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Report on the individual review of the annual submission of Italy submitted in 2019*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2019 annual submission of Italy, conducted by an expert review team in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol". The review took place from 7 to 12 October 2019 in Rome.

* In the symbol for this document, 2019 refers to the year in which the inventory was submitted, not to the year of publication.

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Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
B_o	maximum methane-producing capacity of manure
CDM	clean development mechanism
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
COPERT	software tool for calculating road transport emissions
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DE%	feed digestibility
EF	emission factor
E-PRTR	European Pollutant Release and Transfer Register
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
FM	forest management
FMRL	forest management reference level
$Frac_{leachMS}$	value of the percentage of managed manure nitrogen losses due to run-off and leaching
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
IPPU	industrial processes and product use
ISPRA	Italian Institute for Environmental Protection and Research
ISTAT	Italian National Institute of Statistics
IUTI	Italian Land-Use Inventory
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LULUCF	land use, land-use change and forestry
MMS	manure management system(s)
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NFI	national forest inventory
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SF_6	sulfur hexafluoride
SWDS	solid waste disposal site(s)
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
VS	volatile solids
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
Y_m	methane conversion rate

I. Introduction[1]

1. This report covers the review of the 2019 annual submission of Italy organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (decision 13/CP.20). The review took place from 7 to 12 October 2019 in Rome and was coordinated by Tomoyuki Aizawa and Veronica Colerio (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Italy.

Table 1
Composition of the expert review team that conducted the review of Italy

Area of expertise	*Name*	*Party*
Generalist	Songli Zhu	China
Energy	Duduzile Nhlengethwa-Masina	Eswatini
IPPU	María José Lopez	Belgium
Agriculture	Olga Gavrilova	Estonia
LULUCF and KP-LULUCF activities	Ana Blondel	Canada
Waste	Eduardo Calvo Buendia	Peru
Lead reviewers	María José Lopez	
	Songli Zhu	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2019 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Italy resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Italy to resolve them, are also included.

4. 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.

5. Annex I shows annual GHG emissions for Italy, including totals excluding and including the LULUCF sector, indirect CO_2 emissions, and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected by Italy, by gas, sector and activity.

6. Information to be included in the compilation and accounting database can be found in annex II.

[1] At the time of publication of this report, Italy had submitted its instrument of ratification of the Doha Amendment; however, the Amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, para. 6, pending the entry into force of the Amendment.

[2] Issues are defined in decision 13/CP.20, annex, para. 81.

[3] Problems are defined in decision 22/CMP.1, annex, paras. 68 and 69, as revised by decision 4/CMP.11.

II. Summary and general assessment of the 2019 annual submission

7. Table 2 provides the assessment by the ERT of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
Summary of review results and general assessment of the inventory of Italy

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
Dates of submission	Original submission: 15 April 2019 (NIR), 5 April 2019 (CRF tables) version 1, 15 April 2019 (standard electronic format tables)		
Review format	In country		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	A.5, A.6, A.7, A.9
	(c) Development and selection of EFs?	Yes	E.5, A.8
	(d) Collection and selection of AD?	Yes	I.8, L.7
	(e) Reporting of recalculations?	Yes	L.1, L.2, KL.5
	(f) Reporting of a consistent time series?	Yes	L.15, KL.7
	(g) Reporting of uncertainties, including methodologies?	No	
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories/completeness?[b]	Yes	L.8, L.13, L.14
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	No	A.10, A.11, A.12, L.8
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	KL.6
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the technical standards for data exchange?	No	

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
	Have any issues been identified related to reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	Yes	G.12
	Have any issues been identified related to the following reporting requirements for KP-LULUCF activities:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	Yes	KL.1
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No	
	(c) Reporting requirements of decision 6/CMP.9?	Yes	KL.3
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34?	Yes	KL.7
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	The Party does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Questions of implementation	Did the ERT list any questions of implementation?	No	

[a] The ERT identified additional issues and/or problems in all sectors as well as issues and/or problems related to reporting on KP-LULUCF activities that are not listed in this table but are included in table 5.

[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

III. Status of implementation of issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 29 January 2019.[4] For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2019 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

Table 3
Status of implementation of issues and/or problems raised in the previous review report of Italy

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	NIR (G.3, 2018) Convention reporting adherence	Ensure as part of its QA/QC processes that table 1.1 of the NIR, as well as the QA/QC plan, are updated to be consistent with the latest UNFCCC Annex I inventory reporting guidelines when referring to IPCC sectors and categories.	Resolved. The Party revised table 1.1 of the NIR (p.33) to make it consistent with the terminology used in the 2006 IPCC Guidelines by removing the solvent and other product use sector, which is included under the IPPU sector. However, solvent and other product use is still presented as a sector in the Quality Assurance/Quality Control Plan for the Italian Emission Inventory (Procedures Manual 2014) and the Quality Assurance/Quality Control Plan for the Italian Emission Inventory Year 2019 (e.g. solvent and other product use is still presented as a sector, for example, on p.6 of the former document and p.7 of the latter). During the review, the Party explained that the annual QA/QC plan focuses on solvent use in terms of the importance of non-methane volatile organic compound emissions in the pollutant inventory, which is prepared with the GHG inventory. In response to the preliminary main findings, Italy explained that the QA/QC procedures manual is not updated annually and that page 7 of the 2019 QA/QC plan refers to past activities that occurred when the sector was called "industrial processes and solvent and other product use". The ERT noted that the solvent and other product use sector is mainly used in relation to the pollutant inventory in the annual QA/QC plan and the terminology in the annual QA/QC plan does not affect the plan itself. However, the ERT believes that using the same terminology in the annual QA/QC plan and the 2014 procedures manual as in the NIR will improve their transparency and adherence to the UNFCCC Annex I inventory reporting guidelines.
Energy			
E.1	1.A Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O (E.9, 2018) Transparency	Clearly justify the recalculation in the NIR in line with paragraph 44 of the UNFCCC Annex I inventory reporting guidelines, explaining the choice of change of AD across years, as well as the	Resolved. Recalculations were explained in NIR section 3.1 (pp.64 and 65) for the overall fuel combustion approach. This is in addition to the sectoral explanations given in sections 3.4.6, 3.5.3.5, 3.5.4.5, 3.6.6 and 3.9.6 describing the years and fuels affected by the recalculations.

[4] FCCC/ARR/2018/ITA.

ID#	Issue and/or problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		fuels and years affected by the recalculations.	
E.2	1.A.1.c Manufacture of solid fuels and other energy industries – biomass – CH_4 (E.13, 2018) Comparability	Use the appropriate notation key for emissions from charcoal production and provide justification for the use of "NE" in the NIR and CRF table 9.	Resolved. There is now consistency between the NIR and CRF table 9, both of which report "NE". The Party reported that emissions from charcoal production are kept at a minimum through the use of modern boilers (see ID# E.9 in table 5). The Party reported that the 2006 IPCC Guidelines do not provide guidance for charcoal production, while the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* do not contain guidance for closed furnace charcoal production (NIR, p.77); the explanation is also included in CRF table 9.
E.3	1.A.2 Manufacturing industries and construction – other fossil fuels – CO_2, CH_4 and N_2O (E.1, 2018) (E.2, 2016) (E.2, 2015) Transparency	Include a discussion in the NIR on the impact of any recalculations on the trend in CO_2, CH_4 and N_2O emissions at the category, sector and national total level, as appropriate.	Resolved. Section 3.4.6 of the NIR now includes information on the impact of the recalculations on all three gases, namely CO_2, CH_4 and N_2O.
E.4	1.A.2.d Pulp, paper and print – biomass – CO_2 (E.2, 2018) (E.3, 2016) (E.3, 2015) Accuracy	Further analyse the EU ETS data for the time series available, taking into consideration biomass fuel mix in the relevant year, and document the relevant information in the NIR.	Addressing. Italy reported the CO_2 IEF for 1998–2007 to be stable at 112.57 t CO_2/TJ; it has not been recalculated since the 2018 submission. After 2008, the CO_2 IEF varies between 50.94 and 58.51 t CO_2/TJ. There was a sudden decrease in this IEF between 2007 and 2008. In NIR section 3.4.3 (subparagraph on pulp, paper and print, p.85), the Party reported that prior to 2008, there was no direct reporting to the EU ETS in this regard, however, data from a sectoral industrial association (Assocarta) show that before 1998, no use of biomass was reported. From 1998 to 2007, biomass was used in the form of black liquor, industrial sludge and biogas from industrial organic waste. EU ETS data first became available in 2008 and they reveal that from 2013, only the use of biogas remained. This analysis does not explain the sudden decrease in the IEF between 2007 and 2008.
E.5	1.A.2.e Food processing, beverages and tobacco – biomass – CH_4 (E.3, 2018) (E,4, 2016) (E.4, 2015) Accuracy	Further analyse and collect information at the plant level in order to verify, and if appropriate update, the CH_4 EF.	Resolved. In NIR section 3.4.2 (p.85), the Party reported that it still does not have comprehensive data for this sector, with only a few plants part of the EU ETS. Italy reported in section 3.4.3 that it plans to collect relevant plant-level data to update the EF, taking into account technological improvements that have occurred since the 1990s. However, during the review, the Party informed the ERT that, first, no more specific information about the CH_4 EF could be collected at the plant level, and second, the actual EF used for the food industry sector (equal to 0.153 kg/GJ) is from the *EMEP/CORINAIR Emission Inventory Guidebook 2007* (EEA, 2007), group 3, chapter B112, table 7, and is equal to the maximum value of the range associated with stationary engine combustion technology; the same EF was used to estimate CH_4 emissions from biogas consumption in agriculture and commercial plants. The ERT

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			confirmed that the guidebook provides this EF (153 g/GJ).
E.6	1.A.3.b Road transportation – liquid fuels – CH_4 and N_2O (E.10, 2018) Transparency	Include in the NIR a discussion on the impact of the application of COPERT version 5.1 on the trend in CH_4 and N_2O emissions at the category and sectoral level, also specifying the different drivers behind the trends (e.g. the introduction of abatement devices) and any significant inter-annual changes.	Resolved. In the NIR (section 3.1, p.67), Italy explained that COPERT 5.1 had an error regarding the sulfur content of fuel, which had been corrected in version 5.2. The ERT noted that COPERT version 5.2.2 (February 2019) was used for the 2019 submission. NIR section 3.5.3.5 explains the recalculations, the new methodological features introduced in the category and the inter-annual changes, including the drivers of these changes.
E.7	1.A.3.b Road transportation – liquid fuels – CO_2, CH_4 and N_2O (E.14, 2018) Transparency	Update its NIR, clarifying that the COPERT methodology is used for the entire category and that country specificities are taken into account in the model in line with the tier 3 method of the 2006 IPCC Guidelines.	Resolved. NIR section 3.5.3.2 (p.94) explains the use of COPERT and country specificities that are taken into consideration for the entire category and across the time series. These include the physical characterization of fuels used in Italy and the structure of the Italian vehicle fleet.
IPPU			
I.1	2.A.4 Other process uses of carbonates – CO_2 (I.14, 2018) Accuracy	Correct the 2012 AD and CO_2 emission values reported for the use of carbonates in power plants.	Resolved. The AD and CO_2 emissions were corrected in the CRF tables. The AD in the 2018 submission were 267.09 kt carbonates in pulp, paper and power plants and 1,067.47 kt CO_2 emissions for category 2.A.4 (other process uses of carbonates). These values were corrected to 447.42 kt carbonates and 1,146.81 kt CO_2 emissions in the 2019 submission.
I.2	2.A.4 Other process uses of carbonates – CO_2 (I.15, 2018) Transparency	Improve the transparency of reporting on the emissions from carbonate use by providing information on the AD and any significant changes in the trend at the subcategory level in the NIR.	Resolved. The NIR presents information on AD and the trend in CO_2 emissions in other process uses of carbonates in section 4.2.1 (pp.129 and 134) under the heading "Other processes uses of carbonates (limestone and dolomite use in brick and tiles; fine ceramics; paper industry and power plants)".
I.3	2.F.3 Fire protection – HFCs (I.9, 2018) (I.9, 2016) (I.9, 2015) (36, 2014) Accuracy	Implement the plans for collecting and updating AD for this category.	Resolved. The emission estimate approach was confirmed by the two largest companies in the fire extinguisher market. As is the case for all categories, in order to implement a continuous improvement process the Party remains in contact with key experts and companies in the sector so that it is aware when new data become available.
I.4	2.F.3 Fire protection – HFCs (I.10, 2018) (I.20, 2016) (I.20, 2015) Transparency	Correct the description in the expected trend of HFC emission estimates for 2010–2014 and explain that for these years the emissions are assumed to be constant and not decreasing.	Resolved. The NIR (p.178) indicates that data were assumed to be constant from 2005 to 2010, and the CRF tables indicate that the amount of HFCs filled into new manufactured products is constant from 2005 to 2010. The NIR also indicates that after 2010, no detailed consumption data are available, but according to information supplied by the two main national fire protection companies (Gielle and Gastec Vesta), the amount of HFC-227 extinguishing agent decreased from 2010 to 2016 – with Novec, a new chemical, replacing around 20 per cent of it – for the entry into force of European Union regulation on fluorinated GHGs (regulation 517/2014). The CRF tables reflect this decrease.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O (A.9, 2018) Transparency	Improve the description of the consideration of bedding material in the estimates for the categories animal manure applied to soils (3.D.a.2.a), crop residues (3.D.a.4) and field burning of agricultural residues (3.F) in the NIR.	Resolved. In its NIR (pp.221, 222 and 227), Italy included information on the amount of bedding material used in the estimates of N_2O emissions from animal manure applied to agricultural soils (3.D.a.2.a), N_2O emissions from crop residues (3.D.a.4) returned to soils, and CH_4 and N_2O emissions from the field burning of agricultural residues (3.F).
A.2	3.A.1 Cattle – CH_4 (A.10, 2018) Transparency	Transparently demonstrate in the NIR that the Y_m values for all non-dairy cattle subcategories are accurate by providing sufficient scientific evidence for the country-specific values (e.g. referring to the prediction equations in Ellis et al. (2007)).	Resolved. Italy transparently demonstrated the accuracy of the Y_m values for all non-dairy cattle subcategories in the NIR (annex 7) by providing the input information used to evaluate the country-specific values of the Y_m for all non-dairy cattle. Moreover, Italy verified the calculation of the Y_m values of all non-dairy cattle using the approach reported in Ellis et al. (2007). The results of the verification procedure are presented in annex 7 to the NIR.
A.3	3.B.5 Indirect N_2O emissions – N_2O (A.15, 2018) Transparency	Describe the approach used when estimating the amount of N lost from leaching during manure management in the NIR, particularly with respect to the default methodology suggested by equation 10.28 in the 2006 IPCC Guidelines (vol. 4).	Resolved. Italy provided information justifying the approach used to estimate indirect N_2O emissions from MMS by multiplying $Frac_{leachMS}$ to the amount of N contained in animal manure after N volatilized from manure management is subtracted (NIR, p.210).
LULUCF			
L.1	4. General (LULUCF) (L.8, 2018) Transparency	Report more detailed explanatory information and a justification for recalculations in the NIR in line with paragraph 44 of the UNFCCC Annex I inventory reporting guidelines (e.g. providing information on the updated AD and/or on errors corrected in the models used).	Not resolved. The ERT did not find enough information in the NIR to explain the drivers of the recalculations, except for the grassland category (section 6.4.7), for which the recalculations resulted in a relatively small change (a 1.5 per cent increase in 2016). Significant downward recalculations of 1,380.22 kt CO_2 eq (55.5 per cent) were applied to cropland estimates, and these were only explained by updates in the AD from ISTAT. However, it is not clear how these updates triggered this significant reduction in emissions in 2016, which has had an impact on the trend in cropland and CM emissions (see ID# KL.6 in table 5). There were also significant recalculations in the settlements category in both AD and CO_2 emissions associated with cropland converted to settlements during 2009–2015 and with grassland converted to settlements in 2016, resulting in a reduction in emissions in the settlement category ranging from –1,106.62 kt CO_2 (–14.0 per cent) in 2009 to –4,154.11 kt CO_2 (–42.9 per cent) in 2016 and affecting the emission trend for this category. Significant recalculations such as these are not clearly explained in the NIR. Further, the ERT noted less significant recalculations in forest land for all years and in wetlands for 2009–2016, and also noted that the NIR includes no information on recalculations in these categories (sections 6.2.7 and 6.5.6). In response to questions from the ERT

