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Climate Change

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Report on the individual review of the annual submission of Portugal submitted in 2018*

Note by the expert review team

Summary


Each Party included in Annex I to the Convention must submit an annual greenhouse gas inventory covering emissions and removals of greenhouse gas emissions 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 2018 annual submission of Portugal, 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 10 to 15 September 2018 in Lisbon, Portugal.

* In the symbol for this document, 2018 refers to the year in which the inventory was submitted, not to the year of publication.

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Abbreviations and acronyms

2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
AAU	assigned amount unit
AD	activity data
Annex A sources	source categories included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
ARR	annual review report
Article 8 review guidelines	“Guidelines for review under Article 8 of the Kyoto Protocol”
BCEF	biomass conversion and expansion factor
CER	certified emission reduction
CH ₄	methane
CM	cropland management
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CORINE	Coordinated Information on the Environment
COS	<i>Cartografia de Uso e Ocupação do Solo</i> [Land Cover and Use Map]
CP1	first commitment period
CP2	second commitment period
CPR	commitment period reserve
CRF	common reporting format
DE%	digestible energy expressed as a percentage of gross energy
DOC	degradable organic carbon
EF	emission factor
EMEP/EEA	European Monitoring and Evaluation Programme/European Environment Agency
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
FM	forest management
FMRL	forest management reference level
GDP	gross domestic product
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
IPPU	industrial processes and product use
JRC	Joint Research Centre
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
Kyoto Protocol Supplement	<i>2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol</i>
LKD	lime kiln dust
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MAI	mean annual increment

MCF	methane conversion factor
N ₂ O	nitrous oxide
NA	not applicable
ND	natural disturbances
NE	not estimated
NF ₃	nitrogen trifluoride
NFI	national forest inventory
NIR	national inventory report
NMVO	non-methane volatile organic compound
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
Revised 1996 IPCC Guidelines	<i>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i>
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF ₆	sulfur hexafluoride
SIAR	standard independent assessment report
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”
WDR	wetland drainage and rewetting
Wetlands Supplement	<i>2013 Supplement to the 2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories: Wetlands</i>

I. Introduction¹

1. This report covers the review of the 2018 annual submission of Portugal 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 10 to 15 September 2018 in Lisbon, and was coordinated by Mr. Peter Iversen and Mr. Roman Payo (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Portugal.

Table 1

Composition of the expert review team that conducted the review of Portugal

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Ms. Melissa Weitz	United States of America
Energy	Mr. Jongikhaya Witi	South Africa
IPPU	Ms. Alice Au	Canada
Agriculture	Mr. Leandro Buendia	Philippines
LULUCF	Mr. Iordanis Tzamtzis	Greece
Waste	Mr. Chart Chiemchaisri	Thailand
Lead reviewers	Ms. Weitz Mr. Witi	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2018 annual submission in accordance with the Article 8 review guidelines. The ERT notes that the individual inventory review of Portugal’s 2017 annual submission did not take place during 2017 owing to insufficient funding for the review process.

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

4. A draft version of this report was communicated to the Government of Portugal, 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 Portugal, including totals excluding and including the LULUCF sector, indirect CO₂ 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 gas, sector and activity for Portugal.

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, Portugal 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, paragraph 6, pending the entry into force of the Amendment.

² Issues are defined in decision 13/CP.20, annex, paragraph 81.

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

II. Summary and general assessment of the 2018 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 Portugal

<i>Assessment</i>	<i>Issue or problem ID#(s) in table 3 and/or 5^a</i>
Date of submission	Original submission: 12 April 2018 (NIR), 11 April 2018, version 1 (CRF tables), 12 April 2018 (SEF CP2-2017), 18 September 2018 (SEF CP1-2017) (SEF tables) Revised submission: 10 May 2018 (NIR), 7 May 2018, version 3 (CRF tables) Unless otherwise specified, the values from the latest submission are used in this report
Review format	In-country
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	1. Have any issues been identified in the following areas:
	(a) Identification of key categories
	(b) Selection and use of methodologies and assumptions
	(c) Development and selection of EFs
	(d) Collection and selection of AD
	(e) Reporting of recalculations
	(f) Reporting of a consistent time series
	(g) Reporting of uncertainties, including methodologies
	(h) QA/QC
	(i) Missing categories/completeness ^b
	(j) Application of corrections to the inventory
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?

<i>Assessment</i>		<i>Issue or problem ID#(s) in table 3 and/or 5^a</i>	
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	L.11
Supplementary information under the Kyoto Protocol	2. Have any issues been identified related to the national system:		
	(a) The 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	Yes	G.2, G.11
	3. 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	
	4. Have any issues been identified related to reporting of information on ERUs, CERs, AAUs 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 SIAR?	Yes	G.10
	5. 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.1
	6. Have any issues been identified related to the reporting of KP-LULUCF activities, as follows:		
	(a) Reporting requirements in decision 2/CMP.8, annex II, paragraphs 1–5	Yes	KL.21
(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14	Yes	KL.15, KL.16	
(c) Reporting requirements of decision 6/CMP.9	No		
(d) Country-specific information to support provisions for ND, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	Yes	KL.15	
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?	No	G.9
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	Portugal does not have a previously applied adjustment

<i>Assessment</i>		<i>Issue or problem ID#(s) in table 3 and/or 5^a</i>
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
Question of implementation	Did the ERT list a question of implementation?	No

^a The ERT identified additional issues and/or problems in all sectors and for KP-LULUCF activities that are not listed in this table but are included in table 3 and/or 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 5 September 2017.⁴ 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 2018 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 Portugal

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
General			
G.1	Article 3, paragraph 14, of the Kyoto Protocol (G.7, 2016) (G.7, 2015) (134, 2014) Transparency	Report any change(s) in the information provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1, annex, chapter I.H, and/or further relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.	Addressing. Portugal reported the same information regarding its reporting under Article 3, paragraph 14, of the Kyoto Protocol in both the 2017 and 2018 annual submissions. The NIR (chapter 15) includes information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. However, it does not indicate whether there are any changes compared with the information reported in the 2017 annual submission. During the review, the Party confirmed that there were no changes in the information provided under Article 3, paragraph 14, of the Kyoto Protocol.
G.2	Inventory management (G.6, 2016) (G.6, 2015) (18, 2014) (11, 2013) Transparency	Improve the archiving system by providing further descriptions of the record-keeping and archiving procedures.	Addressing. The NIR (pp.1-13 and 1-14) includes additional information not provided in the 2016 NIR, including where and how information is archived, and what information is archived (e.g. documentation on the compilation and calculation processes). However, the NIR does not include a full description of the record-keeping and archiving procedures (e.g.

⁴ FCCC/ARR/2016/PRT. The ERT notes that the individual inventory review of Portugal's 2017 annual submission did not take place during 2017. As a result, the latest previously published ARR reflects the findings of the review of the Party's 2016 annual submission.

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
			information on documentation related to QA/QC implementation, the uncertainty analysis or the key category analysis).
G.3	Key category analysis (G.5, 2016) (G.5, 2015) (16, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Identify key categories in accordance with the IPCC <i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i> , given that the Party failed to identify some non-LULUCF key categories.	Resolved. Portugal conducted its key category analysis using approaches 1 and 2 for both level and trend, with and without LULUCF, in line with the 2006 IPCC Guidelines (NIR, pp.K-1–K-7).
G.4	Key category analysis (G.10, 2016) (G.10, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Correct the calculation errors for LULUCF categories 4.A, 4.B and 4.C in the key category analysis.	Resolved. The errors regarding the key category analysis identified in the 2016 annual submission were corrected. Categories 4.A, 4.B and 4.C were included in the key category analysis and the following categories were identified as key: 4.A.1 forest land remaining forest land; 4.A.2 land converted to forest land; 4.B.1 cropland remaining cropland; 4.B.2 land converted to cropland; 4.C.1 grassland remaining grassland; and 4.C.2 land converted to grassland.
G.5	National system (G.11, 2016) (G.11, 2015) Transparency	Include a detailed description of the new legal framework and a table with the participating entities and their attributions in the NIR.	Resolved. The section in the NIR on the national system was improved (e.g. pp.1-8–1-10), and includes a more detailed description of the legal framework, as well as a figure (figure 1.3) that shows the main entities in the national system, their links and their roles.
G.6	QA/QC and verification (G.2, 2016) (G.2, 2015) (12, 2014) Transparency	Provide information on QC activities and the related results.	Addressing. Portugal made some improvements in its application and reporting of QA/QC activities, notably by providing category-specific information in the NIR on categories in the agriculture and waste sectors (e.g. pp.5-25, 5-56 and 5-77 regarding the agriculture sector and pp.7-18, 7-19, 7-30, 7-31, 7-52 and 7-53 regarding the waste sector). During the review, the Party explained that it was planning to implement these improvements across all sectors. (See ID# I.2 below.)
G.7	Uncertainty analysis (G.3, 2016) (G.3, 2015) (table 4, 2014) (table 4, 2013) Adherence to UNFCCC Annex I inventory reporting guidelines	Revise and update the uncertainty data for the AD and EFs.	Resolved. The 2016 annual submission did not include fluorinated gases in the uncertainty analysis. However, in its 2018 annual submission, Portugal expanded its uncertainty analysis to include fluorinated gases (NIR, p.L-9).
G.8	Uncertainty analysis (G.12, 2016) (G.12, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Correct the compilation errors for LULUCF categories 4.A, 4.B and 4.C and withdraw from the uncertainty analysis those categories not included in the national totals.	Resolved. The errors identified in the 2016 annual submission were corrected. The uncertainty analysis no longer includes CO ₂ emissions from bunker fuels and biomass and the values in the uncertainty analysis for LULUCF emissions/removals from categories 4.A, 4.B, and 4.C were identical to the values included in the CRF tables.

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
Energy			
E.1	Fuel combustion – reference approach – all fuels – CO ₂ (E.1, 2016) (E.1, 2015) (25, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Improve the consistency between the energy balance and the data available for large point sources in order to reduce the differences between the reference and sectoral approaches.	Not resolved. There are still significant differences in CO ₂ emissions between the reference and sectoral approaches. For example, fuel combustion CO ₂ emissions differ by 1.9 and 3.7 per cent for 2015 and 2016, respectively, and the differences according to type of fuel are significant (for 2015, the differences are 1.7, 5.1 and –9.4 per cent for liquid, solid and gaseous fuels, respectively; for 2016, the differences are 3.6, 7.1 and –9.1 per cent, respectively). During the review, the Party explained that the inconsistencies between these two data sets were caused by the data reported by facilities for the compilation of the energy balance. Portugal stated that the next energy balance would be corrected and that these corrections would impact the reference approach for the entire time series of reported emissions.
E.2	Fuel combustion – reference approach – all fuels – CO ₂ (E.2, 2016) (E.2, 2015) (25, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Improve the consistency in the split between domestic and international energy consumption for aviation and navigation in order to reduce the differences between the reference and sectoral approaches.	Resolved. The ERT noted that the differences between the reference and sectoral approach for international aviation bunkers had been reduced, the biggest difference being in 1990 (5 per cent). During the review, the Party explained that in the 2018 annual submission the issue of consistency between domestic and international aviation was resolved by adopting the Eurostat time series for 1990–2006, because for this period a different methodology was used to classify whether flights were domestic or international in the Portuguese energy balance. From 2007 onward, the percentage of jet fuel used for international aviation has been calculated on the basis of the origin and final destination of each flight.
E.3	Feedstocks, reductants and other non-energy use of fuels – liquid fuels – CO ₂ (E.5, 2016) (E.3, 2015) (28, 2014) (22, 2013) Transparency	Implement the planned revision and further development of the reporting of feedstocks and non-energy uses of fuels and explain transparently the estimates and the notation keys reported in CRF table 1.A(d).	Addressing. The ERT noted that Portugal still uses “NO” in CRF table 1.A(d) for CO ₂ emissions from a number of fuels used for non-energy purposes, such as the use of residual fuel oil and natural gas for the production of city gas and crude oil for the production of carbon black. The Party improved its reporting on non-energy uses of fuels for LPGs, naphtha and lubricants by specifying the amount of CO ₂ emissions related to non-energy use as well the category under which the emissions were reported. However, for some fuels such as other kerosene and diesel oil, CO ₂ emissions are still reported as “NO”.
E.4	Feedstocks, reductants and other non-energy use of fuels – gaseous fuels – CO ₂ (E.8, 2016) (E.8, 2015) (31, 2014) Transparency	Explain the method used to estimate CO ₂ emissions resulting from the use of natural gas for hydrogen production in one refinery.	Addressing. Portugal included a new section in the NIR (p.3-152) describing the methodology used to estimate CO ₂ emissions from the use of natural gas for hydrogen production in the only refinery producing hydrogen. However, the ERT noted that Portugal still uses “NO” in CRF table 1.A(d) for CO ₂ emissions from a number of fuels used for non-energy purposes, such as the use of natural gas in hydrogen production. During the review, Portugal explained that it had estimated fugitive emissions associated with hydrogen production for the first time in its 2018 annual submission. However, this value was mistakenly not included in CRF table 1.A(d). Portugal explained that

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
			it intends to include this estimate in CRF table 1.A(d) in the next annual submission.
E.5	Feedstocks, reductants and other non-energy use of fuels – gaseous, liquid and solid fuels – CO ₂ (E.22, 2016) (E.22, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Carry out QC checks for non-energy uses of fuels, as prescribed in the 2006 IPCC Guidelines (volume 3, chapter 1.4).	Not resolved. Portugal did not carry out or document any QC checks for non-energy uses of fuels in the NIR.
E.6	Feedstocks, reductants and other non-energy use of fuels – gaseous, liquid and solid fuels – CO ₂ (E.22, 2016) (E.22, 2015) Transparency	Provide information on non-energy uses of LPG, naphtha and natural gas and indicate the categories under which the related emissions, if any, have been included.	Addressing. Portugal reported the AD and CO ₂ emission values associated with non-energy uses of LPG and naphtha in CRF table 1.A(d), together with information on the categories under which these emissions were included. However, information on CO ₂ emissions from the non-energy use of natural gas was not reported.
E.7	1.A Fuel combustion – sectoral approach – other fuels – CO ₂ (E.10, 2016) (E.10, 2015) (35, 2014) Transparency	Move the methodological description for CO ₂ emissions from limestone used for desulfurization in the NIR from the energy sector to the industrial processes sector.	Resolved. This information is now contained in section 4.3.8 of the NIR (p.4-203).
E.8	1.A Fuel combustion – sectoral approach – all fuels – CO ₂ , CH ₄ and N ₂ O (E.23, 2016) (E.23, 2015) Transparency	Update the NIR to reflect that the methodologies and EFs from the 2006 IPCC Guidelines were used in the calculations.	Addressing. Portugal updated its use of EFs from the Revised 1996 IPCC Guidelines to the 2006 IPCC Guidelines. However, in some cases, the NIR continues to refer to the Revised 1996 IPCC Guidelines (e.g. table 3.71 and section 3.3.4.5.4).
E.9	1.A Fuel combustion – sectoral approach – all fuels – CO ₂ (E.24, 2016) (E.24, 2015) Transparency	Explain the use of oxidation factors when country-specific or plant-specific oxidation factors are used.	Addressing. In the majority of cases, the oxidation factors from the Revised 1996 IPCC Guidelines were updated to the value of 1 (complete oxidation), which was transparently documented in the NIR. However, the ERT noted that the Party still uses oxidation factors lower than 1 for iron and steel production (e.g. NIR, table 3.71, where oxidation factors from the Revised 1996 IPCC Guidelines are used) (see also ID# E.40 in table 5).
E.10	1.A.1 Energy industries – all fuels – CO ₂ (E.26, 2014) (E.26, 2015) Accuracy	Develop a country-specific CO ₂ EF for natural gas and provide further information on the reasons for not deriving country-specific CO ₂ EFs for other fuels (hard coal and fuel oil) that are identified as key.	Not resolved. Portugal continues to apply default CO ₂ EFs to natural gas, hard coal and fuel oil. Information justifying the use of default EFs was not provided in the NIR. During the review, the Party explained that it was not possible to develop a country-specific CO ₂ EF in time for it to be included in the 2018 annual submission.

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
E.11	1.A.1 Energy industries and 1.A.2 Manufacturing industries and construction – all fuels – CO ₂ , CH ₄ and N ₂ O (E.27, 2016) (E.27, 2015) Transparency	Include information on the consumption of fuels in non-public generation plants (auto-producers of energy) in the NIR, providing reasons for the variation in the trends in fuel consumption.	Resolved. Information on the trends in fuel consumption was included in the NIR (section 3.3.1.1.4.3, p.3-18) for non-public generation energy producers.
E.12	1.A.1.a Public electricity and heat production – biomass – CO ₂ , CH ₄ and N ₂ O (E.9, 2016) (E.9, 2015) (34, 2014) Accuracy	Analyse and consider in the emission estimates the humidity content of the incinerated waste to ensure that the corresponding emissions are not overestimated.	Resolved. Portugal used the methodology described in the 2006 IPCC Guidelines (volume 5, chapter 5). The Party used the default parameters for dry matter and total carbon content for different types of waste (NIR, p.7-24).
E.13	1.A.1.a Public electricity and heat production – other fossil fuels and biomass – CO ₂ (E.28, 2016) (E.28, 2015) Transparency	Provide a clear explanation of how the CO ₂ EF was obtained and the fuels taken into account in the waste incineration process.	Resolved. Portugal included in the NIR (table 7.10 and figure 7.10) information on the carbon content of each waste type, the fossil carbon content of each waste stream and the amount of waste incinerated (p.7-24).
E.14	1.A.1.b Petroleum refining – gaseous and liquid fuels – CO ₂ (E.11, 2016) (E.11, 2015) (36, 2014) Transparency	Include in the NIR the information provided during the review on the estimation of plant-specific CO ₂ EFs and AD for liquid and gaseous fuels combusted for energy purposes in the category petroleum refining.	Resolved. The Party included this information in section 3.3.1.2.3 of the NIR (p.3-25).
E.15	1.A.1.b Petroleum refining – liquid fuels – CO ₂ (E.29, 2016) (E.29, 2015) Accuracy	Include in the NIR information on the CO ₂ EF for petroleum refining used in the two existing plants prior to the start of the EU ETS and update the EF used for the closed refinery in line with the EF provided in the 2006 IPCC Guidelines.	Resolved. Portugal included information in the NIR (section 3.3.1.2.3) on the CO ₂ EF for petroleum refining. The NIR shows the EFs used before and after the start of the EU ETS (table 3.10). The values are in line with the default factors presented in the 2006 IPCC Guidelines.
E.16	1.A.1.c Manufacture of solid fuels and other energy industries – gaseous and liquid fuels – CO ₂ , CH ₄ and N ₂ O (E.14, 2016) (E.14, 2015) (41, 2014) Transparency	Improve the explanations as to how emissions of fuel gas, LPG, fuel oil, naphtha and natural gas used as feedstock in the production of city gas are estimated and allocated.	Not resolved. No additional information was provided in the NIR. During the review, the Party explained that it was not possible to provide further clarification regarding the consumption of feedstock in the production of city gas. The Party further explained that all consumption of oil products as feedstock is reported in a single category in the energy balance, therefore making it difficult to determine the quantities used in city gas production only. The ERT acknowledges the Party's response, but notes that this explanation was not included in the NIR.

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
E.17	1.A.1.c Manufacture of solid fuels and other energy industries – all fuels – CO ₂ (E.31, 2016) (E.31, 2015) Transparency	Include in the NIR a description of categories 1.A.1.c.i (manufacture of solid fuels) and 1.A.1.c.iii (other energy industries), including the methodology used for estimating emissions.	Resolved. Portugal added a new section to the NIR (section 3.3.1.3) to describe all subcategories under categories 1.A.1.c.i (manufacture of solid fuels) and 1.A.1.c.iii (other energy industries), including the methodologies used to estimate emissions.
E.18	1.A.2 Manufacturing industries and construction – gaseous, liquid and solid fuels – CO ₂ , CH ₄ and N ₂ O (E.15, 2016) (E.15, 2015) (42, 2014) Transparency	Explain and justify in the NIR the circumstances which led to the inclusion of emissions from fuel consumption in coal mining in category 1.A.2 (manufacturing industries and construction) under extractive industry instead of under category 1.A.1.c (manufacture of solid fuels and other energy industries).	Resolved. The relevant justification has been included in the NIR (section 3.3.2.2.1.2.15, p.3-66). In the NIR, Portugal explained that it was impossible to separate the consumption of these two categories because they are reported together in the energy balance.
E.19	1.A.2 Manufacturing industries and construction – gaseous fuels – CO ₂ (E.32, 2016) (E.32, 2015) Transparency	Report the correct CO ₂ EF used to estimate emissions for category 1.A.2.	Resolved. Portugal updated the CO ₂ EF for city gas on the basis of the recommendation made by the previous ERT. The Party reported transparently on the use of the updated CO ₂ EF (44.4 kg/GJ) in the NIR (section 3.3.2.3).
E.20	1.A.2 Manufacturing industries and construction – all fuels – CO ₂ , CH ₄ and N ₂ O (E.33, 2016) (E.33, 2015) Accuracy	Update the EFs in accordance with the 2006 IPCC Guidelines for category 1.A.2 and accurately reflect the EFs used in the NIR.	Addressing. The ERT noted that Portugal updated the CO ₂ EFs on the basis of the 2006 IPCC Guidelines in the calculations and in the NIR. However, for CO ₂ , Portugal still uses oxidation factors from the Revised 1996 IPCC Guidelines for natural gas, LPG and gas oil (NIR, table 3.70). The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
E.21	1.A.2.a Iron and steel – all fuels – CO ₂ , CH ₄ and N ₂ O (E.34, 2016) (E.34, 2015) Accuracy	Improve the description for this category by including information on the method used to calculate emissions from iron and steel production and revise the CO ₂ , CH ₄ and N ₂ O emission estimates by updating the EFs in accordance with the 2006 IPCC Guidelines for fuels for which Portugal still uses the Revised 1996 IPCC Guidelines.	Addressing. The Party performed recalculations for all fuels on the basis of the updated CO ₂ EFs in accordance with the 2006 IPCC Guidelines, with the exception of natural gas, gas oil and LPG. The CH ₄ and N ₂ O EFs were updated on the basis of the default EFs provided in the 2006 IPCC Guidelines (NIR, p.10-25). Portugal also explained in the NIR (p.10-7) that the section on the methodology used would be improved in its next annual submission. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
E.22	1.A.2.b Non-ferrous metals – all fuels – CO ₂ , CH ₄ and N ₂ O (E.35, 2016) (E.35, 2015) Transparency	Include the explanation for the use of “IE” for this category in the CRF tables, explaining that emissions from non-ferrous metals are reported under the category manufacturing of machinery (1.A.2.g.i).	Resolved. Portugal added an explanation for the use of “IE” for this category in CRF table 9. The Party explained that these emissions are reported under category 1.A.2.g.i (manufacturing of machinery), and that it is not possible to separate the data for non-ferrous metals from the data for metallurgy industries in the energy balance.

