COMPLIANCE COMMITTEE **CC/ERT/ARR/2021/14**
6 May 2021

Report of the individual review of the annual submission of Portugal submitted in 2020

Note by the secretariat

The report of the individual review of the annual submission of Portugal submitted in 2020 was published on 5 May 2021. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decisions 4/CMP.4 and 8/CMP.9), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2020/PRT, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report on the individual review of the annual submission of Portugal submitted in 2020*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual review of the 2020 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 26 to 31 October 2020 remotely.

* In the symbol for this document, 2020 refers to the year in which the inventory was submitted, not to the year of publication.

Contents

Abbreviations and acronyms

AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
BCEF	biomass conversion and expansion factor
CER	certified emission reduction
CH_4	methane
CM	cropland management
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COPERT	software tool for calculating road transport emissions
CPR	commitment period reserve
CRF	common reporting format
DE%	digestible energy expressed as a percentage of gross energy
DGEG	Directorate General for Energy and Geology of Portugal
DOC	degradable organic carbon
EEA	European Environment Agency
EF	emission factor
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
Eurostat	statistical office of the European Union
FM	forest management
FMRL	forest management reference level
$Frac_{gasM}$	fraction of applied organic nitrogen fertilizer materials and of urine and dung nitrogen deposited by grazing animals that volatilizes as ammonia and nitrogen oxides
$Frac_{leachMS}$	fraction of managed manure nitrogen losses due to leaching and run-off
GDP	gross domestic product
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
IE	included elsewhere
IEF	implied emission factor
INIAV	National Institute for Agricultural and Veterinary Research of Portugal
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LKD	lime kiln dust

LPG	liquefied petroleum gas
LUCAS	Land Use/Cover Area frame statistical Survey
LULUCF	land use, land-use change and forestry
MAI	mean annual increment
MMS	manure management system(s)
N	nitrogen
NA	not applicable
NE	not estimated
NFI	national forest inventory
NF_3	nitrogen trifluoride
NIR	national inventory report
NMVOC	non-methane volatile organic compound
NO	not occurring
N_2O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SWDS	solid waste disposal site(s)
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*

I. Introduction

1. This report covers the review of the 2020 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" (annex to decision 13/CP.20). The review took place from 26 to 31 October 2020 remotely[1] and was coordinated by Roman Payo, Ruta Bubniene and Peter Iversen (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Portugal.

Table 1
Composition of the expert review team that conducted the review for Portugal

Area of expertise	*Name*	*Party*
Generalist	John David Watterson	United Kingdom
Energy	Yuriko Hayabuchi	Japan
	Hiroshi Ito	Japan
	Alexander Zahar	Australia
IPPU	Juan Luis Martin Ortega	El Salvador
	Newton Paciornik	Brazil
	Takuji Terakawa	Japan
Agriculture	Abdulkadir Bektaş	Turkey
	Amnat Chidthaisong	Thailand
	Paulo Cornejo	Chile
LULUCF and KP-LULUCF	Pierre Brender	United Kingdom
	Agustín José Inthamoussu	Uruguay
	Midori Yanagawa	Japan
Waste	Veronica Jakarasi	Zimbabwe
	Takefumi Oda	Japan
Lead reviewers	Newton Paciornik	
	John David Watterson	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2020 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Portugal resolve identified findings, including issues [2] designated as problems. [3] Other findings, and, if applicable, the encouragements of the ERT to Portugal to resolve related issues, 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 presents the annual GHG emissions of Portugal, including totals excluding and including LULUCF, indirect CO_2 emissions, and emissions by gas and by sector, and

[1] Owing to the circumstances related to the coronavirus disease 2019, the review had to be conducted remotely.
[2] Issues are defined in decision 13/CP.20, annex, para. 81.
[3] Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.

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

II. Summary and general assessment of the Party's 2020 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2020 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 2020 annual submission of Portugal

Assessment			*Issue/problem ID#(s) in table 3 or 5*[a]
Date of submission	Original submission: NIR, 3 April 2020; CRF tables (version 1), 3 April 2020; SEF tables, 3 April 2020		
Review format	Centralized review conducted remotely		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	Yes	L.4
	(b) Selection and use of methodologies and assumptions?	Yes	I.16, A.8, A.9
	(c) Development and selection of EFs?	Yes	E.8, E.17, A.10, A.11, L.20, L.24
	(d) Collection and selection of AD?	Yes	E.35, I.14, L.5, L.8, L.9, L.10, L.11, L.14, L.15, L.16, L.21, KL.1, KL.2, KL.3, KL.4, KL.5
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	Yes	E.30, I.10, I.32, I.34
	(g) Reporting of uncertainties, including methodologies?	Yes	G.8, G.13, A.2
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories, or completeness?[b]	Yes	I.6, I.24, I.27, I.28, I.36, L.7, L.22, KL.6, KL.7, KL.9, KL.10, KL.14, KL.17
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	NA	The Party did not report any insignificant categories as "NE"
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under	Have any issues been identified related to the following aspects of the national system:		