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			before and during the review week, the Party referred to updates in AD from ISTAT, which reduced the area of annual crops by less than 1.0 per cent for 2015 and 2016 and increased the area of woody crops by 1.1 per cent for 2016, and to the method used for estimating gains and losses in cropland. The ERT considers that these small changes in area and a reference to the method used are not enough to explain the significant reduction in emissions in cropland in 2016. Italy explained that the recalculations were due to the updated land use and land-use change data derived from the 2016 IUTI assessment (the previous IUTI assessment was in 2008), affecting the data on the rate of annual land-use change in both wetlands and settlements. The ERT considers that although these updates in AD explain the recalculations applied to these categories, they need to be better described in the NIR. Italy noted that recalculations in forest land were due to corrections to errors in the estimates reported in the previous submission. The ERT considers this to be a driver of recalculations that needs to be documented in the NIR.
L.2	4. General (LULUCF) (L.8, 2018) Transparency	Ensure that the NIR contains up-to-date and consistent information on recalculations applied in the sector.	Not resolved. Although some information has been provided in the NIR to explain the recalculations in some categories (e.g. NIR section 6.3.7 notes that the cropland category was recalculated using the updated AD), the ERT considers that there is not enough information in the NIR to explain the recalculations applied in the sector. More details are provided in ID# L.1 above.
L.3	4.A Forest land – CO_2 (L.2, 2018) (L.5, 2016) (L.5, 2015) (56, 2014) Transparency	Document the For-est Model validations in the NIR.	Addressing. NIR section 6.2.6 explains that verification activities were carried out by independent researchers (i.e. a comparison of the model results with NFI data (Tabacchi et al., 2010) and a comparison of NFI current increment data with For-est Model current increment data). During the review, the Party noted that full validation of the model has not yet occurred as the data from the ongoing second phase of the third NFI (NFI 2015), which involves ground visits and attribute collection, are expected to be released by the end of 2019. In response to questions from the ERT on the planned timeline for phases two and three of the third NFI and the integration of their outcomes into the NIR, the Party clarified that the analysis of the collected data is planned to be completed by the end of October 2020 and that it plans to use the outcomes of the NFI data analysis for the 2021 submission.
L.4	4.A Forest land – CO_2 (L.5, 2018) (L.7, 2016) (L.7, 2015) (58, 2014) Transparency	Provide definitions and thresholds for carbon pools in a table in the NIR.	Addressing. In the NIR, Italy reported a table of carbon pools and ecosystem components of the NFI surveys (p.241) and information on different pools and relative thresholds (section 6.2.4). Specific documentation and information on the definitions of the NFI pools (e.g. the diameter threshold for deadwood and how this pool is

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			differentiated from litter; which soil horizons are included in the soil pool; and which pool contains the humus layer) are available on the NFI website (https://www.inventarioforestale.org/it/node/72 (i.e. https://www.inventarioforestale.org/sites/default/files/datiinventario/manuale_fase3%2B_v4_definitiva_REGp.pdf; https://www.inventarioforestale.org/sites/default/files/datiinventario/pubb/INFC2015_Guida_per_i_rilievi_in_campo_2016-12.pdf). The ERT considers that the table and the additional documentation on the threshold values provided in this submission provide enough information on the definitions of carbon pools (see ID# L.12 in table 5). The ERT also considers that complementing the table of carbon pools and ecosystem components in the NFI surveys with the references provided during the review will fully resolve this transparency issue.
L.5	4.A.1 Forest land remaining forest land – CO_2 (L.9, 2018) Transparency	Include a summary on the For-est Model in an annex to the NIR, together with information on its verification and regular updates.	Resolved. A dedicated annex (annex 14) has been included in the NIR to document the use of the For-est Model, which the ERT considers to be a notable improvement. The annex includes a description of regular updates from NFI, harvest data from ISTAT and fire statistics from the National Forest Service. Some verification activities are described in the annex, including a comparison between carbon estimated by the model for the biomass and dead organic matter pools and estimates provided by the second NFI (NIR, p.585). Other verification activities are ongoing and are documented in NIR section 6.2.6 (see ID# L.3 above for more details).
L.6	4.B.1 Cropland remaining cropland – CO_2 (L.11, 2018) Transparency	Provide information on the smoothing process applied for the estimates and provide a table with the calculations with and without the smoothing in the NIR.	Addressing. Tables reporting land-use data with and without smoothing over a five-year period were included in the NIR (tables 6.3a and 6.3b). Smoothing of the areas is clearly noted and there appears to be no artificial change in the trend. However, the ERT, when attempting to check the smoothing process using values from these tables, could not reproduce the smoothed area values calculated by Italy for 2006 and 2016. In response to questions from the ERT on the calculation of values for 2006, 2016 and the first and most recent years of the time series, the Party explained that the smoothing process was implemented at the most disaggregated level, that is, for annual and woody crops, and that it was implemented from 1970 to the last reported year (i.e. 2017). It also noted that for the latest period, 2015–2017, 2016 area values were smoothed, adding half of the difference between 2017 and 2015 to the 2015 AD. These additional clarifications provided by the Party to the ERT need to be included in the NIR to fully resolve this transparency issue.
L.7	4.C.1 Grassland remaining grassland – CO_2 (L.6, 2018) (L.13,	Include the subset of “improved grazing” land in the CRF tables and the NIR under the Convention while the new	Addressing. Italy reported grassland remaining grassland in CRF table 4.C under the Convention, disaggregating the data as “other wooded lands” and “grazing lands”. During the review, the Party

ID#	Issue and/or problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
	2016) (L.13, 2015) Accuracy	information is becoming available.	noted that it is carrying out a process to verify the data related to the area of organic grazing land from 1990 to 1998 (data are only available from 1999 onward) in order to include this "improved grazing land" subset as a subset of grassland area, consequently reporting the relative CSCs in mineral soils. See ID# L.14 in table 5.
L.8	4(V) Biomass burning (4.E Settlements) – CO_2, CH_4 and N_2O (L.12, 2018) Completeness	Revise the use of the notation key from "NO" to "NE" for CO_2, CH_4 and N_2O emissions together with the relevant justification for excluding the emissions in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines (regarding biomass burning for settlements).	Addressing. "NO" was changed to "NE"; however, a justification for excluding the emissions, as required by paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, was not provided. In response to questions from the ERT, the Party noted that settlement areas affected by wildfires are quite small in Italy: an average area of 38 ha is estimated for 1990–2017. The Party also noted that the 2006 IPCC Guidelines do not include an appropriate EF for fires in settlements, so it used the value for shrublands (2006 IPCC Guidelines, vol. 4, table 2.4), namely 26.7 t dry matter/ha, to give the ERT an approximate estimate of the likely level of emissions from fires affecting the settlements category. This resulted in a maximum of 7.96 kt CO_2 eq in 2017, which is less than 500 kt CO_2 eq and represents 0.002 per cent of the national totals without LULUCF in 2017, which is less than 0.05 per cent of the national totals without LULUCF in 2017. This approximate estimate needs to be documented in the NIR to fully meet the requirements of paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.
L.9	4(V) Biomass burning – CO_2, CH_4 and N_2O (L.12, 2018) Completeness	Include emissions from fires in settlements for the years where the affected area is significant (e.g. 1990–1995, 1998) if emissions prove to be significant, together with supporting methodological information (regarding biomass burning for settlements).	Resolved. The ERT noted recalculations for the AD for biomass burning in settlements for 1990–1998, which resulted in the AD decreasing by 99.9 per cent. During the review, Italy noted that an error had occurred in the reporting of areas affected by fires under the settlements category for 1990–1998 in the 2018 submission. The correct burned area, which is reported in the 2019 submission, is much smaller, and the related GHG emissions are insignificant. The ERT acknowledges the correction of the error and considers this issue to be resolved in terms of the areas that had appeared to be significant in the previous submission. For the justification of the insignificance of the likely level of emissions, see ID# L.8 above.
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.6, 2018) Transparency	Provide in the NIR further explanation on the basis of the assumed disaggregation (studies, references) of slowly degraded waste, as well as the reasons for using the aggregated k values (ln(2)/half-life) for slowly degrading waste instead of the specific k values for wood and paper and thereby applying a different approach (bulk waste)	Resolved. In the NIR (p.289), Italy explained that it checked the k values for slowly degrading waste and demonstrated that using a weighted average of paper and wood does not result in an underestimation of emissions. During the review, Italy provided a technical reference (ISPRA, 2018) that assesses the value and background of k values and explains how the current k values were calculated. The ERT noted the reference provides a proposed methodology for separating

