissions from the energy sector amounted to 415,726.54 Gg CO₂ eq, or 82.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 0.5 per cent. The key driver for the decrease in emissions is the decrease in emissions from manufacturing industries and construction, which have decreased by 25,928.02 Gg CO₂ eq since the base year, or 29.7 per cent. Decreases in emissions were also observed in the category energy industries (a decrease of 3,959.23 Gg CO₂ eq, or 2.9 per cent since the base year) and fugitive emissions from fuels (a decrease of 3,349.39 Gg CO₂ eq, or 31.2 per cent since the base year). The significant decreases in these categories were partly offset by an increase in emissions from the category other sectors, which have increased by 15,809.28 Gg CO₂ eq, or 20.2 per cent since the base year, and from transport, which have increased by 15,771.17 Gg CO₂ eq, or 15.3 per cent, since the base year. Within the sector, 32.1 per cent of emissions were from energy industries, followed by 28.6 per cent from transport, 22.6 per cent from other sectors and 14.8 per cent from manufacturing industries and construction. Fugitive emissions from fuels accounted for 1.8 per cent of the sectoral emissions. The remaining 0.2 per cent were from other (energy).

32. Italy has made recalculations for the energy sector between the 2011 and 2012 annual submissions, including some in response to the 2011 annual review report. The impact of these recalculations on the energy sector is a decrease in the estimate of emissions of 0.3 per cent for 2009. The main recalculations took place in the following categories:

⁶ More information regarding the archiving system is available at http://www.sinanet.apat.it/it/sinanet/serie_storiche_emissioni.

(a) For the entire energy sector: the update of CO₂ EFs for natural gas for 2009 on the basis of additional information for imported natural gas; the update of CO₂ average EFs for refinery gas, petroleum coke, synthesis gas from heavy residual fuel and coal-derived gases for the years 2005–2009; and the update of the CO₂ average EF for residual gas from chemical processes for the years 1990–2009 on the basis of plant-specific data collected under the EU ETS;

(b) Transport: the update to the latest version of the COPERT IV software and methodology (version 9) and the update of average CH₄ and N₂O EFs for recreational boats for the years 2000–2010, resulting in changes in emission estimates, mainly for the estimated CH₄ and N₂O emissions for the entire time series and very minor changes to the estimated CO₂ emissions for 2009;

(c) Other sectors: the update of biomass fuel combustion under the subcategory residential for the years 2001–2009 according to the relevant data supplied in the national energy balance for 2010; and the update of waste fuel consumption for commercial heating for the entire time series as a consequence of the reorganization of the waste incinerators database;

(d) Fugitive emissions: the update of natural gas losses from one operator and the length of high pressure pipelines for natural gas transport for 2009.

33. The ERT noted that biomass fuels are used in many categories in the energy sector, whereas the CO₂, CH₄ and N₂O IEFs for biomass fuels differ depending on the category where biomass is consumed. In response to questions raised by the ERT during the review, Italy responded that this is due to the different mix of biomass fuels, with different EFs, consumed in each category. The ERT recommends that Italy include, in the NIR, the AD and EFs for all biomass fuel consumed in each category of the energy sector and provide more detailed explanations of the estimation of average EFs for biomass fuels in its next annual submission in order to improve the transparency and comparability of the inventory.

34. The ERT noted with appreciation that the current NIR is generally consistent with the CRF tables and appropriate QA/QC measures have been conducted. However, the ERT observed that there are some errors in the NIR, including an incorrect indication of the share of GHG emissions from the energy sector in the total GHG emissions (page 65 of the NIR indicates that the energy sector is equal to 84.6 per cent of total national GHG emissions on a CO₂ eq basis, while the CRF tables indicate the energy sector is responsible for 82.9 per cent of total GHG emissions.) Another inconsistency was identified regarding recalculations. The NIR indicates that the primary driving factor for the recalculation of the emissions from the energy sector for the base year is a revision of fugitive emissions to account for the addition of N₂O emissions from flaring in refineries and CO₂ emissions from transmission and distribution of natural gas. However, in response to a question raised by the ERT during the review, Italy indicated that the changes for the base year were due to application of the new version of COPERT IV (version 9) to estimate road transportation emissions, and an update of the CO₂ EF for residual gas from chemical processes. Finally, a third error was identified in the trend of total steel production as compared with that of integrated steel plants. On page 74 of the NIR it is reported that an upward trend in emission levels in the subcategory manufacture of solid fuels and other energy industries is observed from 1990 to 2008, which is explained by the increasing quantities of steel production. However, on page 77 of the NIR, it is reported that the steel production of integrated steel plants (from which most emissions in iron and steel are derived) has not changed significantly in the period from 1990 to 2008. In response to a question raised by the ERT during the review regarding this apparent discrepancy, Italy agreed that the explanation in the NIR is not clear and the Party intends to improve the text in the next annual submission. The ERT therefore recommends that Italy further enhance its QA/QC efforts for the NIR and make the recommended modifications in its next annual submission.

2. Reference and sectoral approaches

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

35. For 2010, the CO₂ emission estimates according to the reference approach were 1.8 per cent lower than those calculated according to the sectoral approach. The ERT has identified that the difference is due mainly to emissions for the category other (energy), which is included in the sectoral approach but not in the reference approach: if these emissions were added to the reference approach, the CO₂ emissions estimated by the reference approach would be only 0.3 per cent lower than those in the sectoral approach. The ERT therefore recommends that Italy include the AD and emissions for the category other (energy) in the estimation of the reference approach manually in CRF table 1.A(c) and update the difference between the reference approach and sectoral approach in its next annual submission.

36. The total apparent consumption in 2010 reported by Italy in the NIR (6,339.21 PJ) is higher than that of the International Energy Agency (IEA) by 2.6 per cent. In response to questions raised by the ERT during the review, Italy explained that this may be due to discrepancies in stocks of refinery feedstocks and residual fuel oil consumption in bunkers.

37. The ERT welcomes the effort made by Italy to reduce the differences between the inventory data and the data from international statistics since the previous annual submission. Nevertheless, the ERT found that the difference in the reported information on refinery feedstock exports prior to 1998 between the IEA data and the data in the CRF tables, identified in the previous review report, still exists: CRF table 1.A(b) includes information on exports in 1991, while this information is not included in the IEA data set; and from 1992 to 1997 information on exports is included in the IEA data set, but not in CRF table 1.A(b). In response to questions raised by the ERT during the review, Italy explained that, in its national energy balances, specific figures for refinery feedstock export are not available for 1992 to 1997 because refinery feedstock exports were included under the figure for crude oil export. Italy believes that IEA could have disaggregated the figures for crude oil and refinery feedstocks. The ERT recommends that Italy include this information and its explanation on the differences between the inventory data and the IEA data in the next annual submission. The ERT further encourages Italy to collect more information and disaggregate refinery feedstocks from crude oil export in its next annual submission in order to improve the comparability and transparency of the data.

International bunker fuels

38. Fuel consumption for international aviation as reported in CRF table 1.C is on average 5 per cent lower than data reported to the IEA for the period 1991–2002, but the data generally correspond closely for the period from 2003 onward.

39. With regard to the reporting on international marine bunkers, the ERT welcomes the improvements made for the Party's 2012 annual submission in response to the recommendation in the previous review report that Italy ensure that there are no discrepancies between CRF tables 1.C and 1.A(b) for residual fuel oil and gas/diesel oil. As identified in the previous review report, the discrepancy was due, in part, to a different split between international and domestic navigation for both residual fuel oil and gas/diesel oil being reported to IEA from that used for the CRF tables. Although the ERT acknowledges that the inconsistency has been resolved, it found that the actual split between domestic and international bunkers used for the reporting has not been documented in the NIR. Therefore, the ERT recommends that the Party document the split between domestic and international marine bunkers in the NIR of its next annual submission.