Assessment			*Issue/problem ID#(s) in table 3 or 5[a]*
the Kyoto Protocol	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	No	
	Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the 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
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	No	
	(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.12
	(c) Reporting requirements of decision 6/CMP.9?	No	
	(d) Country-specific information to support provisions for natural disturbances in accordance with decision 2/CMP.7, annex, paragraphs 33–34?	Yes	KL.12
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18?	No	G.9
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	NA	Portugal does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for assessing conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Questions of implementation	Did the ERT list any questions of implementation?	No	

[a] Further information on the issues identified, as well as additional findings, may be found in tables 3 and 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 recommendations included in the previous review report

8. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 1 April 2019,[4] and had not been resolved by the time of publication of the review report of the Party's 2018 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances. The ERT noted that the individual review of Portugal's 2019 annual submission did not take place in 2019 owing to insufficient funding for the review process.

Table 3
Status of implementation of recommendations included in the previous review report for Portugal

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	Article 3, paragraph 14, of the Kyoto Protocol (G.1, 2018) (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.	Not resolved. The ERT considered the information reported in the NIR (section 15, p.15-1) and was unable to determine whether or not there has been any change in the information reported since the previous NIR. During the review, the Party explained that it did not report information on changes since the previous submission, as recommended by the previous ERT, and indicated that this was an oversight. Portugal provided the information that should have been added since the previous NIR, indicating that all sectors must contribute to enabling the transition to a carbon-neutral economy by 2050. It noted that in the context of the Party's Roadmap for Carbon Neutrality 2050 and its integrated national energy and climate plan 2030, there is a push to diversify energy sources and increase the use of endogenous renewable resources. Some implemented measures pertaining to the diversification of primary energy sources, including the introduction of natural gas to the economy in the late 1990s, have both helped to reduce Portugal's emissions and positively impacted the economy of a number of countries that export fossil fuels. To ensure that all relevant possible impacts are taken into account, Portugal established its National System of Policies and Measures by Council of Ministers resolution 45/2016 on 26 August 2016 to assess the economic and social consequences of climate policy measures across different sectors.
G.2	CPR (G.9, 2018) KP reporting adherence	Report in the NIR a value for the CPR without decimals, rounding up to the nearest full unit.	Resolved. The Party reported in its NIR (section 12.5, p.12-1) the value of the CPR as 386,623,773 t CO_2 eq, without using decimals.

[4] FCCC/ARR/2018/PRT. The ERT notes that the report on the individual inventory review of Portugal's 2019 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2018 annual submission.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
G.3	Inventory management (G.2, 2018) (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.	Resolved. The ERT found in the NIR satisfactory descriptions of the record-keeping and archiving procedures (section 1.6, p.1-21).
G.4	National registry (G.10, 2018) KP reporting adherence	Submit the SEF tables for the first commitment period on time.	Resolved. Portugal submitted the SEF tables for the first commitment period with Kyoto Protocol units on time, on 3 April 2020.
G.5	QA/QC and verification (G.6, 2018) (G.2, 2016) (G.2, 2015) (12, 2014) Transparency	Provide information on QC activities and their results.	Addressing. Portugal is implementing in stages over time improvements in its reporting of QA/QC measures that were recommended by previous ERTs. During the review, the Party explained that some of the sectoral chapters and category-specific sections of the NIR include new information on QA/QC activities. Portugal provided examples of improvements that it has made to QA/QC, including the inclusion of a comparison between the fuel consumption values considered in the inventory and those reported in the DGEG energy balance and the Eurostat energy balance (in section 3.6.6) and a comparison of energy consumption data from the energy balance reported by DGEG, the data on total fuel sales imported to COPERT and the data on total fuel consumption exported from COPERT (in section 3.5.2.6). Portugal included in its submission QA/QC chapters for all subcategories and had introduced QA/QC procedures for the calculations for iron and steel, following major methodological changes for that category. Portugal reported that work is ongoing to enhance the reporting of QC activities for the IPPU sector. The ERT concludes that Portugal has made good progress in terms of enhancing the clarity and improving the level of detail of its reporting on QC activities. Once the Party has made improvements to the reporting of QC activities for the IPPU sector, the ERT will consider this issue to have been resolved.
G.6	QA/QC and verification (G.11, 2018) Convention reporting adherence	Review the 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; Include the results of this review in the NIR.	Resolved. The NIR text has been updated to describe the Party's efforts to update the QA/QC procedures manual. The ERT welcomes the work carried out in this regard. The NIR (p.1-21) states that the Portuguese Environment Agency produced a new QA/QC manual which outlines the procedures for QA/QC and verification activities that should be followed during inventory compilation with a view to improving the inventory. During the review, Portugal indicated that a revised manual for QA/QC procedures and verification activities has been produced on the basis of the 2006 IPCC Guidelines.
G.7	Uncertainty analysis (G.12, 2018)	Ensure that the total GHG emissions used in the uncertainty analysis are consistent with the final total	Resolved. The estimated total GHG emissions used in the uncertainty analysis were within one decimal place of the total GHG emissions and removals