ID#	Issue and/or problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		for these waste types to that used for the other estimation of the emissions from SWDS.	future emission estimates by dry zones and wet zones.
W.2	5.A Solid waste disposal on land – CH_4 (W.7, 2018) Transparency	Provide in the NIR further explanation on how time-series consistency and completeness is ensured. (This could be done by including a description on how the historical and more recent waste categorizations are combined (e.g. textiles, leather and wood in historical data are included in other waste type).)	Addressing. In NIR tables 7.4–7.7, waste composition for the four periods (1950–1970, 1971–1990, 1991–2005, 2006–2017) is provided without an explanation of how historical and more recent waste categories were combined. During the review, Italy provided the Excel calculation file used for AD estimation for the whole time series. The ERT assessed the file and observed that the AD used were estimated by filling the gaps using data in tables 7.4–7.7 with a combination of the methods provided in the 2006 IPCC Guidelines (mainly overlap and interpolation). The ERT agrees with this approach; however, it suggests including in the NIR a brief explanation of how AD were estimated and gaps were filled, as recommended by the 2006 IPCC Guidelines (vol. 1, chap. 5).
W.3	5.A Solid waste disposal on land – CH_4 (W.7, 2018) Transparency	Provide in the NIR a reason for applying the current waste composition in the calculation for the weighted average k values for the entire time series (for slowly degraded waste (paper, nappies, textiles, leather, wood), which varies in composition and is inconsistently categorized throughout the time series (see W.1 above)).	Addressing. During the review week, Italy explained that the current waste composition in the calculation for weighted average k is applied as a proxy because no data are available for some waste compositions. The ERT noted that while the Excel calculation file (the "input worksheet" of the Excel file) provided (see ID# W.2 above) shows the estimation and calculation processes, including for k values, there is a need for including in the NIR a brief explanation of how the k values were estimated.
W.4	5.A Solid waste disposal on land – CH_4 (W.8, 2018) Transparency	Provide in the NIR summary information on waste disposal amounts for each climate zone.	Not resolved. During the review, technical note no. 1/2018, prepared by the Party as an update to CH_4 emissions from landfills, was provided to the ERT. Annex 1 to this document contains summary information on waste disposal amounts for each climate zone. The ERT considers that including in the NIR a brief explanation of waste disposal amounts for each climate zone will solve this issue.
W.5	5.A Solid waste disposal on land – CH_4 (W.9, 2018) Transparency	Include in the NIR the information of the delay time used for the estimates.	Resolved. It is clearly indicated under methodological issues (NIR section 7.2.2) that the decay reaction starts on 1 January of the year after disposal.
W.6	5.A.2 Unmanaged waste disposal sites – CH_4 (W.10, 2018) Transparency	Include in the NIR information to justify why disposal amounts from unmanaged disposal sites related to the Naples waste management issue are not included in the inventory estimates.	Addressing. In the NIR (section 7.2.4), Italy explained that there are no quantitative data for this issue, but from a qualitative point of view, it is known that the waste is mostly industrial waste rich in heavy metals and inorganic chemicals, generally not biodegradable or only at a slow rate. Furthermore, the waste is collected, officially registered and sent to undergo appropriate treatment, resulting in the data reported by the national database. However, the Naples issue was not explicitly mentioned (though "illegal dumping" was referred to on p.289) and needs to be added to the next NIR to improve transparency.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
W.7	5.B Biological treatment of solid waste – CH_4 and N_2O (W.11, 2018) Transparency	Include in the NIR the information of dry basis AD and the assumption of moisture content.	Addressing. Although Italy explained in the NIR (section 7.3.2) that the EFs for dry waste are estimated from the wet waste EFs, assuming a moisture content of 60 per cent in wet waste, it did not report information on dry basis AD in the NIR, even though this information is available in CRF table 5.B. Italy explained that it would include this information in the next submission of the NIR.
W.8	5.C.1 Waste incineration – CO_2 (W.4, 2018) (W.1, 2016) (W.1, 2015) (66, 2014) Accuracy	Apply the time-series carbon content as well as fossil carbon fraction in line with the variation of the waste compositions, and report thereon.	Resolved. The NIR states that after 2010, new carbon contents and new fossil carbon fractions (50 per cent) were applied accordingly and the oxidation factor was updated for the whole time series (NIR section 7.4.5). As a result of these methodological changes, the sum of the CO_2 emissions from categories 1.A.4.a (other fossil fuel) and 5.C.1 (waste incineration) for 2010–2016 were recalculated and were found to increase by 16.5–22.0 per cent.
W.9	5.D.2 Industrial wastewater – N_2O (W.12, 2018) Transparency	Improve the transparency of the NIR and of CRF table 5.D by using the appropriate AD in the CRF table or by including an explanation that the AD reported in CRF table 5.D are in fact the N-N_2O in the effluent.	Addressing. NIR table 7.34 includes N-N_2O in the effluent. However, the ERT noted that the same AD are used in CRF table 5.D and the resulting IEF, which is still 1.00 kg N_2O-N/kg N for the entire time series, is used instead of a value within the default range of the 2006 IPCC Guidelines (0.0005–0.25 kg N_2O-N/kg N). The different units of the AD and the IEF are not explained in CRF table 5.D (e.g. in a footnote or cell comment).
W.10	5.D.2 Industrial wastewater – N_2O (W.12, 2018) Transparency	Include in the NIR information on anticipated future improvements for the category.	Resolved. According to NIR section 7.5.6, Italy expects to obtain better environmental data from industrial operators. As soon as additional data are available, further improvements will be implemented.
KP-LULUCF activities			
KL.1	Article 3.4 activities – CO_2 (KL.1, 2018) (KL.2, 2016) (KL.2, 2015) Accuracy	Include transparent and verifiable information that demonstrates that the litter pool and deadwood pool for CM and above-ground biomass, below-ground biomass, litter, deadwood pools for GM are not net sources, as stated in the annex to decision 2/CMP.7, and change the notation key from "NO" to "NE".	Addressing. "NO" was changed to "NE" for the litter and deadwood pools in CM and GM, where appropriate. Furthermore, additional information was added to NIR section 9.3.1.2 to justify why these carbon pools are not a net source, using arguments that refer to the tier 1 assumption that dead organic matter stocks are insignificant (annual crops) or in equilibrium (perennial crops); the policies of the European Union promoting increasingly sustainable and climate friendly agricultural practices; and the decreasing area of annual and perennial crops over time. During the review week, Italy referred to relevant sections of the 2006 IPCC Guidelines and the Kyoto Protocol Supplement on the options available to Parties for demonstrating that a specific carbon pool is not a net source. The ERT considers that the argument on the relevant policies of the European Union needs to be better supported by providing verifiable references and suggests as a starting point including references to the Common Agricultural Policy and the Progress Report on LULUCF Actions under article 10.2 of European Union decision

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			529/2013/EU, which were cited by Italy in its response to questions from the ERT. Further, the ERT considers that the argument about the reduction in land-use areas may not be valid and should be revised and better explained in the NIR because areas of GM reported under GM activities increased from 382.84 to 544.05 kha between 2013 and 2017, and areas reported under CM activities increased slightly, from 8,937.17 to 8,980.58 kha, in the same time frame.
KL.2	FM – CO_2 (KL.5, 2018) Transparency	Transparently specify in the NIR the FMRL value used for the purposes of accounting for the FM in the second commitment period in accordance with decision 2/CMP.7, annex, paragraphs 12–15.	Resolved. Italy clearly indicates in the NIR (p.330) the correct value of the FMRL used for the accounting.
KL.3	FM – CO_2 (KL.6, 2018) Accuracy	Correct the reporting of the FM cap in the CRF accounting table.	Not resolved. Italy reported the value 18,267.221 kt CO_2 eq for the FM cap in the accounting table for the 2019 submission, which represents 3.5 per cent of national total emissions excluding LULUCF in the base year without multiplying by eight as required by decision 2/CMP.7, annex, paragraph 13. The value should be 146,137.768 kt CO_2 eq to comply with the requirements of this decision, in line with the recommendation from the previous ERT. The Party acknowledged this error and stated that it would be corrected in the next annual submission.
KL.4	CM – CO_2 (KL.7, 2018) Transparency	Provide detailed information in the NIR on how the IUTI is updated and how it impacts the further refinement of AD classes in woody crops and non-woody crops, together with detailed information on the typologies of perennial woody crops and biomass estimates that are affected by the IUTI updates, which may affect the IEF changes.	Addressing. According to annex 12 to the NIR (p.579), modifications were made to annex 10 to address the recommendation. However, the ERT did not find in annex 10 any updates to the information that had been included in NIR 2018. During the review week and in response to questions from the ERT, the Party gave a presentation on the land classification system that provided additional details on how IUTI is updated; the sampling scheme used; the photo interpretation process used, which is based on an established threshold; comparison analysis among the different land cover/use data sources in Italy; and how the results from the interpretation process are reconciled with other national data sets where it is not possible to differentiate between some subcategories in cropland and grassland (e.g. annual pastures and grazing land). During the review, the Party noted that this information is provided in section 6.1 of the NIR. The ERT considers that the information on IUTI reported in section 6.1 of the NIR clearly summarizes how IUTI is updated and that the additional information presented by the Party during the review week could be included in annex 10 or cited as a reference if it is available elsewhere to better document the IUTI update process. The ERT also considers that the NIR description of how IUTI updates impact the further refinement of AD classes in woody crops and non-woody crops, as well as the IEF,

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			resulting in recalculations and changes in trends in the reported estimates needs to be improved (see ID# L.1 above and ID# KL.6 in table 5).

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue and/or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per para. 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with para. 69 of the Article 8 review guidelines in conjunction with decision 4/CMP.11.

IV. Issues identified in three successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2019 annual submission of Italy, and have not been addressed by the Party.

Table 4
Issues and/or problems identified in three successive reviews and not addressed by Italy

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed* [a]
General	No issues identified	
Energy	No issues identified	
IPPU	No issues identified	
Agriculture	No issues identified	
LULUCF		
L.3	Document the For-est Model validations in the NIR	4 (2014–2019)
L.4	Provide definitions and thresholds for carbon pools in a table in the NIR	4 (2014–2019)
L.7	Include the subset of "improved grazing" land in the CRF tables and the NIR under the Convention while the new information becomes available	3 (2015/2016–2019)
Waste	No issues identified	
KP-LULUCF activities		
KL.1	Include transparent and verifiable information that demonstrates that the litter pool and deadwood pools for CM and above-ground biomass, below-ground biomass, litter, deadwood pool for GM are not net sources, as stated in the annex to decision 2/CMP.7, and change the notation key from "NO" to "NE"	3 (2015/2016–2019)

[a] The report on the review of the 2017 annual submission of Italy has not yet been published. Therefore, 2017 was not included when counting the number of successive years in table 4. As the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2019 annual submission

10. Table 5 contains findings made by the ERT during the individual review of the 2019 annual submission of Italy that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2019 annual submission of Italy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
General			
G.2	Inventory planning	Chapter 1 of the NIR (in particular section 1.2.1, "National inventory system") contains information on the institutional arrangements for inventory preparation and outlines the roles and responsibilities of different authorities within the system. However, the ERT considers this information to have limited transparency, particularly the explanation of how academic institutes and universities are defined and allocated specific responsibilities in the inventory development process. During the review, in response to a question raised by the ERT, the Party provided an organizational chart of the authorities and institutes involved in the compilation of the inventory and explained that ISTAT, the Ministry of Economic Development, the Ministry of Infrastructure and Transport, and Terna (an electricity transmission system operator) are the major institutions within the system; other academic institutes and consultants provide data and information on request but are not part of the system. Contracts and/or memorandums of understanding are signed between ISPRA and these external institutes and universities. During the review week, the contract between ISPRA and the Research Center for Animal Production and the workplan for inventory preparation were provided by the Party to the ERT as an example of the arrangements that are in place. The ERT recommends that the Party improve the transparency of the description of its national system by including an explanation of the involvement of external organizations that contribute to inventory development.	Yes. Transparency
G.3	Inventory management	All of the information and material used for preparing the inventory are documented and archived at ISPRA, including all of the spreadsheets used in estimating emissions and removals. A "reference" database is also expanded every year to increase the transparency of inventory preparation, as reported on page 46 of the NIR. During the review week, the ERT accessed and examined the record-keeping and documentation system. In response to a question raised by ERT on the existence of an integrated database that facilitates the compilation and reporting of information, the Party clarified that emission/removal estimates and background calculations are managed using Excel spreadsheets and that data for industrial facilities, waste incinerators and road transport are managed in specific databases.	Not an issue/problem
G.4	Key category analysis	The Party provided the overall results of the key category analysis in tables 1.3–1.6 of the NIR (pp.37–41) and provided detailed key category analysis results for 2017 using approach 1 in annex 1. However, detailed results for the base year were not included in the annex. During the review, in response to a question raised by the ERT, the Party provided the detailed key category analysis results for the base year using approach 1 to the ERT. The ERT recommends that the Party include the detailed key category analysis results for the base year using approach 1, including and excluding LULUCF, in annex 1 to the NIR of its next annual submission.	Yes. Transparency
G.5	Key category analysis	The Party carried out key category analyses using approaches 1 and 2, and the overall results for the base year (1990) and 2017 (excluding and including LULUCF) are provided in NIR tables 1.3–1.6 (pp.37–41). However, the reporting mixes the results from approach 1 and approach 2, and the key categories identified are arranged alphabetically by category title, rather than by sector. The ERT is of the view that the reporting makes it difficult for the ERT to check for consistency by comparing the NIR with CRF table 7, where key categories are	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		automatically reported using approach 1, and reduces the comparability of the reporting with other Parties included in Annex I to the Convention. During the review week, Italy explained that its reporting style is the most comprehensive way of presenting the results from both approaches in one table. The ERT encourages the Party to ensure the adherence of NIR tables 1.3–1.6 with table 4.1 of the 2006 IPCC Guidelines, that is, the captions of the tables should be arranged as category code, category title, gas assessed, specific consideration, approach 1 (for the latest inventory year, both level and trend analysis should be presented) and approach 2 (for the latest inventory year, both level and trend analysis should be presented).	
G.6	Uncertainty analysis	The uncertainty analysis was carried out using both approach 1 (error propagation equations) and approach 2 (Monte Carlo analysis). However, the scope of the application of approach 2 is reported with limited transparency. For example, the categories and inventory years covered by the approach and the future plan are ambiguous in the NIR (section 1.7, p.47), although additional information provided in annex 1 (pp.415–429) indicates that approach 2 was used for a range of categories (i.e. stationary combustion of solid, liquid and gaseous fuels, road transportation, cement production) and inventory years (i.e. 2005, 2009, 2012). In addition, the hyperlink leading to an uncertainty workshop in 2005 is not accessible. During the review, the Party explained that approach 2 was mainly used for the 2009 inventory for the energy and IPPU sectors and was extended to the 2012 inventory for the agriculture sector. The ERT recommends that the Party streamline the description of its use of approach 2 in the uncertainty analysis by explicitly explaining the scope of its application so far, and delete the hyperlink if the website it leads to is no longer accessible.	Yes. Transparency
G.7	Uncertainty analysis	The key category and uncertainty analyses are mixed together in annex 1 to the NIR in that they are presented in the following order: key category analysis approach 1, uncertainty analysis approach 1, key category analysis approach 2 and uncertainty analysis approach 2. The ERT is of the view that the mixed reporting does not follow the suggested outline and general structure of the NIR set out in the appendix to the UNFCCC Annex I inventory reporting guidelines, thus making annex 1 not fully transparent. During the review, the Party replied that the application of key category analysis approach 2 required the use of the uncertainty analysis results, which is why the introduction to uncertainty analysis approach 1 appears between key category analysis approaches 1 and 2. The ERT encourages the Party to follow the suggested outline and general structure of the NIR set out in the appendix to the UNFCCC Annex I inventory reporting guidelines by reporting detailed results from the key category analysis in annex 1 and from the uncertainty analysis in annex 2, referring to the uncertainty analysis results in annex 1 when necessary.	Not an issue/problem
G.8	Uncertainty analysis	The Party provided a quantitative uncertainty analysis for each category in annex 1, which presents the uncertainty values for the AD and EFs in each category, and also provided further information in the category-specific sections of the NIR. However, the sources of the uncertainty values are only briefly described in the NIR (p.47). During the review, in response to a question raised by ERT, the Party provided a document about the review of these values and clarified that the parameters linked to the uncertainty of national statistics are country specific, while others are IPCC default parameters. The ERT noted that these parameters had not been updated for years. The Party mentioned that it would like to update the uncertainty values when sufficient references are available.	Not an issue/problem