Feedstocks and non-energy use of fuels

40. Italy has presented detailed information in the NIR on the fraction of carbon stored for different fuel categories. The ERT welcomes the improvement made by Italy, but noted that the fractions of carbon stored reported in the NIR are still not consistent with those reported in CRF table 1.A(d) for some fuels (e.g. fraction of carbon stored for lubricants is reported as 1 in the CRF table but 0.95 in the NIR). Further, the ERT observed that some fractions reported in the NIR were greater than 1 (e.g. carbon stored for other fuel is reported as 1.26) and some had negative values of carbon stored (e.g. carbon stored in liquefied petroleum gas is reported as -0.25). In response to questions raised by the ERT during the review, Italy explained that the value for other fuel of greater than 1 is not correct and that the negative values of fraction of carbon stored for the other fuels are calculated as a balance of input and output. Regarding the inconsistencies observed between CRF table 1.A(d) and the NIR, Italy explained that the fuel quantity amounts in CRF table 1.A(d) refer to the 'net' fuel amount (i.e. the amount of fuel stored) but not the gross (only input) fuel amount. In order to improve comparability, consistency and transparency, the ERT recommends that Italy add a note in CRF table 1.A(d) explaining that the fuel quantity refers to the 'net' fuel quantity and an explanation of what 'net quantity' means. The ERT also recommends that Italy provide additional explanation in the NIR of its next annual submission as to why the fractions of carbon stored reported in the NIR are different from those included in CRF table 1.A (d).

3. Key categoriesStationary combustion: liquid fuels – CO₂

41. Recommendations in the previous review reports included that Italy provide a description of the drivers behind the increasing trend of the CO₂ IEF for consumption of liquid fuels in petroleum refining in order to improve the transparency of the inventory (the CO₂ IEF increased from 66.21 t/TJ in 1990 to 73.74 t/TJ in 2010, an increase of 11.4 per cent). Italy has included an explanation for this issue in its 2012 annual submission. The ERT commends the Party for the inclusion of this additional information, but had additional questions regarding the consumption of each liquid fuel under this category. In response to questions raised by the ERT during the review, Italy provided the consumption data on each fuel in this category. The ERT recommends that Italy include this information and clarify the drivers behind the trend in the EFs in its next annual submission in order to improve transparency.

Stationary combustion: solid fuels –CH₄

42. For CH₄ emissions from solid fuel use in the subcategory manufacture of solid fuels and other energy industries, the ERT identified a decreasing trend in the CH₄ IEF value between 1990 (63.00 kg/TJ) and 2010 (11.25 kg/TJ), which is driven by the reduction of fugitive CH₄ emissions from cokeries which are reported in this category. In addition, there is a large inter-annual change of 53.0 per cent in the CH₄ IEF between 2008 and 2009 (7.86 kg/TJ to 12.05 kg/TJ). In response to a question raised by the ERT during the review, Italy explained that due to the economic crisis in 2009, coke production decreased by 40 per cent from the previous year, resulting in a loss in efficiency of the production plants and an increase in emissions per unit of product. The ERT recommends that Italy include this information in the NIR in its next annual submission to improve the transparency of the inventory.

43. The ERT noted that the CH₄ IEF for solid fuels in the iron and steel subcategory for 2010 is 19.37 kg/TJ, which is much higher than those in other manufacturing industries (e.g. the CH₄ IEF for non-ferrous metals and chemicals is 1.50 kg/TJ) and also higher than the

default value (10 kg/TJ) from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). In response to questions raised by the ERT during the review, Italy explained that the higher CH₄ IEF for this subcategory derives mainly from processes such as the sinter production process, where emissions are due to the combustion of fuels and to the specificities of the production process in Italy. The ERT recommends that Italy transparently document in the NIR of its next annual submission the rationale for the relatively high CH₄ IEF for solid fuels in the iron and steel subcategory. Furthermore, if, in its research, Italy identifies that process-related emissions of CH₄ also occur, the ERT encourages the Party to disaggregate CH₄ emissions from industrial processes and reallocate them to the industrial processes sector in its next annual submission, consistent with the IPCC good practice guidance.

Stationary combustion: other fuels – CO₂, CH₄ and N₂O⁷

44. The use of other fuels is included in the subcategories: public electricity and heat production; chemicals; and commercial/institutional. However, Italy does not describe in the NIR which other fuels are used, or the respective EFs. In response to a question raised by the ERT during the review, Italy explained that: other fuels in the subcategory public electricity and heat production refers to a mix of industrial waste, such as plastics, rubber and solvents, and synthesis gas from heavy residual fuel; other fuels in the subcategory chemicals refers to the residual gas from chemical processes; and other fuels in the subcategory commercial/institutional refers to municipal waste. The ERT recommends that Italy include this information, as well as the fuel quantity and EFs for each other fuel used in these subcategories, in the NIR of its next annual submission.

Oil and natural gas: natural gas – CO₂, CH₄ and N₂O

45. Italy improved the transparency and completeness of its reporting on fugitive emissions from oil, natural gas and other sources in the 2012 annual submission by reporting venting and flaring emissions from oil production, gas flaring from natural gas production and refinery gas flaring. In the previous review report, Italy was encouraged to improve transparency further by disaggregating fugitive emissions; however, no additional information was provided in the 2012 annual submission. The ERT recommends that Italy further disaggregate oil and natural gas exploration and production, and oil transport and refining/storage, if higher-tier data allow. In addition, the ERT encourages Italy to further disaggregate the other fugitive emission categories (e.g. leakages in industrial and power stations and commercial and domestic uses and emissions from venting) in future annual submissions.

46. The ERT noted that fugitive CO₂ emissions in the subcategory natural gas – other leakage are reported as not applicable (“NA”). In response to questions raised by the ERT during the review, Italy explained that this is an error and that the notation key included elsewhere should be used instead. The ERT recommends that, in its next annual submission, Italy use the correct notation key and provide a description in the NIR and in CRF table 9(a).

⁷ Not all emissions related to all gases under this category are key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

4. Non-key categories

Fugitive emissions from solid fuels – CO₂

47. The ERT noted that there are AD for underground mines and solid fuel transformation, but that the fugitive CO₂ emissions for these categories are reported as “NA”. In response to questions raised by the ERT during the review, Italy clarified that, consistent with the UNFCCC reporting guidelines, when emissions do not occur, but the AD exist, the notation key “NA” should be reported. The ERT encourages Italy to document the rationale for assuming emissions do not occur and clarify the use of the notation key “NA” for these categories in its next annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

48. In 2010, emissions from the industrial processes sector amounted to 31,962.93 Gg CO₂ eq, or 6.4 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1,658.22 Gg CO₂ eq, or 0.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 16.7 per cent in the industrial processes sector, and decreased by 32.5 per cent in the solvent and other product use sector. The key drivers for the decrease in emissions in the industrial processes sector are a 76.8 per cent decrease in emissions from the chemical industry (due to the introduction of fully operational abatement technology in the adipic acid industry) and metal production (decreased 71.2 per cent predominantly due to the closure of one integrated iron and steel production facility and the reduction of emissions in that category). Within the industrial processes sector, 55.3 per cent of the emissions were from mineral products, followed by 28.8 per cent from consumption of halocarbons and SF₆, 7.2 per cent from chemical industry and 5.0 per cent from metal production. Production of halocarbons and SF₆ accounted for 3.6 per cent. The remaining 0.01 per cent of emissions were from the category other (industrial processes).