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E.23	1.A.2.c Chemicals – other fossil fuels – CO ₂ , CH ₄ and N ₂ O (E.36, 2016) (E.36, 2015) Transparency	Clarify in the NIR that other fossil fuels in CRF table 1.A(a) correspond to residual gas (tables 3.22 and 3.24 of the NIR) and where the flared amounts of residual gas and emissions are reported.	Addressing. Portugal continued to report the AD and emissions from other fossil fuels in CRF table 1.A(a)s2 (e.g. 4.27 TJ, 0.27 kt CO ₂ , 0.000004 kt CH ₄ and 0.00002 kt N ₂ O), but did not clearly demonstrate whether the residual gas reported in tables 3.24 and 3.26 of the NIR (formerly tables 3.22 and 3.24) corresponded to those reported emissions. Portugal included an explanation in the NIR (p.3-24) for the allocation of fugitive emissions occurring in flares from chemical industry. During the review, Portugal also showed that combustion emissions related to this activity are reported in category 1.A.2.c, but fugitive emissions are reported in category 1.B.2.c, in line with the 2006 IPCC Guidelines (volume 2, chapter 1). The ERT also noted that Portugal did not include in the NIR a correspondence table between the IPCC allocation of fuels and the Party's allocation of fuels, as was encouraged by the previous ERT.
E.24	1.A.2.f Non-metallic minerals – all fuels – CO ₂ and CH ₄ (E.37, 2016) (E.37, 2015) Comparability	Report emissions from non-energy uses of coal and coke consumed as additives (to produce coloured glass) in CRF table 2.A.3 instead of in CRF table 1.A.2.f.	Resolved. During the review, the Party explained that to start estimating the non-energy use of coal and coke consumed as additives (to produce coloured glass) in CRF table 2.A.3 instead of in CRF table 1.A.2.f, it needs to restructure its compilation method because it receives EU ETS data from each plant, and for Portuguese glass plants under the EU ETS these emissions are estimated based on a fuel consumption methodology (using coal consumption, a low heating value and an EF). Noting the Party's response, and the fact that the non-energy use of fuels is not specifically mentioned in the 2006 IPCC Guidelines for glass production, the ERT considers this issue resolved.
E.25	1.A.2.f Non-metallic minerals – all fuels – CO ₂ , CH ₄ and N ₂ O (E.37, 2016) (E.37, 2015) Transparency	Include explanations for the introduction of industrial waste and the rate of biogenic and fossil fuel use in the NIR.	Not resolved. Portugal did not include an explanation in the NIR for the introduction of industrial waste and the rate of biogenic and fossil fuel use.
E.26	1.A.3.a Domestic aviation – liquid fuels – CO ₂ , CH ₄ and N ₂ O (E.38, 2016) (E.38, 2015) Transparency	Update the NIR with the correct AD for consumption of jet kerosene at airports in the Azores and Madeira for 1990.	Resolved. Portugal updated the NIR (section 3.2.1, p.3-5) to provide the correct AD for the consumption of jet kerosene at airports in the Azores and Madeira for 1990.
E.27	1.A.3.b Road transportation – liquid fuels – CO ₂ (E.16, 2016) (E.16, 2015) (44, 2014) Accuracy	Continue with the efforts to develop country-specific CO ₂ EFs for gasoline and diesel oil, and investigate the possibility of obtaining a country-specific CO ₂ EF for gasoline and diesel oil reported under the EU ETS.	Not resolved. During the review, the Party explained that, despite numerous efforts, it had not been able to develop country-specific CO ₂ EFs for gasoline and diesel oil. However, attempts have been made to obtain information from Portuguese refineries on EFs for diesel oil and gasoline produced locally, but so far that information is not available.
E.28	1.A.3.b Road transportation – liquid fuels – CO ₂ ,	Include a detailed explanation of the fuel consumption for road	Resolved. Portugal added the explanation to the NIR (section 3.3.3.2).

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	CH ₄ and N ₂ O (E.39, 2016) (E.39, 2015) Transparency	transportation, including how the use of biofuels is considered.	
E.29	1.A.3.d Domestic navigation – liquid fuels – CO ₂ , CH ₄ and N ₂ O (E.40, 2016) (E.40, 2015) Transparency	Include in the NIR information on how the gross tonnage for each ship type is calculated and a description of the methodology for estimating emissions from domestic navigation.	Resolved. Portugal included this information in the NIR (section 3.3.3.4, p.3-113) (see ID# E.43 in table 5).
E.30	1.A.3.e. Other transportation – gaseous, liquid and solid fuels – CO ₂ , CH ₄ and N ₂ O (E.21, 2016) (E.21, 2015) (49, 2014) Comparability	Explain in the NIR and in CRF table 1.A(a) where emissions from the combustion of fuels used for supporting pipeline transportation activities are allocated.	Resolved. In the NIR (section 3.3.3.5.1), Portugal explained that all pipeline transportation activities (category 1.A.3.e.i) are powered by electricity; therefore, there are no direct emissions from this activity (the activity is correctly reported as “NO” in CRF table 1.A(a)s3).
E.31	1.A.3.e.ii Other (other transportation) – gaseous, liquid and solid fuels – CO ₂ , CH ₄ and N ₂ O (E.21, 2016) (E.21, 2015) (49, 2014) Comparability	Report the AD and emissions from ground activities at airports under the other transportation category, explain what type of consumption is included under the item “Serviços” in the energy balance and report the fuel consumption and the associated emission estimates under the appropriate category.	Addressing. In the NIR (section 3.3.3.5.1), Portugal explained that fuel consumption for ground activities at airports (which should be reported under category 1.A.3.e.ii) is still reported under the commercial/institutional category (category 1.A.4.a) because the energy balance allocates those activities under the item “Serviços” (emissions from category 1.A.3.e.ii are still reported as “IE” in CRF table 1.A(a)s3).
E.32	1.A.4.b Residential – liquid fuels – CH ₄ and N ₂ O (E.41, 2016) (E.41, 2015) Accuracy	Revise the CH ₄ and N ₂ O estimates for liquid fuels for category 1.A.4.b by correcting the CH ₄ and N ₂ O EF for LPG.	Resolved. Portugal revised the CH ₄ and N ₂ O emission estimates for liquid fuels in category 1.A.4.b and explained the revision in the NIR (section 3.3.4.2.4, p.3-123).
E.33	1.B.1.a Coal mining and handling – solid fuels – CO ₂ and CH ₄ (E.42, 2016) (E.42, 2015) Accuracy	Report the correct AD in figure 3.82 of the NIR and apply the EFs from the 2006 IPCC Guidelines.	Resolved. Portugal updated the NIR (figure 3.85). Regarding the EFs, the Party used the default EFs from the 2006 IPCC Guidelines as per CRF table 1.B.1.
E.34	1.B.1.a Coal mining and handling – solid fuels – CH ₄ (E.43, 2016) (E.43, 2015) Accuracy	Clarify whether any coal mines were abandoned in Portugal between 1901 and 1993 and provide information accordingly in the NIR.	Addressing. Portugal clarified that no mines ceased operations in 1990–1992, one mine ceased operations in 1993 and another ceased operations in 1995 (NIR p.3-139). However, the NIR does not include any information on mines that ceased operations between 1901 and 1993. During the review, the Party stated that it would address the issue in the 2019 annual submission. The ERT believes that future ERTs should consider this issue further to ensure that emissions from this category are not underestimated.
E.35	1.B.2.a Oil – liquid fuels – CO ₂	Include in the NIR the information provided during the	Resolved. The associated information in the NIR (section 3.3.1.2) was revised to increase the

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	(E.19, 2016) (E.19, 2015) (47, 2014) Transparency	review on how Portugal ensures that some fugitive CO ₂ emissions from oil refineries are not double counted or omitted.	transparency of the AD considered in the estimate. The information provided during the review of the 2014 annual submission, specifically that the use of EU ETS data allowed fuel combustion emissions to be separated from fuel consumption in other units, was provided in the NIR (p.3-25).
E.36	1.B.2.a Oil – liquid fuels – CO ₂ (E.44, 2016) (E.44, 2015) Completeness	Calculate and report CO ₂ emissions from oil transport using either the default CO ₂ EF from the 2006 IPCC Guidelines or any country-specific EF available, and, where a disproportionate amount of effort is required to collect the necessary data, provide a justification for excluding the emissions in terms of the likely level of emissions.	Resolved. Portugal estimated and reported CO ₂ emissions from oil transport for the entire time series. For example, Portugal reported 0.000008 kt CO ₂ eq for 2016 in CRF table 1.B.2.
E.37	1.B.2.b Natural gas – gaseous fuels – CO ₂ and CH ₄ (E.45, 2016) (E.45, 2015) Accuracy	Review the methodology used to estimate CO ₂ and CH ₄ fugitive emissions from natural gas in order to avoid an overestimation of emissions; apply the methods in accordance with the 2006 IPCC Guidelines; and explain the methodology used in the NIR.	Resolved. Portugal updated the methodology used for the estimation of fugitive CO ₂ and CH ₄ emissions from the transport and distribution of natural gas. The updates are explained in section 3.3.6.3.2 of the NIR. The ERT notes that the method is in accordance with the 2006 IPCC Guidelines.
E.38	1.B.2.d Other (oil, natural gas and other emissions from energy production) – CO ₂ (E.46, 2016) (E.46, 2015) Transparency	Provide detailed information on the flows and operating regimes for geothermal energy production, and on how the CO ₂ EFs are derived.	Not resolved. Portugal explained in the NIR (p.10-10) that even though it has received information on the operating regimes of geothermal energy production plants, it was not possible to include this information in the 2018 annual submission. During the review, the Party explained that information on the operating regimes of geothermal plants was used to derive the CO ₂ EFs.

IPPU

I.1	2. General (IPPU) (I.1, 2016) (I.1, 2015) (53, 2014) Transparency	Improve the transparency of the information on how the consistency of the time series is ensured for subcategories for which EU ETS data are used only for some years in 1990–2012.	Addressing. For some IPPU categories the EU ETS is used as a source of AD for some years, while other data sources are used for other years (e.g. for cement production, data are collected directly from plants; and for lime production, data are gathered from dedicated plants by the National Statistics Institute using the annual survey on industrial production). The ERT noted that efforts were made to ensure consistency in the time series, for example for lime production by updating the AD through backcasting (see ID# I.4 below). However, in the 2018 NIR, similarly to the 2016 NIR, Portugal did not indicate how time-series consistency is checked and ensured for cases where different data sources are used.
I.2	2. General (IPPU) (I.2, 2016) (I.2, 2015) (54, 2014)	Include information in the NIR on specific QA/QC activities for industrial processes, for example for limestone and dolomite use and for glass production (reported under other mineral products), for	Not resolved. The Party did not include information in the NIR on specific QA/QC activities, except for cement production. During the review, the Party explained that it would address this issue in future submissions.

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	(39, 2013) Transparency	which this information is not currently included.	
I.3	2. General (IPPU) – indirect CO ₂ (I.10, 2016) (I.10, 2015) Accuracy	Report the correct values of indirect CO ₂ emissions in CRF table 6 (CO ₂ emissions from category 2.B.10.d (solvent use in plastic products manufacturing) were incorrectly considered as direct CO ₂ emissions).	Addressing. The Party updated its indirect CO ₂ emissions in CRF table 6 and reported “NO” for category 2.B.10.d (solvent use in plastic products manufacturing) in CRF table 2(I)A.Hs2 in the 2018 annual submission. For 2014, the Party reported 41.68 kt of indirect CO ₂ emissions from IPPU in CRF table 6. However, the ERT noted that that value is different from the value of 67.6 kt CO ₂ eq that the Party confirmed to be correct during the previous review. During the review, the Party explained that it would verify the values used in CRF table 6 to ensure accuracy, and make any necessary corrections.
I.4	2.A.2 Lime production – CO ₂ (I.4, 2016) (I.4, 2015) (57, 2014) (41, 2013) Consistency	Ensure the consistency of the entire time series in order to avoid differences in the IEF between 1990–2004 (and 2005) and 2006 onward.	Resolved. The Party updated the AD for the entire time series to address the issue regarding differences in the IEF. However, following the update of the AD, variations in the IEF now occur in a different period of the time series (see ID# I.38 in table 5).
I.5	2.A.2 Lime production – CO ₂ (I.12, 2016) (I.12, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Update the NIR and the CRF tables with the correct AD (calcium carbonate consumption) for dedicated plants.	Resolved. The Party updated its AD for the whole time series for this category. The AD used for dedicated plants are raw material consumption data from the EU ETS (for 2005 onward) and production data from the National Statistics Institute annual survey on industrial production (for 1990–2004), which are then used to estimate raw material consumption for 1990–2004. AD are presented in the NIR (section 4.3.3.4).
I.6	2.A.2 Lime production – CO ₂ (I.13, 2016) (I.13, 2015) Accuracy	Apply the correction for LKD and for hydrated lime in the lime used in iron and steel plants.	Not resolved. The Party has not yet applied the correction for LKD. Given that the Party has been obtaining lime production data directly from plant operators since 2010, the ERT asked whether the Party had attempted to request data on LKD from the plant operators. The Party explained that the current assumption is that LKD equals zero, but that efforts would be made to obtain reliable data for LKD and include this information in the next annual submission. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
I.7	2.A.2 Lime production – CO ₂ (I.14, 2016) (I.14, 2015) Completeness	Investigate whether lime production in sugar mills and artisanal production of lime for sanitation purposes or for whitewash are potential activities and, in cases where such activities are present, provide estimates of CO ₂ emissions.	Addressing. Explanations were provided in the NIR (sections 4.3.3.1 and 4.3.3.4.3). In the NIR, Portugal explained that the artisanal production of lime for sanitation purposes or for whitewash no longer exists. In 1997 six or seven traditional kilns were still in operation in the south of the country. Those kilns were intermittent ovens which were unprofitable. In 2007, only two existed, which have since ceased operations. The NIR explains that these emission sources are considered to be irrelevant/negligible. However, the ERT noted that the Party did not provide justification for excluding those sources in terms of the likely level of emissions (UNFCCC Annex I inventory reporting guidelines, para. 37(b)).

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I.8	2.A.2 Lime production – CO ₂ (I.15, 2016) (I.15, 2015) Transparency	Improve the description of the method used (i.e. how the correction of the AD was made, how the data provided by the facilities were collected and what types of data (e.g. kiln type, lime production, LKD, lime humidity) were collected from the facilities) in the NIR.	Not resolved. The 2018 NIR does not include any new information compared with the 2016 NIR.
I.9	2.A.2 Lime production – CO ₂ (I.16, 2016) (I.16, 2015) Consistency	Use an approach that is in line with the 2006 IPCC Guidelines (e.g. use additional years) for backcasting the AD.	Not resolved. The Party has not revised its backcasting method. The current ERT, similarly to the previous ERT, believes that using the value from a single year for backcasting will introduce a bias in the estimation of the AD and, as a result, is not in accordance with the 2006 IPCC Guidelines. During the review, the Party explained that it uses data for a year or a given period of time for the backcasting because it believes such data are representative of the sector or circumstances. The ERT considers that the Party could provide evidence in the NIR, such as expert opinions or results of analyses conducted, that demonstrates that such an assumption is in accordance with the 2006 IPCC Guidelines.
I.10	2.A.2 Lime production – CO ₂ (I.17, 2016) (I.17, 2015) Consistency	Assess the methodology used for the extrapolation of AD for 1995–2001 using different surrogate data and present the results; and use a forecasting method in accordance with the 2006 IPCC Guidelines.	Not resolved. The Party has not revised the methodology used for the extrapolation of AD for 1995–2001. During the review, the Party explained that it uses data for a year or a given period of time for the backcasting because it believes that such data are representative of the sector or circumstances. The ERT considers that the Party could provide evidence in the NIR, such as expert opinions, research findings or results of analyses conducted, to demonstrate that the extrapolation is in accordance with the 2006 IPCC Guidelines.
I.11	2.A.2 Lime production – CO ₂ (I.18, 2016) (I.18, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Report the correct unit for the carbon content of raw material in the NIR.	Resolved. The ratio of 44/12 (CO ₂ to carbon) was removed from the equation in section 4.3.3.2.2 of the NIR to address the issue raised in the previous review. See ID #I.39 in table 5.
I.12	2.A.3 Glass production – CO ₂ (I.11, 2016) (I.11, 2015) Completeness	Include the emission estimates for CO ₂ emissions from rock wool production (under category 2.A.3 – glass production). If emissions do not occur, use the appropriate notation key (“NO”) in the CRF tables together with an explanation in the NIR for this assessment. If the emissions from any of these categories are judged as insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, use the	Addressing. In the 2016 NIR (section 4.3.5.1), Portugal explained that two plants produce rock wool but that the associated emissions had not been estimated. The 2018 NIR does not include any information on rock wool production. During the review, the ERT asked the Party about CO ₂ emissions from rock wool production. Portugal explained that AD (for the two plants that produce rock wool) are only available for the years after 2005. The Party also explained that the plants use basalt as a raw material. Also, on the basis of the available data (which were also provided to the ERT), Portugal concludes that this source is below the threshold of significance (the level of emissions estimated by the Party during the review

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		appropriate notation key (“NE”) in the CRF tables, providing a qualitative and quantitative justification in the NIR.	<p>is between 2.2 and 4.4 kt CO₂ eq for 2005–2016). Portugal intends to report these emissions in the future, but would first prefer to have a complete time series to ensure consistency in the emission trend for category 2.A.3. Portugal also intends to report on progress made in the next NIR.</p> <p>The ERT agrees that this underestimation is below the threshold for initiating an adjustment procedure in accordance with paragraph 80(b) of the annex to decision 22/CMP.1 and therefore this issue was not included in the list of potential problems and further questions raised by the ERT. The ERT notes that any emissions from rock wool are to be reported under subcategory 2.A.5 (not 2.A.3), in accordance with the 2006 IPCC Guidelines (volume 3, chapter 2, p.2.27). However, since the CRF tables do not include category 2.A.5, the ERT suggests that Portugal include emissions from rock wool under category 2.A.3 and explain this allocation/inclusion of emissions in the “Party comment” box under category 2.A.3. Preliminary research by the ERT during the review seems to indicate that pure basalt contains no or very low amounts of carbonates and that the production process may not involve a chemical reaction, only physical processes. The ERT invites Portugal to contact the two plants and investigate the composition of the raw materials used and the production process to assess whether any non-energy CO₂ is emitted during the production of rock wool (and, if so, how much).</p>
I.13	2.A.3 Glass production – CO ₂ (I.19, 2016) (I.19, 2015) Transparency	Describe in the NIR the detailed methodology and assumption considered in the CO ₂ emission estimates of glass production.	Addressing. The Party included in the NIR (p.4-191) an equation for the estimation of carbonate use (i.e. the AD used in the estimation of CO ₂ emissions) for 1990–2004. Portugal also added new information on the estimation of CO ₂ emissions from crystal glass production (p.4-192). However, the Party has not yet included details on the assumption made (i.e. why 2005 was chosen as the reference year to estimate consumption for 1990–2004).
I.14	2.A.3 Glass production – CO ₂ (I.20, 2016) (I.20, 2015) Transparency	Explain the methodology, assumptions, AD and EF used in the CO ₂ estimations.	Resolved. Relevant information was provided in NIR chapter 4.3.4. With regard to the assumptions made, see ID# I.13 above.
I.15	2.A.3 Glass production – CO ₂ (I.21, 2016) (I.21, 2015) Transparency	Clarify the assumptions used for the AD and EFs for this category and include an explanation as to how the cullet ratio for the manufacture of glass was considered in the emission calculations throughout the time series.	Resolved. In the NIR (section 4.3.4.4), Portugal explained that cullet incorporation (i.e. recycled glass) is not directly included in the estimates because it does not result in process emissions. However, the increase in cullet incorporation in glass production leads to a decrease in the consumption of other raw materials, as observed in 2010 and 2011.
I.16	2.A.4 Other process uses of carbonates – CO ₂ (I.22, 2016) (I.22, 2015) Consistency	Increase the consistency of the time series and revise the methodology applied by revising the energy values for biomass (e.g. using a greater number of years as the basis for the	Resolved. Biomass consumption values were corrected for 1990–2010. The methodologies used for 1990–2014 and for 2015 onward are explained separately in the NIR (section 4.3.5.2, p.4-196 and p.4.197, respectively). However, after the corrections, emissions from category 2.A.4.a (other process uses of