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT encourages the Party to indicate the progress in improving inventory quality over the years following inventory development by updating the parameters of the quantitative uncertainty analysis for the categories in which significant improvement work has been done to reduce uncertainty, and to include in the NIR information on the sources of the uncertainty values used in the inventory.	
G.9	QA/QC and verification	Information on QA/QC and verification is provided in section 1.6 of the NIR (pp.41–46). The transparency of this section is limited as the QA and QC procedures are reported together, with no subheadings to explicitly separate them, and it is sometimes unclear whether the information refers to routine activities undertaken every year or new activities that started in the 2018–2019 inventory cycle (e.g. the comparison of top-down with local inventories described on p.43 of the NIR). During the review, the Party acknowledged the mixed reporting pointed out by the ERT, and clarified that the comparison between top-down and local inventories, though it may not cover all sectors, falls under annual activities.	Yes. Transparency
		The ERT recommends that the Party streamline its description of QA/QC and verification by updating information on procedures to accurately reflect whether they are annual or new activities.	
		Additionally, the ERT encourages the Party to add subheadings under section 1.6 of the NIR (e.g. 1.6.1 for QC procedures, 1.6.2 for QA procedures and verification, 1.6.3 for the final approval procedure of the inventory and archiving) in order to increase the transparency of reporting.	
G.10	Transparency	The Party reported each sector's contribution to total GHG emissions including LULUCF by indicating that LULUCF contributes 4.1 per cent of the total GHG emissions (NIR, p.50). The ERT understands that LULUCF in Italy is a net removal and its role is offsetting, but not contributing. During the review week, the Party clarified that the percentage LULUCF contribution is calculated by considering the absolute value of LULUCF emissions/removals in terms of the national totals including LULUCF, as this is a way of conventionally representing the relevance of the sector, as a key category, for the overall inventory.	Not an issue/problem
		The ERT encourages the Party to increase the transparency of its reporting by adding a footnote to the percentage contribution of LULUCF to total GHG emissions that explains the rationale behind the calculation.	
G.11	NIR	Some tables in the agriculture sector chapter of the NIR do not have table numbers (e.g. the table titled "Farms characteristics from agricultural censuses" on p.190). This is also the case for a number of tables in the energy, IPPU and LULUCF sectors (e.g. the tables on p.123, p.151 and p.241). This lack of numbering makes it difficult to refer to the values presented in these NIR tables.	Not an issue/problem
		The ERT encourages the Party to include table numbers for all tables in the NIR.	
G.12	Article 3, paragraph 14, of the Kyoto Protocol	Italy reported updated information on financial resources provided to developing countries and multilateral organizations for 2016 and 2017 (NIR table 14.4). However, the Party did not provide any information on changes to priority actions, as specified in decision 15/CMP.1, annex, paragraph 24, since the previous annual submission except for a general description of actions implemented in and before 2011. In response to questions raised by the ERT during the review, the Party confirmed that there had been no changes to priority actions since the previous submission.	Yes. KP reporting adherence
		The ERT recommends that the Party, in its annual submission, report any changes in the information it provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1 in conjunction with	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		decision 3/CMP.11. If there have been no changes, the ERT recommends that the Party highlight this in the NIR in order to improve the transparency of the reported information.	
G.13	Article 3, paragraph 14, of the Kyoto Protocol	Page 344 of the NIR states that Italy is the sole proposer for 39.8 per cent of its CDM projects, whereas page 344 of the 2018 NIR gives this figure as 40.6 per cent. After comparing the CDM projects listed in the two NIRs, the ERT noticed that there has been no change in the number of CDM projects hosted exclusively by the Party. In response to a question raised by the ERT during the review, the Party acknowledged that 40.6 per cent is the correct figure and that there is an error in the 2019 NIR. In response to the preliminary main findings, the Party explained that the error was in the percentage reported, not in the information on CDM projects. The ERT recommends that the Party provide accurate information on CDM projects hosted exclusively by the Party in the NIR.	Convention reporting adherence
Energy			
E.8	Fuel combustion – reference approach – biomass – CO_2	There was a significant relative increase in apparent consumption calculated using the reference approach, with "biomass total" in 2017 reaching 1,159.43 per cent of the base-year level. According to section 3.1 of the NIR, this biomass comes from the waste sector (biomass component), the forestry sector (steam wood) and the agriculture sector (animal waste/manure, agricultural residue). However, the NIR does not provide information on the amount of biomass from each sector. The ERT encourages the Party to improve transparency and ensure consistency across the sectors by providing information on how much biomass comes from each sector, both in energy and mass units.	Not an issue/problem
E.9	1.A.1.c Manufacture of solid fuels and other energy industries – biomass – CH_4	Italy did not estimate emissions from charcoal production because the 2006 IPCC Guidelines do not contain a methodology for estimating CH_4 emissions from charcoal production. There is no information in the NIR on the technology used for charcoal production. During the review, the Party provided a weblink to information on the boilers used (http://www.btrcharcoal.com/en/page/production-process.html) (see ID# E.2 in table 3). The ERT encourages the Party to include in the NIR information on the technology used for the production of charcoal, for example by including the hyperlink it provided to the ERT during the review.	Not an issue/problem
E.10	1.B.2 Oil, natural gas and other emissions from energy production – liquid and gaseous fuels – CH_4	The IPCC good practice guidance was used for oil and gas exploration instead of the 2006 IPCC Guidelines. Italy explained that there are no EFs in the 2006 IPCC Guidelines when the only AD available are the number of wells (NIR, p.121). In the IPCC good practice guidance, the tier 1 methodology and default EFs are based on the number of wells, whereas in the 2006 IPCC Guidelines, they are based on the volume of oil production. In response to questions raised by the ERT during the review week, the Party clarified that: (a) The Ministry of Economic Development issues annual reports with the numbers of both gas and oil exploration wells, but no information is provided on the production of these wells; (b) If overall oil production were used as a proxy in estimating emissions from oil and gas exploration, there would be an overestimation. For example, if production were stable over the years, yet drilling and testing occurred in some years and not in others, using the 2006 IPCC Guidelines would result in stable emissions, even for years with no drilling or exploration activity;	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		(c) Current oil production is onshore, while exploration is now being done offshore, and the methodology in the 2006 IPCC Guidelines does not reflect this situation. The ERT considers that the relationship between exploration/drilling activity and production volume applies when the two activities occur within the same bed. In the case of onshore production and offshore exploration, the onshore production is not necessarily related to the exploration, and only offshore exploration is recorded. The ERT recommends that the Party include in the NIR specific information on why using the IPCC good practice guidance rather than the more recent guidelines (2006 IPCC Guidelines) better reflects national circumstances.	
E.11	1.B.2.b Natural gas – gaseous fuels – CH_4	The quantity of natural gas being distributed is less than 50 per cent of the natural gas transmitted in the whole time series, and the CH_4 IEF of gas distribution in 2017 (4,151.76 kg/million m^3) is almost four times the default EF in the 2006 IPCC Guidelines (0.0011 Gg/million m^3) (vol. 2, table 4.2.4). During the review week, the Party clarified that a significant proportion of natural gas does not go through the distribution network but is instead directly transported to industrial sites, including for energy production. The Party also clarified that the EFs are generated by combining measured data obtained directly from the main gas operators with calibrated estimates from smaller operators. The ERT recommends that the Party include an explanation of the AD gap between gas transmission and distribution and highlight the difference between the CH_4 IEF for natural gas distribution and the default EF in the 2006 IPCC Guidelines in its next annual submission.	Yes. Transparency
E.12	Multilateral operations – all fuels – CO_2, CH_4 and N_2O	Following recommendations by previous ERTs, Italy now consistently reports “NE” for multilateral operations owing to unavailable data. During the review, Italy clarified that it was not possible to collect these data as their unavailability was due to the confidential nature of the multilateral operations. The ERT encourages the Party to improve transparency by including in the NIR an explanation for why data from multilateral operations are unavailable.	Not an issue/problem
IPPU			
I.5	2. General (IPPU) – CO_2, CH_4 and N_2O	The ERT noted errors in the information provided in the NIR and inconsistencies between the NIR and the CRF tables in most of the categories in the sector, for example: (a) There is a reference to the wrong IPCC guidelines in the NIR; (b) 2.A.1: the hyperlink to the Ministry of Economic Development web page on clinker and cement production is not working; (c) 2.A.2: recalculations had to be performed for 2014, 2015 and 2016 because of processing errors for EU ETS AD for lime facilities in the CRF tables, but the recalculations were not mentioned in the NIR; (d) 2.A.3: the NIR (p.136) wrongly indicates that recalculations occurred in the current submission for CO_2 emissions in 2012 (resulting in an increase of 7.43 per cent) owing to the correction of AD and emission data for that year, while the CRF tables do not include any recalculations; (e) 2.A.4: recalculations were performed for both AD and CO_2 emissions for 2012 in the CRF tables, but no recalculations are indicated for this category in the NIR;	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		(f) 2.B: SF_6 emissions are constant from 1990 to 2017 according to NIR table 4.1, while the corresponding CRF tables show emissions before 1998 and "NO" from 1999; (g) 2B and 2C: PFC emissions are constant from 1990 to 2017 according to NIR table 4.1, while the corresponding CRF tables show upward and downward trends in PFC emissions; (h) 2.B.9: the NIR wrongly states (p.139) that a focus on by-product emissions from this sector led to revised emission estimates for the whole time series; (i) 2.D: CO_2 emissions are reported as zero in 2016 and 2017 (NIR table 4.1), while the corresponding CRF tables (tables 2(I).s2 and 2(I).A-Hs2) report CO_2 emissions; (j) 2.F.1: emissions from disposal are reported as "NO" for commercial and industrial refrigeration (CRF table 2(II).B-Hs2, gases HFC-23, HFC-125 and HFC-143a), but these emissions are included under operating system emissions, so the correct notation key is "IE". The ERT recommends that Italy address the above-mentioned issues and reinforce and implement QA/QC procedures for this sector, including, as a minimum, the following measures: (a) Verifying the references and weblinks to AD, ensuring that they are functional and correct, and considering the inclusion of a table containing the information shown in the NIR; (b) Verifying systematically the processing of AD; (c) Checking the description of recalculations in the NIR against the CRF tables and ensuring that any recalculations performed are correctly described in the NIR in both the category sections and the chapter summarizing the recalculations; (d) Ensuring proper use of the notation keys; (e) Performing QA of the NIR and the CRF tables and correcting the errors annually before each submission.	
I.6	2. General (IPPU) – CO_2, CH_4 and N_2O	The NIR provides information for each category under headings such as "Source category description", "Methodological issues" and "Source-specific QA/QC and verification". However, methodological and verification issues are mixed together and described under all headings, impeding understanding. In addition, trends in most categories are explained by the use of the data source (i.e. EU ETS, E-PRTR, the relevant association) but explanations of the methodologies and assumptions used when estimating the emissions for each subcategory are not sufficiently clear. In addition, the simultaneous use of EU ETS and E-PRTR data is not transparently presented for all the categories, which is likely to cause confusion. During the review, Italy described the methodologies used in each subcategory together with the input AD and their sources. When available, EU ETS-verified data are the preferred source, provided they cover all plants of the subcategory. This source of data is complemented by E-PRTR data when they help to cover the whole subcategory. Where the EU ETS-verified data complemented by E-PRTR are not applicable for estimating, national data are used and cross-checked with EU ETS and E-PRTR data. Large combustion plant data are used for cross-checking purposes. Although this is the general approach, the exact combination and prioritization of data sources can differ for each subcategory.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT recommends that Italy include focused information under each heading in the NIR to support understanding and provide detailed information on the AD selection and the methodologies used for estimating emissions under the "Methodological issues" heading in each subcategory of the IPPU sector.	
I.7	2.B Chemical industry – N_2O	In recent years, as EU chemical plants have begun to be required to report emissions under the EU ETS, Italy has used information on measured GHG emissions for N_2O emissions from nitric acid production and adipic acid production. However, a tier 2 method is indicated in CRF table summary 3 as having been used for the gases in these categories, rather than a tier 3 method based on measurements. During the review, Italy explained that a tier 2 method was reported because the emissions had not been estimated using detailed information or complex models.	Yes. Transparency
		The ERT recommends that Italy select a tier methodology in accordance with the 2006 IPCC Guidelines and provide updated information on the tiers used across the time series in the NIR.	
I.8	2.B.1 Ammonia production – CO_2	The amount of recovered CO_2 from ammonia production that is fed into urea production processes was subtracted from the CO_2 emissions from ammonia production for the whole time series using data provided by industrial operators. According to the 2006 IPCC Guidelines (vol. 3, section 3.2.2.1), CO_2 recovered for downstream use can be estimated from the quantity of urea produced, but when a deduction is made for CO_2 used in urea production, it is good practice to ensure that emissions from urea use are included elsewhere in the inventory.	Yes. Transparency
		In the Italian inventory, the amount of urea applied to agricultural soils comes from national statistics on the use of urea as a fertilizer in agriculture provided by ISTAT; the amount of urea used for emission abatement in engines comes from COPERT 5; and the amount of urea used for emission abatement in power plants is provided by operators under the EU ETS.	
		Italy cross-checked the apparent consumption of urea (estimated using production data from operators and trade data from ISTAT) against the amount of urea used as reported in the inventory (national statistics on urea use in agriculture from ISTAT, plus the use of urea reported under category 4.D (2.D.3.a (urea used for emission abatement in engines) and 2.D.3.b (urea used for emission abatement in power plants))). Overall, across the whole time series (in particular 1995–2017), apparent consumption is twice as high as the amount of urea used according to the Italian inventory, but the reasons for this difference are unknown. During the review, the Party outlined its plans to contact urea producers to obtain information on sales (e.g. to determine which Italian markets use the urea) and investigate whether there could be non-emissive use of urea in Italy.	
		The ERT recommends that Italy investigate the reasons for the difference between apparent consumption and the amount of urea used in the inventory and include the results of this investigation in the NIR.	
I.9	2.F.1 Refrigeration and air conditioning – HFCs	Italy described in NIR section 4.7.2 the methodological approach for estimating GHG emissions from the consumption of fluorinated gases in refrigeration and air conditioning (2.F.1), foam blowing agents (2.F.2), fire protection (2.F.3) and aerosols (2.F.4). The Party differentiated between the methodological approach used for refrigeration and air conditioning (based on data related to air-conditioning equipment production and sales) and the approach used for mobile air conditioning, foam blowing agents, fire protection and aerosols (based on single gas consumption data supplied by the industry). In both cases, the NIR does not describe exactly how the AD used for estimating emissions in operating systems and emissions at decommissioning were calculated. During the review week, Italy clarified that in the case of refrigeration and air conditioning, the bank of gases in service (the	Yes. Transparency