49. The Party has made recalculations for the industrial processes sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the industrial processes sector is an increase in the estimate of emissions of 3.1 per cent for 2009. The main recalculation was due to reporting, for the first time for 2010, actual PFC emissions from by-product emissions in the category production of other halocarbons and SF₆ (resulting in an increase in the estimate of emissions of 845.00 Gg CO₂ eq for 2009) (see para. 54 below).

50. The Party has made recalculations for the solvent and other product use sector between the 2011 and 2012 annual submissions following changes in AD and EFs. The impact of these recalculations on the solvent and other product use sector is a decrease in the estimate of emissions of 2.5 per cent for 2009.

51. For categories in the industrial processes sector, in response to questions raised by the ERT during the review, Italy could provide the information on how it derives the country-specific EFs and AD. The ERT considers that the industrial processes sector inventory is of high quality and well prepared.

2. Key categories

Cement production – CO₂

52. For CO₂ emissions from cement production, the Party applied the IPCC tier 2 method using clinker production and a country-specific EF. This is consistent with IPCC

good practice guidance because cement production is a key category. The CO₂ IEF for cement production was constant from 1990 to 2004 (0.54 t/t) and then fluctuated with an overall steady decrease by 1.1 per cent between 2005 and 2010 to 0.53 t/t in 2010. In response to a question raised by the ERT during the review about the decreasing trend, the Party responded that the national cement facilities association (Associazione Italiana Tecnico Economica Cemento) confirmed that for the last decade operators have been committed to the reduction of CO₂ emissions from their production by producing the types of cement that have a lower clinker demand. The operators have achieved this by partially replacing clinker with different materials (e.g. fine ground carbonates and fly ash). In addition, Italy indicated that the IEF for each plant depends on the quality of the raw material input. The ERT noted that altering the fraction of clinker in cement, while reducing total CO₂ emissions, should not have an impact on the decreasing IEF, which is based on emissions/t clinker produced. However, the ERT agrees that the quality of the raw material input (e.g. carbonate content) could result in a fluctuating IEF. Therefore, the ERT recommends that the Party further explore the fluctuating IEF and provide information thereon in its next annual submission.

Iron and steel production – CO₂

53. Consistent with the IPCC good practice guidance, Italy provides the energy and carbon balance in the iron and steel category, with a detailed explanation (in annex 3 to the NIR). However, CO₂ emissions due to the consumption of coke, coal and other reducing agents used in the iron and steel industry have been accounted for as fuel consumption and reported under the energy sector. The IPCC good practice guidance shows a preference for including these emissions under the industrial processes sector rather than the energy sector.⁸ Therefore, the ERT encourages Italy to disaggregate the process emissions from iron and steel production and report them under the industrial processes sector in its next annual submission in order to improve transparency.

3. Non-key categories

Production of halocarbons and SF₆ – PFCs

54. Italy reports CF₄ emissions as other by-product emissions, consistent with the Party's reporting to the national Pollutant Release and Transfer Register. The ERT welcomes the inclusion of country-specific subcategories into the national GHG inventory, which is consistent with the IPCC good practice guidance and increases the completeness of the inventory. However, because there is no methodology in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, the ERT encourages Italy to provide detailed information on the methodology applied for this category in its next annual submission.

Consumption of halocarbons and SF₆ – SF₆

55. The Party estimated SF₆ emissions from electrical equipment according to the IPCC good practice guidance tier 2a approach for 1990 to 1994 because facility-level data are not available. The IPCC tier 3c approach has been used for 1995 onward (for both medium- and high-voltage electrical equipment) because facility-level data are available. In the NIR, Italy indicates that it is not possible to extend the tier 3c approach back over the whole time series. The ERT observed that there are large inter-annual changes beginning between 1994 and 1995 (emissions increased by 62.7 per cent) and continuing in subsequent years (e.g. 1995/1996 (29.2 per cent), 1997/1998 (-28.2 per cent), 1998/1999

⁸ IPCC good practice guidance, section 3.1.3.1, pages 3.23 and 3.28.

(–35.8 per cent), 2003/2004 (22.3 per cent) and 2009/2010 (–11.8 per cent)). In response to a question raised by the ERT during the review and to the draft of this review report, Italy explained that the variability in the emission estimates relates not to the use of multiple estimation methods, but rather to the mass balance of the amount of SF₆ emissions from manufacturing, stocks and disposal. The ERT recommends that, in its next annual submission, the Party provide detailed information on the AD and EFs used for the estimation of emissions by each method, in order to increase transparency and demonstrate time-series consistency.

D. Agriculture

1. Sector overview

56. In 2010, emissions from the agriculture sector amounted to 33,741.17 Gg CO₂ eq, or 6.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 17.2 per cent. The key driver for the fall in emissions is a reduction in AD, for example the number of animals and cultivated surface/crop production. Within the sector, 44.9 per cent of the emissions were from agricultural soils, followed by 31.8 per cent from enteric fermentation, 18.6 per cent from manure management and 4.6 per cent from rice cultivation. The remaining less than 0.1 per cent were from field burning of agriculture residues. Emissions from prescribed burning of savannas are reported as not occurring (“NO”). Direct N₂O emissions from agricultural soils and CH₄ emissions from enteric fermentation contribute 3.0 per cent and 2.1 per cent of total GHG emissions, respectively.

57. The Party has made recalculations for the agriculture sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report and following changes in AD (see paras. 61, 63 and 65 below). The impact of these recalculations on the agriculture sector is an increase in the estimate of emissions of 0.9 per cent for 2009. The main recalculations took place in the following categories:

- (a) Enteric fermentation: estimated emissions increased by 227.67 Gg CO₂ eq (or 2.1 per cent);
- (b) Manure management: estimated emissions increased by 37.33 Gg CO₂ eq (or 0.6 per cent);
- (c) Rice cultivation: estimated emissions decreased by 13.85 Gg CO₂ eq (or 0.9 per cent);
- (d) Agricultural soils: estimated emissions increased by 43.20 Gg CO₂ eq (or 0.3 per cent).

58. The ERT concludes that the inventory for the agriculture sector is of high quality. The inventory is complete with respect to the coverage of categories, gases and years, and is transparent, accurate and in accordance with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Uncertainties, recalculations, QA/QC procedures and planned improvements are described in the NIR at the appropriate category level. The estimates are consistent across the time series and the sources of AD and EFs, methodological issues and emission trends and trends in AD and EFs are transparently explained in the NIR.

2. Key categories

Enteric fermentation – CH₄

59. Italy uses both tier 1 and tier 2 methods from the IPCC good practice guidance to estimate emissions from enteric fermentation: a tier 2 method and country-specific EFs are

used to estimate emissions from dairy cattle, non-dairy cattle, buffalo and rabbits; while a tier 1 method and default EFs are used for other livestock categories. The ERT concludes that this approach is in accordance with the IPCC good practice guidance.

60. Recalculations for 2009 were due to an error identified in the allocation of the number of non-dairy cattle between the ages of 1 and 2 years that were used for breeding and for slaughter; the values should have been changed so that 617,494 heads of non-dairy cattle were used for breeding and 183,420 for slaughter. Addressing this error led to a change in the estimate of emissions from non-dairy cattle for 2009. The number of rabbits was also updated for 2009. Recalculations resulted in increases in the estimated emissions for the category equal to 0.8 per cent and 2.1 per cent for 1990 and 2009, respectively.