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		adjustment; using plant-specific data; or choosing another approach based on the quantities of raw material consumption and the IEF); and provide a justification in the NIR for the methodology applied to estimate emissions.	carbonates, ceramics) are lower in the 2018 NIR compared with the 2016 NIR (see ID# 1.40 in table 5).
I.17	2.A.4 Other process uses of carbonates – CO ₂ (I.23, 2016) (I.23, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Apply the correct unit for the carbon content of raw material in table 4.11 of the NIR.	Resolved. The ratio of 44/12 (CO ₂ to carbon) was removed from the equation in section 4.3.5.2 of the NIR.
I.18	2.B.1 Ammonia production – CO ₂ (I.24, 2016) (I.24, 2015) Accuracy	Review the methodology used, given that estimating CO ₂ emissions based only on feedstock consumption is not in line with the 2006 IPCC Guidelines.	Not resolved. The ERT noted from the NIR (section 4.4.1.1, p.4-207) that ammonia production occurred between 1990 and 2009, and that this issue is noted as “implemented” in section 10 of the NIR. However, the equations in section 4.4.1.2 of the NIR show that the emissions are still based on feedstock consumption only (not the total fuel requirement). During the review, the Party explained that it does not possess data on fuel requirements in ammonia production but that facilities will be contacted in order to address this issue in future submissions.
I.19	2.B.1 Ammonia production – CO ₂ (I.25, 2016) (I.25, 2015) Transparency	Update the description of the methodology to estimate CO ₂ emissions (especially how the CO ₂ emissions recovered for use in urea production were subtracted from the CO ₂ emissions from feedstock consumption) in the NIR.	Resolved. The Party included in the NIR (section 4.4.1.2) explanations for the subtraction of CO ₂ emissions recovered for use in urea production from CO ₂ emissions from feedstock use during ammonia production.
I.20	2.B.2 Nitric acid production – N ₂ O (I.26, 2016) (I.26, 2015) Transparency	Include information on the assumptions for the AD and EFs and on how the facilities monitor emissions in the NIR.	Not resolved. The Party has not reported any new information in the 2018 NIR compared with the 2016 NIR.
I.21	2.B.8 Petrochemical and carbon black production – CO ₂ (I.27, 2016) (I.27, 2015) Transparency	Update the description of how these emissions are estimated in the NIR.	Resolved. In the NIR (section 4.4.9.2), Portugal explained the method used, which is based on EFs. In section 4.4.9.3, the Party further explained that it is not possible to present the EFs owing to confidentiality constraints because there is only one ethylene production plant in Portugal.
I.22	2.B.8 Petrochemical and carbon black production – CO ₂ and CH ₄ (I.28, 2016) (I.28, 2015) Transparency	Update the description of these emission estimates in the NIR.	Resolved. The Party reported CH ₄ and CO ₂ emissions from vinyl chloride monomer production and explained the method, EFs and AD used in the NIR (sections 4.4.10.2, 4.4.10.3 and 4.4.10.4, pp.4-216–4-218) (see ID# I.42 in table 5).

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I.23	2.B.8 Petrochemical and carbon black production – CO ₂ and CH ₄ (I.29, 2016) (I.29, 2015) Comparability	Correct the CO ₂ value reported in CRF table 2(I).A-Hs1, reporting “NO” if the activity does not occur; check the values of CH ₄ and NMVOC emissions for 2014; and explain in the NIR that carbon black production ceased before 2014.	Resolved. The Party reported CO ₂ emissions from carbon black production as “NO” in CRF table 2(I).A-Hs1 for 2014 onward (as the plant had ceased operations) and included information in the NIR (section 4.4.13.4) explaining that carbon black production ceased before 2014. CH ₄ emissions were also reported as “NO” from 2014 onward.
I.24	2.B.10 Other (chemical industry) – CO ₂ (I.30, 2016) (I.30, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Update the NIR in accordance with the values reported in the CRF tables by providing a transparent explanation of the methodology used for the direct and indirect CO ₂ emission estimates from solvent use in plastic products manufacturing.	Resolved. The Party used “NO” to report AD and direct CO ₂ , CH ₄ and N ₂ O emissions in CRF table 2(I).A-Hs1. The NIR (p.4-221) indicates that there are no direct CO ₂ , CH ₄ or N ₂ O emissions but that there are indirect CO ₂ emissions related to NMVOCs. See ID# I.44 in table 5. The ERT notes that, even if no explanations of the method used to estimate indirect CO ₂ emissions are provided, the UNFCCC Annex I inventory reporting guidelines, paragraph 29, indicate that Parties should, but do not have to, provide information on NMVOCs.
I.25	2.B.10 Other (chemical industry) – CO ₂ , CH ₄ and N ₂ O (I.11, 2016) (I.11, 2015) Completeness	Include the emission estimates for CO ₂ , CH ₄ and N ₂ O emissions from ammonium sulfate production (under category 2.B.10.b).	Resolved. For direct CO ₂ , CH ₄ and N ₂ O emissions from ammonium sulfate production, Portugal reported the AD as confidential and the emissions as “NO” in CRF table 2(I).A-Hs1. In the NIR (p.4-221), Portugal explained that there are no direct CO ₂ , CH ₄ or N ₂ O emissions, but that there are indirect CO ₂ emissions related to NMVOCs.
I.26	2.B.10 Other (chemical industry) – CO ₂ , CH ₄ and N ₂ O (I.11, 2016) (I.11, 2015) Completeness	Include the emission estimates for CO ₂ , CH ₄ and N ₂ O emissions from explosives production (category 2.B.10.c).	Resolved. The Party reported the AD in CRF table 2(I).A-Hs1 (e.g. 14.63 kt for 2016). Portugal reported CO ₂ , CH ₄ and N ₂ O emissions as “NO” in CRF table 2(I).A-Hs1. During the review of the 2016 annual submission, Portugal stated that information on this category would be provided in the next annual submission. However, the ERT notes that the section on explosives production has been completely removed from the 2018 NIR. During the review, the Party explained that the methodology for estimating nitrogen oxides and sulfur dioxide emissions is provided in Portugal’s informative inventory report (chapter 4.1.2.24) under the Convention on Long-range Transboundary Air Pollution and that this information (i.e. a reference to that report) would be included in the next NIR. Regarding CO ₂ , CH ₄ and N ₂ O emissions, the ERT agrees with Portugal that the 2006 IPCC Guidelines do not include a methodology for estimating emissions from the production of explosives and that reporting these emissions is therefore not mandatory.
I.27	2.B.10 Other (chemical industry) – CO ₂ , CH ₄ and N ₂ O (I.11, 2016) (I.11, 2015) Completeness	Include the emission estimates for CO ₂ , CH ₄ and N ₂ O emissions from solvent use in plastic products manufacturing (category 2.B.10.d).	Resolved. In the NIR (section 4.4.17, p.4-221), Portugal explained that there are no direct CO ₂ , CH ₄ or N ₂ O emissions, but that there are indirect CO ₂ emissions related to NMVOCs. The Party reported the AD and direct CO ₂ , CH ₄ and N ₂ O emissions as “NO” in CRF table 2(I).A-Hs1. See ID# I.44 in table 5.

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I.28	2.C.1 Iron and steel production – CO ₂ (I.31, 2016) (I.31, 2015) Comparability	Reallocate emissions from on-site blast furnace gas combustion to category 2.C.1.	Not resolved. The emissions were not reallocated. During the review, the Party explained that it needs to double check how blast furnace emissions are embedded in category 1.A.2 and determine whether their disaggregation from category 1.A.2 is possible.
I.29	2.C.1 Iron and steel production – CO ₂ (I.32, 2016) (I.32, 2015) Transparency	Improve the QC procedure for this category and include information on how emissions from sintering are estimated and allocated in the NIR.	Resolved. The Party corrected the text in the NIR (section 4.5.1.2, p.4-223), which suggests the QC procedures have been improved. The Party explained that emissions from sintering are estimated using a similar equation to that reported on page 4-39 of the 2016 NIR and are reported under category 2.C.1.d (metal industry, sinter).
I.30	2.C.1 Iron and steel production – CO ₂ (I.33, 2016) (I.33, 2015) Accuracy	Make efforts to improve the estimation of AD for basic oxygen furnace and electric arc furnace steel production for 1995–2001 and investigate the possibility of using another type of surrogate data for the estimation of the AD and report the conclusions in the NIR.	Not resolved. The Party has not reported any additional information in the 2018 NIR compared with the 2016 NIR. During the review, the ERT suggested that coke consumption could be a better type of surrogate data. The Party responded that it has data on coke consumption and will use them as surrogate data.
I.31	2.C.1 Iron and steel production – CO ₂ (I.34, 2016) (I.34, 2015) Transparency	Include information on the types of fuel used for the CO ₂ emission estimates and how CO ₂ emissions are allocated (from 2002 onward) between categories 2.C.1 and 1.A.2.a.	Not resolved. The Party has not reported any additional information in the 2018 NIR compared with the 2016 NIR or changed the allocation of the emissions.
I.32	2.C.1 Iron and steel production – CO ₂ (I.35, 2016) (I.35, 2015) Completeness	Estimate emissions from the use of limestone and dolomite and report these estimates under category 2.C.1.	Not resolved. The Party has not yet estimated these emissions.
I.33	2.D.3 Other (non-energy products from fuels and solvent use) – CO ₂ (I.36, 2016) (I.36, 2015) Comparability	Report emissions from urea used as catalysts under category 2.D.3 (other) in accordance with the 2006 IPCC Guidelines; and explain this reallocation in the NIR.	Resolved. The Party reported in CRF table 2(I).A-Hs2 emissions from urea used as catalysts in category 2.D.3.c (urea-based catalyst) under category 2.D.3 (other) in accordance with the 2006 IPCC Guidelines. Explanations of the method used were provided in section 3.3.3.2 of the NIR on road transportation.
I.34	2.E.1 Integrated circuits or semiconductors – HFCs, PFCs, SF ₆ and NF ₃ (I.11, 2016) (I.11, 2015) Completeness	Include the estimates for HFCs, PFCs, SF ₆ and NF ₃ emissions from integrated circuits or semiconductors (category 2.E.1). If emissions do not occur, use the appropriate notation key (“NO”) in the CRF tables together with an explanation in the NIR for this assessment. If the emissions from any of these categories are judged as insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, use the appropriate notation key (“NE”) in the CRF tables, providing a	Not resolved. The Party reported these emissions as “NO” in CRF table 2(II) and has not reported any additional information in the 2018 NIR compared with the 2016 NIR. The Party explained that, until it has these estimates, it would use the notation key “NE” instead of “NO” to report these emissions in the CRF tables. It will also clarify this issue with national experts and provide updates in the next NIR. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.

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		qualitative and quantitative justification in the NIR.	
I.35	2.E.2 Thin-film transistor flat-panel displays – PFCs, SF ₆ and NF ₃ (I.11, 2016) (I.11, 2015) Completeness	Include the estimates for PFCs, SF ₆ and NF ₃ emissions from thin-film transistor flat-panel displays (category 2.E.2). If emissions do not occur, use the appropriate notation key (“NO”) in the CRF tables together with an explanation in the NIR for this assessment. If the emissions from any of these categories are judged as insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, use the appropriate notation key (“NE”) in the CRF tables, providing a qualitative and quantitative justification in the NIR.	Addressing. The Party reported these emissions as “NO” in CRF table 2(II) and has not reported any additional information in the 2018 NIR compared with the 2016 NIR. However, during the review, the Party explained that some progress had been made since 2016. For example, the Party checked with the Ministry of Economy whether production of this type of equipment exists. The Party also explained that it would continue its research with national experts on the existence of production and production data (if applicable) and, until it has this information, report these emissions as “NE”. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
I.36	2.F. Product uses as substitutes for ozone-depleting substances – HFCs, PFCs and SF ₆ (I.37, 2016) (I.37, 2015) Transparency	Explain how the estimates for categories 2.F.1, 2.F.2, 2.F.3 and 2.F.4 are calculated, including detailed information on the AD and EFs used and their sources.	Addressing. The Party included in the NIR (section 4.8) information on how the estimates for categories 2.F.1, 2.F.2, 2.F.3 and 2.F.4 were calculated, and on the EFs and AD used. However, the ERT was not able to determine the data sources of the EFs. During the review, the Party provided a spreadsheet showing all EF values and the data sources used, as well as a brief description of the data sources used for the AD.
Agriculture			
A.1	3.A Enteric fermentation – CH ₄ (A.7, 2016) (A.7, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	Improve the QA/QC procedures and correct the errors in the unit indicated for milk production, and in the footnote to tables 5.15 and 5.16 of the NIR.	Resolved. The error in the unit for milk production was corrected in the NIR (table 5.4, p.5-10). Also, the footnotes to NIR tables 5.15 and 5.16 were deleted to avoid inconsistencies with the equations in the main text. The ERT concludes that the QA/QC procedures were improved.
A.2	3.A Enteric fermentation – CH ₄ (A.8, 2016) (A.8, 2015) Accuracy	Promote a new data-gathering process to update the data set used as a basis for the determination of the growth profile of the livestock (weight at different ages until slaughter), and report in the NIR any plan or implementation status related to this update (the use of a new data set may dismiss the need for the use of the Jarrige model from 1988).	Addressing. During the review, the Party indicated that it had started gathering data but that the data-gathering and analysis process had not yet been completed. The ERT believes that future ERTs should consider this issue further to ensure that emissions from this category are not overestimated or underestimated.
A.3	3.A Enteric fermentation – CH ₄ (A.9, 2016) (A.9, 2015) Transparency	Clarify the rationale and references for the equation referred to in the 2016 NIR on pages 5-14 and 5-18.	Resolved. The equation referred to in the 2016 NIR was removed. During the review, Portugal explained that the correlation factor used to correct the EF for non-dairy cattle, sheep and goats was not appropriate. The ERT agrees with the Party’s assessment.

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A.4	3.B Manure management – CH ₄ and N ₂ O (A.10, 2016) (A.10, 2015) Transparency	Include information on which climatic zones are adopted for islands that are part of the country.	Resolved. The Party explained in the NIR (p.5-33) that the Azores and Madeira are both in the temperate climate zone.
A.5	3.B Manure management – CH ₄ (A.11, 2016) (A.11, 2015) Transparency	Update the description of the calculations of emissions from swine manure in the NIR.	Resolved. Portugal provided revised values and descriptions of the share (trend for 1990–2010) of manure for sows and other swine in each type of management system, on the basis of information from the last general Agricultural Census (2009) and from the national animal registration database (table 5.23 of the NIR). The MCF used for manure storage in tank systems was also revised.
A.6	3.D.a.2 Organic N fertilizers – N ₂ O (A.12, 2016) (A.12, 2015) Completeness	Account for the use of compost as a fertilizer and the associated emissions, given the implementation of the regulatory framework that allows for its use.	Resolved. The NIR (pp.5-67 and 5-68) explains that compost resulting from biological treatment of municipal solid waste was only recognized as a fertilizer as of June 2015 (Decree Law 103/2015). The decree established the associated quality standards and control measures, including the monitoring of compost applied to agricultural soils. The Party began accounting for this type of nitrogen fertilizer for 2015, and in its 2018 annual submission, Portugal reported 0.018 kt N ₂ O and 0.016 kt N ₂ O for 2015 and 2016, respectively, for category 3.D.a.2.c (other organic fertilizers applied to soils) in CRF table 3.D.
A.7	3.D.b.2 Nitrogen leaching and run-off – N ₂ O (A.13, 2016) (A.13, 2015) Accuracy	Make further efforts to determine the percentage of the territory (soils) on which the water-holding capacity is exceeded during the rainy season, and revise the N ₂ O emission estimates.	Resolved. During the review, Portugal reiterated its understanding and assumption that the water-holding capacity of soils is exceeded for the entire national territory (i.e. only in areas where crops are grown) during the rainy season, as a result of both rainfall and irrigation practices associated with spring/summer crops. Hence, the same estimate of leaching/run-off losses was used for the entire territory. The ERT agrees with this assumption. Portugal confirmed that it will include this explanation in the next NIR, taking into account the applicability of the default value as provided in table 11.3 of the 2006 IPCC Guidelines.

LULUCF

L.1	4. General (LULUCF) – AD (L.3, 2016) (L.3, 2015) (77, 2014) Transparency	Provide information on the applicability of each data set that is not country-specific, and document all information and considerations that lead to the application of data from Spain for living biomass values for perennial crops.	Resolved. The Party provided in the NIR (section 6.1.3.3.3, p.6-25, footnote 128) the necessary information explaining the reasons that led to the use of data from country-specific sources of Spain. The ERT agreed with the justification provided by the Party.
L.2	4. General (LULUCF) – AD (L.15, 2016) (L.15, 2015) Accuracy	Revise the MAI and other relevant AD (e.g. the country-specific definition of important variables such as MAI and wood volume, the methodology on how the MAI is defined, as mentioned in the 2016 ARR, table 5, ID#s L.1 and L.5); and provide all methodological updates (as	Not resolved. During the review, Portugal informed the ERT that the NF16 data have not yet been published, and that no changes were made in the 2018 NIR compared with the 2016 or 2017 annual submissions.