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		AD used for calculating emissions from stocks) is calculated as the amount of gas included in the bank in the previous year, minus the amount of leakage, plus the amount of gas sold in the current year. Furthermore, Italy clarified that after the useful life of the equipment, the refrigerant charge is subtracted from the bank of gases in service. The Party also clarified that, as data on average annual stock are used in the calculation, the gases introduced to the bank for maintenance purposes are considered in the estimate. Additionally, Italy specified that the charge remaining at decommissioning is calculated as a differential, considering the amount of gas contained in each equipment type, the product life leakage rate and average lifetime. The ERT commends Italy for the detailed information provided during the review and for its efforts to implement improvements in this category. The ERT recommends that the Party describe in the NIR the approach followed and the equations used for calculating the AD and EFs as well as the emissions at each stage of the useful life cycle of the equipment (manufacturing, stock and disposal) for each subcategory in accordance with the information provided in CRF table 2(II).B-Hs2.	
I.10	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	Italy reported indirect CO_2 emissions from the atmospheric oxidation of non-methane volatile organic compounds under category 2.D.3 (NIR, p.63, and CRF table 2(I).s2). However, in CRF table summary 1.As3 and CRF table 6, Italy reported indirect CO_2 as "NO", and in CRF tables 10s1 and 10s2, the Party reported both total CO_2 eq emissions, including indirect CO_2, without LULUCF, and total CO_2 eq emissions, including indirect CO_2, with LULUCF, as "NA". According to the UNFCCC Annex I inventory reporting guidelines, for Parties that decide to report indirect CO_2, the national totals shall be presented with and without indirect CO_2. The ERT recommends that the Party present national totals with and without indirect CO_2 emissions in CRF table summary 2. The ERT also recommends that the Party report indirect CO_2 emissions in CRF table 6 as "IE" instead of "NO".	Yes. Convention reporting adherence
Agriculture			
A.4	3.A.2 Sheep – CH_4	In an unnumbered NIR table titled "Parameters for the calculation of sheep EFs from enteric fermentation" (p.198), Italy reported that the 2006 IPCC Guidelines (vol. 4, chap. 10) were used as a reference source for determining the value of DE% (65 per cent) of feed consumed by sheep (i.e. mature ewes and other mature sheep). The ERT noted that table 10.A-9 of the 2006 IPCC Guidelines (vol. 4, p.10.82) has 60 per cent as the DE% value for sheep farmed in developed countries. In response to a question raised by the ERT during the review week, Italy clarified that the DE% value had been determined using the data reported in table 10.2 (vol. 4) of the 2006 IPCC Guidelines. However, as the data in that table are presented as a range of digestibility representative of the different diets of various livestock categories, the Party clarified that it used the average default value for pasture fed animals in the "Cattle and other ruminants" category. Moreover, in response to the draft review report, Italy informed the ERT that it considers the DE% value reported in table 10.A-9 of the 2006 IPCC Guidelines is not fully transparent as it does not include any description and that the DE% value for sheep farmed in developed countries is probably incorrect (i.e. it is reported as 0.6 per cent instead of 60 per cent). The Party noted that table 10,A-9 has been removed from the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The ERT recommends that Italy improve the transparency of its reporting on the enteric fermentation of sheep by providing information on the assumptions used to adjust the DE% values for mature ewes and other mature sheep.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
A.5	3.B Manure management – CH_4	Italy applied an approach developed by Husted (1994) to estimate CH_4 emissions from manure management of cattle (dairy and non-dairy) and buffaloes (cow and other). The approach is based on average regional monthly temperature, content of VS in manure (per head) produced by different subcategories of cattle (dairy and non-dairy) and buffaloes (cow and other), and storage time of manure in MMS. Italy used VS contents of 47 g VS/kg slurry manure and 142 g VS/kg solid manure, and referenced Husted (1994). The ERT noted, however, that the VS contents reported in Husted (1994) are 47.5 g VS/kg slurry manure and 142.7 g VS/kg solid manure. In addition, the VS content values in Husted (1994) were developed by a researcher from a university in Denmark for 1992. During the review, Italy acknowledged that rounding up the VS content values might lead to inaccurate results and confirmed that unrounded values would be used in the next annual submission. The ERT recommends that the Party justify in the NIR the applicability of the current VS content values it uses, which were developed by a researcher from a Danish university in 1992, to the national circumstances of Italy for the entire reporting period, and if a justification is not possible, to consider using equation 10.24 of the 2006 IPCC Guidelines (vol. 4) to calculate VS excretion per day on a dry organic matter basis (kg/VS day). Furthermore, the ERT recommends that Italy correct the values for VS content to match the reference currently in use; that is, that the Party does not round fractional parts.	Yes. Accuracy
A.6	3.B Manure management – CH_4	Following on from ID# A.5 above, during the review week, Italy stated that the value of VS content refers to both (1) the sum of VS excreted in manure (VS_{manure}) and VS contained in bedding material ($VS_{bedding}$) for manure handled as solid and (2) VS contained in manure (VS_{manure}) for manure handled as liquid/slurry. The ERT noted that the NIR contains no information that clarifies the main components (i.e. VS_{manure} and $VS_{bedding}$) of the VS content values applied in the estimates of the Party. In response to a question raised by the ERT during the review week on how Italy obtained the data on the amount of manure produced by all subcategories of cattle (dairy and non-dairy) and buffaloes (cow and other) and on the quantity of bedding material, the Party stated that these data were obtained from the results of the MeditAIRaneo project (Research Center for Animal Production, 2006(a)). The ERT concluded that the information reported by Italy on the amount of manure produced by all subcategories of cattle and buffaloes and on the quantity of bedding material used is not presented in a transparent manner. The ERT recommends that Italy improve the transparency of its reporting on manure management by reporting information on the amount of manure generated by each subcategory of cattle and buffaloes (e.g. in kg VS_{manure}/head/day or in kg manure/head/day) and including information on the quantity of bedding material used in solid MMS (e.g. in kg $VS_{bedding}$/head/day or in kg/head/day). Moreover, the ERT recommends that Italy cross-check the country-specific values of VS for cattle and buffaloes against the values calculated on the basis of gross energy intake for each subcategory of cattle and buffaloes (using equation 10.24 of the 2006 IPCC Guidelines, vol. 4) and report the results of this verification in the next NIR.	Yes. Transparency
A.7	3.B Manure management – CH_4	In CRF table 3.B(a)s2 and NIR table A.7.2, Italy reported information on AD for the cattle (dairy and non-dairy) and buffaloes (cow and other) population (by subcategory) and allocated MMS to two climate zones: cool and temperate. During the review, the Party provided the ERT with a spreadsheet developed for estimating CH_4 emissions from manure management; this spreadsheet increased the ERT's understanding of the approach and input parameters used by the Party. However, the data reported in the spreadsheet for estimating CH_4 emissions from manure handled in slurry/liquid and in solid MMS are not the same as those reported in CRF table 3.B(a)s2. Moreover, Italy used a one-year data set on monthly temperature for the entire reporting period. The ERT	Yes. Accuracy

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		considers that this approach could lead to an overestimation or underestimation of CH_4 emissions from slurry/liquid and solid MMS. The ERT recommends that Italy improve the accuracy of the CH_4 emission estimates from cattle and buffalo manure management by using data on the allocation of MMS for both cool and temperate climate zones, as reported in CRF table 3.B(a)s2, and applying average monthly temperatures from each year in calculating CH_4 emissions from manure management across the entire reporting period for both zones. The ERT believes that future ERTs should consider this issue further to ensure that the data on allocation of MMS and average monthly temperature are updated and there is not an overestimation or underestimation of CH_4 emissions from manure management for any subcategory of cattle or buffaloes. Moreover, the ERT recommends that Italy improve the transparency of its reporting on manure management by providing information on the average monthly temperatures used in its estimations, the specific CH_4 emission rate (g CH_4/kg VS) it calculates using the equations reported in the NIR, and the total amount of VS handled in slurry/liquid and solid MMS for the entire reporting period (e.g. in an annex table).	
A.8	3.B.1 Cattle – CH_4	In CRF table 3.B(a)s1, Italy reported a B_o value for dairy cattle of 0.14 m^3 CH_4/kg VS. The ERT noted that this B_o value is the lowest reported by all Parties for the entire reporting period (e.g. values range from 0.21 m^3 CH_4/kg VS to 0.24 m^3 CH_4/kg VS for 2017) and is below the IPCC default value for Western Europe (0.24 m^3 CH_4/kg VS) (2006 IPCC Guidelines, vol. 4, table 10.A-4). In response to a question raised by the ERT during the review week on how the B_o value for dairy cattle was determined, the Party explained that it used equation 10.23 from the 2006 IPCC Guidelines (vol. 4), and indicated that this information is reported in its NIR (p.204). The ERT considers that the estimation of B_o is not in line with the guidance presented in the 2006 IPCC Guidelines (vol. 4, p.10.43), which states that "the preferred method to obtain B_o measurement values is to use data from country-specific published sources, measured with a standardised method. If country-specific B_o measurement values are not available, default values are provided in Tables 10A-4 through 10A-9". The ERT recommends that Italy use a country-specific B_o value obtained from measurements developed to obtain the B_o value for dairy cattle or apply the default value provided in table 10.A-4 of the 2006 IPCC Guidelines (vol. 4).	Yes. Accuracy
A.9	3.B.1 Cattle – CH_4	Italy reported in annex 7 to the NIR (p.485) that it used values from the 2006 IPCC Guidelines for the amount of N in bedding material to estimate N_2O emissions from animal manure applied to soils (i.e. 7–10 kg N/head/year for dairy cows and heifers and 4 kg N/head/year for other cattle). In response to a question raised by the ERT during the review week on whether the amount of bedding material used for calculating CH_4 emissions from manure management of dairy and non-dairy cattle is consistent with the amount of bedding material used for estimating N_2O emissions from animal manure applied to agricultural soils, Italy stated that a cross-check between these two inventory categories had not been completed. The ERT recommends that Italy cross-check the amounts of bedding material used for estimating CH_4 emissions from manure management and N_2O emissions from animal manure applied to agricultural soils, ensuring that the amounts are consistent between the two reporting categories.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
A.10	3.B.1 Cattle – CH_4	The calculation file provided by Italy shows that CH_4 emissions from pasture, range and paddock manure management of cattle (dairy and non-dairy) and buffaloes were not estimated by the Party. However, Italy reported in CRF table 3.B(a)s2 pasture management practices for cattle (dairy and non-dairy) and buffaloes. In response to a question raised by the ERT during the review week on whether CH_4 emissions from pasture range and paddock management practices were estimated and reported by the Party in CRF table 3.B(a)s1 for the entire reporting period, Italy stated that CH_4 emissions from pasture, range and paddock manure management were neither estimated for cattle and buffaloes nor reported in CRF table 3.B(a)s1 for the entire reporting period. The ERT concluded that this reporting is not in line with the 2006 IPCC Guidelines (vol. 4), for example with equations 10.22 and 10.23 for estimating CH_4 emissions from manure management (including pasture, range and paddock). However, during the review week, the Party provided the ERT with a calculation file demonstrating that CH_4 emissions for dairy and non-dairy cattle from pasture, range and paddock amounted to 0.48 kt CH_4 in 2017 (12.1 kt CO_2 eq), which equates to about 0.003 per cent of the national total CO_2 eq emissions for 2017 without LULUCF and is below the threshold stated in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that Italy complete the estimation of CH_4 emissions from pasture, range and paddock manure management of cattle (dairy and non-dairy) and buffaloes for the entire reporting period and report the emissions, or if this is not possible, provide in the NIR a justification for the exclusion of these estimates in terms of the likely level of emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Completeness
A.11	3.B. Other livestock – CH_4	During the review week, Italy clarified that the total CH_4 emissions from manure management of other livestock categories (i.e. sheep, goats, horses, mules and asses) does not include CH_4 emissions from pasture, range and paddock for the entire reporting period. However, Italy reported in CRF table 3.B(a)s1 that the manure of these livestock categories is handled in pasture management practices. The ERT concluded that this reporting is not in line with the 2006 IPCC Guidelines (vol. 4), specifically equations 10.22 and 10.23 for estimating CH_4 emissions from manure management (including pasture, range and paddock). During the review, the Party provided the ERT with a spreadsheet containing the calculation of CH_4 emissions from pasture, range and paddock of other livestock categories, which amounted to 2.6 kt CH_4 in 2017 (63.8 kt CO_2 eq), which is about 0.01 per cent of the national total CO_2 eq emissions for 2017 without LULUCF and is below the threshold stated in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that Italy complete the estimation of CH_4 emissions from pasture management practices of sheep, goats, horses, mules and asses for the entire reporting period and report the emissions, or if this is not possible, provide in the NIR a justification for the exclusion of these estimates in terms of the likely level of emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Completeness
A.12	3.B.4 Other livestock – CH_4	Italy did not estimate CH_4 emissions from ostrich manure management in CRF table 3.B(a). In response to a question raised by the ERT during the review week, the Party explained that although there are some ostrich farms in the country, GHG emissions from their manure management are not significant. Italy indicated that according to data collected by ISTAT, the ostrich population was 5,246 in 2010, 5,568 in 2013 and 3,159 in 2016. The Party provided a preliminary estimate of CH_4 emissions from ostrich manure management using the AD for 2010, 2013 and 2016 and the IPCC default EF (2006 IPCC Guidelines, vol. 4, table 10.A-9). The emissions amounted to 0.03	Yes. Completeness