Manure management – CH₄ and N₂O

61. Italy used a tier 2 approach and country-specific EFs to estimate CH₄ emissions from manure management of cattle, buffalo and swine. For other livestock categories a tier 1 method and the default values from the Revised 1996 IPCC Guidelines were used, which is in accordance with the IPCC good practice guidance. The previous review report identified a potential error in the default EFs applied, whereby the 2011 annual submission indicated that the IPCC default EFs for the cold climatic region were used but the default EFs presented in the NIR did not match those for the cold region (e.g. for sheep, the default CH₄ EF in the NIR is 0.22 kg CH₄/head/year, but the Revised 1996 IPCC Guidelines state 0.19 kg CH₄/head/year). In the 2012 annual submission, Italy explains that the IPCC default EFs applied to estimate emissions have been weighted to reflect the fact that the manure of some animals occurs in Italian provinces where average temperatures represent a more temperate climatic zone. The ERT welcomes the consideration of country-specific circumstances and the increased transparency in the most recent annual submission.

62. CH₄ emissions were recalculated owing to an update to the rabbit population numbers and an update of the allocation of biogas recovered between swine and cattle. The recalculation resulted in a decrease in the estimate of CH₄ emissions for 2009 of 0.5 per cent. For N₂O emissions, an update of the AD for non-dairy cattle females, 1–2 years of age (see para. 61 above), led to a recalculation. The recalculation resulted in an increase in the estimate of N₂O emissions for 2009 of 1.3 per cent.

Agricultural soils – N₂O

63. Italy used tier 1 and country-specific methods in line with IPCC good practice guidance for the estimation of direct and indirect emissions from agricultural soils.

64. Emissions of N₂O were recalculated for the whole time series owing to the update of the fraction of livestock nitrogen excretion that volatilizes on the basis of continuing research conducted through the Nitrogen Balance Inter-regional Project, which investigates the nitrogen balance on animal farms. In addition, for 2009, there was an update of the fraction of livestock nitrogen excretion by non-dairy cattle females aged 1–2. The recalculation resulted in an increase in the estimate of emissions of 0.3 per cent in 2009.

E. Land use, land-use change and forestry

1. Sector overview

65. In 2010, net removals from the LULUCF sector amounted to 56,530.51 Gg CO₂ eq. Since 1990, net removals have increased by 63.9 per cent. The key drivers for the rise in removals are net removals from forest land, which have increased by 21,603.40 Gg CO₂ eq, or 118.0 per cent since the base year, and net removals from grassland, which have increased by 7,177.87 Gg CO₂ eq, (1,495.5 per cent) since the base year. In the same period,

net removals from cropland have decreased by 5,857.55 Gg CO₂ eq, or 32.1 per cent, from removals of 18,230.58 Gg CO₂ eq in the base year. Within the sector, net removals of 39,903.92 Gg CO₂ eq were from forest land, followed by 12,373.03 Gg CO₂ eq from cropland and 7,657.83 Gg CO₂ eq from grassland. Settlements had net emissions of 3,404.27 Gg CO₂ eq. Emissions and removals from wetlands and other land were reported as “NO”.

66. Italy has made recalculations for the LULUCF sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report, specifically those related to the carbon stock changes in mineral soils, following changes in AD and EFs, and in order to rectify identified errors. The impact of these recalculations on the LULUCF sector is a change to the whole time series and a decrease in the estimate of removals of 40.9 per cent for 2009. The main recalculations took place in the following categories:

(a) Forest land: a decrease in the estimate of net removals of 26,231.36 Gg CO₂ eq (or 39.5 per cent);

(b) Grassland: a decrease in the estimate of net removals of 12,456.09 Gg CO₂ eq (or 63.8 per cent).

67. One of the main improvements for the LULUCF sector is the use of the IPCC good practice guidance for LULUCF default land-use transition period of 20 years in the estimation process of carbon stock changes in mineral soils related to land-use changes, consistent with recommendations in the previous review report. In particular, the 20-year transition period has been applied to estimate carbon stock changes for the following land-use changes: land converted to forest land; land converted to cropland; and land converted to grassland. A transition period equal to one year continues to be used for land converted to settlements. The ERT commends Italy for the improvement of its reporting in accordance with the IPCC good practice guidance for LULUCF.

68. Italy reports land-use change matrices for every year in the period 1990–2010. The annual figures for land-use change areas consider, in the first instance, the growth of forest land, using data from the national forestry inventory in 1985 and 2005 along with interpolation and extrapolation, as appropriate. For other land uses, Italy uses additional statistics and a set of hierarchical rules on land-use change that were derived from assumptions based on expert judgement. In the NIR, Italy reports that activities planned within the framework of the national registry for forest carbon sinks will be useful to detect land uses and land-use changes between 1990 and 2012. In response to questions raised by the ERT during the review, the Party informed the ERT that in a final agreement the overall responsibility for the national land-use inventory (IUTI) for 2012 has been assigned to the State Forestry Corps, and the work is planned to be completed by June 2013. In addition, in response to questions raised by the ERT during the review, the Party provided the ERT with an article⁹ documenting that IUTI has monitored the land use and land-use changes and forestry across the country for the years 1990, 2000 and 2008, and that the main results show significant changes affecting the surface and distribution of the various classes for arable lands, forests and urban areas. The ERT recommends that the Party use the new land-use matrix and present any related recalculations in the next annual submission.

69. Italy allocates plantations under cropland and reports in the NIR that plantations in Italy are considered an agroforestry system, characterized by a short rotation coppice system. Poplar stands, representing 83 per cent of the total plantation areas in Italy, are typically grown in a short rotation coppice system for 2–5 years. NIR table 7.16 indicates in

⁹ Marchetti M. et al. 2012. *Cambiamenti di copertura forestale e dell'uso del suolo nell'inventario dell'uso delle terre in Italia*. (Changes in forest cover and land-use inventory in Italy). Available at <<http://www.sisef.it/forest@/contents/?id=efor0696-009>>.

the inventory typology that plantations are allocated under cropland. Combining this with the information on the use of the plantation products, the ERT concluded that the land use is for energy crops and not forestry plantation. In response to questions raised by the ERT during the review, Italy informed the ERT that other (forestry) plantation typologies, such as chestnut and cork oak, have been included under forest. In addition, Italy clarified that in the Forest Resource Assessment context, all plantations are included in the reporting in order to have a more complete representation of all wood-related sources, even if they do not meet the forest definition. Therefore, the ERT agrees that land use for energy crops should be allocated under cropland. The ERT recommends that Italy provide a clear description of the area plantations that are not for energy crops and that have been reported under forest land in its next annual submission.

2. Key categories

Forest land remaining forest land – CO₂

70. In 2010, forest land remaining forest land was a net sink of 38,757.73 Gg CO₂ eq, and net removals have increased by 114.7 per cent since 1990. Italy reports an area of 8,994.68 kha for forest land remaining forest land. This area is based on forest inventories, statistics and expert judgement. For estimating growing stock and related carbon, Italy refers in the NIR to the “For-est model”, with reference to an article by Federici et al. (2008). This model is implemented using updated AD, on the basis of the final outcome of the National Forestry Inventory and the national forest definition. Thus, the areas reported in the CRF tables and those presented in the article differ: the article presents higher area values for forest land (e.g. for 2006, 11,144 kha) than are reported in CRF table 5.A and the NIR for forest land (e.g. 8,683 kha for 2006). The ERT concludes that the data used in the CRF tables are related to the larger areas (e.g. the values in NIR table 7.6 for root-to-shoot ratio and wood basic densities are equal to those in table 2 of the above-mentioned article). The values used by the Party to estimate changes in the litter pool are also based on the areas presented in the article. The ERT considers that it is not possible to judge whether this might result in under- or overestimations of carbon stock changes. Therefore, the ERT recommends that the Party improve the transparency of its reporting and assess whether the values taken from the article should be updated or not and report on this assessment in its next annual submission.