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L.3	4.A Forest land – AD (L.16, 2016) (L.16, 2015) Transparency	mentioned in the 2016 ARR, table 5, ID# L.6) as soon as the NFI6 is officially published and in accordance with the 2006 IPCC Guidelines. Provide more transparent information on the reasons for the large differences in NIR tables 6.11 and 6.12 (information on volumes per hectare) and on the relationship between the biomass volume and the MAI calculation.	Addressing. Portugal included in the NIR (section 6.1.3.2.1, p.6-20 and p.6-21) the explanation provided to the ERT reviewing the 2016 annual submission, namely that differences in “other broadleaves”, “pinus pinea” and “other coniferous” are larger and probably also influenced by the lower number of sampled plots in the NFI for 1995. No further information on the reasons for the large differences noted by the previous ERT in NIR tables 6.11 and 6.12 (information on volumes per hectare) or on the relationship between the biomass volume and the MAI calculation was provided in the 2018 NIR. During the review and in response to a follow-up question raised by the ERT on whether the explanation included in the 2018 NIR is the result of expert judgment or an analysis of available data from the two NFIs (1995, 2005), and whether additional information has been included in the 2018 NIR on the relationship between the biomass volume and the MAI calculation, Portugal explained that no changes to these parameters were made in the 2018 annual submission. The Party explained that it is planning to address this issue and include the results of the NFI6, which has just been completed, in the 2019 annual submission.
L.4	4.A.1 Forest land remaining forest land – CO ₂ (L.6, 2016) (L.6, 2015) (80, 2014) Accuracy	Complete the NFI6 to report updated estimates based on the new inventory information, for example for changes in forest areas caused by site fertility, the average volume per hectare and average MAI data.	Not resolved. According to the NIR (p.10-16), the NFI6 was delayed and the Party indicated that as soon as the Institute for Nature Conservation and Forestry (the agency in charge of the NFI6) releases the data, Portugal would update all variables that require that information source. The ERT noted that the same status was reported at the end of the review of the 2016 annual submission. During the review, the Party explained that the NFI6 data have not yet been published. The ERT requested that Portugal provide more information on the reasons for the delay and a possible time frame for when the NFI6 results are expected, given that, as reported in the 2014 ARR (para. 80), final data from the NFI6 were expected to be available in 2015 at the latest. Portugal presented further information with regard to the NFI6, its technical specificities and the projected time frame. The Party explained that the NFI6 results were not available in time for the 2018 annual submission but that the data-collection work with regard to the biotic characteristics of vegetation has been completed and the results would be included in the next annual submission.
L.5	4.A.1 Forest land remaining forest land – CO ₂ (L.8, 2016) (L.8, 2015) (87, 2014) Transparency	For losses from living biomass that now include loss types as well as the estimation of natural mortality, include an explanation of the expert judgments used for the methodology and validate the	Addressing. During the review, the Party explained that a footnote in table 6.23 of the NIR (p.6-32) had been added to address this issue. However, footnote 130 to table 6.23 of the NIR does not provide the information requested, namely an explanation of the assumptions and considerations that led to the expert

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		expert judgments or replace them with specific measurements.	judgment used for the methodology, as indicated in the 2014 ARR (para. 87). Portugal included a short description in table 6.23 of the NIR of the expert judgment used, but this was not validated and/or replaced with specific measurements.
L.6	4.A.1 Forest land remaining forest land – CO ₂ (L.10, 2016) (L.10, 2015) (88, 2014) Transparency	For the loss type other wood use, explain the respective expert judgment used for the assumption and validate the expert judgment, or replace it with specific measurements.	Addressing. In the NIR (section 6.2.1.2.2, p.6-33), Portugal provided reasons for using the respective expert judgment. However, no information was provided to explain the expert judgment (i.e. documentation on the expert judgment used or information on the decision made by the GHG reporting experts of the Portuguese Environmental Agency and the NFI experts from the Institute for Nature Conservation and Forests), as included in the 2014 ARR (para. 88). During the review of the 2018 annual submission, Portugal explained that no further work had yet been carried out on validating the values obtained from expert judgment or replacing the latter with measurements. Portugal also noted that it is extremely difficult to validate the requested information regarding the informal uses of wood with measurements, since there are no official statistics for such information. See also ID# L.22 in table 5.
L.7	4.A.2 Land converted to forest land – CO ₂ (L.11, 2016) (L.11, 2015) (90, 2014) Adherence to UNFCCC Annex I inventory reporting guidelines	Address the inconsistency in the reporting of the value of harvesting under land converted to forest land in the NIR.	Resolved. The incorrect reference to the harvest rate was removed. The NIR included an explanation (section 6.2.2.2.2, pp.6-35 and 6-36) stating that harvesting under land converted to forest land was estimated on the basis of the ratio of the area of “land converted to eucalyptus” to “total eucalyptus area” in the respective year.
L.8	4.A.2 Land converted to forest land – CO ₂ (L.12, 2016) (L.12, 2015) (95, 2014) Accuracy	Develop further the sampling and estimation system and the application of the sampling system when developing carbon stock change estimates for mineral soils.	Not resolved. There has been no further development of the sampling and estimation system or application of the sampling system since the 2016 ARR. During the review, Portugal explained that the NFI6 soil module had not yet been carried out due to financial difficulties and that no new data were available. Portugal also explained that it would consider the use of alternative data sources for the EFs in the next annual submission (e.g. Chiti et al., 2018). See also ID# L.23 in table 5.
L.9	4.B.1 Cropland remaining cropland – CO ₂ (L.13, 2016) (L.13, 2015) (96, 2014) Transparency	Include in the NIR the information provided during the review (i.e. that non-tillage of cropland was the result of the application of economic incentives from agri-environmental measures that started, for no tillage, in 2004). Before that time, the use of no tillage outside experimental plots and farms was marginal.	Resolved. Portugal added a reference in the NIR (section 6.3.1.5, p.6-39), explaining that the activity only became large-scale after the introduction of the agri-environmental payment in 2004 (farmers that committed to not using tillage received compensation). Before that year, the Party assumed that the use of no-tillage techniques outside experimental and research plots was marginal.
L.10	4.C.1 Grassland remaining grassland – CO ₂ (L.14, 2016) (L.14,	Include in the NIR the information provided during the review on the reporting of carbon stock gains in soils from areas	Not resolved. During the review, the Party explained that the requested information had been included in the NIR (annex I, “Methodological Note concerning the calculation of carbon sequestration in areas with sown

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	2015) (97, 2014) Transparency	under biodiverse pastures to increase transparency.	biodiverse pastures”). However, the ERT notes that the Party did not include in annex I to the NIR the information recommended by the previous ERT in the 2014 ARR (and in the 2016 ARR, table 3, ID# L.14), namely that the sowing of pasture started in the 1990s and remained very low until 1995, and that the area subject to sowing in the pre-1990 period was not significant and, therefore, sowing of biodiverse pastures in 1990 was reported as “zero”, as well as data on the expansion of the activity and information on the system of financing biodiverse sowing in the country.
Waste			
W.1	5.A Solid waste disposal on land – CH ₄ (W.4, 2016) (W.4, 2015) Transparency	Explain why the waste composition values for non-food fermentable materials and wood for the 1960s, 1970s and 1980s were zero and where they were included for DOC calculation purposes.	Resolved. The Party included in the NIR (p.7-7) information on the recalculation of CH ₄ emissions from urban waste using a DOC content value of 20 for non-food fermentable materials and 43 for wood. This was supported by information on the waste composition for non-food fermentable materials and wood for the 1960s, 1970s and 1980s provided in table 7.7.3 of the NIR (p.7-14).
W.2	5.A Solid waste disposal on land – CH ₄ (W.5, 2016) (W.5, 2015) Accuracy	Either provide justification for not adapting the DOC values for food waste, by considering the waste included under this category with a higher DOC content (garden and park and wood), or provide the DOC values accordingly.	Resolved. Portugal revised the waste composition and reported the non-food fermentable materials and wood fractions separately using a DOC content value of 20 for non-food fermentable materials and 43 for wood (NIR, p.7-7 and table 7.7.3, p.7-14).
W.3	5.A Solid waste disposal on land – CH ₄ (W.6, 2016) (W.6, 2015) Accuracy	Clarify and provide detailed information on the consistency of data between the waste groups as reported for the time series 1960–2003 and the waste groups as reported for 2004–2014 (i.e. how consistency is ensured for the different waste groups reported for 1960–2003 and 2008–2014).	Not resolved. Detailed information to clarify the consistency of data between the waste groups reported for 1960–2003 and 2004–2014 was not provided in the NIR. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
W.4	5.A Solid waste disposal on land – CH ₄ (W.6, 2016) (W.6, 2015) Transparency	Include information on the composition of mixed and undifferentiated materials and explain why household and similar wastes are included in table 7.4 of the NIR (although they are already considered as municipal waste – as reported in table 7.3 of the NIR).	Resolved. The Party included information on the composition of mixed and undifferentiated materials in the NIR (p.7-15). During the review, the Party clarified that household and similar wastes reported in table 7.4 of the NIR were from industrial sources and cannot be considered as municipal waste.
W.5	5.A Solid waste disposal on land – CH ₄ (W.6, 2016) (W.6, 2015) Accuracy	Consistently apply the default DOC values from the 2006 IPCC Guidelines (also for historical depositions) or apply well-justified country-specific parameters.	Resolved. Portugal revised the waste categories to take account of more specific guidance from the 2006 IPCC Guidelines. Paper and textiles are now considered as two different categories (NIR, p.7-14). The Party also transparently reported the composition of mixed and undifferentiated materials and the method used to calculate its DOC value (20 per cent) in the NIR (p.7-8). It also recalculated CH ₄ emissions from urban

ID#	Issue and/or problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
			waste using a DOC content value of 20 for non-food fermentable materials and 43 for wood in accordance with the 2006 IPCC Guidelines for the whole time series (NIR, p.7-7).
W.6	5.B. Biological treatment of solid waste – CH ₄ and N ₂ O (W.7, 2016) (W.7, 2015) Transparency	Update the NIR explaining the methodology and values applied.	Resolved. Portugal reported in the 2018 NIR (table 7.7.8, p.7-20) that emissions of CH ₄ and N ₂ O from biological treatment are calculated using default EFs from the ninth corrigenda of the 2006 IPCC Guidelines, published in 2015.
KP-LULUCF			
KL.1	General (KP-LULUCF) – CO ₂ (KL.1, 2016) (KL.1, 2015) (111, 2014) Accuracy	Continue to develop the land area identification system for Madeira to ensure that the land-use and land-use change identification system meets the indicated area requirements.	Not resolved. Portugal stated in its NIR (pp.10.1–10.18 and table 10.1) that there are no new data for Madeira on this topic. During the review, Portugal also informed the ERT that there had not been any developments in addressing the low resolution in relation to the identification system for Madeira.
KL.2	General (KP-LULUCF) – CO ₂ (KL.2, 2016) (KL.2, 2015) (112, 2014) Accuracy	Develop the estimation system for carbon stock changes in mineral soils, as indicated in paragraph 95 of the 2014 ARR.	Not resolved. During the review, Portugal informed the ERT that no new information is available (see also ID# L.8 above).
KL.3	General (KP-LULUCF) – AD (KL.4, 2016) (KL.4, 2015) Comparability	Complete CRF tables NIR-2, NIR-2.1 and 4(KP-I)A.2 with the relevant notation keys and CRF table NIR-3 with the relevant data as reported in table 1.4 of the 2016 NIR (section 1.5).	Resolved. Portugal correctly completed the CRF tables following the suggestions made by the previous ERT, as follows: (a) The Party used “NA” for reporting RV and wetlands in CRF table NIR-2; (b) The Party used “NO” in CRF table NIR-2.1 to report additional information with regard to the area of natural forests converted to planted forests; (c) The Party completed CRF table NIR-3 with regard to the overview of key categories for KP-LULUCF activities; (d) The Party used “NO” in CRF table 4(KP-I)A.2 for net carbon stock change in HWP.
KL.4	General (KP-LULUCF) – CO ₂ (KL.5, 2016) (KL.5, 2015) Transparency	Make clear in the text of the NIR the information on which types of ND were included in the background level estimates.	Resolved. Portugal added text in the NIR (section 11.1.7, p.11-5) specifying that the only disturbance type considered for the background level estimates was forest fires.
KL.5	General (KP-LULUCF) – CO ₂ , CH ₄ and N ₂ O (KL.6, 2016) (KL.6, 2015) Transparency	Report relevant figures in NIR table 11.2 or provide an explanation for not doing so.	Resolved. Portugal reported emissions and removals for CM and GM activities in table 11.2 of its NIR (p.11-8).
KL.6	Deforestation – CO ₂ , CH ₄ and N ₂ O (KL.7, 2016) (KL.7, 2015) Transparency	Include in the NIR information clarifying how the five-year rule is implemented when the time between land-use maps is longer than five years.	Addressing. Portugal reported in its NIR (section 11.3.2, p.11-7) that where the time gap is greater than five years, the loss of forest is treated as permanent. However, the Party has still not completely transparently reported in the NIR how the five-year

<i>ID#</i>	<i>Issue and/or problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
			rule is implemented when the time between each new land-use map is more than five years.
KL.7	FM – CO ₂ , CH ₄ and N ₂ O (KL.8, 2016) (KL.8, 2015) Accuracy	Report the correct value for the FM cap in the CRF table “accounting”.	Resolved. Portugal reported the correct value for the FM cap (i.e. the value established in the report on the review of the report to facilitate the calculation of the assigned amount for the CP2 of the Kyoto Protocol of Portugal (document FCCC/IRR/2016/PRT, table 3, ID #6; and annex I, table 4)) in the CRF table “accounting”, which is namely 17,010.374 kt CO ₂ eq.
KL.8	FM – CO ₂ , CH ₄ and N ₂ O (KL.9, 2016) (KL.9, 2015) Comparability	Report –6,830.00 kt CO ₂ eq as the FMRL in the CRF table “accounting” in accordance with decision 2/CMP.7.	Resolved. Portugal reported the correct value for the FMRL in the CRF table “accounting”, namely –6,830.00 kt CO ₂ eq, in accordance with the appendix to the annex to decision 2/CMP.7.
KL.9	FM – CO ₂ (KL.11, 2016) (KL.11, 2015) Transparency	Review the question of identifying the drivers of/reasons for the high losses in above-ground biomass and provide more transparent information in the NIR.	Addressing. Portugal reported a summary overview of the differences between the original and recalculated values of the parameters in relation to the FMRL in NIR tables 11.3 and 11.4. However, no detailed information was included in the NIR on the identification of the drivers of/reasons for the high losses in above-ground biomass. During the review, Portugal explained that the recalculations are the result of the incorporation of additional losses from living biomass, as listed in the NIR (section 6.2.1.2.2, pp.6-32 and 6-33, and table 6.23).

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

^b The review of the 2017 annual submission of Portugal did not take place during 2017 and, as such, the 2017 ARR was not available at the time of this review. Therefore, the recommendations reflected in table 3 are taken from the 2016 ARR. For the same reason, the year 2017 is excluded from the list of years in which the issue has been identified.

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 2018 annual submission of Portugal, and have not been addressed by the Party.

Table 4

Issues identified in three successive reviews and not addressed by Portugal

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed^f</i>
General		
G.1	Report any change(s) in the information provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1, annex, chapter I.H, and/or further relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	3 (2014–2018)

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed^d</i>
G.2	Improve the archiving system by providing further descriptions of the record-keeping and archiving procedures	4 (2013–2018)
G.6	Provide information on QC activities and the related results	3 (2014–2018)
Energy		
E.1	Improve the consistency between the energy balance and the data available for large point sources in order to reduce the differences between the reference and sectoral approaches	3 (2014–2018)
E.3	Implement the planned revision and further development of the reporting of feedstocks and non-energy uses of fuels and explain transparently the estimates and the notation keys reported in CRF table 1.A(d)	4 (2013–2018)
E.4	Explain the method used to estimate CO ₂ emissions resulting from the use of natural gas for hydrogen production in one refinery	3 (2014–2018)
E.16	Improve the explanations as to how emissions from fuel gas, LPG, fuel oil, naphtha and natural gas used as feedstock in the production of city gas are estimated and allocated	3 (2014–2018)
E.27	Continue with the efforts to develop country-specific CO ₂ EFs for gasoline and diesel oil, and investigate the possibility of obtaining a country-specific CO ₂ EF for gasoline and diesel oil reported under the EU ETS	3 (2014–2018)
E.31	Report the AD and emissions from ground activities at airports under the other transportation category; explain what type of consumption is included under the item “Serviços” in the energy balance; and report the fuel consumption and the associated emission estimates under the appropriate category	3 (2014–2018)
IPPU		
I.1	Improve the transparency of the information on how the consistency of the time series is ensured for subcategories for which EU ETS data are only used for some years in 1990–2012	3 (2014–2018)
I.2	Include information in the NIR on specific QA/QC activities for industrial processes, for example for limestone and dolomite use and for glass production (reported under other mineral products), for which this information is not currently included	4 (2013–2018)
Agriculture		
	No issues identified	
LULUCF		
L.4	Complete the NFI6 to report updated estimates based on the new inventory information, for example for changes in forest areas caused by site fertility, the average volume per hectare and average MAI data	3 (2014–2018)
L.5	For losses from living biomass that now include loss types as well as the estimation of natural mortality, include an explanation of the expert judgments used for the methodology	3 (2014–2018)

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed^a</i>
	and validate the expert judgments or replace them with specific measurements	
L.6	For the loss type other wood use, explain the respective expert judgment used for the assumption and validate the expert judgment, or replace it with specific measurements	3 (2014–2018)
L.8	Develop further the sampling and estimation system and the application of the sampling system when developing carbon stock change estimates for mineral soils	3 (2014–2018)
L.10	Include in the NIR the information provided during the review on the reporting of carbon stock gains in soils from areas under biodiverse pastures to increase transparency	3 (2014–2018)
Waste	No issues identified	
KP-LULUCF		
KL.1	Continue to develop the land area identification system for Madeira to ensure that the land-use and land-use change identification system meets the indicated area requirements	3 (2014–2018)
KL.2	Develop the estimation system for carbon stock changes in mineral soils, as indicated in paragraph 95 of the 2014 ARR	3 (2014–2018)

^a The review of the 2017 annual submission of Portugal did not take place during 2017. Therefore, the year 2017 is not taken into account when counting the number of successive years in table 4. In addition, as the reviews of the 2015 and 2016 annual submissions were held in conjunction with each other, they are not considered “successive” years and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2018 annual submission

10. Table 5 contains findings made by the ERT during the individual review of the 2018 annual submission of Portugal that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2018 annual submission of Portugal