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		kt CH_4 in 2010 and 0.02 kt CH_4 in 2016 (0.75 and 0.45 kt CO_2 eq, respectively), which is about 0.0001 per cent of the national total CO_2 eq emissions in 2010 and 2016 without LULUCF and is below the threshold stated in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT recommends that Italy provide in its NIR the calculation for CH_4 emissions from ostrich manure management as provided to the ERT during the review (i.e. using the AD for 2010, 2013 and 2016 and the default EF from the 2006 IPCC Guidelines, vol. 4, table 10.A-9) to justify the exclusion of these emissions as an insignificant source in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	
A.13	3.B.1 Cattle – N_2O	Italy used a constant Nex rate of 116 kg N/head/year for dairy cattle to estimate N_2O emissions from manure management for the entire time series. During the review week, Italy explained that the value was developed under the Nitrogen Balance Inter-regional Project (Research Center for Animal Production, 2006(a)), where data on the average daily dry matter intake of dairy cattle, the composition of feed ration, the protein content of milk and the N retained in the calf embryo were collected and used as the basis for evaluating the quantity of N consumed and N retained by dairy cattle for 2006. However, according to the results reported and evaluated under the enteric fermentation category, between 2006 and 2017, the value of gross energy intake by dairy cattle increased from 312.5 to 345.2 MJ/head/day, and the milk yield rose from 17.4 to 20.7 kg/head/day. The pregnancy rate fluctuated over the entire reporting period. The ERT therefore concluded that the changes in gross energy intake and performance parameters might lead to changes in the value of the Nex rate of dairy cattle over the entire reporting period. Moreover, the ERT concluded that changes in the Nex rate of dairy cattle could lead to changes in the amount of managed manure N available for application to agricultural soils and in the amount of manure N dropped during the grazing period of dairy cattle, which, in turn, might result in changes in direct and indirect N_2O emissions from manure management (3.B(b)) and direct and indirect N_2O emissions from agricultural soils (3.D) over the whole reporting period. During the review, the Party acknowledged these concerns raised by the ERT. The ERT recommends that Italy improve the consistency of its data on the performance parameters and feed rations used to estimate gross energy intake of dairy cattle under enteric fermentation of dairy cattle and the Nex rates for dairy cattle for the entire reporting period. The ERT believes that future ERTs should consider this issue further to ensure that this reporting inconsistency and any underestimations of direct or indirect N_2O emissions from manure management of dairy cattle or direct or indirect N_2O emissions from agricultural soils are resolved.	Yes. Accuracy
A.14	3.B.1 Cattle – N_2O	In table 5.21 of the NIR, Italy provided the Nex rates used for estimating N_2O emissions from manure management. The ERT noted that the Party listed the category "other dairy cattle" under the subcategory "non-dairy females aged two years and more". In addition, a footnote to the table specifies that the category covers "suckling cows and cows in late career". In response to a question raised by the ERT during the review week about the definition of "cows in late career", Italy clarified that the these are cows that have had their last lactation and are no longer productive (i.e. cows that are still lactating and are slaughtered when their lactation period ends). The ERT considers that referring to suckling cows as "other dairy cattle" is misleading. During the review, the Party acknowledged that the reporting of Nex rates for "suckling cows and cows in late career" under the "other dairy cattle" category is misleading. The ERT recommends that Italy revise the "other dairy cattle" subcategory title to "other non-dairy cattle", provide a definition for the subcategory "cows in late career" and justify why milk produced by cows in late career is not used for human consumption in commercial quantities.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
A.15	3.D.a Direct N_2O emissions from managed soils – N_2O	Italy reported significant inter-annual changes in AD on the amounts of sewage sludge and other organic fertilizers applied to agricultural soils: there was a remarkable increase in the amount of sewage sludge applied to agricultural soils between 2000 and 2001 (from 10,953,550 to 16,076,079 kg), and a significant increase in the amount of other organic fertilizers applied to agricultural soils between 2010 and 2011 (from 43,342,100 to 103,399,700 kg) followed by a sharp decrease in 2012 (50,933,900 kg). The NIR does not include any information that explains the drivers of these significant inter-annual changes. In response to a question raised by the ERT during the review week, Italy stated that AD on the amount of sludge applied to agricultural soils were collected by the Ministry of the Environment (which collects these AD at the regional level under the Council directive on sewage sludge (directive 86/278/EEC)), while AD on the amount of other organic fertilizers applied to agricultural soils were collected and processed by ISTAT through questionnaires given to Italian distribution companies. Moreover, Italy clarified that ISTAT verified the amount of other organic fertilizers applied to agricultural fields in 2011 and confirmed the anomalous trend for the amount of other organic fertilizers applied between 2011 and 2012. Nevertheless, the ERT concluded that the information provided by Italy does not clarify the reasons for significant inter-annual changes in AD. The ERT recommends that Italy investigate the drivers of the significant inter-annual changes in AD on the amounts of sewage sludge (between 2000 and 2001) and other organic fertilizers (between 2010 and 2011 and between 2011 and 2012) applied to agricultural soils and report this information in its next submission.	Yes. Transparency
A.16	3.D. Direct and indirect N_2O emissions from agricultural soils 3.F Field burning of agricultural residues – N_2O and CH_4	Italy used the amount of crop residues for estimating both N_2O emissions from crop residues returned to soils and CH_4 and N_2O emissions from field burning of agricultural residues, while the amount of crop residues used as bedding material was used for estimating N_2O emissions from animal manure applied to agricultural soils. The ERT noted that it is difficult to assess the total amount of crop residues produced over the entire reporting period and establish the shares of crop residues used for different purposes, namely crop residues used as bedding material (3.D.a.2.a), left on fields (3.D.a.4), burned on site (3.F) and burned off site (1.A, 5.C.2). During the review, Italy stated that the NIR (p.484) provides an example of how the total amount of wheat residues generated in 2017 were distributed among the above-mentioned categories in the NIR; however, the Party acknowledged the issue raised by the ERT. The ERT recommends that Italy enhance the transparency of its reporting on crop residues in the NIR by providing information on the total amount of crop residues generated and on the shares of crop residues used for different purposes (e.g. in tabular format or in a flow chart).	Yes. Transparency
A.17	3.D. Direct and indirect N_2O emissions from agricultural soils – N_2O	In table 5.26 of its NIR, Italy reported information on the amount of synthetic fertilizer distributed (t N/year) in 2017 sorted by fertilizer type, N content (%) and N amount (t N/year). The N content reported by the Party for some types of fertilizer does not correspond to the content calculated using the chemical formulas of fertilizers applied to soils, for example, ammonium sulfate ($(NH_4)_2SO_4$: 21.2 per cent compared with 17.9 per cent reported by the Party) and urea ($CO(NH_2)_2$: 46.7 per cent compared with 41.7 per cent reported by the Party). In response to a request for clarification raised by the ERT during the review week as to how the data on N content (%) were determined, Italy stated that information on the amount of fertilizer distributed (t/year) and the amount of N contained in the fertilizers (t N/year) was collected by ISTAT from annual questionnaires sent to fertilizer producers (an ISTAT questionnaire was provided for reference). The Party explained that the N content (%) of fertilizers depends on the formulation applied in the technological process. Moreover, in response to the draft	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		review report, Italy informed the ERT that it is necessary to consider the percentage of chemical elements in the different formulations; for example, national formulations of ternary fertilizers (NPK) may have more or less N than phosphorus or potassium. Given that ISTAT sums all the N contained in the ternaries, the N content (%) may be different from that calculated using the chemical formulas of the ternaries. The Party confirmed that the data on N content (%) reported in NIR table 5.26 are values calculated on the basis of the amount of fertilizer distributed and the N amount, and are not directly used in the estimations of N_2O emissions from inorganic fertilizers applied to soils because the estimates are based on the N amount data obtained from the annual questionnaires sent to fertilizer producers. The ERT recommends that Italy improve the transparency of the NIR by including information on how the N content (%) values reported in NIR table 5.26 are calculated (e.g. in a footnote to the table).	
LULUCF			
L.10	Land representation	While the total national land area is the same in CRF table 4.1 at 30,133.60 kha for most years in the time series, it changes in 2005 (30,130.63 kha), 2006 (30,153.97 kha) and 2007 (30,156.94 kha). These changes do not appear in table 6.3 or table 6.4 of the NIR and are not reflected in the total sum of land areas in CRF tables 4.A–4.F. In response to questions from the ERT, Italy acknowledged an error in the CRF table 4.1 updates to AD related to forest land remaining forest land for 2005, 2006 and 2007 and confirmed that this error would be corrected in the next annual submission. The ERT recommends that Italy correct the error in the reporting of the total national land area in the land transition matrix reported in CRF table 4.1, which is the result of an error made when updating the areas of forest land remaining forest land for 2005, 2006 and 2007.	Yes. Convention reporting adherence
L.11	4.A Forest land – CO_2	Annex 14, which was added to the NIR to provide a summary of the For-est Model (see ID# L.5 in table 3), contains a reference to “informal harvest” and an explanation that the time series was recalculated by applying a correction factor on a regional basis to the commercial harvested wood statistical data with a view to taking the informal harvest into account (see the note on p.581 of the NIR). In the NIR, the Party also explains that the correction factor was determined from the outcome of a 2005 NFI survey that included a regional assessment of the harvested biomass. In response to questions from the ERT on how these correction factors were determined, Italy provided information on the process: the correction factors were calculated for each region as the ratio of the harvested volumes from the 2005 NFI survey and the ISTAT official statistics. The ERT recommends that Italy include in annex 14 to the NIR a summary of the process used to determine the correction factors introduced to ensure that the informal harvest is accounted for in the CSC estimates for forest land, and a table or a graph similar to the ones presented to the ERT during the review showing how the correction factors are calculated by region.	Yes. Transparency
L.12	4.A Forest land – CO_2	In the unnumbered NIR table on carbon pools (section 6.2.4, p.241), Italy provided the threshold value of $\varnothing \leq 2$ mm for below-ground biomass and specified the threshold values for litter as $\varnothing \leq 2.5$ cm for fine woody debris and $\varnothing > 2$ mm for all other non-living biomass. The ERT considers that these threshold values may not be correct because fine roots less than 2 mm in diameter are usually hard to distinguish from soil organic matter or litter, which means that applying the values in the NIR might lead to double counting of emissions by sources or	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		removals by sinks for different carbon pools. In response to questions from the ERT on the validity of these threshold values, Italy acknowledged errors in the threshold values provided in the NIR and confirmed that the threshold used for below-ground biomass is ⌀ ≥ 2 mm and that the threshold for all other non-living biomass in litter is ⌀ < 2 mm. The ERT noted that the above-mentioned table has not been numbered in the NIR, making it difficult to reference (see ID# G.11 above). The ERT recommends that Italy correct the threshold values for below-ground biomass and for all other non-living biomass in litter contained in the table on carbon pools (NIR 2019, section 6.2.4, p.241) and encourages the Party to add the appropriate table number to the table.	
L.13	4.B.1 Cropland remaining cropland – CO_2	Italy explained in the NIR (p.250) that the soil organic matter of cropland mineral soils was reported as "NE" because no data were available on management practices in specific units of land. CSCs in this carbon pool were therefore reported as "NE" in CM under KP-LULUCF activities. However, this carbon pool was reported as "NO" in CRF table 4.B for cropland remaining cropland. Noting that the 2006 IPCC Guidelines (vol. 4) provide guidance on the tier 1 method (section 5.2.3.1), including the use of equation 2.25 (vol. 4, chap. 2) for estimating the change in soil organic carbon stocks in mineral soils, the ERT considers the absence of CSC reporting in cropland remaining cropland to be a completeness issue. During the review week, Italy presented the main outcomes of an ad-hoc project carried out in the past two years aiming to develop a country-specific estimation methodology that would enable the estimation process for CSCs related to the soils pool to take into account detailed information on implemented management practices. Preliminary estimates for CM, including the soils pool, were presented to the ERT, and the Party indicated it plans to report them in the next annual submission. The ERT commends Italy for its efforts to improve the inventory. The ERT recommends that Italy report estimates of CSC in mineral soils in cropland remaining cropland and in CM under KP-LULUCF activities made using the country-specific methodology it has recently developed.	Yes. Completeness
L.14	4.C.1 Grassland remaining grassland – CO_2	Italy explained in the NIR (p.254) that the soil organic matter of grassland mineral soils was reported as "NE" because no data were available on management practices in specific units of land. However, CSC values in this carbon pool were reported in GM under KP-LULUCF activities (category B.3), and in CRF table 4.C under grassland remaining grassland, mineral soils in grazing land were reported as "NO" and mineral soils in other wooded lands as "NA" on the basis of the tier 1 assumption that this carbon pool is not a net source. In response to questions from the ERT and in the presentations made by the Party during the review week, Italy described the main outcomes of an ad-hoc project (see ID# L.13 above) and preliminary estimates for GM, including the soils pool. The Party plans to report these estimates under KP-LULUCF activities as well as to apply the same method to the corresponding land-use category under the Convention and report the resulting estimates in the next annual submission. The ERT commends Italy for its efforts to improve the inventory. The ERT recommends that Italy, in its NIR, report the new estimates of CSC in mineral soils in grassland or report this carbon pool as "NA" if the assumption of steady state for the carbon stock provided for the tier 1 method in the 2006 IPCC Guidelines (vol. 4, section 6.2.3.1) can be justified.	Yes. Completeness
L.15	4(V) Biomass burning – CO_2, CH_4 and N_2O	Section 6.12 of the NIR documents the methodology used by Italy for estimating emissions from biomass burning on forest land, cropland and grassland. The AD used to come from two data sources: ISTAT for 1990–2007 and the National Forestry Service of the Ministry of Agriculture, Food and Forestry Policies for 2008–2017. Italy	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		explained in this section how the two data sources were combined, which involved subdividing the AD into three data sets: (1) time series from 2008 onward for 15 of Italy's regions; (2) time series from 2008 onward for the five autonomous regions; and (3) time series from 1990 to 2007 for all 20 Italian regions. For data set (3), Italy noted in the NIR (p.271) that the associated emissions from fires were estimated on the basis of the maximum average values of carbon released calculated for 2008–2016 per fire type and region. The ERT is of the view that using the maximum average values estimated for 2008–2016 to estimate emissions for the first period of the time series, 1990–2007, may lead to an overestimation of emissions in that period and may also create an artificial declining trend in emissions. During the review, Italy presented the estimation methodology in more detail and agreed with the ERT on the likely overestimation of emissions in the first period of the time series (see ID# KL.7 below). The ERT recommends that Italy revise the methodology used for estimating emissions from biomass burning by using the mean instead of the maximum average values calculated for 2008–2016 to estimate emissions for 1990–2007.	
L.16	4.G HWP – CO_2	Italy reported net CO_2 emissions from HWP in SWDS in the information item section of CRF table 4.Gs1, reporting only carbon losses because carbon gains are reported as "NO" for all years in the time series and using a half-life value of 3.89 years. The ERT did not find any documentation in the NIR of the method used for estimating these emissions or of the rationale for the half-life value used. Furthermore, CO_2 emissions in the memo item annual change in total long-term carbon storage in HWP waste in CRF table 5 (waste sector) were reported as "NO", which results in inconsistent reporting of emissions from HWP in SWDS between the LULUCF and waste sectors (see ID# W.11 below). During the review, Italy noted that the estimation method was based on the Kyoto Protocol Supplement (sections 2.8.1 and 2.8.2), treating HWP in SWDS and wood harvested for energy by applying the tier 1 "instantaneous oxidation" provision, and that the default Kyoto Protocol Supplement half-life values in chapter 2, table 2.8.2, were used for paper (two years) and wooden material (35 years), resulting in a calculated average value (from CRF Reporter) of 3.89 years, clarifying that the carbon inputs to SWDS are relative to wood disposed of after its life cycle only. The ERT considers that although these emissions were reported on a voluntary basis, the fact that Italy reported them without providing any documentation in either the NIR or the comments section of the relevant CRF table raises a transparency issue. The Party also noted that carbon inputs are not zero but were reported as "NO" to avoid reporting an artificial net sink in this pool. The ERT considers that reporting carbon inputs to SWDS does not cause a net sink as they have already been considered in the estimation of carbon losses and of the associated CO_2 emissions based on instantaneous oxidation. The ERT recommends that Italy document in the NIR the methodology used for estimating CO_2 emissions from SWDS reported in CRF table 4.Gs1 and the rationale for the reported half-life value of 3.89 years. Further, the ERT encourages the Party to report carbon input to SWDS or report it as "IE", noting that these values have already been considered in the estimation of carbon losses.	Yes. Transparency
Waste			
W.11	5. General (waste) – CO_2	Italy reported the annual change in total long-term carbon storage in HWP waste as "NO" under the memo items in CRF table 5, however, in CRF table 4.Gs1, the Party reported net CO_2 emissions from HWP in SWDS in 2017 as 2,681.15 kt CO_2. The ERT noted that this is not consistent. During the review, Italy explained that the same database was used for HWP for both the waste and the LULUCF sectors (see ID# L.16 above).	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT recommends that Italy ensure that the information on the annual change in total long-term carbon storage in HWP waste presented in CRF table 5 is consistent with the information reported under LULUCF in CRF table 4.Gs1.	
W.12	5.C.1 Waste incineration – CO_2	Following a recommendation made in the previous review report (see ID# W.8 in table 3), Italy recalculated the emissions from waste incineration and from category 1.A.4.a (other fossil fuel). However, the ERT noted that the values of carbon content for the time series and the reason for the changes in carbon content, fossil carbon fraction and oxidation factor are not provided in the NIR.	Yes. Transparency
		The ERT recommends that the Party improve the transparency of reporting on waste incineration by including the values of carbon content for the whole time series and the reason for the changes in carbon content, fossil carbon fraction and oxidation factor in order to facilitate the replication of the estimation. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CO_2 emissions from these categories.	
KP-LULUCF activities			
KL.5	General (KP-LULUCF activities) – CO_2, CH_4 and N_2O	Italy reported recalculations in CM of –191.57 kt CO_2 eq (an increase of net removals of 29.2 per cent) in 2016, which might be related to the recalculations applied to cropland under the Convention for the same year (see ID# L.1 in table 3) and further recalculations in GM for 2013–2016, ranging from +507.64 kt CO_2 eq (a decrease in net removals of 79.1 per cent) in 2013 to +672.23 kt CO_2 eq (a decrease in net removals of 95.2 per cent) in 2015. A small recalculation (an increase in net removals of 191.76 kt CO_2 eq (0.66 per cent)) was also applied to FM in 2016. No specific information on these recalculations was found in NIR chapters 8 or 9. In response to questions from the ERT about the drivers of these recalculations, Italy explained that the drivers of CM recalculations were basically the same as those described in the cropland category under the Convention given the AD and estimation process adopted for CM are the same.	Yes. Transparency
		Given the different temporal frameworks of Convention categories and KP-LULUCF activities and the rules applied by the Party in the areas subject to KP-LULUCF activities (NIR section 9.5.3), the ERT considers that recalculations for CM, GM and FM need to be documented in the NIR and therefore recommends that Italy clearly describe in the NIR the drivers of recalculations applied to KP-LULUCF activities.	
KL.6	CM – CO_2, CH_4 and N_2O	The inter-annual change in the CSC of perennial woody crops between 2015 (1,234.36 kt CO_2) and 2016 (32.36 kt CO_2) represents a 97.4 per cent decrease and is considered significant. During the review, Italy noted that this inter-annual change is due to the small inter-annual variation in the area of perennial woody crops in the same period (from 2,403.8 to 2,402.9 kha). This small change in area is the driver of the assessment of carbon losses associated with cropland activity area where perennial crops have been removed; in 2015, areas where perennial crops had been removed were estimated as 34 kha, while only 1 kha was estimated in 2016. The Party referred the ERT to NIR table 6.12, which reports the time series of areas with carbon losses.	Yes. Transparency
		The ERT noted a sudden drop of 1,051.53 kt CO_2 eq (a decrease of 49 per cent) in cropland emissions between 2015 and 2016, which is not clearly explained in the NIR. In response to questions from the ERT about the drivers of this decrease, Italy explained that the change in the values for 2015 and 2016 between the 2019 and 2018 submissions was triggered by ISTAT's update of the 2015 area of annual crops (to 6,415.95 kha in the 2019	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		submission from 6,419.19 kha in the 2018 submission) and its update of the 2016 area of woody crops (to 2,403.87 kha in the 2019 submission from 2,377.56 kha in the 2018 submission). The ERT considers that important changes in emission/removal trends such as this significant drop in cropland estimates between 2015 and 2016, which impacted the CM estimates under KP-LULUCF activities, need to be better explained in the NIR and recommends that the Party clearly document in the NIR any significant inter-annual changes in the area data and explain other drivers of significant changes in emission/removal trends in CM.	
KL.7	Biomass burning – CO_2, CH_4 and N_2O	The ERT found that the methodology documented in NIR section 6.12 for estimating emissions from biomass burning, which uses the maximum average values estimated for 2008–2016 for estimating emissions for the first period of the time series, 1990–2007, may lead to an overestimation of emissions in that period and may also create an artificial declining trend in emissions (see ID# L.15 above). During the review, Italy expressed concern about the possible impact of a recalculation of the time series of biomass burning estimates on the background level and margin values used to calculate its assigned amount for the second commitment period of the Kyoto Protocol. The ERT clarified that the background level and margin values to be applied to the provision of natural disturbances to FM and AR activities under KP-LULUCF activities have to be estimated and reported in each annual submission on the basis of the actual reported estimates and that these values were not included in the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Italy. The ERT noted that this was done by Italy in tables 9.12 and 9.16 of the NIR. The ERT recommends that Italy revise the methodology used for estimating emissions from biomass burning by using the mean instead of the maximum average values calculated for 2008–2016 for estimating emissions for 1990–2007. The ERT also recommends that Italy report in the NIR revised information on the calculation of the background level and the margin, including any recalculations made to them, to maintain methodological consistency with the reported emissions and the FMRL and revise accordingly the values reported in CRF tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3, where applicable.	Yes. KP reporting adherence