71. In the previous review report it was recommended that Italy apply an IPCC tier 1 method, or develop a more robust method, to estimate carbon stock changes in soil organic matter. Italy has reported that it decided to apply the IPCC tier 1 method, assuming that, for forest land remaining forest land, the carbon stock in soil organic matter does not change. The ERT commends Italy for implementing the above-mentioned recommendation.

72. Italy reports root-to-shoot ratios in NIR table 7.6, but did not provide documentation on these ratios. In response to questions raised by the ERT during the review, Italy informed the ERT that the assessment of the root-to-shoot ratios takes into account different studies conducted at the national and local level in different years and different contexts, but that no scientific papers have been published. Italy informed the ERT that it will improve the documentation and include a list of the relevant studies in its next annual submission. The ERT recommends that this improved documentation be included in the next annual submission.

Cropland remaining cropland – CO₂

73. In 2010, cropland remaining cropland was a net sink of 12,480.58 Gg CO₂ eq, and has decreased by 34.5 per cent since 1990 (19,066.02 Gg CO₂ eq), owing mainly to a decrease in the cropland area (by 14.9 per cent in the same period).

74. Italy reported only organic soils in perennial woody crops in CRF table 5.B. In response to questions raised by the ERT during the review, Italy informed the ERT that these soils should be allocated under annual crops because the related CO₂ emissions have been estimated (as well as direct and indirect N₂O emissions reported under the agriculture sector) using default EFs for warm temperate climates and that this will be corrected in the next annual submission. The ERT welcomes this correction in the allocation of organic soils and recommends that the Party implement this correction in its next annual submission.

3. Non-key categories

Land converted to forest land – CO₂

75. Italy reports the changes in carbon stock in mineral soils using, among others, IPCC good practice guidance for LULUCF equation 3.2.32, and used the country-specific value for grassland, set to 78.9 t carbon/ha, as soil organic carbon for non-forest land. Equation 3.2.32 requires a reference carbon stock for a given soil (defaults are presented in table 3.2.4 of the IPCC good practice guidance for LULUCF). In response to questions raised by the ERT during the previous review, Italy had explained that it was not possible to use these default values for the reference soil organic carbon content or to develop country-specific reference values for the different land-use categories. However, in the NIR of the 2012 annual submission Italy does not transparently document which values it uses in applying equation 3.2.32, particularly given that section 10.3.1.2 of the NIR describes changes in soil organic carbon over time for forest land. The ERT recommends that Italy provide transparent documentation on the values used in applying equation 3.2.32 in its next annual submission and reiterates the recommendation in the previous review report that the Party develop a country-specific reference soil carbon content for forest land.

Land converted to cropland – N₂O

76. In response to recommendations in the previous review report, Italy reports land-use change for a 20-year conversion period. As conversion from grassland only occurred in 1990–1995, N₂O emissions from disturbance associated with land-use conversion to cropland have decreased over the years. The ERT noted that the reported value for 2010 (0.27 Gg N₂O) appears to be an error. The ERT concludes that the correct value is 0.003 kt N₂O-N, resulting in 0.04 Gg N₂O. The ERT recommends that Italy review the value for 2010 and provide, in its next annual submission, an explanation for the finalization of grassland conversion to cropland in 1996.

Land converted to settlements – CO₂

77. For the period 1990–1995, Italy has reported land conversions from grassland to settlements, but land conversions from cropland to settlements have been reported as zero. For 1995 onward, land conversions from grassland to settlements have been reported as zero, while data have been reported for land conversions from cropland to settlements. This change in 1995 is not well documented in the NIR and it is not clear whether the change is related to a change in statistics or is based on expert judgement. The ERT recommends that Italy, in its next annual submission, improve the documentation on why only conversion from grassland to settlements has been reported for the period 1990–1995.

Biomass burning – CH₄ and N₂O

78. Italy reports biomass burning in forest land remaining forest land. In response to questions raised by the ERT during the review about whether fires occur on non-forest lands and if so, what is the methodology used to estimate emissions, Italy informed the ERT that, to date, available statistics account for data on forest fires and on fires affecting non-forest areas, mainly settlements. An expert panel on forest fires has been established in

order to obtain geographically representative data on burned areas in the different land uses. The ERT recommends that Italy review its reporting on biomass burning for its next annual submission, especially as another source¹⁰ indicates that about 40 per cent of wild fires occur on land with an agricultural land cover, 20 per cent on forest and other woody land, 35 per cent on nature land, while fewer than 1 per cent of wild fires occur in settlements.

F. Waste

1. Sector overview

79. In 2010, emissions from the waste sector amounted to 18,228.79 Gg CO₂ eq, or 3.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 8.1 per cent. The key driver for the fall in emissions is the national policy on waste, which focuses on reduction of waste sent to landfill and landfill gas recovery. Within the sector, 70.7 per cent of emissions were from solid waste disposal on land, followed by 25.9 per cent from wastewater handling and 3.3 per cent from waste incineration. The remaining 0.03 per cent of the emissions were from composting (reported in the category other (waste)).

80. Italy has made recalculations for the waste sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the waste sector is an increase in the estimate of emissions of 2.6 per cent in 2009. The main recalculations took place in the following categories:

(a) Solid waste disposal on land: an increase in the estimated CH₄ emissions of 495.50 Gg CO₂ eq (or 3.9 per cent);

(b) Waste incineration: a decrease in the estimated CO₂ emissions of 31.52 Gg CO₂ eq (or 12.6 per cent).

81. The waste sector is complete in terms of gases covered and categories. The inventory for the waste sector is generally transparently (see paras. 83, 84 and 87 below) described and the ERT commends Italy for the quality of the report.

2. Key categories

Solid waste disposal on land – CH₄

82. CH₄ emissions from solid waste disposal on land were calculated using the first order decay model and IPCC tier 2 methodology, applying a combination of IPCC default values and country-specific factors on waste quantities, waste composition and degradable organic carbon content. For the 2012 annual submission, recalculations have been performed in this category owing to updated AD for waste recovered.

83. The ERT noted that information regarding the amount of waste disposed to managed and unmanaged landfill sites was included in this annual submission, consistent with recommendations in the previous review report. Italy has explained in the NIR that the amount of solid waste disposed to unmanaged landfills was estimated as a function of the waste disposed to managed landfills on the basis of different studies; however, the ERT noted that the explanation does not include details about how this relationship was determined from these studies. The ERT also noted that the relationship is not constant over time: in 1990 the amount of waste disposed to unmanaged landfills represented 28.0 per cent of all non-hazardous waste disposed to landfills, while in 1995 this percentage was

¹⁰ JRC. 2010. *The European Forest Fire Information System Newsletter*. 2010 (1), 3 September 2010, EUR 24533 EN.

18.8 per cent. The ERT recommends that Italy provide more information regarding these historical data in its next annual submission.

84. As noted in the previous review report, the methane generation constant (k), which is based on a foreign study and considered by Italian national experts to be representative of Italian conditions, does not result from experimental data in Italy, and the ERT noted that the NIR still does not provide sufficient documentation to support the application of these values to the Italian conditions. The ERT encourages Italy to provide more explanation and documentation to support the use of the chosen values for this parameter in its next annual submission. Further, the ERT noted that, on the basis of the foreign study, Italy used a different (k) value for 1990 (0.46) when compared with that used for the rest of the time series (0.36). In response to questions raised by the ERT during the review, Italy explained that the average (k) value is calculated on the basis of waste composition, so as waste composition changed the average (k) value changed over different time periods (1971–1990, 1991–2005 and 2006–2030). The ERT recommends that Italy include the explanation provided during the review in the NIR of its next annual submission.