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue and/or a problem?^a If yes, classify by type</i>
General			
G.9	CPR	<p>The Party reported its CPR as 386,623,772.11 t CO₂ eq in its NIR (chapter 12.5). The ERT noted that the CPR cannot have decimals because it refers to an amount of Kyoto Protocol units, and considers that the value should be 386,623,773 t CO₂ eq (i.e. rounding up the decimals), on the basis of the 2018 annual submission.</p> <p>The ERT recommends that Portugal report in the NIR a value for the CPR without decimals, rounding up to the nearest full unit.</p>	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
G.10	National registry	<p>The standard independent assessment report contained a recommendation for Portugal to submit the 2017 CP1 SEF tables. During the review, the Party submitted the 2017 CP1 SEF tables to the secretariat.</p> <p>The ERT recommends that, in future, the Party submit the CP1 SEF tables on time.</p>	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
G.11	QA/QC and verification	<p>In the NIR (p.1-20), Portugal explained that the QA/QC plan is contained in the QA/QC manual, entitled “Manual de Procedimentos de Controlo e Garantia de Qualidade”, which is a major part of its QA/QC system. The QA/QC manual was published in 2012 and has not been updated to ensure it is in line with the 2006 IPCC Guidelines or with QA/QC activities performed for recent national inventories. The ERT notes that this is not in line with paragraph 19 of the UNFCCC Annex I inventory reporting guidelines, which states that the QA/QC plan must be implemented in line with the 2006 IPCC Guidelines. During the review, Portugal explained that its QA/QC manual contains most of the QA/QC concepts and procedures provided in the 2006 IPCC Guidelines.</p> <p>The ERT recommends that the Party review its QA/QC plan to ensure it is in line with the 2006 IPCC Guidelines and either confirm that the QA/QC plan does comply with the 2006 IPCC Guidelines or update it so that it does. The ERT also recommends that the Party include the results of this review in the NIR.</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
G.12	Uncertainty analysis	<p>The Party reported total GHG emissions including LULUCF of 60,973.58 kt CO₂ eq and 62,216.48 kt CO₂ eq for 1990 and 2016, respectively, in annex L to the NIR (uncertainty assessment). However, elsewhere in the NIR, and in the CRF tables, the total GHG emissions are reported as 60,980.06 kt CO₂ eq and 62,226.95 kt CO₂ eq for 1990 and 2016, respectively. During the review, the Party explained that the submission of 10 May 2018 (version 3) included minor changes compared with the previous version (version 1) submitted on 11 April 2018. The Party also explained that, owing to time constraints, this revision was not reflected in the uncertainty analysis included in the 2018 NIR and that the totals presented in the uncertainty analysis in annex L are from the version 1 submission.</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
G.13	Uncertainty analysis	<p>The ERT recommends that the Party ensure that the total GHG emissions used in the uncertainty analysis are consistent with the final total GHG emissions/removals reported in other parts of the NIR and in the CRF tables.</p> <p>The Party reported uncertainty information in NIR table L-1 (pp.L-2–L-9). For some of the emissions/removals, the uncertainty of the AD or EFs was reported as 0.0 per cent (e.g. energy industries (solid fuels); fugitive emissions (natural gas); cement production; and land converted to settlements), which the ERT considered to be potentially incorrect. For these sources and others, limited documentation on the selection of the uncertainty parameters was provided. During the review, the Party explained that the QA/QC procedures were implemented in a less comprehensive manner for the 2018 annual submission, particularly regarding the uncertainty analysis. The Party explained that changes to the structure of files on the IPPU and energy sectors and the summary of information on sectoral uncertainty were not updated for the 2018 annual submission. The Party also identified other compilation errors, which were generally coding errors.</p> <p>The ERT recommends that the Party avoid reporting the uncertainty of the AD of EFs as 0.0 per cent and ensure that the uncertainty analysis incorporates and reports the intended information by checking for and correcting coding and compilation errors, and document the results of this QA/QC procedure in the NIR.</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
G.14	Uncertainty analysis	<p>The Party reported the results of the uncertainty analysis in NIR table L.1 (pp.L-2–L-9), without specifying which categories were key. The ERT notes that this reporting is not in line with paragraph 42 of the UNFCCC Annex I inventory reporting guidelines, which states that Annex I Parties should indicate in the uncertainty tables those categories identified as key in their inventory.</p> <p>The ERT encourages the Party to specify which categories are key in the uncertainty analysis tables.</p>	Not an issue/problem
Energy			
E.39	1.A.1.c Manufacture of solid fuels and other energy industries – solid fuels – CO ₂ , CH ₄ and N ₂ O	<p>During the review, Portugal indicated that all its iron and steel plants report data under the EU ETS and are required to prepare carbon balances as part of the monitoring reports. The Party presented these carbon balances to the ERT. The ERT noted that Portugal reconciles the energy consumption data from the EU ETS with data from the energy balance. The results of this analysis show that there are differences between the fuel consumption reported under the EU ETS and the fuel consumption data in Portugal’s energy balance owing to the different definitions of fuel consumption in the two reporting programmes.</p> <p>Portugal reported the fuel combustion emissions reported under the EU ETS under category 1.A.2.a. The Party reported the differences in the fuel consumption data between the national energy balance and the EU ETS under category 1.A.2.g. The ERT considers that this approach to the allocation of fuels does not result in an under-reporting of fuel consumption from all iron and steel plants in Portugal. Therefore, the fuel approach followed by Portugal does not lead to an underestimation of emissions. However, the ERT also noted that there might be a transparency issue related to how fuel consumption and CO₂ emissions from the integrated iron and steel plants are allocated and reported between fuel combustion, fugitive emissions and the IPPU sector. During the review, the</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
E.40	1.A.2.a Iron and steel – liquid and gaseous fuels – CO ₂	<p>ERT asked Portugal whether it had developed a material/carbon balance for tracking carbon across all the relevant categories for its iron and steel plants.</p> <p>In order to enhance transparency, the ERT recommends that Portugal include a table in the NIR indicating all emission streams for its iron and steel operations and provide in the table information on all those emission streams, as well as the categories under which these emissions are reported and the rationale for such allocation.</p> <p>The ERT noted that, in NIR tables 3.69, 3.70 and 3.71 (on the iron and steel industry), Portugal used oxidation factors lower than 1 for most of the fuels reported in these tables. According to the 2006 IPCC Guidelines (volume 2, chapter 2), the oxidation factors for all tier 1 CO₂ EFs should be 1 (complete oxidation). During the review, Portugal explained that this principle had not yet been applied in the iron and steel industry and that it plans to address this issue in its next annual submission. Portugal also estimated the CO₂ emissions if the oxidation factor were 1, in accordance with the 2006 IPCC Guidelines. The preliminary estimates performed by Portugal showed that CO₂ emissions from category 1.A.2.a are underestimated by 3.8 kt CO₂ eq and 0.2 kt CO₂ eq for 1990 and 2016, respectively. The ERT noted that this underestimation is below the threshold for initiating an adjustment procedure in accordance with paragraph 80(b) of the annex to decision 22/CMP.1 and therefore this issue was not included in the list of potential problems and further questions raised by the ERT (for Portugal's 2018 annual submission, the significance threshold for 2013–2016 was 32.62–33.89 kt CO₂ eq).</p> <p>The ERT recommends that the Party use 1 as the oxidation factor or justify the use of oxidation factors lower than 1, recalculate all emissions where the oxidation factor has been revised and explain all recalculations, and provide information on all oxidation factors used in the NIR.</p>	Yes. Accuracy
E.41	1.A.2.c Chemicals – liquid and gaseous fuels – CO ₂ , CH ₄ and N ₂ O	<p>With respect to NIR table 3.72 (chemical industry), the ERT noted that Portugal applied EFs sourced from the <i>EMEP/EEA air pollutant emission inventory guidebook 2009</i>. In response to a question raised by the ERT during the review on the suitability of these CO₂ EFs for the situation in Portugal, the Party explained that the text in the paragraph below NIR table 3.72 is unclear and misleads the reader as the reference in the text of that paragraph concerns the paper and pulp sector (table 3.73), in particular for fuels such as black liquor that are not included in the 2006 IPCC Guidelines. Portugal further explained that the EFs reported in NIR table 3.73 are default EFs from the 2006 IPCC Guidelines and that the oxidation factors used are also from the 2006 IPCC Guidelines. The ERT also noted that the percentage of the fossil carbon content for most fuels was reported as 0 per cent, even though these fuels are derivatives of primary fossil fuels (e.g. LPG) and therefore must contain some fossil carbon. Portugal explained that it intends to update the notes and content of NIR table 3.73 to increase the transparency of the source and the EFs and oxidation factors used in the emission estimates. Portugal also explained that, in the pulp and paper industry, CO₂ and N₂O emissions are estimated using the energy approach only, using default EFs from the 2006 IPCC Guidelines. In the case of CH₄ emissions, both approaches (from the 2006 IPCC Guidelines and the <i>EMEP/EEA air pollutant emission inventory guidebook 2009</i>) are used. Default EFs from the 2006 IPCC Guidelines are used for the energy approach, while EFs from the <i>EMEP/EEA air pollutant emission inventory guidebook 2009</i> are used for the production approach, as reported further in NIR table 3.74. However, NIR table</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		<p>3.74 references “EEA, 2002” instead of the <i>EMEP/EEA air pollutant emission inventory guidebook 2009</i>. Portugal stated that this error would be addressed in the next annual submission.</p> <p>The ERT recommends that Portugal correct the information in NIR table 3.73 regarding the oxidation factors, the CO₂, CH₄ and N₂O EFs and the sources of the parameters used in the estimates.</p>	
E.42	1.A.3.b Road transportation – liquid fuels – CO ₂	<p>During the review, the Party explained that, with regard to road transportation, the approaches it applied to estimate the distance travelled and vehicle fleet for 1990–2002 were based on vehicle sales data from 1970 onward as well as backcasted data on distances travelled for 2003–2016. The ERT noted that the backcasting methodologies used are not documented transparently in the NIR and therefore the ERT was not able to assess whether these complied with the time-series consistency methodologies described in the 2006 IPCC Guidelines (volume 1, chapter 5). Portugal presented to the ERT the methodology it applied and noted that the parameters used in the estimation of the vehicle fleet and distance travelled include a series of parameters and that the technical conditions change throughout the time series. This implies that the time-series splicing techniques presented in the 2006 IPCC Guidelines are not adequate to fill the data gaps for this category. The ERT therefore agreed with the methodological approach used by Portugal. However, the methodology needs to be documented in the NIR and, as per the 2006 IPCC Guidelines, compared with the standard splicing techniques presented in table 5.1 of the 2006 IPCC Guidelines (volume 1, chapter 5).</p> <p>Therefore, the ERT recommends that Portugal transparently document in the NIR the methodology used to fill data gaps for the estimates of the vehicle fleet and distance travelled for 1990–2002 and ensure that the results of the methodology are compared with the standard splicing techniques contained in the 2006 IPCC Guidelines.</p>	Yes. Transparency
E.43	1.A.3.d Domestic navigation – liquid fuels – CO ₂ , CH ₄ and N ₂ O	<p>The ERT noted that the AD for domestic navigation are based on ship movement with a tonnage threshold (i.e. any vessel below the threshold is not considered in the AD method based on ship movement). During the review, Portugal explained that energy balance data on navigation are used to complete the fuel consumption estimates for domestic navigation. The ERT noted that this procedure is not well documented in the NIR or in figure 3.66 describing the methodology for this category. The ERT considers that this makes it difficult for it to assess whether there is an underestimation or overestimation of fuel consumption for this category. After consulting its national energy authority (the General Directorate for Energy and Geology) during the review, Portugal informed the ERT that the fuel consumption of small boats is included in the consumption of national navigation, but that it is not possible to disaggregate this consumption by tonnage. The ERT agrees that, on the basis of this information, there is no underestimation of emissions. The Party stated that it would make efforts to disaggregate fuel consumption associated with small boats from national navigation and report the results in its next annual submission.</p> <p>The ERT recommends that Portugal update its methodological description of domestic navigation in the NIR to describe how information from the energy balance is considered in the methodology to quantify fuel consumption for domestic navigation. The ERT also recommends that the Party describe the results of its efforts to disaggregate fuel consumption for small boats in its bottom-up emission quantification methodology for reporting.</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
E.44	1.B.1.b Solid fuel transformation – solid fuels – CH ₄	<p>The Party reported CO₂, CH₄ and N₂O emissions from category 1.A.1.c.i (manufacture of solid fuels) for 1990–2001 (these emissions are reported as “NO” from 2002 onward). During the review, Portugal explained that the emissions reported under category 1.A.1.c.i are related to fuel combustion emissions from coke production in iron and steel production in 1990–2001. The ERT further notes that fugitive CH₄ emissions from coke production are reported as “NO” in CRF table 1.B.1 even though an EF for coke production is available in table 4.2 of the 2006 IPCC Guidelines (volume 3, chapter 4). During the review, Portugal confirmed that CH₄ fugitive emissions from coke production were not estimated. The Party provided provisional estimates for the period in which coke production occurred (1990–2001). For example, for 2001, emissions of CH₄ amounted to 0.0002 kt CO₂ eq. The ERT agrees with these estimates as well as the methodology used by Portugal. The ERT noted that this underestimation of emissions is below the significance threshold established in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines (for Portugal’s 2018 annual submission, the significance threshold for 2001 is 41.49 kt CO₂ eq).</p> <p>The ERT recommends that Portugal report fugitive CH₄ emissions estimates and document the methodology applied in the NIR. Alternatively, the ERT recommends that the Party report these emissions as “NE” and demonstrate in the NIR that the likely level of emissions is below the significance threshold indicated in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.</p>	Yes. Transparency
E.45	1.B.2.a Oil – liquid fuels – CH ₄	<p>The ERT noted there may be an error in how CH₄ emissions from oil transport (category 1.B.2.a.iii.3) were calculated. Portugal used the default EF from the 2006 IPCC Guidelines to estimate these emissions (NIR, p.3-147). However, the ERT believes that Portugal may have been using incorrect units for the EFs owing to an incorrect conversion from Gg to kg. The 2006 IPCC Guidelines (volume 2, table 4.2.4) provide a default CH₄ EF of 5.4 x 10⁻⁶ Gg/1,000 m³ oil transported, but NIR table 3.130 reports a CH₄ EF of 5.4 x 10⁻⁶ kg/1,000 m³ oil transported. During the review, Portugal confirmed that this is an error in the conversion of the units of the EF and therefore that the emissions were underestimated. Portugal quantified the underestimated emissions to be 1.5–2.2 kt CO₂ eq for 1990–2016. The ERT noted that this underestimation is below the values of the threshold of significance (for Portugal’s 2018 annual submission, the significance threshold for 2013–2016 is 32.62–33.89 kt CO₂ eq).</p> <p>The ERT agrees with this assessment by Portugal and recommends that Portugal correct the EF units and revise these emission estimates.</p>	Yes. Accuracy
E.46	1.B.2.a Oil – liquid fuels – CH ₄	<p>The ERT noted that CH₄ emissions from oil refining/storage are reported as “NO”. The ERT notes that the 2006 IPCC Guidelines (volume 2, table 4.2.4) provide a range for the default CH₄ EF for this category of 2.6–41.0 x Gg/1,000 m³ oil refined. During the review, the Party confirmed that these emissions were not estimated. Using the upper limit of the range suggested for the EF in the 2006 IPCC Guidelines, the Party quantified the missing emission estimates as ranging between 3.1 and 6.0 kt CO₂ eq for 1990–2016. The ERT noted that this underestimation is below the threshold for initiating an adjustment procedure in accordance with paragraph 80(b)</p>	Yes. Transparency.

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		of the annex to decision 22/CMP.1 and therefore this issue was not included in the list of potential problems and further questions raised by the ERT.	
		The ERT recommends that the Party report fugitive CH ₄ emissions from oil refining/storage in the CRF tables and explain the estimation methodology used in the NIR or, if the Party considers these emissions to be insignificant, that the Party report these as “NE” and include a justification of the likely level of emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	
E.47	1.B.2.b Natural gas – gaseous fuels – CO ₂ and CH ₄	<p data-bbox="422 513 1566 878">During the review, the Party explained that the EFs and AD for transmission and storage and distribution from the Energy Services Regulatory Body are used to calculate natural gas emissions. The ERT noted that the NIR does not stipulate whether emissions from sources in addition to pipeline leaks (i.e. transmission compression stations, any distribution metering/regulating stations also known as city-gate stations) are included in the emission data provided by the Energy Services Regulatory Body. The NIR notes that reduction stations and reduction and counting stations are sources of leaks, which may mean that station emissions are included. During the review, Portugal demonstrated that the EFs used to estimate fugitive emissions of natural gas are obtained from an annual publication by the Energy Services Regulatory Body. The publication contains several adjustment factors for estimating own consumption and leakage occurring along the national natural gas network, including (i) the national natural gas transportation network (leakage during maintenance interventions, or resulting from incidents affecting the infrastructure); (ii) reception, storage and regasification terminals for natural gas liquids (purges and natural gas burning); (iii) underground storage (mostly own consumption); and (iv) distribution networks (gas released in safety valves, incidents on distribution networks).</p> <p data-bbox="422 902 1566 1040">The ERT considers that the information provided by Portugal, as well as quantification spreadsheets, shows that CO₂ and CH₄ fugitive emission leaks from other sources in addition to pipeline leaks are included in the total emissions for this subcategory. The ERT recommends that Portugal explain that all fugitive emissions reported include own consumption and leakage occurring along the national gas network, including transmission and compression stations and city-gate stations, in the NIR.</p>	Yes. Transparency
E.48	1.B.2.d Other (oil, natural gas and other emissions from energy production) – liquid and gaseous fuels – CO ₂ and CH ₄	<p data-bbox="422 1065 1566 1349">Following the previous review wherein the ERT requested that Portugal explain how emissions of fuel gas, LPG, fuel oil, naphtha and natural gas are estimated and allocated (see ID# E.16 in table 3), the ERT noted that the NIR does not describe how fugitive emissions related to these processes are quantified and reported. During the review, Portugal confirmed that fugitive emissions related to the production of city gas are not estimated. The fugitive emissions from city gas are estimated taking into account the fuels used for its production. Thus, the carbon content present in fuel gas, LPG, fuel oil, naphtha and natural gas is considered in order to estimate the CO₂ and CH₄ emitted during the combustion of city gas. The ERT noted that the explanation provided by Portugal only relates to the combustion of city gas and not to fugitive CO₂ and CH₄ emissions associated with the production of city gas. The ERT further noted that the 2006 IPCC Guidelines do not provide fugitive CO₂ and CH₄ EFs for the production of city gas.</p>	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		Given that there are no EFs in the 2006 IPCC Guidelines for the city gas production process, the ERT recommends that Portugal report fugitive emissions from the production of city gas as “NE” and provide an explanation in CRF table 9 and in the NIR.	
IPPU			
I.37	2. General (IPPU) – CO ₂	For cement production, lime production from dedicated plants, other process uses of carbonates and lead production, the Party reported two sources of AD: the EU ETS for some years and another data source for other years (NIR, pp.4-178, 4-183, 4-198 and 4-228). The ERT notes that although the Party has made efforts to address the time-series consistency issue for lime production (by updating the AD for lime production), the 2018 NIR, similarly to the 2016 NIR, does not explain how time-series consistency is checked and ensured in cases where two data sources are used. During the review, the Party explained that checks (e.g. of the AD used) are performed when large inter-annual differences in emissions are observed. The ERT recommends that the Party include explanations of the checks performed to ensure time-series consistency for cement production, lime production from dedicated plants, other process uses of carbonates and lead production, where two data sources are used throughout the time series. These explanations can be included in the category-specific QC section.	Yes. Transparency
I.38	2.A.2 Lime production – CO ₂	The Party updated the AD for lime production in CRF table 2(I)A-H. The ERT notes that the updates address the time-series consistency issue regarding the IEF (see ID# I.4 in table 3). However, fluctuations in the IEF have shifted to a different period of the time series following the update of the AD, namely to 2009–2015 (with fluctuations of around 12 per cent, compared with the IEFs for the years prior to 2009). In the 2018 annual submission, the CO ₂ IEF is 0.39 t/t for 1990–2005, increasing continuously up to 0.44 t/t in 2010 and then decreasing continuously to 0.41 t/t in 2016. During the review, the Party explained that, with regard to the data reported by facilities under the EU ETS, it is possible that the methods used by facilities are not consistent from one year to another, which could have contributed to the differences observed. The ERT recommends that the Party check whether there are data transcription errors and confirm the correctness of the data with the facilities when large inter-annual changes in the IEFs are observed, in particular for 2009–2015.	Yes. Consistency
I.39	2.A.2 Lime production – CO ₂	The Party used the wording “carbon content” in the equation used to estimate emissions from lime production and in NIR table 4.5 (p.4-187). The ERT notes that this parameter has t CO ₂ /t material as a unit, and should therefore be referred to as an EF. During the review, the Party agreed with the observation of the ERT. The ERT recommends that the Party revise the description of carbon content referred to in the equation used to estimate emissions from lime production and in NIR table 4.5 and change it to EF, where appropriate.	Yes. Transparency
I.40	2.A.4 Other process uses of	The Party reported that, for category 2.A.4 (other process uses of carbonates – ceramics), the biomass consumption values were corrected for 1990–2010 (2017 NIR, p.4-3). The ERT notes that possible underestimations of	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
	carbonates – CO ₂	<p>emissions were noted by the ERT in the 2016 ARR (see ID# I.16 in table 3) but, following the corrections, the emission values were even lower in the 2018 NIR compared with those in the 2016 NIR. For example, in the 2016 NIR Portugal reported emissions of 6,036.5 kt CO₂ eq for 1990 but in the 2018 NIR the Party reported emissions of 2,960.8 kt CO₂ eq for the same year. During the review, the Party explained that fuel consumption data (including biomass data) were used because it was believed that raw material data from the EU ETS (for the earlier years when data became available) were not of the quality needed for backcasting purposes. As such, the Party used the energy balance trend to backcast fuel consumption data for the ceramics industry. Also, because the fuel consumption data for this industry show a step change between 1990–2014 and 2015 onward, the Party believed it necessary to backcast fuel consumption based on the general energy balance trend. Portugal then used estimated fuel consumption data to backcast process emissions (for 1990–2014). The Party explained that it was seeking to ensure time-series consistency by applying this method. The ERT believes that the various steps involved in backcasting, one after another, would decrease the accuracy of the emission estimates.</p> <p>As such, the ERT recommends that the Party work with the data provider (the EU ETS) to improve the quality of raw material data (e.g. by contacting facilities to check for reporting errors) and use raw material data for the years for which data from the ceramics industry were collected under the EU ETS as the AD for backcasting, instead of using estimated fuel consumption data collected directly from facilities. The ERT believes future ERTs should consider this issue further to ensure that emissions for this category are not underestimated, particularly for 2013 and 2014.</p>	
I.41	2.A.4 Other process uses of carbonates (ceramics) – CO ₂	<p>The Party used the wording “carbon content” in the equation to estimate emissions from other process uses of carbonates (ceramics) in the NIR (p.4.196) and in NIR table 4.11 (p.4-198). The ERT notes that, in view of the unit used for this parameter (t CO₂/t material), carbon content should instead be referred to as an EF. During the review, the Party agreed with the observation made by the ERT.</p> <p>The ERT recommends that the Party revise the description and explanation of carbon content referred to in the equation used to estimate emissions both in the NIR and in NIR table 4.11 and change it to EF, where appropriate.</p>	Yes. Transparency
I.42	2.B.8 Petrochemical and carbon black production (vinyl chloride monomer) – CO ₂ and CH ₄	<p>The Party reported that, from 1991 onward, vinyl chloride production data are estimated based on the GDP trend (NIR, p.4-218). The ERT notes that this reporting lacks clarity. During the review, the Party explained that vinyl chloride monomer production data for 1991 onward were obtained by multiplying the data for 1990 by the ratio of GDP for a specific year to the GDP for 1990.</p> <p>The ERT recommends that the Party include details of the type of GDP used (i.e. for which sector) and the method used to multiply data by the GDP ratio to estimate vinyl chloride monomer production for 1991 onward, and demonstrate that the use of the proxy data is in accordance with the 2006 IPCC Guidelines.</p>	Yes. Transparency
I.43	2.B.8 Petrochemical and carbon black	<p>The Party reported that methanol was used to scrub the exit gas in ammonia production (NIR, p.4-208). The ERT notes, however, that methanol production was reported as “NO” throughout the time series and asked the Party about the origin of the methanol used. During the review, the Party explained that from 2009 onward ammonia has</p>	Yes. Completeness