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines, or problems as defined in para. 69 of the Article 8 review guidelines.

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments to the 2019 annual submission of Italy.

VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

12. Italy has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable to the 2019 review.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2019 annual submission.

Annex I

Overview of greenhouse gas emissions and removals for Italy for submission year 2019 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Italy in its 2019 annual submission

1. Tables 1–4 provide an overview of total GHG emissions and removals as submitted by Italy.

Table 1
Total greenhouse gas emissions for Italy, base year[a]–2017
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions[b]*		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)[c]*	*KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–22 166.00
Base year	514 538.74	517 822.23	NA	NA	NA		–124.65	
1990	514 462.17	517 745.65	NA	NA				
1995	510 500.49	532 419.03	NA	NA				
2000	537 876.73	554 105.75	NA	NA				
2010	471 099.44	505 773.05	NA	NA				
2011	463 376.76	492 475.31	NA	NA				
2012	450 913.71	472 722.36	NA	NA				
2013	405 755.94	442 708.38	NA	NA		–5 830.08	263.01	–30 169.88
2014	388 780.10	426 211.75	NA	NA		–6 360.93	305.93	–31 129.58
2015	394 435.77	434 043.79	NA	NA		–6 820.91	315.93	–32 509.02
2016	395 561.04	432 119.01	NA	NA		–6 350.78	–1 004.71	–29 302.03
2017	409 328.96	427 707.85	NA	NA		–3 301.97	–849.70	–14 118.04

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases except NF_3, for which the base year is 1995. The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Italy. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

[b] The Party did not report indirect CO_2 emissions in CRF table 6.