Wastewater handling – CH₄ and N₂O¹¹

85. Italy calculated the CH₄ emissions from wastewater handling using the IPCC tier 2 methodology, applying IPCC default EF values owing to the lack of country-specific data. Recalculations have been performed in the category as a result of updated AD. The ERT encourages Italy to further explore country-specific EFs to improve the accuracy of the inventory in its next annual submission.

86. N₂O emissions from human sewage were calculated according to the IPCC good practice guidance methodology based on population and protein per capita intake. Italy has used protein consumption data from the Food and Agriculture Organization of the United Nations (FAO). N₂O emissions from industrial wastewater were estimated using EFs from EMEP/CORINAIR (2007).¹² The ERT encourages Italy to further explore country-specific EFs to increase the accuracy of the inventory in its next annual submission.

3. Non-key categories

Waste incineration – CO₂, CH₄ and N₂O

87. The NIR does not clearly describe where the energy recovery from waste incineration was included under the energy sector (see para. 44 above). In the NIR it is stated that energy recovery is included under the energy sector in the category other sectors (commercial/institutional). In response to requests from the ERT during the review for further clarification, Italy explained that biogas emissions recovered from landfills and used for energy purposes were reported under the category other sectors (commercial/institutional) – biomass. The ERT noted that the value presented in NIR table 8.31 for CO₂ emissions from waste incineration reported under the energy sector (4,651 Gg CO₂ eq) matches the value reported under other fuels, not that reported in the category other sectors (commercial/institutional) – biomass. The ERT recommends that Italy improve the transparency of its reporting of the total amount of CO₂ emissions from waste incineration used for energy purposes that is included under the energy sector in its next annual submission.

¹¹ Not all emissions related to all gases under this category are key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

¹² EMEP/CORINAIR. 2007. Atmospheric Emission Inventory Guidebook. Technical report No 16/2007.

Other (waste) – CH₄

88. The CH₄ emissions from composting in Italy have been estimated using an EF from international literature (0.029 g CH₄/kg waste); however, there is no explanation provided in the NIR to support the application of this EF to the Italian conditions. The ERT encourages Italy to include an explanation regarding the selection of the EF used to estimate CH₄ emissions from composting in its next annual submission.

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

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

Overview

89. Under Article 3, paragraph 3, of the Kyoto Protocol, Italy has reported emissions and removals from afforestation and reforestation, and deforestation, and under Article 3, paragraph 4, of the Kyoto Protocol, the Party has reported emissions and removals from the elected activity forest management, for 2008, 2009 and 2010. Italy has chosen to account for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol at the end of the commitment period.

90. The inventory of emissions and removals resulting from KP-LULUCF activities is complete. The emissions and removals from all KP-LULUCF activities were estimated and reported in accordance with the IPCC good practice guidance for LULUCF and decisions 15/CMP.1 and 16/CMP.1 and in accordance with the requirements outlined in paragraphs 5 to 9 of the annex to decision 15/CMP.1.

91. Italy uses the IPCC reporting method 1 for land areas subject to afforestation and reforestation, deforestation and forest management. The boundaries of the land areas are the same as the administrative boundaries of the Italian regions at the Nomenclature of Territorial Units for Statistics level 2 for all KP-LULUCF activities. Within each area, several units of land have been identified as either afforested, reforested, deforested or under forest management, and the spatial assessment threshold used to identify the areas under afforestation and reforestation and deforestation is 0.5 ha, which is also the same threshold used to identify forest areas.

92. Italy reports in the NIR that the reported areas are estimations and that a new system for identifying land uses and land-use changes is under development and that this new system will be used for reporting at the latest for the 2014 annual submission.

93. Italy implemented some of the recommendations in the previous review reports and now reports land-use changes with a 20-year conversion method. In addition, Italy no longer reports carbon stock changes in mineral soils but rather demonstrates that mineral soils under forest management are not a net source of emissions.

94. Italy includes plantations in cropland under reporting under the Convention, but does not include plantations under KP-LULUCF activities. In response to questions raised by the ERT during the review, Italy explained that these areas, characterized by the short rotation coppice system and used for energy crops, have been classified under the cropland land-use category according to the national circumstances and species planted. In response to further questions raised by the ERT during the review, Italy informed the ERT that other plantation typologies, such as chestnut and cork oak, have been included under forest, although this was not well presented in the NIR. Therefore, the ERT recommends that Italy provide, in its next annual submission, documentation in the NIR on the inclusion of forestry plantations under KP-LULUCF activities and explain why the information reported

in the CRF tables is different from that reported to FAO, as required by decision 16/CMP.1, annex, paragraph 16.

95. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2008 and 2009 is as follows:

(a) Afforestation and reforestation: a decrease in the estimated removals of 290.42 Gg CO₂ (or 2.2 per cent);

(b) Deforestation: an increase in the estimated emissions of 0.03 Gg CO₂ (less than 0.01 per cent);

(c) Forest management: a decrease in the estimated removals of 28,318.83 Gg CO₂ (or 28.4 per cent).

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

Afforestation and reforestation – CO₂

96. Italy reports that natural afforestation and reforestation occurring on abandoned agricultural land is included in the reported activities under Article 3, paragraph 3, of the Kyoto Protocol. Italy explains that the inclusion of natural afforestation and reforestation on abandoned agricultural lands is consistent with the definitions provided in decision 16/CMP.1, because abandoned arable lands are left to forest naturally, and that a frequent forest management strategy in Italy consists, in fact, in the exploitation of natural regrowth caused by the seed of adjacent trees. In addition, the Party states that these transitions are due to political decisions under European Economic Commission (EEC) regulations and therefore the emissions are human-induced. In response to questions raised by the ERT during the review for Italy to justify that these activities are directly human-induced, Italy provided additional information on the laws and decrees referred to in the NIR. This information did not provide the ERT with clear evidence or justification that natural afforestation and reforestation on all of these abandoned lands are directly human-induced (e.g. the Italian Law Decree 227/2001 includes no specific reference to the management strategy of abandoned lands). By Law Decree 3267/1923, updated in 1999, (articles 39 and 75) afforestation and reforestation activities on areas were planned for protection purposes (in particular hydrogeological purposes) and clear-cut or clearing on areas subject to afforestation or reforestation activities were explicitly forbidden (article 51). Furthermore, the same decree (articles 90 and 91) subsidized land owners to enable them to naturally regenerate forest on bare lands or on grassland. But the area of naturally regenerated forest resulting from this subsidy is not included in the NIR or in other documentation provided during the review. Law 353/2000 is targeted at forest fires. Law 431/1985 relates to the protection of nature and landscape in relation to forest use. Articles 10, paragraph 1, and 31, paragraph 1, of EEC Regulation 1257/99 (Council Regulation (EC) No 1257/1999 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund) refer directly to the provision of income to elderly farmers who decide to stop farming and to the support granted for the afforestation of agricultural land. But, again, the area of naturally regenerated forest resulting from this subsidy is not included in the NIR or in other documentation provided during the review. Also, an external reference used by the ERT did not provide any additional information to support Italy's conclusion that all natural regrowth of forest in Italy is a direct human-induced conversion. The ERT therefore recommends that, in its next annual submission, Italy provide better documentation to prove that the areas of natural afforestation and reforestation activities on abandoned agricultural lands are directly human-induced, or

exclude the natural afforestation and reforestation of these lands from its accounting under Article 3, paragraph 3, of the Kyoto Protocol.

97. Italy has estimated the carbon stock changes for all carbon pools under afforestation and reforestation activities and, following recommendations in the previous review reports, now uses a default land-use transition period of 20 years. The ERT welcomes this improvement.