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	production (methanol production) – CO ₂ and CH ₄	<p>not been produced in Portugal. Currently, the Party does not possess data on the origin of the methanol used in ammonia production until 2009, but will try contacting the facilities in order to address this issue in future submissions.</p> <p>The ERT recommends that the Party investigate the origin of the methanol used and, if it is determined that the methanol used was produced in Portugal, report the associated emissions. The ERT also recommends that the Party ascertain whether there has been any methanol production in the country since 2009, even after the closure of the ammonia plants, and report on the associated emissions. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.</p>	
I.44	2.B.10 Other (chemical industry) – all gases	<p>For category 2.B.10.d (solvent use in plastic products manufacturing), the Party reported the AD as “NO” in CRF table 2(I)A-Hs1. However, in the NIR (section 4.4.17), the Party explained that there are no direct emissions, but that there are indirect emissions. The ERT notes that this seems to suggest that the activity may be occurring.</p> <p>The ERT recommends that the Party clarify in its NIR whether the activity solvent use in plastic products manufacturing is occurring (category 2.B.10.d) and revise the NIR or the reporting of the AD in CRF table 2(I)A-Hs1.</p>	Yes. Transparency
I.45	2.C.1 Iron and steel production (sinter production) – CO ₂	<p>In CRF table summary 3s1, the Party reported the use of a tier 2 method for estimating CO₂ emissions from metal production (category 2.C). The ERT noted that, for sintering (a method to produce iron and steel), the Party calculated emissions by multiplying an EF and an output (production). The ERT notes that this reporting is not in line with the 2006 IPCC Guidelines, which state that a tier 2 method is based on input and carbon content, and not an EF multiplied by an output (production), which is a tier 1 method. During the review, the Party agreed with the observation of the ERT.</p> <p>The ERT recommends that the Party correct the description of the method type for metal production in CRF table summary 3s1 to indicate the use of a tier 1 method in addition to a tier 2 method for this category. The ERT also recommends that the Party change the text on p.4-223 of the NIR (section 4.5.1.2) from “... emissions from sintering were also estimated using similar equation” to “... emissions from sintering are estimated using the equation above”.</p>	Yes. Transparency
I.46	2.C.2 Ferroalloys production – CO ₂ and CH ₄	<p>The Party reported the AD and emissions from ferroalloys production as “NO” in the NIR (p.4-227) and CRF table 2(I)s1. The ERT notes, however, that there are ferrocerium production data in the Eurostat database. For example, the Eurostat database indicates ferrocerium production of 45,714 kg and 43,283 kg for 2013 and 2014, respectively. The ERT also noted that the 2006 IPCC Guidelines do not seem to contain specific EFs for ferrocerium production. The Party explained that, after discussing this matter with the ERT during the review, it has started to search for associations and other entities related to ferroalloys in order to establish appropriate contacts and confirm whether there has been any production of ferroalloys, including ferrocerium, since 1990.</p> <p>The ERT encourages the Party to estimate and report the AD and CO₂ and CH₄ emissions in the CRF tables, include a section related to ferroalloys production in the NIR to explain the AD and CO₂ and CH₄ EFs for</p>	Not an issue/problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		ferrocerium production, including for 2013 and 2014 (given that the Eurostat database includes ferrocerium production data for Portugal for these years), and demonstrate that the EFs used are in accordance with the 2006 IPCC Guidelines. Until the estimates are available, the ERT recommends that the Party report these emissions as “NE”.	
I.47	2.D Non-energy products from fuels and solvent use (urea used as catalyst) – CO ₂	<p>The Party reported that it included in the CRF tables and in the NIR (section 3.3.3.2.1) emissions from urea used as a catalyst under category 2.D.3.c (other) in accordance with the 2006 IPCC Guidelines. The ERT notes that explanations of the method used are provided in NIR section 3.3.3.2 on road transportation and that there is no mention in chapter 4 (on the IPPU sector) of urea used as a catalyst. During the review, the Party explained that details of the method used are provided in the chapter of the NIR on the energy sector, but that a cross reference to the explanations of the method in section 3.3.3.2 could be included in chapter 4.</p> <p>The ERT recommends that the Party either include, in the IPPU chapter of the NIR, a cross reference to the section in the energy sector where the estimation of CO₂ emissions from urea used as a catalyst are included or simply move the explanations of the estimation to chapter 4 of the NIR.</p>	Yes. Transparency
I.48	2.F. Product uses as substitutes for ozone-depleting substances – HFCs, PFCs	<p>The Party reported the methods used for category 2.F (product uses as substitutes for ozone-depleting substances) for the years from 1995 onward as “IE, NO” in CRF table summary 3s1. However, the ERT notes that this reporting is incorrect, as the Party estimated and reported HFC emissions for several subcategories under category 2.F, namely subcategories 2.F.1 (refrigeration and air conditioning), 2.F.2 (foam blowing agents), 2.F.3 (fire protection) and 2.F.4 (aerosols). During the review, the Party agreed with the observation of the ERT.</p> <p>The ERT recommends that the Party replace the notation key “IE, NO” with the correct estimation method for all subcategories under category 2.F in CRF table summary 3s1.</p>	Yes. Transparency
Agriculture			
A.8	3.A Enteric fermentation – CH ₄	<p>The Party reported in the NIR (p.5-25) that it assumed the uncertainty of the estimates of DE% to be 20 per cent for all animal categories. This assumption is based on the 2006 IPCC Guidelines (volume 4, chapter 10, section 10.2.3), which indicate that uncertainty estimates for DE% may be as high as +20 per cent. During the review, Portugal explained that experts from the National Institute for Agriculture and Veterinary Research had estimated the DE% for dairy cattle. However, the available data on the country-specific uncertainty associated with the DE% estimates for dairy cattle, assumed to be 20 per cent, were not provided in the NIR.</p> <p>The ERT noted that, according to the 2006 IPCC Guidelines (volume 4, chapter 10, p.10.32), the accurate estimation of diet DE% is singularly important in the estimation of feed intake and thus emissions, and that a 10 per cent error in estimating DE% will be magnified to 12–20 per cent when estimating CH₄ emissions. The ERT also noted that enteric fermentation was identified as key, and that CH₄ emissions from enteric fermentation for dairy and non-dairy cattle are a significant part of the total emissions from enteric fermentation (e.g. for 2016, total CH₄ emissions from enteric fermentation were 142.19 kt, of which 31.05 kt, or 21.8 per cent, were from dairy cattle, and 86.64 kt, or 60.9 per cent, from non-dairy cattle). During the review, the Party stated that it would try to</p>	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

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		<p>provide and improve (if needed) the uncertainty of the DE% estimates for dairy cattle in the next annual submission.</p> <p>The ERT recommends that the Party make efforts to provide and improve the uncertainty of the DE% estimates for dairy cattle and report the results of those efforts in the NIR.</p>	
A.9	3.B Manure management – CH ₄	<p>The Party reported the MCF values for different manure management systems under temperate and cool climate conditions (NIR table 5.25, p.5-36). For example, for lagoon systems, Portugal reported MCF values of 32 and 25 per cent for temperate and cool climates, respectively, and 15 and 20 per cent for tanks/earthen ponds, respectively. In the NIR, Portugal also reported that it assumes a mean annual temperature of 14 °C and 17 °C for cool and temperate climate conditions, respectively. The ERT noted that the default MCF values from the 2006 IPCC Guidelines (volume 4, chapter 10, table 10.17) for uncovered anaerobic lagoon systems are 73 per cent for a mean annual temperature of 14 °C and 76 per cent for 17 °C, which are higher than the values reported by the Party. The ERT also noted that table 10.17 of the 2006 IPCC Guidelines does not include manure management tanks/earthen ponds.</p> <p>During the review, the Party presented a revised NIR table 5.25 explaining that the category lagoon systems in the NIR is equivalent to the category liquid/slurry with natural crust cover in table 10.17 of the 2006 IPCC Guidelines, and that the category tanks/earthen ponds in the NIR is equivalent to liquid/slurry without natural crust cover. The IPCC default values for these systems (volume 4, chapter 10, table 10.17) are as follows: for liquid/slurry with natural crust cover, 15 per cent for a mean annual temperature of 14 °C and 20 per cent for 17 °C; and for liquid/slurry without natural crust cover, 25 per cent for a mean annual temperature of 14 °C and 32 per cent for 17 °C.</p> <p>The ERT recommends that Portugal revise NIR table 5.25 and explain in the NIR that the country-specific manure management lagoon systems and tanks/earthen ponds correspond to the categories liquid/slurry with and without natural crust cover in the 2006 IPCC Guidelines, respectively.</p>	Yes. Transparency
A.10	3.G Liming 3.H Urea application – CO ₂	<p>The Party reported in figure 5.4 of the NIR (p.5-4) the overview of the methodology for the agriculture sector. The ERT notes, however, that the figure is not complete since two categories for which Portugal reported emission estimates are missing: (i) CO₂ emissions from liming and (ii) CO₂ emissions from urea application. During the review, the Party acknowledged the missing categories and stated that it would add them to figure 5.4 in the 2019 annual submission.</p> <p>The ERT recommends that the Party revise NIR figure 5.4 to include categories 2.G (liming) and 2.H (urea application).</p>	Yes. Transparency
LULUCF			
L.11	4. General (LULUCF) –	<p>The ERT identified notable inter-annual changes in total net emissions for the LULUCF sector and across the land-use categories. For example:</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
	CO ₂ , N ₂ O and CH ₄	<p>(a) For total LULUCF emissions, for 1991–1992 (–396.1 per cent), 2002–2003 (–132.2 per cent), 2003–2004 (–374.3 per cent), 2004–2005 (–121.2 per cent) and 2005–2006 (–642.6 per cent);</p> <p>(b) For forest land, for 1991–1992 (65.1 per cent), 2002–2003 (–96.0 per cent), 2003–2004 (2,122.9 per cent), 2004–2005 (–85.4 per cent) and 2005–2006 (644.5 per cent);</p> <p>(c) For settlements, for 1990–1991 (–27.5 per cent), 1994–1995 (–1,038.6 per cent) and 1995–1996 (–24.4 per cent).</p> <p>During the review, Portugal explained that the most significant changes were caused by a very high inter-annual variability in emissions from fires (as shown in NIR figure 6.30, p.6-54). Portugal also explained that another reason for such changes was the methodology applied to estimate the annual area land-use changes. In particular, since the land representation is not based on annual maps, the value assumed for annual changes in periods where a new map is not available is the linear interpolation between the values for the two available maps for the years immediately before and after the period without maps. Therefore, when a new map is introduced, there is a difference between the previous and the subsequent annual land-use change value, which, in turn, may lead to significant changes in annual emissions in categories such as forest land converted to settlements, which will be relatively constant for each period between two consecutive maps.</p> <p>However, the ERT notes that although the rationale provided by Portugal may explain certain cases of fluctuations, it does not cover all the cases identified. For example, NIR figure 6.30 depicts 2003 and 2005 as particularly severe in terms of the area burned historically. However, as noted by the ERT, the most significant variations in forest land were identified between 2003 and 2004 and between 2005 and 2006. Similarly, in the case of settlements, the largest variation was identified for 1994–1995, which was not affected by the new set of maps the Party used to obtain the land-use changes (i.e. 1995–2007).</p> <p>The ERT recommends that Portugal analyse and transparently report the reasons which led to the significant inter-annual fluctuations in net emissions in the LULUCF sector, including for forest land and settlements.</p>	
L.12	4. General (LULUCF)	<p>Portugal did not complete CRF table summary 3s2 for the LULUCF sector, and did not report adequate information in the NIR on the methodological level (i.e. tier) and EFs applied in the different land-use categories and subcategories. In CRF summary 3s2 the methods and EFs applied were only reported for forest land (CO₂, CH₄ and N₂O) and cropland and grassland (CH₄ and N₂O only). Thus, the ERT could not assess the tier level and EFs applied to the GHG inventory for the categories in the LULUCF sector. The ERT notes that this reporting is not in line with the UNFCCC Annex I inventory reporting guidelines, according to which Parties should use notation keys in all CRF tables to fill in the cells where no quantitative data are entered, and that the NIR must include descriptions, references and sources of information for methodologies and EFs, and an indication of the level of complexity (i.e. tier) applied.</p> <p>During the review, the Party explained that it unintentionally omitted the information on methods and EFs for certain categories in CRF table summary 3s2 and that this would be included in the 2019 annual submission.</p>	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		<p>Portugal also presented a table to the ERT listing the methodological level and the source of EFs used for the key categories identified.</p> <p>The ERT recommends that Portugal complete CRF table summary 3s2 for all LULUCF categories and provide transparent information in the NIR on the descriptions, references and sources of information for the methodologies and EFs, as well as an indication of the level of complexity (i.e. tier) applied at the land-use subcategory and pool level.</p>	
L.13	4. General (LULUCF)	<p>Portugal conducted a key category analysis for the LULUCF sector in line with IPCC approaches 1 and 2 and included the results in the NIR (annex K). However, the NIR did not contain any information on which carbon pools and subcategories are significant for each key category. The ERT notes that, according to the 2006 IPCC Guidelines (volume 1, chapter 4.2, and volume 4, chapter 1.3), it is good practice to use the significance of carbon pools and subcategories to determine the level of the tier method that should be used to estimate GHG emissions and removals from sources and sinks. During the review, the Party explained that it had not performed any significance analyses in this regard.</p> <p>The ERT recommends that Portugal carry out a significance analysis to determine which carbon pools and subcategories are significant in each key category on the basis of the 2006 IPCC Guidelines (volume 1, chapter 4.2, and volume 4, chapter 1.3), and provide in the NIR detailed information on the results of this analysis.</p>	Yes. Adherence to UNFCCC Annex I inventory reporting guidelines
L.14	4. General (LULUCF)	<p>Portugal's territorial area consists of the mainland and the two archipelagos (the Azores and Madeira). As described in the NIR (section 6.1.2.1), the approaches followed for land representation vary between the three territorial units. However, GHG emissions are reported in an aggregated manner (total territorial area). During the review, the ERT requested further information on why the reported GHG emissions and removals for the LULUCF sector were not disaggregated between the mainland and two archipelagos areas. Portugal explained that the land-use stratification consists of 19 subcategories (NIR table 6.1, p.6-3) which apply to all three regions. Also, Portugal explained that the area estimates are calculated separately for each region because the information sources for each region differ and that the areas of each of the 19 land uses and all the 19 x 19 possible land-use changes of the three regions are then aggregated into national totals, which form the basis for calculating all emissions and removals. The Party also explained that it would be difficult to calculate all of this information for each region using the current calculation method.</p> <p>The ERT is of the view that, since different land data sources are used for land representation between the mainland and the two autonomous regions, and disaggregated area information is available for each of the three regions, Portugal should be able to report net GHG emissions from the LULUCF sector in a more disaggregated manner.</p> <p>The ERT encourages the Party to report net GHG emissions from the LULUCF sector separately for the three regions, or alternatively report net emissions for the mainland separately from the combined emissions for the two archipelagos.</p>	Not an issue/problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
L.15	4. General (LULUCF)	<p>The ERT noted that Portugal classifies shrubland areas covered by woody vegetation under the other land category (NIR table 6.1) and requested further information on whether the grassland category in accordance with Portugal's land-use classification scheme only includes herbaceous vegetation (i.e. non-woody vegetation), and whether all other woody vegetation (i.e. brush, shrubs, etc.) falls under shrubland areas. During the review, Portugal explained that shrubland is mostly unmanaged land and, for that reason, was included under the other land category. Thus, the grassland category currently only covers areas with (mostly) grass and non-woody vegetation (i.e. pasture). Portugal also informed the ERT that the issue had already been identified and that it intends to reallocate shrubland to a separate subcategory of grassland in the next annual submission, taking advantage of the publication of the new COS.</p> <p>The ERT notes that, according to the 2006 IPCC Guidelines (volume 4, chapter 3, p.3.6, and chapter 9, pp.9.4–9.7), systems with woody vegetation falling below the forest land threshold definition are to be classified under the grassland category, whereas the other land category includes land without significant carbon stocks only.</p> <p>The ERT recommends that Portugal revise its land-use classification scheme so that the other land category only includes land without significant carbon stocks and land areas that do not fall within any other land-use category. The ERT also recommends that Portugal reallocate shrubland to the appropriate land-use category in line with national land-use definitions (e.g. under forest land, grassland or cropland), reconstruct the land-use matrix accordingly and report the associated GHG emissions and removals from shrubland in the respective land-use category. The ERT further recommends that Portugal report on the impact of this reallocation on the associated emissions/removals in the land-use categories affected, namely grassland and, if necessary, forest land and cropland.</p>	Yes. Accuracy
L.16	4. General (LULUCF) – CO ₂	<p>The Party reported in NIR table 6.17 (section 6.1.3.3.3) litter values for all land uses and for all years using expert judgment and information from a thesis on forest fires by Rosa (2009). The ERT requested further information on how the carbon stock changes from this pool were estimated, taking into account NIR equation 6.14 and the need for a second litter stock value. During the review, the Party explained that the values are considered as typical litter stocks of each forest type. The reason for using this source is that the NFI does not provide the necessary information on carbon stocks in the litter pool. As a result, Portugal assumed constant values of litter stock for land remaining under the same land use, and changes in litter stocks are estimated only in cases of land-use changes.</p> <p>The ERT recommends that the Party include in the NIR information on the data source of the litter carbon stocks, the reasons for using information from this data source, and how the carbon stock changes from the litter pool were estimated.</p>	Yes. Transparency
L.17	4. General (LULUCF) – CO ₂	<p>The Party reported the carbon stock changes in the soil organic matter pool as “NO” for the following categories: (i) settlements converted to forest land; (ii) grassland and settlements converted to cropland; (iii) grassland remaining grassland before 2008; and (iv) cropland and settlements converted to grassland. During the review, the Party explained that the approach followed is the result of previous reviews by ERTs, following a conservative approach. Further, Portugal explained that emissions were assumed to be zero when the differences between</p>	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
L.18	Land representation	<p>carbon stocks of different land uses were not considered to be statistically significant from zero, resulting in the use of “NO”. However, the ERT notes that a tier 1 method is available in the 2006 IPCC Guidelines (volume 4, chapters 2.3.3, 4.3.3, 5.3.3, 6.2.3 and 6.3.3) to estimate the carbon stock changes in the soil organic matter pool for (i) settlements converted to forest land, (ii) grassland and settlements converted to cropland, (iii) grassland remaining grassland and (iv) cropland and settlements converted to grassland.</p> <p>The ERT recommends that the Party estimate and report the carbon stock changes in the soil organic matter pool by applying, as a minimum, the tier 1 methodology from the 2006 IPCC Guidelines (volume 4, chapters 2.3.3, 4.3.3, 5.3.3, 6.2.3 and 6.3.3) for (i) settlements converted to forest land, (ii) grassland and settlements converted to cropland, (iii) grassland remaining grassland before 2008 and (iv) cropland and settlements converted to grassland.</p> <p>Portugal developed its land representation (especially for the mainland) using land-use maps derived through remote sensing (the COS for 1995, 2007 and 2010 and the NFIs) and combined the maps for use as the main data source for estimating land-use change areas. For the units for the archipelagos, different data sources and approaches were used (e.g. CORINE Land Cover data, the NFI, agricultural censuses), even though the land-use classification system for the whole territorial area is the same. Portugal classified tree vegetation using the same remote sensing techniques, which presented challenges when trying to distinguish between different land-use categories (e.g. olive trees as cropland compared with wild olive trees as forest land and permanent crops as cropland compared with sweet chestnut as forest land). The Party also acknowledges that it is difficult for the analysers of the photographs to differentiate between rain-fed annual crops and grassland (NIR, section 6.1.2.3.1). The ERT requested further information on the classification and QC protocols followed by Portugal and on the validation activities conducted to ensure the accuracy of the maps.</p> <p>During the review, Portugal provided useful information on the production of the COS and the NFI land-use classification approach followed for the land representation of the mainland. The maps used for the mainland are derived from aerial photography with a 50 cm resolution. Auxiliary information is also used in the production process of the COS, such as field checks from the NFI and other maps (e.g. vineyard cadastre, olive tree cadastre). A detailed production protocol for the maps (e.g. classification protocol, map technical specification) was produced to ensure that the same criteria were applied consistently across the entire territory. The CORINE Land Cover maps and other information from the archipelagos are more limited in terms of classification and spatial resolution and required a methodology that combined the area estimates with statistics and assumptions. Portugal also provided further information on the technical specification of the maps, the classification scheme, the QC and inconsistency identification protocol, the response design and the overall accuracy of the maps. With regard to the objective of the accuracy assessment, the response design encompasses a random sampling design, with 900 sampling units for reference data, information collected in the field (for 2009 and 2010) and photo-interpretation techniques. The overall accuracy of the maps was estimated for 1995, 2007 and 2010 and ranges between 76 and 97 per cent. The ERT commends Portugal for the information provided during the review.</p> <p>The ERT recommends that Portugal provide detailed information on the technical specifications of the maps used for land representation, the classification protocol followed to ensure consistency over time, the QC protocol, the</p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
L.19	Land representation	<p>response design and the results of the accuracy assessment. The ERT encourages Portugal to include in its NIR a confusion matrix established by means of reference data.</p> <p>Portugal used COS for 1995, 2007 and 2010, the NFI results, agricultural statistics and assumptions (e.g. linear interpolation, assuming a constant area of wetlands, settlements and other land between 1970 and 1994) for the land representation for the mainland. For the Azores, the COS for 2007, the results of the NFI and agricultural statistics were used, while for Madeira the main data sources were the CORINE Land Cover maps for 1990 and 2006, the NFIs and agricultural statistics. The ERT requested further information on whether there are any plans to address the data gap before 1995 and after 2010 for the mainland, whether there is any updated information on the data sources used for Madeira, and the possible use of the CORINE Land Cover database for the Azores in order to enhance consistency in the land representation of the archipelagos units. During the review, Portugal explained that a new COS for 2018 would be produced in 2019, along with revised versions of the COS for 1995, 2007, 2010 and 2015 for the mainland. Also, with the production of the COS for 2018, a revised COS for 1990 will be made available. For Madeira, Portugal informed the ERT that, although there is updated CORINE Land Cover information, this has not yet been used in the inventory. For the Azores, Portugal stated that it would examine the use of the CORINE Land Cover database for the land representation.</p> <p>The ERT encourages Portugal to (i) report on the development of the new COS for 2018 and the revised versions of the COS for 1990, 1995, 2007 and 2010; and (ii) use the new COS for 2018 and the revised versions for the other years as soon as they become available.</p> <p>The ERT recommends that Portugal revise the assumption of constant areas for wetlands, settlements and other land between 1970 and 1994, taking into account any updated information from the new COS (for 1990, 1995, 2007, 2010 and 2015).</p> <p>The ERT also recommends that Portugal use the available updated CORINE Land Cover information for Madeira and use the same data sources for the Azores to enhance consistency in the land representation between the two archipelagos units.</p>	Yes. Accuracy
L.20	Land representation	<p>Portugal provided in the NIR (section 6.1.2) information on the land representation, including information on the different data sources used for the area AD and a set of land-use matrices for the different periods (i.e. 1970–1974, 1974–1979, 1979–1985, 1985–1989, 1989–1995, 1995–2005 and 2005–2016) for the mainland and the two autonomous regions (Madeira and the Azores). However, the ERT identified several inconsistencies in the land representation and the way in which the land-use conversion matrix has been developed. In particular:</p> <p>(a) For all reported years and for all land-use categories, the values reported in CRF table 4.1 in the “Final area” row in year X-1 do not equal the values in the “Initial area” column in year X. For example, for land-use forest land for 2015, the final area is 4,365.16 kha, but the initial area for the same land use for 2016 is 4,366.08 kha;</p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		<p>(b) For all reported years and for all land-use categories, the values reported in CRF table 4.1 in the “Final area” row in year X for each land-use category do not equal the values in the background CRF tables 4.A–4.F for the total area of the respective land-use category for the same year X. For example, for land-use cropland for 2016, the final area as reported in CRF table 4.1 is 2,391.22 kha, but the area reported in CRF table 4.B for the same year is 2,390.59 kha;</p> <p>(c) A verification of the consistency of the time series of the area data reported for the land-use categories from 2010 onward showed that, although the area data reported for the land-use conversion categories seemed to be consistent, this was not the case for land remaining under the same land use for all land-use categories for all years. Namely, for year X, the cumulative area reported for land remaining under the same land use does not match the area of the year X-1, minus the annual areas converted from that land-use category in year X, plus the annual areas converted to that land-use category 20 or more years before. For example, for 2016, for forest land remaining forest land, an area of 3,995.73 kha was reported in CRF table 4.A, whereas the area estimated by the ERT amounted to 3,989.59 kha.</p> <p>During the review, Portugal explained that this problem was probably caused by rounding performed by the CRF Reporter software. Portugal also clarified that the calculations were made without any rounding, that the differences are extremely small and do not have a substantial impact on the emission estimates, and that this issue would be addressed again after the time series had been revised on the basis of the new COS set. However, the ERT notes that the CRF Reporter software does not change the area reported in the different CRF tables (e.g. due to rounding) and that for some years considerable differences were detected (e.g. with regard to the inconsistencies related to point (b) above, the difference amounts to 84.19 kha for cropland for 1994).</p> <p>The ERT recommends that Portugal correct the inconsistencies with regard to the areas of the different categories of land use and land-use change and revise the GHG emissions and removals by:</p> <p>(a) Ensuring that, for all years and all land-use categories, the values reported in CRF table 4.1 in the “Final area” row in year X-1 equal the values in the “Initial area” column in year X;</p> <p>(b) Ensuring that, for all years and all land-use categories, the values reported in CRF table 4.1 in the “Final area” row in year X for each land-use category equal the values in the background CRF tables 4.A–4.F for the total area of the respective land-use category for the same year X;</p> <p>(c) Ensuring that, for all years and all land remaining under the same land-use category, the cumulative area reported and taken into account in the estimation of the carbon stock changes and associated emissions and removals also appropriately takes into account the annual land-use conversions from a land-use category and the annual areas converted to that land-use category 20 or more years before;</p> <p>(d) Explaining in the NIR the reasons for recalculating the associated GHG emissions and/or removals as a result of the revision of the land transition matrix.</p>	