[c] The value reported in this column refers to 1990.

[d] Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

Table 2
Greenhouse gas emissions by gas for Italy, excluding land use, land-use change and forestry, 1990–2017
(kt CO_2 eq)

	CO_2 [a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	439 639.71	48 262.93	26 083.81	444.00	2 906.86	NO, NA	408.35	NA, NO
1995	451 433.24	50 360.89	27 430.38	926.65	1 492.31	19.26	679.72	76.57
2000	470 293.76	50 765.19	28 444.59	2 476.87	1 488.50	19.26	604.31	13.26
2010	426 350.97	46 918.91	18 825.62	11 723.95	1 520.39	19.26	393.79	20.17
2011	413 944.23	45 486.83	18 289.88	12 604.67	1 661.28	19.26	441.36	27.78
2012	392 629.77	46 081.53	18 843.25	13 178.80	1 499.21	19.26	445.61	24.93
2013	364 089.13	44 682.27	18 011.33	13 753.40	1 705.41	19.26	421.88	25.70
2014	348 547.49	43 830.12	17 545.21	14 317.99	1 564.34	19.26	359.16	28.17
2015	355 784.64	43 800.50	17 547.05	14 703.35	1 688.33	19.26	472.25	28.42
2016	353 487.27	43 576.61	17 943.64	15 045.11	1 613.73	19.26	399.42	33.98
2017	348 991.36	43 852.32	17 796.11	15 294.12	1 313.68	19.26	417.49	23.50
Per cent change 1990–2017	**–20.6**	**–9.1**	**–31.8**	**3 344.6**	**–54.8**	**NA**	**2.2**	**NA**

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.
[a] Italy did not report indirect CO_2 emissions in CRF table 6.

Table 3
Greenhouse gas emissions by sector for Italy, 1990–2017
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	425 232.61	40 471.72	34 739.37	–3 283.49	17 301.95	NO
1995	439 357.66	38 367.51	34 700.64	–21 918.54	19 993.22	NO
2000	459 094.71	39 177.96	33 945.95	–16 229.02	21 887.13	NO
2010	418 614.60	36 747.51	30 012.21	–34 673.61	20 398.72	NO
2011	405 174.15	36 998.16	30 549.52	–29 098.54	19 753.49	NO
2012	387 593.14	34 194.03	31 082.44	–21 808.64	19 852.74	NO
2013	360 648.71	33 122.21	30 314.24	–36 952.44	18 623.23	NO
2014	345 174.97	32 645.95	29 923.24	–37 431.65	18 467.59	NO
2015	352 832.06	32 575.82	30 065.25	–39 608.02	18 570.67	NO

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2016	350 284.32	32 556.04	31 000.17	–36 557.97	18 278.48	NO
2017	345 851.74	32 826.57	30 780.40	–18 378.89	18 249.14	NO
Per cent change 1990–2017	**–18.7**	**–18.9**	**–11.4**	**459.7**	**5.5**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions; (2) The Party did not report emissions/removals in the sector other (sector 6); the corresponding cells in the CRF tables were blank; (3) Italy did not report indirect CO_2 emissions in CRF table 6.

Table 4

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2017, for Italy

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Activities under Article 3, paragraph 3, of the Kyoto Protocol*		*FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–22 166.00				
Technical correction				–1 680.06				
Base year	NA				–119.52	–5.13	NA	NA
2013		–7 841.80	2 011.72	–30 169.88	396.99	–133.98	NA	NA
2014		–8 383.66	2 022.73	–31 129.58	336.54	–30.61	NA	NA
2015		–8 854.38	2 033.48	–32 509.02	349.69	–33.75	NA	NA
2016		–8 394.44	2 043.66	–29 302.03	–847.89	–156.82	NA	NA
2017		–5 244.94	1 942.97	–14 118.04	–787.93	–61.77	NA	NA
Per cent change base year–2017					**559.2**	**1 104.7**	**NA**	**NA**

Note: Values in this table include emissions from land subject to natural disturbances, if applicable.

[a] The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Italy. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

[b] The value reported in this column refers to 1990.

2. Table 5 provides an overview of key relevant data from Italy's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 5
Key relevant data for Italy under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2019 annual submission

Key parameters	*Values*
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM: commitment period accounting (d) CM: commitment period accounting (e) GM: commitment period accounting (f) RV: not elected (g) WDR: not elected
Election of activities under Article 3, paragraph 4	CM, GM
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF	18 267.221 kt CO_2 eq (146 137.768 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	NA
2. Deforestation	NA
3. FM	NA
4. CM	NA
5. GM	NA
6. RV	NA
7. WDR	NA

Annex II

Information to be included in the compilation and accounting database

Tables 1–5 include the information to be included in the compilation and accounting database for Italy. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table 1
Information to be included in the compilation and accounting database for 2017, including on the commitment period reserve, for Italy
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CPR	2 169 262 279	–	–	2 169 262 279
Annex A emissions for 2017	–	–	–	–
CO_2[a]	348 991 359	–	–	348 991 359
CH_4	43 852 325	–	–	43 852 325
N_2O	17 796 108	–	–	17 796 108
HFCs	15 294 122	–	–	15 294 122
PFCs	1 313 677	–	–	1 313 677
Unspecified mix of HFCs and PFCs	19 264	–	–	19 264
SF_6	417 494	–	–	417 494
NF_3	23 500	–	–	23 500
Total Annex A sources	**427 707 847**	–	–	**427 707 847**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2017	–	–	–	–
AR	–5 244 941	–	–	–5 244 941
Deforestation	1 942 974	–	–	1 942 974
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2017	–	–	–	–
FM	–14 118 035	–	–	–14 118 035
CM	–787 934	–	–	–787 934
CM for the base year	–119 523	–	–	–119 523
GM	–61 771	–	–	–61 771
GM for the base year	–5 127	–	–	–5 127

[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Table 2
Information to be included in the compilation and accounting database for 2016 for Italy
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2016	–	–	–	–
CO_2[a]	353 487 267	–	–	353 487 267
CH_4	43 576 609	–	–	43 576 609
N_2O	17 943 640	–	–	17 943 640
HFCs	15 045 111	–	–	15 045 111
PFCs	1 613 725	–	–	1 613 725
Unspecified mix of HFCs and PFCs	19 264	–	–	19 264

	Original submission	*Revised estimate*	*Adjustment*	*Final*
SF_6	399 415	–	–	399 415
NF_3	33 979	–	–	33 979
Total Annex A sources	**432 119 011**	–	–	**432 119 011**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016	–	–	–	–
AR	–8 394 440	–	–	–8 394 440
Deforestation	2 043 660	–	–	2 043 660
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016	–	–	–	–
FM	–29 302 027	–	–	–29 302 027
CM	–847 888	–	–	–847 888
CM for the base year	–119 523	–	–	–119 523
GM	–156 820	–	–	–156 820
GM for the base year	–5 127	–	–	–5 127

[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Table 3
Information to be included in the compilation and accounting database for 2015 for Italy
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2015	–	–	–	–
CO_2[a]	355 784 637	–	–	355 784 637
CH_4	43 800 500	–	–	43 800 500
N_2O	17 547 051	–	–	17 547 051
HFCs	14 703 354	–	–	14 703 354
PFCs	1 688 326	–	–	1 688 326
Unspecified mix of HFCs and PFCs	19 264	–	–	19 264
SF_6	472 245	–	–	472 245
NF_3	28 417	–	–	28 417
Total Annex A sources	**434 043 793**	–	–	**434 043 793**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015	–	–	–	–
AR	–8 854 382	–	–	–8 854 382
Deforestation	2 033 477	–	–	2 033 477
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015	–	–	–	–
FM	–32 509 024	–	–	–32 509 024
CM	349 686	–	–	349 686
CM for the base year	–119 523	–	–	–119 523
GM	–33 751	–	–	–33 751
GM for the base year	–5 127	–	–	–5 127

[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Table 4
Information to be included in the compilation and accounting database for 2014 for Italy
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2014	–	–	–	–
CO_2[a]	348 547 488	–	–	348 547 488
CH_4	43 830 123	–	–	43 830 123

	Original submission	*Revised estimate*	*Adjustment*	*Final*
N_2O	17 545 208	–	–	17 545 208
HFCs	14 317 990	–	–	14 317 990
PFCs	1 564 344	–	–	1 564 344
Unspecified mix of HFCs and PFCs	19 264	–	–	19 264
SF_6	359 158	–	–	359 158
NF_3	28 175	–	–	28 175
Total Annex A sources	**426 211 750**	–	–	**426 211 750**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014	–	–	–	–
AR	–8 383 663	–	–	–8 383 663
Deforestation	2 022 730	–	–	2 022 730
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014	–	–	–	–
FM	–31 129 577	–	–	–31 129 577
CM	336 543	–	–	336 543
CM for the base year	–119 523	–	–	–119 523
GM	–30 611	–	–	–30 611
GM for the base year	–5 127	–	–	–5 127

[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Table 5
Information to be included in the compilation and accounting database for 2013 for Italy
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2013	–	–	–	–
CO_2[a]	364 089 125	–	–	364 089 125
CH_4	44 682 267	–	–	44 682 267
N_2O	18 011 332	–	–	18 011 332
HFCs	13 753 402	–	–	13 753 402
PFCs	1 705 414	–	–	1 705 414
Unspecified mix of HFCs and PFCs	19 264	–	–	19 264
SF_6	421 884	–	–	421 884
NF_3	25 696	–	–	25 696
Total Annex A sources	**442 708 383**	–	–	**442 708 383**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013	–	–	–	–
AR	–7 841 803	–	–	–7 841 803
Deforestation	2 011 719	–	–	2 011 719
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013	–	–	–	–
FM	–30 169 881	–	–	–30 169 881
CM	396 993	–	–	396 993
CM for the base year	–119 523	–	–	–119 523
GM	–133 980	–	–	–133 980
GM for the base year	–5 127	–	–	–5 127

[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Annex III

Additional information to support findings in table 2 in this report

Missing categories that may affect completeness

The categories for which methods are included in the 2006 IPCC Guidelines that were reported as "NE" or for which the ERT otherwise determined that there may be an issue with the completeness of reporting in the Party's inventory are the following:

(a) 4(V) biomass burning (4.E settlements) (CO_2, CH_4 and N_2O) (see ID# L.8 in table 3 in this report);

(b) 4.B.1 cropland remaining cropland (CO_2) (see ID# L.13 in table 5 in this report);

(c) 4.C.1 grassland remaining grassland (CO_2) (see ID# L.14 in table 5 in this report).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

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B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2013, 2014, 2015, 2016 and 2018 annual submissions of Italy contained in documents FCCC/ARR/2013/ITA, FCCC/ARR/2014/ITA, FCCC/ARR/2015/ITA, FCCC/ARR/2016/ITA and FCCC/ARR/2018/ITA, respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/sites/default/files/resource/AGI%202019.pdf.

Annual status report for Italy for 2019. Available at https://unfccc.int/sites/default/files/resource/asr2019_ITA.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Riccardo De Laureti (ISPRA), including additional material on the methodology and assumptions used. The following references are reproduced as received:

Institute for Environmental Protection and Research, ISPRA and Italian Institute for agricultural and agro-food market, ISMEA. 2016. *PROGRESS REPORT ON LULUCF ACTIONS UNDER ARTICLE 10(2) OF DECISION 529/2013/EU, ITALY*. Available at http://cdr.eionet.europa.eu/it/eu/mmr/lulucf/envwm_kbq.

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Force on Emission Inventories and Projections. Luxembourg City: EEA. Available at http://www.eea.europa.eu/publications/EMEPCORINAIR5/#parent-fieldname-title.

Ellis J. L., Kebreab E., Odongo N. E., McBride B. W., Okine E. K., France J., 2007. *Prediction of Methane Production from Dairy and Beef Cattle. Article in Journal of Dairy Science - August 2007*.

EMISIA, *COPERT Versions*, Available at https://www.emisia.com/utilities/copert/versions/.

European Environmental Agency, 2018, *Monitoring of CO2 emissions from passenger cars – Regulation (EC) No 443/2009*, Available at https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-14/.

Husted S., 1994. *Seasonal variation in methane emissions from stored slurry and solid manures*, J. Env. Qual. 23, pp. 585-592.

A questionnaire of ISTAT, Mod. ISTAT A.43 /18. *Rilevazione sulla distribuzione per uso agricolo dei fertilizzanti-anno 2017*.

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Tabacchi G., De Natale F., Di Cosmo L., Floris A., Gagliano C., Gasparini P., Genchi L., Scrinzi G., Tosi V., 2007. *Le stime di superficie 2005 – Parte 1. Inventario Nazionale delle Foreste e dei Serbatoi Forestali di Carbonio. MiPAF - Corpo Forestale dello Stato - Ispettorato Generale, CRA - ISAFA, TN.: 1-413, vers. 2*.

Tabacchi G., De Natale F., Gasperini P., 2010. *Coerenza ed entità delle statistiche forestali - Stime degli assorbimenti netti di carbonio nelle foreste italiane, Sherwood n.165/2010.*