98. The ERT noted that Italy continues to estimate the carbon stock changes in mineral soils using a linear relationship with above-ground biomass that is not clearly documented by the Party and has high uncertainty. The ERT reiterates the recommendation in the previous review report that the Party provide transparent documentation in its next annual submission.

99. Italy reports the use of the “For-est model” to estimate the carbon stock changes in dead wood. The NIR does not provide transparent information on the method for estimating dead wood for afforestation and reforestation. The dead wood biomass was calculated by applying a dead mass conversion factor of 0.20 for evergreen forests and 0.14 for deciduous forests, as reported in table 3.2.2 of the IPCC good practice guidance for LULUCF. But the ERT noted that this table relates to forest land remaining forest land. In addition, the ERT noted that this approach for dead wood is not in line with the IPCC good practice guidance for LULUCF, which states on page 3.36 that table 3.2.2 provides data which may be useful for comparison between models but are not suitable for use as defaults. The ERT therefore recommends that Italy estimate carbon stock changes in dead wood using country-specific methods and parameters, in line with the IPCC good practice guidance for LULUCF, and provide this information in its next annual submission.

Deforestation – CO₂

100. Italy has estimated the carbon stock changes for all carbon pools under deforestation activities. However, the ERT noted that the conversion of plantations to other non-forested land was not accounted for as a deforestation activity, because, according to the NIR, plantations were not considered within the forest definition rather were reported under cropland. In response to questions raised by the ERT during the review, Italy clarified that there are some plantations (e.g. chestnut and cork oak) that meet the forest definition. The ERT considers that emissions from plantations meeting the forest definition that are deforested should be estimated (see para. 94 above). The ERT recommends that Italy provide clear documentation on the emissions from deforested plantations that meet the forest definition in its next annual submission.

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

Forest management – CO₂

101. Italy has estimated the changes in carbon stock in all carbon pools for all areas under forest management. Following the recommendations in the previous review report, Italy decided not to report the carbon stock changes in soil, but to demonstrate that this pool is not a net source. In the NIR, section 10.3.1.2, Italy provided transparent information that the soils pool is not a net source.

102. Italy reports the use of the “For-est model” to estimate the carbon stock changes in dead wood. As described in paragraph 100 above, the IPCC good practice guidance for LULUCF notes that the data provided in table 3.2.2 of that guidance are not suitable for use as defaults. Therefore, the ERT recommends that Italy develop country-specific methods and parameters to estimate carbon stock changes in dead wood, in line with the IPCC good practice guidance for LULUCF, and provide this information in its next annual submission.

103. Italy reports forest management excluding plantations, as these are included under cropland for the reporting under the Convention. Consistent with the IPCC good practice guidance for LULUCF, which states that: “Young natural stand and all plantations which have yet to reach a crown density of 10–30 per cent or tree height of 2–5 metres are included under forest”, the ERT recommends that Italy provide clear documentation on the inclusion of forestry plantations in the reporting on forest management in its next annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

104. Italy 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.¹³ 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.

105. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

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

Calculation of the commitment period reserve

107. Italy has reported its commitment period reserve in its 2012 annual submission. Italy reported that its commitment period reserve has not changed since the initial report review (2,174,650,108 t CO₂ eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

¹³ The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

3. Changes to the national system

108. Italy reported that there are no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

109. Italy reported that there are changes in its national registry since the previous annual submission. The Party described the changes in the NIR, including changes to the registry hardware infrastructure and upgrades to new versions of the software, modifications in security procedures, a change in the location of the disaster recovery site and a revision of the disaster recovery plan and backup procedures. Details on these changes are presented in annex 11 to the NIR. The ERT concluded that, taking into account the confirmed changes in the national registry, Italy's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

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

110. Italy reported that there are no changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, since the previous annual submission. The ERT concluded that the information provided continues to be complete and transparent.

111. Italy has reported on: the assessment of social, environmental and economic effects of clean development mechanism projects; funding, strengthening capacity and transfer of technology; and priority actions in implementing its commitments under Article 3, paragraph 14, of the Kyoto Protocol. These priority actions include:

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

(b) Cooperation in the development, diffusion and transfer of advanced fossil fuel technologies which emit less GHG emissions, and/or technologies relating to fossil fuels that capture and store GHGs, and the encouragement of their wider use;

(c) Facilitating the participation of the least developed countries and other Parties not included in Annex I to the Convention in this effort;

(d) Strengthening the capacity of developing country Parties to improve efficiency in upstream and downstream activities relating to fossil fuels, taking into consideration the need to improve the environmental efficiency of these activities;

(e) Assisting developing country Parties which are highly dependent on the export and consumption of fossil fuels in diversifying their economies.

III. Conclusions and recommendations

A. Conclusions

112. Italy made its annual submission on 11 April 2012. 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, 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.

113. The ERT concludes that the inventory submission of Italy has been prepared and reported 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 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases.

114. 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.

115. The Party's inventory is in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

116. The Party has made recalculations for the inventory between the 2011 and 2012 annual submissions in response to the 2011 annual review report, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the national totals is an increase in the estimate of emissions of 0.1 per cent for 2009. The main recalculations took place in the following sectors/categories:

(a) CO₂ emissions in the entire energy sector owing to the update of the CO₂ EF on the basis of data from the EU ETS;

(b) Forest land in the LULUCF sector.

117. Italy has reported emissions and removals from activities under Article 3, paragraph 3 and 4, of the Kyoto Protocol for 2008 through 2010. The reporting of emissions and removals from afforestation and reforestation, deforestation and forest management is in accordance with decisions 15/CMP.1 and 16/CMP.1. However, the ERT considers that the decision to exclude plantations from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol has not been clearly explained in the NIR. In response to questions raised by the ERT during the review, Italy informed the ERT that only land use for energy crops is excluded, while forestry plantations are included. Specifically, the ERT concludes that Italy does not provide a clear description of how Italy's accounting for emissions from plantations is consistent with the IPCC good practice guidance for LULUCF, as required by decision 15/CMP.1, annex, paragraph 6, nor does Italy explain why the information reported in the CRF tables is different from that reported to FAO, as required by decision 16/CMP.1, annex, paragraph 16.

118. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on each KP-LULUCF activity for 2008 and 2009 is as follows.

(a) Afforestation and reforestation: estimated net removals decreased by 290.42 Gg CO₂ eq (2.2 per cent);

(b) Deforestation: estimated emissions increased by 0.03 Gg CO₂ eq (less than 0.01 per cent);

(c) Forest management: estimated net removals decreased by 28,318.83 Gg CO₂ eq (28.4 per cent).

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

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

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

122. Italy has reported information under decision 15/CMP.1, annex, chapter I.H, “Minimization of adverse impacts in accordance with Article 3, paragraph 14”, as part of its 2012 annual submission. The information was provided on 11 April 2012 and the ERT concluded that the information provided continues to be complete and transparent. Italy has reported on: the assessment of social, environmental and economic effects of clean development mechanism projects; funding, strengthening capacity and transfer of technology; and priority actions in implementing its commitments under Article 3, paragraph 14, of the Kyoto Protocol (see para. 111 above).

B. Recommendations

123. The ERT identifies issues for improvement as listed in table 6 below. Recommendations are for the next annual submission, unless otherwise specified.