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue and/or a problem?^a If yes, classify by type</i>
L.21	4.A Forest land – CO ₂ , CH ₄ and N ₂ O	<p>The Party reported that the forest land area is provided by both the COS and the NFI for 1995. However, the COS was chosen as a starting point for the forest land area for 1995 (NIR, p.6-6). The ERT requested further information on the differences in the forest land area between those two data sources. During the review, the Party explained that the NFI usually produces lower estimates of the forest land area than the COS, and that the forest land area as estimated in the 1995 NFI and the COS for 1995 equals 3.3 Mha and 4.1 Mha, respectively. Portugal also explained that the differences are partly justified by the different production methods used (sampling points versus polygons), but also by the slightly different definitions and classification/generalization criteria used. Also, a review of the COS was recently carried out with the aim of resolving some of the differences identified.</p> <p>The ERT recommends that the Party include detailed information on the differences between the NFIs and the COS for the forest land area, along with a justification for these differences and the reasons that led to the choice of the data source for the forest land area.</p>	Yes. Transparency
L.22	4.A Forest land – CO ₂	<p>Portugal uses expert judgment (i.e. 25 per cent of the MAI) for estimating the carbon losses in living biomass associated with other wood use (see ID# L.6 in table 3). The reason for this is that there are no statistics on harvesting for other wood use, including domestic use of biomass for energy. During the review, Portugal informed the ERT that such information is not collected in the context of the NFIs conducted.</p> <p>The ERT recommends that Portugal establish a system for data collection on fuelwood gathering in order to collect the necessary information for estimating losses from living biomass and report on any updates on this matter in the NIR.</p>	Yes. Accuracy
L.23	4.A Forest land – CO ₂	<p>Portugal uses different data sources for obtaining the EFs to estimate the carbon stock changes in the soil organic matter pool, such as the Land Use and Coverage Area frame Survey database and the Biosoil project of the International Cooperative Programme on the Assessment and Monitoring of Air Pollution Effects on Forests (NIR, section 6.1.3.5). The ERT requested further information on whether, in the context of the NFIs conducted by Portugal, and especially the new NFI6, which the Party is planning to use for GHG inventory purposes, data on carbon stocks in soils would be collected. During the review, Portugal explained that, although in the context of the NFI6 there is a specific module for soil carbon evaluation in forest land and cropland for which all preparatory and design activities have been completed, the data-collection process has not yet started owing to financial difficulties, and that updated information on the future of this module is expected in the first part of 2019.</p> <p>The ERT recommends that Portugal provide detailed information on the scope and phases of the NFI6 in the NIR, including any updates with regard to the module/phase on the evaluation of soil organic carbon.</p>	Yes. Accuracy
L.24	4.A.1 Forest land remaining forest land – CO ₂	<p>Portugal listed in the NIR (table 6.10, p.6-19) the values of MAI per dominant forest type, which are the result of expert judgment from a group of national experts. The ERT requested further information on whether these values were validated with measurements (e.g. as part of the NFIs), and whether they include loss due to mortality. During the review, Portugal explained that the MAI values were derived from potential growth calculated from growth models and production tables, and that although the potential growth describes fully stocked forests, these</p>	Yes. Transparency

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		<p>were not used directly, but rather reduced on the basis of expert judgment to reflect temporarily unstocked areas and burned areas undergoing regeneration. Portugal considered that this approach is a conservative estimate of forest growth that will not lead to CO₂ removals being overestimated. Also, Portugal clarified that the MAI values do not include loss due to mortality, since that type of biomass loss is estimated separately.</p> <p>In a provisional estimate made by the ERT using the MAI values from NIR table 6.10 and default BCEF values from the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.5) applicable to net annual increment for the temperate zone and to a growing stock level of 41–100 m³, the Party's estimated above-ground biomass growth ranges between 0.45 and 3.36 t dm ha⁻¹ year⁻¹, as opposed to the range of 3.0–4.4 t dm ha⁻¹ year⁻¹ included in the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.12), which refers to the net biomass growth.</p> <p>The ERT recommends that Portugal include in its NIR information on the justification of the expert judgment applied to estimate the MAI values reported in table 6.10 of the NIR and an explanation that these MAI values do not include loss due to mortality.</p> <p>The ERT encourages the Party to include information on the results of the verified values together with the updated information expected from the use of the results of the NFI6 in the NIR.</p>	
L.25	4.A.1 Forest land remaining forest land – CO ₂	<p>Portugal estimated country-specific BCEF values, labelled “BEF_i” in the NIR (section 6.1.3.1.1). Portugal applied these expansion factors to the growing stock (NIR equation 6.10) and to the net annual increment (NIR equation 6-16). The ERT notes that, in accordance with the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.5), the BCEF values that apply to growing stock, net annual increment and wood removals are all different, with the BCEF values for growing stock greater than the BCEF values for net annual increment. During the review, the Party explained that the BCEF values used are average values derived from country species-specific biomass and volume equations applied to NFI information. They therefore reflect the average forest characteristics of Portuguese forests (e.g. tree composition, age structure, density). A single BCEF value was derived, which is considered to apply to both stocks and increments.</p> <p>The ERT recommends that the Party include detailed information on how the country-specific BCEF values were derived. The ERT also recommends that Portugal demonstrate that applying the same country-specific average BCEF values to growing stock, net annual increment and wood removals ensures that CO₂ removals and emissions are neither over- nor underestimated, using NFI information. Alternatively, the ERT recommends that Portugal apply the country-specific BCEF values to the growing stock and apply IPCC default BCEF values to net annual increment and wood removals.</p>	Yes. Accuracy
L.26	4.B.1 Cropland remaining cropland – CO ₂	<p>The Party only reported the carbon stock changes in living biomass for conversions between cropland types (annual to perennial; perennial to annual; and, for perennial remaining perennial, only for conversions between three permanent crops: vineyards, olive groves and fruit trees). However, the tier 1 methodology in the 2006 IPCC Guidelines (volume 4, chapter 5.2.1) requires the estimation of carbon stock changes in perennial woody vegetation (i.e. in cropland remaining cropland), the biomass growth from biomass accumulation, and the biomass losses associated with harvest, gathering or disturbance, respectively. During the review, the Party explained that it</p>	Yes. Completeness

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		<p>considers three categories of permanent crops, namely vineyards, olive groves and fruit trees, and the approach to identifying conversions between those three categories. For example, vineyard areas converted to olive tree areas are reported as a loss of vineyard biomass and a gain of olive tree growth, while, for example, under “vineyards remaining vineyards” the gains (growth from existing plantations) are assumed to be equal to the losses (replacement of old vineyards with young vineyards (i.e. without land-use change)) and, as such, an EF of 0 is applied.</p> <p>The ERT recommends that the Party estimate and report all carbon stock changes in living biomass for perennial cropland types remaining under the same type in accordance with the 2006 IPCC Guidelines (volume 4, chapter 5.2.1), taking into account the biomass growth and biomass losses associated with harvest, gathering or disturbance.</p>	
L.27	4.B.1 Cropland remaining cropland – CO ₂	<p>Portugal reported in the NIR (table 6.16) values of above- and below-ground biomass and the transition periods used in the GHG inventory. The sources of these values are the <i>EMEP/EEA air pollutant emission inventory guidebook 2009</i> and the 2012 NIR of Spain. For example, in NIR table 6.16 Portugal reported a value of 0.31 t carbon/year for above- and below-ground biomass for annual crops. The ERT notes that the <i>EMEP/EEA air pollutant emission inventory guidebook 2009</i> does not contain any values for below-ground biomass for annual crops. In addition, an estimation made by the ERT of the root-shoot ratio using the transition period, the MAI values listed in NIR table 6.16 and the equation in NIR section 6.1.3.1.1 (p.6-18), when compared with the root-shoot values listed in NIR table 6.9 (labelled “RTS_f” by the Party), showed differences for all vegetation types except for annual crops (e.g. the root-shoot value for vineyards in NIR table 6.9 equals 0.859, while the value estimated by the ERT equals 0.824). During the review, the Party acknowledged that there had been a mistake in the below-ground biomass increments in the subcategories vineyards, olive groves, other permanent crops and shrubland, that these errors were embedded in the carbon stock change estimates, and that they would be corrected in the next annual submission.</p> <p>The ERT recommends that Portugal not consider below-ground biomass in annual crops, in line with the IPCC default assumption (2006 IPCC Guidelines, volume 4, chapter 5, p.5.10). The ERT also recommends that Portugal correct the root-shoot values used, revise the carbon stock change estimates and explain in the NIR the reason for the recalculations.</p>	Yes. Accuracy
L.28	4.B.1 Cropland remaining cropland – CO ₂	<p>The Party reported the areas of organic soils under cropland remaining cropland as “NO”. The ERT noted that the FAOSTAT database^b provides area data for the cultivation of organic soils in Portugal, flagged as calculated data (e.g. 11.65 kha for 2015), and requested further clarification from the Party. During the review, the Party explained that there is no information supporting the figures presented in FAOSTAT and that it did not know the source of the FAOSTAT data. Portugal further provided the ERT with a map from JRC (https://esdac.jrc.ec.europa.eu/images/eusoils_old/Esdb_Archive/octop/Resources/OCTOp.pdf), which does not show any areas with organic soils in the country. The ERT noted that, according to FAOSTAT, the main data sources for estimating the area with organic soils are the FAO Harmonized World Soil Database and the JRC Global Land Cover 2000 data set and requested that Portugal explore the issue further. Portugal provided</p>	Yes. Transparency

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		<p>additional information according to which there are no histosols in Portugal. The maps presented by the Party were obtained from the FAO and JRC databases.</p> <p>The ERT recommends that Portugal provide information to support its statement that no organic soils under cropland use exist in the country, or, if organic soils under cropland are identified, estimate and report the associated CO₂ emissions from organic soils under the LULUCF sector, and the associated N₂O emissions under the agriculture sector, in CRF table 3.D.</p>	
L.29	4.G HWP – CO ₂	<p>Portugal reported in CRF table 4.Gs2 the AD for HWP from 1990 onward. However, the table was not completed for the years before 1990. During the review, Portugal stated that CRF table 4.Gs2 would be appropriately completed in the next annual submission and that the full time series of AD was included in the emission calculations. The ERT recommends that Portugal fill in all cells in CRF table 4.Gs2 from 1960 or the first year for which data are available, whichever is earlier, as indicated in note 3 to that table.</p> <p>The ERT also recommends that Portugal report in the NIR the complete time series of AD (i.e. from 1900) that was used to estimate the contribution of the HWP pool to all HWP categories.</p>	Yes. Comparability
Waste			
W.7	5.A Solid waste disposal on land – CH ₄	<p>The Party reported a decreasing trend for the amount of industrial waste disposed of in landfills during 1999–2016 and explained that the fluctuation was due to waste diversion to other treatment methods (NIR, p.7-7). The ERT notes that the Party did not transparently report the amount of industrial waste treated by all treatment methods. As a result, the ERT cannot clearly explain the decreasing amount of waste disposed of in landfills. An unjustified decrease in the amount of waste disposed of may lead to an underestimation of emissions. During the review, the Party provided information on the amount of waste treated by all treatment methods in the time series 2008–2016: the total amount of industrial waste increased from 7.86 Mt in 2008 to 9.84 Mt in 2016, and the amount disposed of in solid waste disposal sites decreased from 2.13 Mt in 2008 to 1.17 Mt in 2016, while the valorization of waste increased from 4.75 Mt in 2008 to 7.93 Mt in 2016, which could explain the decreasing amount of industrial waste disposed of in landfills.</p> <p>The ERT recommends that the Party report the amount of waste treated by all treatment methods in the time series in the NIR.</p>	Yes. Transparency
W.8	5.A Solid waste disposal on land – CH ₄	<p>The Party reported different industrial organic waste categories for 1999–2003 and 2004–2016 (NIR table 7.7-4, p.7-15). The total amount of industrial waste during 2004–2007 was interpolated between 2003 and 2008. On the basis of the information provided by the Party, the relationship between the waste types reported for 1999–2003 and 2004–2016 was unclear to the ERT, including how the Party maintained consistency in the reporting over the whole time series. The ERT also noted that there was a significant increase in the sludge amount between 2003 (22,687 t of sludge from natural origin) and 2008 (89,469 t of common sludge and 28,674 t of sludge from industrial origin). During the review, the Party explained that the category sludge from natural origin reported for</p>	Yes. Consistency

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		<p>1999–2003 was similar to the common sludge category reported for 2004–2016. However, the increase in the amount of waste could not be explained and a clear relationship between the waste groups for the two periods still needs to be established.</p> <p>The ERT recommends that the Party describe in the NIR the relationship between all waste categories for 1993–2003 and 2004–2016 to demonstrate the consistency of the time series of the estimates.</p>	
W.9	5.A Solid waste disposal on land – CH ₄	<p>The Party reported that the amount of industrial waste for 1960–1998 was calculated considering annual growth rates on the basis of expert judgment (NIR, pp.7-12 and 7-15). It was unclear to the ERT how the growth rate for industrial waste was determined for that period. During the review, the Party explained that annual waste growth rates were established on the basis of expert judgment solicited from one expert. The ERT noted that this reporting is not in line with the 2006 IPCC Guidelines, which indicate that expert judgment should be independently obtained from two or more experts (volume 1, annex 2A.1, p.2.20).</p> <p>The ERT recommends that the Party make efforts to obtain information on the industrial waste growth rate from other experts in line with the 2006 IPCC Guidelines (volume 1, annex 2A.1, p.2.20) and transparently report the expert judgment in the NIR, demonstrating its compliance with the 2006 IPCC Guidelines.</p>	Yes. Transparency
W.10	5.A Solid waste disposal on land – CH ₄	<p>The Party reported the use of a country-specific k value of 0.07 year⁻¹ (NIR, p.7-16) on the basis of national geographical information. It was unclear to the ERT how the k value was derived for Portugal. During the review, the Party explained that the country-specific k value was derived from the recommended IPCC tier 1 default k values for boreal and temperate climate zone under dry (MAT/PET<1) and wet (MAT/PET>1) conditions specified in the 2006 IPCC Guidelines (volume 5, chapter 3, p.3.17) and presented the geographical locations of all solid waste disposal sites reported. The ERT agreed with the explanation provided.</p> <p>The ERT recommends that the Party provide background information on solid waste disposal sites and the climatic conditions used to determine the country-specific k value in the NIR.</p>	Yes. Transparency
W.11	5.B. Biological treatment of solid waste – CH ₄ and N ₂ O	<p>The Party reported the amounts of municipal waste composted and anaerobically digested in an aggregated manner in figure 7.9 in the NIR. The same figure shows aggregated CH₄ emissions from composting and anaerobic digestion and aggregated N₂O emissions from the two treatments. The ERT notes that the amount of waste treated by each method is not transparently reported in the NIR, as the combined reporting does not allow the ERT to evaluate the emission trend of the treatment methods separately. During the review, the Party provided separate amounts for the waste treated by composting and anaerobic digestion in the time series (1990–2016).</p> <p>The ERT recommends that the Party transparently report the amount of waste treated by composting and anaerobic digestion separately in the time series in the NIR.</p>	Yes. Transparency
W.12	5.D.1 Domestic wastewater – N ₂ O	<p>The Party reported the amount of sewage sludge spread in the environment under the waste sector as percentages of organic loading (NIR table 7-20, p.7-35). The ERT noted that this is not consistent with the reporting of the amount of sewage applied to agricultural soils under the agriculture sector as t of dry mass. During the review, the</p>	Yes. Accuracy

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		<p>Party explained that the amount of sludge reported under the waste sector was estimated on the basis of expert judgment from wastewater treatment plant operators, whereas the amount of sludge applied to agricultural soils reported under the agriculture sector was obtained from data collected by the Regional Directorates for Agriculture and Fisheries.</p> <p>The ERT recommends that the Party consistently report the quantity of sewage sludge spread in the environment under the waste sector and the sewage sludge applied to agricultural soils under the agriculture sector.</p>	
KP-LULUCF			
KL.10	General (KP-LULUCF)	<p>Portugal used different data sources for the land representation of Madeira, the Azores and the mainland (see ID# L.19 above). As noted in ID# L.19 above, Portugal expects new data to become available for the mainland, while for Madeira and the Azores updated data are already available.</p> <p>The ERT encourages Portugal to use the new COS products as soon as they become available.</p> <p>The ERT recommends that the Party use the available updated CORINE Land Cover information for Madeira and incorporate the same data sources for the Azores when developing the land transition matrix for KP-LULUCF activities.</p>	Yes. Accuracy
KL.11	General (KP-LULUCF) – CO ₂ , CH ₄ and N ₂ O	<p>As explained in ID# L.15 above, Portugal classifies shrubland areas covered by woody vegetation under the category other land use.</p> <p>The ERT recommends that Portugal (a) reallocate shrubland to the appropriate land-use category in line with the national land-use definitions (e.g. under forest land, grassland and cropland) and KP-LULUCF activity; (b) revise the land transition matrix accordingly; (c) report the associated GHG emissions and removals from shrubland under the respective KP-LULUCF activity; and (d) explain in the NIR the reasons for recalculating the associated GHG emissions and/or removals as a result of the reallocation of shrubland.</p>	Yes. Accuracy
KL.12	General (KP-LULUCF)	<p>Portugal reported in CRF table NIR-2 the areas and changes in areas between the previous and the current inventory years. The ERT identified that for all reported years and for the activities FM, CM and GM and the category other, the values reported in the “Total area at the end of the current inventory year” row in year X-1 do not equal the values in the “Total area at the end of the previous inventory year” column in year X. During the review, the Party justified these differences by referring to the response provided in relation to ID# L.20 above for LULUCF reporting under the Convention. However, the ERT notes that the CRF Reporter software does not change the area reported in the different CRF tables (e.g. due to rounding).</p> <p>The ERT recommends that Portugal correct the inconsistencies in CRF table NIR-2 with regard to the land transition matrix by ensuring that for all reported years and for the activities FM, CM and GM and the category other, the values reported in the “Total area at the end of the current inventory year” row in year X-1 equal the values in the “Total area at the end of the previous inventory year” column in year X, and revise the associated</p>	Yes. Accuracy

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		GHG emissions and/or removals for these activities. The ERT also recommends that Portugal explain in the NIR the reasons for recalculating the associated GHG emissions and/or removals as a result of the revision of the land transition matrix.	
KL.13	General (KP-LULUCF) – CO ₂	<p>Portugal used “NO” to report the carbon stock changes in the soil organic matter pool for the land-use and land-use conversion categories that are part of either mandatory or elected activities under the Kyoto Protocol (see ID# L.17 above).</p> <p>The ERT recommends that the Party estimate the carbon stock changes in the soil organic matter pool for the respective KP-LULUCF activities to which the following land uses and land-use conversions correspond: (i) settlements converted to forest land (AR); (ii) grassland and settlements converted to cropland (CM); (iii) grassland remaining grassland before 2008 (GM); and (iv) cropland and settlements converted to grassland (GM). The ERT recommends that, in cases where Portugal chooses not to report the carbon stock changes from a pool, the Party provide transparent and verifiable information demonstrating that the pool is not a source, in accordance with decision 2/CMP.7, annex, paragraph 26.</p>	Yes. Completeness
KL.14	Deforestation – N ₂ O	<p>The Party reported in the NIR (section 11.1.1.2) that N₂O emissions from N mineralization/immobilization for deforestation only cover the conversion of forest land to cropland, while no information is reported on how N₂O emissions resulting from the other types of deforestation are considered or whether indirect N₂O emissions are also included in the values reported in CRF table 4(KP-II)3. During the review, the Party explained that N₂O emissions associated with any deforestation activities that result in a loss of soil organic carbon are included in CRF table 4(KP-II)3 and that indirect N₂O emissions are not considered. The ERT notes that for 2016, the area reported for the deforestation activity in CRF table 4(KP-II)3 is 102.59 kha, which is smaller than the area reported in CRF table NIR-2 (366.99 kha), and that this could indicate that some deforested land which results in N₂O emissions from N mineralization/immobilization has not been included in the total reported N₂O emissions.</p> <p>The ERT recommends that the Party report direct N₂O emissions from N mineralization/immobilization due to loss/gain associated with all deforestation activities and transparently clarify in the NIR the reasons for any difference in the area reported for deforestation in CRF tables NIR-2 and 4(KP-II)3. The ERT also recommends that the Party include indirect N₂O emission estimates in CRF table 4(KP-II)3.</p>	Yes. Completeness
KL.15	FM – CO ₂ , N ₂ O and CH ₄	<p>Portugal did not provide in the NIR any information relating to the provisions for ND. In particular, the ERT could not find any quantitative information on how the background level of emissions and the margin associated with annual ND were estimated; the time series of emissions used for the estimation of the background level and the margin for both FM and AR; the time series of emissions from the types of ND included in the FMRL; and whether, through the technical correction of the FMRL, as reported in NIR tables 11.3 and 11.4, emissions from ND included in the FMRL and for which Portugal intends to apply the provisions for ND were substituted with the background level of emissions estimated.</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		<p>During the review, the Party explained that the background level and the respective margins for AR and FM were calculated using the methodology provided in the Kyoto Protocol Supplement, and that the fire emissions for AR and FM for 1990–2009 were used as a basis for the calculation. The main reason for the technical correction was the change in the methodology used in the submission to establish the FMRL (country-specific), which was replaced by the above-mentioned IPCC methodology. Portugal also indicated that the background level only included information with regard to forest fires, while other types of disturbances were not considered. The background level also included estimates of substituted emissions from forest fires in the FMRL technical correction.</p> <p>The ERT recommends that the Party (i) include quantitative information on how the background level and the margin were estimated in accordance with decision 2/CMP.7, annex, paragraph 33(a), and the Kyoto Protocol Supplement, including the time series of emissions used for estimating the background level and the margin; (ii) demonstrate how the expectation of net credits or net debits is avoided; and (iii) report how the emissions from forest fires were included in the FMRL.</p>	
KL.16	FM – CO ₂ , N ₂ O and CH ₄	<p>The Party reported in the NIR (section 11.4.5) that the FMRL technical correction value is 3,302 Gg CO₂ eq/year. However, in CRF table 4(KP-I)B.1.1 the value reported is 3,286.49 kt CO₂ eq/year. During the review, the Party explained that the correct value is the one presented in the NIR, and that the value reported in the CRF table is incorrect.</p> <p>The ERT recommends that the Party report the correct value for the FMRL technical correction in CRF table 4(KP-I)B.1.1.</p>	Yes. Accuracy
KL.17	CM – CO ₂	<p>As explained in ID# L.26 above, Portugal only reported the carbon stock changes in living biomass for conversions between cropland types. However, the IPCC tier 1 methodology requires the estimation of carbon stock changes in perennial woody vegetation and growth and losses, respectively.</p> <p>The ERT recommends that the Party estimate and report all carbon stock changes in living biomass for perennial cropland types remaining under the same land type in accordance with the 2006 IPCC Guidelines, taking into account the accumulation from growth and losses associated with harvest, gathering or disturbances.</p>	Yes. Completeness
KL.18	CM and GM – CO ₂ , CH ₄ and N ₂ O	<p>Portugal counted as zero the CP2 emissions and removals for 2013–2020 from lands that were subject to CM and GM in the base year (1990) only, are no longer reported under the respective activity and were not transferred to another reported activity in any year of the CP2, such as cropland conversions to settlements before 2008 (NIR, sections 11.1.1.4, 11.1.1.5 and 6.1.2.8). During the review, the Party explained that the associated emissions and removals for CM and GM and the land conversions from these two activities were estimated in accordance with the Kyoto Protocol Supplement (boxes 2.9.1 and 2.10.2).</p> <p>The ERT recommends that, in order to enhance the transparency of the reporting, the Party describe and report, in accordance with the Kyoto Protocol Supplement, the consequences of excluding emissions and removals from</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? ^a If yes, classify by type
		lands that were subject to CM and GM in the base year (1990) only, are no longer reported under the respective activity and were not transferred to another reported activity in any year of the CP2.	
KL.19	GM – CO ₂ , N ₂ O and CH ₄	<p>The Party reported in the NIR (section 11.1.1.5) that the area estimates for GM are described in NIR section 6.1.2.8. However, section 6.1.2.8 only states that “A similar procedure was used to estimate areas under ‘Grazing land Management’”. During the review, the Party explained that the quoted sentence refers to the methodology described for CM by replacing the words “cropland management” with “Grazing land Management”, and provided information on the equations for estimating the GM area.</p> <p>The ERT recommends that the Party provide transparent information on how the GM area is estimated in section 6.1.2.8 of the NIR, including the equations used in the estimations.</p>	Yes. Transparency
KL.20	Biomass burning – CO ₂	<p>Portugal stated in CRF table NIR-1 that it had reported deforestation, CM and GM activities for CO₂ emissions from biomass burning. However, no emissions of CO₂ from biomass burning as a result of wildfires are reported in CRF table 4(KP-II)4 for these activities. During the review, the Party explained that fire emissions (CO₂, CH₄ and N₂O) are reported for all activities. For all non-forest categories, the general reporting approach is that the annual gains of carbon in living biomass equal the annual losses (i.e. an EF of 0 for land remaining under the same land category), and that exclusive consideration of CO₂ fire emissions would lead to a double counting of losses and, therefore, to ensure consistency with the reporting of living biomass, the emissions are not considered. However, the ERT considers that CO₂ emissions from the burning of woody biomass during wildfires associated with the respective activities do occur and need to be reported in order to avoid an underestimation of emissions.</p> <p>The ERT recommends that the Party report CO₂ emissions from woody biomass burning for the deforestation, CM and GM activities. For activities for which Portugal does not estimate CO₂ emissions from biomass burning but burning does occur, the ERT recommends that Portugal correct the notation key to “NE” in CRF table NIR-1.</p>	Yes. Completeness
KL.21	HWP – CO ₂	<p>Portugal did not report in the NIR (Part II: supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol) information with regard to the HWP pool in accordance with decision 2/CMP.8, annex II, paragraph 2(g)(i) and (ii). During the review, the Party explained that information on HWP data sources and methodologies is provided in NIR section 6.8 (p.6-49) for reporting under the Convention and in NIR section 11.1.8 (p.11-5) for reporting under the Kyoto Protocol, and that the product categories and half-lives are the defaults provided in decision 2/CMP.7, annex, paragraph 29.</p> <p>The ERT recommends that the Party provide transparent quantitative information on the time series of AD and the half-life values for the HWP categories that were used to estimate the contribution of this pool to KP-LULUCF activities, as required by decision 2/CMP.8, annex II, paragraph 2(g)(i) and (ii).</p>	Yes. Transparency

^a Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines, or problems as defined in paragraph 69 of the Article 8 review guidelines. Encouragements are made to the Party to address all findings not related to such issues or problems.

^b Available at <http://www.fao.org/faostat/en>.

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments to the 2018 annual submission of Portugal.

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

12. Portugal has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable for the 2018 review.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2018 annual submission.

Annex I

Overview of greenhouse gas emissions and removals for Portugal for submission year 2018 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Portugal in its 2018 annual submission

1. Tables 6–9 provide an overview of total GHG emissions and removals as submitted by Portugal.

Table 6
Total greenhouse gas emissions for Portugal, base year^a–2016
 (kt CO₂eq)

	<i>Total GHG emissions excluding indirect CO₂ emissions</i>		<i>Total GHG emissions including indirect CO₂ emissions^b</i>		<i>Land-use change (Article 3.7 bis as contained in the Doha Amendment)^c</i>	<i>KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)^d</i>	<i>KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)</i>	
	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>			<i>CM, GM, RV, WDR</i>	<i>FM</i>
FMRL								–6 830.00
Base year	61 100.01	59 945.00	61 206.46	60 051.45	4 276.76		4 795.15	
1990	60 980.06	59 825.04	61 086.51	59 931.49				
1995	65 572.83	70 227.18	65 793.96	70 448.31				
2000	77 463.43	83 141.82	77 684.01	83 362.40				
2010	59 032.37	69 942.80	59 230.04	70 140.47				
2011	57 771.78	68 818.60	57 949.63	68 996.46				
2012	58 374.80	66 945.45	58 560.74	67 131.39				
2013	57 205.16	65 133.50	57 371.19	65 299.53		–1 290.04	390.34	–7 364.70
2014	55 426.91	65 085.72	55 583.44	65 242.25		–1 500.28	380.90	–8 964.12
2015	60 947.21	69 412.54	61 112.04	69 577.38		–1 316.83	316.75	–7 898.57
2016	62 226.95	67 621.06	62 381.45	67 775.56		–375.02	255.65	–2 104.25

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

^a “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, 1995 for HFCs, PFCs and SF₆, and 2000 for NF₃. The base year for CM and GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported. CO₂, CH₄ and N₂O emissions included in the base year do not include the net emissions minus removals from the conversion of forests (deforestation) that were included in Portugal’s initial report for the CP2 of the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned amount.

^b The Party has reported indirect CO₂ emissions in CRF table 6.

^c The value reported in this column refers to 1990.

^d Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely AR and deforestation.

Table 7
Greenhouse gas emissions by gas for Portugal, excluding land use, land-use change and forestry, 1990–2016
 (kt CO₂ eq)

	CO ₂ ^a	CH ₄	N ₂ O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF ₆	NF ₃
1990	45 692.01	10 392.36	3 847.12	NO, NA	NO, NA	NO, NA	NO, NA	NO
1995	55 025.59	11 465.28	3 837.48	106.02	NO	NO	13.93	NO
2000	66 280.52	12 292.80	4 347.70	423.64	1.13	NO	16.61	NO
2010	53 095.25	11 529.00	3 368.57	2 105.03	7.93	NO	34.69	NO
2011	51 891.74	11 688.42	3 097.48	2 280.81	9.05	NO	28.97	NO
2012	50 073.58	11 456.65	3 115.60	2 444.91	10.18	NO	30.47	NO
2013	48 254.86	11 266.12	3 119.19	2 617.06	11.36	NO	30.94	NO
2014	48 119.42	11 145.11	3 189.92	2 749.43	12.59	NO	25.78	NO
2015	52 370.06	11 085.88	3 175.39	2 909.05	13.89	NO	23.11	NO
2016	50 439.97	11 081.71	3 155.29	3 059.85	15.29	NO	23.45	NO
Per cent change 1990–2016	10.4	6.6	-18.0	NA	NA	NA	NA	NA

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

^a CO₂ emissions include indirect CO₂ emissions reported in CRF table 6.

Table 8
Greenhouse gas emissions by sector for Portugal, 1990–2016
 (kt CO₂ eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	41 431.63	5 919.70	7 143.66	1 155.02	5 436.50	NO
1995	50 539.22	6 237.99	7 059.96	-4 654.35	6 611.14	NO
2000	60 900.48	7 665.77	7 506.95	-5 678.39	7 289.20	NO
2010	48 911.01	7 617.99	6 614.09	-10 910.43	6 997.38	NO
2011	48 203.71	7 041.26	6 578.45	-11 046.82	7 173.03	NO
2012	46 747.80	6 798.06	6 624.79	-8 570.65	6 960.75	NO
2013	44 583.79	7 290.55	6 610.76	-7 928.34	6 814.43	NO
2014	44 077.63	7 780.44	6 696.72	-9 658.81	6 687.45	NO
2015	48 429.22	7 868.86	6 724.99	-8 465.34	6 554.31	NO

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2016	47 188.83	7 324.72	6 788.90	-5 394.12	6 473.12	NO
Per cent change 1990–2016	13.9	23.7	-5.0	-567.0	19.1	NA

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions; (2) Totals include indirect CO₂ emissions reported in CRF table 6.

Table 9

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year^a–2016, for Portugal
(kt CO₂ eq)

	<i>Article 3.7 bis as contained in the Doha Amendment^a</i>			<i>Article 3.3 of the Kyoto Protocol</i>				<i>FM and elected Article 3.4 activities of the Kyoto Protocol^b</i>			
	<i>Land-use change</i>	<i>AR</i>	<i>Deforestation</i>	<i>FM</i>		<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>		
FMRL				-6 830.00							
Technical correction				3 286.49							
Base year	4 276.76					3 352.41	1 442.74	NA	NA		
2013		-3 414.76	2 124.72	-7 364.70		347.015	43.321	NA	NA		
2014		-3 600.81	2 100.53	-8 964.12		358.351	22.547	NA	NA		
2015		-3 392.46	2 075.63	-7 898.57		356.342	-39.588	NA	NA		
2016		-2 441.65	2 066.64	-2 104.25		356.272	-100.622	NA	NA		
Per cent change base year– 2016						-89.4	-107.0	NA	NA		

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

^a The value reported in this column refers to 1990.

^b The base year for CM and GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Portugal. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

- Table 10 provides an overview of key relevant data for Portugal's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 10

Key relevant data for Portugal under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2018 annual submission

<i>Key parameters</i>	<i>Values</i>
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 ND	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO ₂ emissions	2 126.297 kt CO ₂ eq (17 010.374 kt CO ₂ eq) for the duration of the commitment period
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. AR in 2016	NA
2. Deforestation in 2016	NA
3. FM in 2016	NA
4. CM in 2016	NA
5. GM in 2016	NA
6. RV in 2016	NA
7. WDR in 2016	NA

Annex II

Information to be included in the compilation and accounting database

Tables 11–14 include the information to be included in the compilation and accounting database for Portugal. 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 11

Information to be included in the compilation and accounting database for 2016, including on the commitment period reserve, for Portugal

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment</i>	<i>Final</i>
CPR	386 623 772	386 623 773		386 623 773
Annex A emissions for 2016				
CO ₂ ^a	50 439 974			50 439 974
CH ₄	11 081 710			11 081 710
N ₂ O	3 155 294			3 155 294
HFCs	3 059 847			3 059 847
PFCs	15 293			15 293
Unspecified mix of HFCs and PFCs	NO			NO
SF ₆	23 447			23 447
NF ₃	NO			NO
Total Annex A sources	67 775 564			67 775 564
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016				
3.3 AR	-2 441 655			-2 441 655
3.3 Deforestation	2 066 636			2 066 636
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016				
3.4 FM	-2 104 248			-2 104 248
3.4 CM	356 272			356 272
3.4 CM for the base year	3 352 406			3 352 406
3.4 GM	-100 622			-100 622
3.4 GM for the base year	1 442 744			1 442 744

^a CO₂ emissions include indirect CO₂ emissions reported in CRF table 6.

Table 12

Information to be included in the compilation and accounting database for 2015, for Portugal

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions for 2015				
CO ₂ ^a	52 370 059			52 370 059
CH ₄	11 085 878			11 085 878
N ₂ O	3 175 393			3 175 393
HFCs	2 909 052			2 909 052
PFCs	13 889			13 889
Unspecified mix of HFCs and PFCs	NO			NO

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment</i>	<i>Final</i>
SF ₆	23 108			23 108
NF ₃	NO			NO
Total Annex A sources	69 577 380			69 577 380
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
3.3 AR	-3 392 463			-3 392 463
3.3 Deforestation	2 075 635			2 075 635
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
3.4 FM	-7 898 566			-7 898 566
3.4 CM	356 342			356 342
3.4 CM for the base year	3 352 406			3 352 406
3.4 GM	-39 588			-39 588
3.4 GM for the base year	1 442 744			1 442 744

^a CO₂ emissions include indirect CO₂ emissions reported in CRF table 6.

Table 13

Information to be included in the compilation and accounting database for 2014, for Portugal
(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions for 2014				
CO ₂ ^a	48 119 422			48 119 422
CH ₄	11 145 112			11 145 112
N ₂ O	3 189 919			3 189 919
HFCs	2 749 427			2 749 427
PFCs	12 591			12 591
Unspecified mix of HFCs and PFCs	NO			NO
SF ₆	25 777			25 777
NF ₃	NO			NO
Total Annex A sources	65 242 249			65 242 249
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 AR	-3 600 809			-3 600 809
3.3 Deforestation	2 100 529			2 100 529
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 FM	-8 964 120			-8 964 120
3.4 CM	358 351			358 351
3.4 CM for the base year	3 352 406			3 352 406
3.4 GM	22 547			22 547
3.4 GM for the base year	1 442 744			1 442 744

^a CO₂ emissions include indirect CO₂ emissions reported in CRF table 6.

Table 14

Information to be included in the compilation and accounting database for 2013, for Portugal(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimates</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions for 2013				
CO ₂ ^a	48 254 865			48 254 865
CH ₄	11 266 116			11 266 116
N ₂ O	3 119 189			3 119 189
HFCs	2 617 061			2 617 061
PFCs	11 360			11 360
Unspecified mix of HFCs and PFCs	NO			NO
SF ₆	30 942			30 942
NF ₃	NO			NO
Total Annex A sources	65 299 531			65 299 531
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 AR	-3 414 760			-3 414 760
3.3 Deforestation	2 124 718			2 124 718
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 FM	-7 364 704			-7 364 704
3.4 CM	347 015			347 015
3.4 CM for the base year	3 352 406			3 352 406
3.4 GM	43 321			43 321
3.4 GM for the base year	1 442 744			1 442 744

^a CO₂ emissions include indirect CO₂ emissions reported in CRF table 6.

Annex III

Additional information to support findings in table 2

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) 2.A.2 lime production: CO₂ emissions from lime production (see ID# I.7 in table 3);
- (b) 2.A.3 glass production: CO₂ emissions from rock wool production (see ID# I.12 in table 3);
- (c) 2.B.8 petrochemical and carbon black production: CO₂ and CH₄ emissions from methanol production (see ID# I.43 in table 5);
- (d) 2.C.1 iron and steel production: CO₂ emissions from the use of limestone and dolomite in iron and steel production (see ID# I.32 in table 3);
- (e) 2.E.1 integrated circuits or semiconductors: HFC, PFC, SF₆ and NF₃ emissions from integrated circuits or semiconductors (see ID# I.34 in table 3);
- (f) 2.E.2 thin-film transistor flat-panel displays: PFC, SF₆ and NF₃ emissions from thin-film transistor flat-panel displays (see ID# I.35 in table 3);
- (g) LULUCF sector: CO₂ emissions from the carbon stock changes in the soil organic matter pool for (i) settlements converted to forest land, (ii) grassland and settlements converted to cropland, (iii) grassland remaining grassland and (iv) cropland and settlements converted to grassland (see ID# L.17 in table 5);
- (h) 4.B.1 cropland remaining cropland: CO₂ emissions and removals from the carbon stock changes in living biomass for perennial cropland types (see ID# L.26 in table 5);
- (i) KP-LULUCF activities: CO₂ emissions and removals from the carbon stock changes in the soil organic matter pool in the appropriate activity (see ID# KL.13 in table 5);
- (j) KP-LULUCF activities: CO₂ emissions from biomass burning for deforestation, CM and GM (see ID# KL.20 in table 5);
- (k) Deforestation: direct and indirect N₂O emissions from N mineralization/immobilization due to loss/gain of soil organic carbon (see ID# KL.14 in table 5);
- (l) CM: CO₂ emissions and removals from the carbon stock changes in living biomass for perennial crop types (see ID# KL.17 in table 5).

Annex IV

Documents and information used during the review

A. Reference documents

Reports of the Intergovernmental Panel on Climate Change

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B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Teresa Costa Pereira (Climate Change Department, Portuguese Environmental Agency), including additional material on the methodology and assumptions used.