Table 6
Recommendations identified by the expert review team

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
General	Inventory preparation	Improve the transparency in the energy sector regarding the reporting of fugitive emissions and in the industrial processes sector regarding the trends impacting emissions.	26
		Improve the transparency of the reporting on the LULUCF sector, especially the reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.	26
Energy	Sector overview	Include the AD and EFs for all biomass fuel consumed in each category of the energy sector and provide more detailed explanations of the estimation of average EFs for biomass fuels in the NIR.	33
		Further enhance QA/QC efforts for the NIR, including correcting the share of the energy sector in national GHG emissions, clarifying the driver for recalculations and correcting the trends in iron and steel production.	34
	Reference and sectoral approaches	Include emissions from other in the estimation of the reference approach manually in CRF table 1.A(c) and update the difference between the reference approach and the sectoral	35

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		approach.	
		Include information on the treatment of refinery feedstocks in the national energy balance, and an explanation of the differences between the inventory data and the IEA data.	37
	International bunker fuels	Document the split between domestic and international marine bunkers in the NIR.	39
	Feedstocks and non-energy use of fuels	Add a note in CRF table 1.A(d) explaining that the fuel quantity refers to the 'net' fuel quantity and provide an explanation of what 'net quantity' means.	40
		Provide additional explanation in the NIR as to why the fractions of carbon stored in the NIR are different from those included in CRF table 1.A(d).	40
	Stationary combustion: liquid fuels – CO ₂	Provide a description of the drivers behind the increasing trend in the CO ₂ IEF for consumption of liquid fuels in petroleum refining.	41
	Stationary combustion: solid fuels – CO ₂ , CH ₄ and N ₂ O	Provide in the NIR the rationale for the decreasing trend in the CH ₄ IEF for manufacture of solid fuels and other energy industries between 1990 and 2010.	42
		Transparently document in the NIR the rationale for the relatively high CH ₄ IEF for solid fuels in the iron and steel subcategory.	43
	Stationary combustion: other fuels – CO ₂ , CH ₄ and N ₂ O	Include additional information on which other fuels are used, as well as the quantity of fuel used and their respective EFs, in the NIR.	44
	Oil and natural gas: natural gas – CO ₂	Further disaggregate oil and natural gas exploration and production, and oil transport and refining/storage, if higher-tier data allow.	45
		Use the correct notation key and provide a description in the NIR and in CRF table 9(a) of where emissions from other leakage are reported.	46
Industrial processes	Cement production – CO ₂	Further explore and report on the fluctuating IEF.	52
	Consumption of halocarbons and SF ₆	For each calculation methodology used, provide detailed information on the AD and EFs used.	55
LULUCF	Sector overview	Use the new land-use matrix and present any related recalculations.	68
		Provide a clear description of the area plantations that are not for energy crops and that have been reported under forest land.	69
		Include the area of plantations that do not meet the agroforestry system definition in the category forest land.	69
	Forest land remaining forest land	Assess whether the values taken from Federici et al. (2008) should be updated in the inventory or not and report on that	70

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	– CO ₂	assessment. Include improved documentation in the NIR.	72
	Cropland remaining cropland – CO ₂	Implement the corrected allocation of organic soils from perennial woody crops to annual crops.	74
	Land converted to forest land – CO ₂	Provide transparent documentation on the values used in applying equation 3.2.32. Develop a country-specific reference soil carbon content for forest land.	75 75
	Land converted to cropland – N ₂ O	Review and, if necessary, correct the 2010 value for N ₂ O emissions from disturbance associated with cropland conversion, and provide an explanation for the finalization of grassland conversion to cropland in 1996.	76
	Land converted to settlements – CO ₂	Improve the documentation on why only conversion from grassland to settlements has been reported for the period 1990–1995.	77
	Biomass burning – CH ₄ and N ₂ O	Review the reporting on biomass burning.	78
Waste	Solid waste disposal on land – CH ₄	Provide more information regarding the historical data from the studies regarding the amount of solid waste disposed to managed and unmanaged landfill sites.	83
	Wastewater handling – CH ₄ and N ₂ O	Include the explanation provided during the review in the NIR regarding the use of different (k) values for different time periods.	84
	Waste incineration – CO ₂ , CH ₄ and N ₂ O	Improve the transparency of the reporting of the total amount of CO ₂ emissions from waste incineration used for energy purposes that is included under the energy sector.	87
Supplementary information under Article 7, paragraph 1, of the Kyoto Protocol	Information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Provide documentation in the NIR on the inclusion of forestry plantations under KP-LULUCF activities and explain why the information reported in the CRF tables is different from that reported to FAO, as required by decision 16/CMP.1, annex, paragraph 16 Provide better documentation to prove that the areas of natural afforestation and reforestation activities on abandoned agricultural lands are directly human-induced, or exclude the natural afforestation and reforestation on these lands from the accounting under Article 3, paragraph 3, of the Kyoto Protocol. Provide transparent documentation on the linear relationships used to estimate carbon stock changes in mineral soils. Estimate carbon stock changes in dead wood using country-specific methods and parameters, in line with the IPCC <i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i> and report the country-specific information used. Provide clear documentation on the emissions from deforested	94 96 98 99 and 102 100

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		plantations that meet the forest definition.	
		Provide clear documentation on the inclusion of forestry plantations in the reporting on forest management.	103

IV. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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

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

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

“Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

“Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol”. Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

“Guidelines for review under Article 8 of the Kyoto Protocol”. Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Italy 2012. Available at <http://unfccc.int/resource/docs/2012/asr/ita.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2012. Available at <http://unfccc.int/resource/webdocs/sai/2012.pdf>.

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

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

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Riccardo De Lauretis and Ms. Daniela Romano (Institute for Environmental Protection and Research), including additional material on the methodologies and assumptions used. The following documents¹ were also provided by Italy:

Corona P, et al, 2012. Land use inventory as framework for environmental accounting: an application in Italy. *iForest* 5: 204-209 [online 2012-08-12] URL: <<http://www.sisef.it/iforest/contents?id=ifor0625-005>>.

Cugusi, B and A. Stocchiero. July 2011. European Study Centre Plural. Mediterranean Regions and Multilevel Governance of the Environment, Mediterranean Governance Policy Brief, no2. <<http://www.medgov.net/sites/default/files/pb2.pdf>>.

FAO-FRA, 2000. Global Forest Resources Assessment 2000, Forest Resources Assessment Programme. Food and Agriculture Organization of the United Nations.

Federici S. et al. 2008. An approach to estimate carbon stocks change in forest carbon pools under the UNFCCC: the Italian case. *iForest* 1: 86-95 URL:

<<http://www.sisef.it/iforest/>>. Law Decree n. 227/2001, art. 3, <<http://www.camera.it/parlam/leggi/deleghe/01227dl.htm>>;

Law n. 353/2000, <<http://www.camera.it/parlam/leggi/003531.htm>>

Law 1497/1939;

Law Decree n. 3267/1923;

Law n. 431/1085.

Marchetti M. et al, 2012. Cambiamenti di copertura forestale e dell'uso del suolo nell'inventario dell'uso delle terre in Italia. (English Translation: Changes in forest cover and land use inventory in Italy). *Forest@* 9: 170-184 [online 2012-07-23] URL: <<http://www.sisef.it/forest@/contents/?id=efor0696-009>>.

MAF/ISAFSA, 1988. Inventario Forestale Nazionale. Sintesi metodologica e risultati. Ministero dell'Agricoltura e delle foreste. Istituto Sperimentale per l'assestamento forestale e per l'Alpicoltura, Trento.

Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases. Available at <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R0842:EN:NOT>>.

¹ Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
ARR	annual review report
CF ₄	tetrafluoromethane
CH ₄	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
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
HFCs	hydrofluorocarbons
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use land-use change and forestry
N ₂ O	nitrous oxide
NA	not applicable
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10 ¹⁵ joules)
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 joules)
UNFCCC	United Nations Framework Convention on Climate Change