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	Convention reporting adherence	GHG emissions and removals reported in other parts of the NIR and in the CRF tables.	without indirect CO_2 reported in the CRF tables. The ERT noted only a rounding difference of 0.02 Gg CO_2 eq between the values reported for the base year in table H-1 in annex H to the NIR (59,707.09 Gg CO_2 eq) and cell B7 of CRF table 10 (59,707.07 Gg CO_2 eq). The ERT did not regard this as a material difference.
G.8	Uncertainty analysis (G.13, 2018) Convention reporting adherence	Avoid reporting the uncertainty of the AD or EFs as 0.0 per cent, 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.	Addressing. During the review, Portugal indicated that it has made changes with a view to resolving the issue related to reporting the uncertainty of the AD or EFs as 0.0 per cent. However, the ERT noted that the Party continued to report AD or EFs as 0.0 per cent in NIR table H-1, including for categories 1.A.4 (combustion other sectors – gaseous fuels CO_2) and 1.A.5 (combustion non-specified other – solid fuels CO_2). During the review, Portugal indicated that the values reported for sector 1.A.4 (combustion other sectors – gaseous fuels CO_2) in NIR table H-1 are not zero, but rather represent very small values that have been shortened to "0.0" to ensure that reporting is to one decimal place. However, it also indicated that category 1.A.5 (combustion non-specified other – solid fuels CO_2) should not have been included in the table as it was reported as "NO" in the CRF tables. The ERT considers that Portugal has made improvements to the reporting but notes that in some cases the reporting is still ambiguous or contains errors. The Party should have in place an effective set of checks to ensure that uncertainty parameters have been reported correctly ahead of submission. The Party should consider adding footnotes to the tables to explain the reasons for reporting "0.0". The ERT noted that the 2006 IPCC Guidelines (vol. 1, chap. 3, note A to table 3.2) permit the reporting of zero in certain circumstances, for example when only total uncertainty is known for a category, not for the EF and AD separately.
Energy			
E.1	Fuel combustion – reference approach – all fuels – CO_2 (E.1, 2018) (E.1, 2016) (E.1, 2015) (25, 2014) Convention reporting adherence	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.	Addressing. There are some differences of over 4 per cent between the estimates reported using the reference and sectoral approaches for some years. Portugal included only a general explanation of the reasons for those differences in the NIR (section 3.9.4), but did not include enough detail to justify the most significant differences. During the review, the Party reported that every year the inventory team tries to improve consistency between energy balance data and data from large point sources, but some issues remain unresolved and new issues arise. It also explained that, in its view, the differences in the estimates from the reference and sectoral approaches can only be resolved by a thorough attempt to reconcile data from point sources and the energy balance. However, despite identifying these differences, the Party is unable to revise the database owing to

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			limitations with regard to availability of data, the data collection process and data processing. Portugal indicated that it intends to continue improving the consistency of data from these two sources.
E.2	Feedstocks, reductants and other non-energy use of fuels – liquid fuels – CO_2 (E.3, 2018) (E.5, 2016) (E.5, 2015) (28, 2014) (22, 2013) Transparency	Implement the planned revision and further development of the reporting of feedstocks and non-energy use of fuels and explain transparently the estimates and the notation keys reported in CRF table 1.A(d).	Resolved. The Party continued to report CO_2 emissions for some fuels, such as other kerosene and diesel oil, as "NO" in CRF table 1.A(d). The Party included information on the reporting and on the estimates and notation keys used for feedstocks and non-energy use of fuels in its NIR (section 3.9.5).
E.3	Feedstocks, reductants and other non-energy use of fuels – gaseous fuels – CO_2 (E.4, 2018) (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.	Resolved. The Party reported in its NIR (p.3-134) the method used to estimate CO_2 emissions resulting from the use of natural gas for hydrogen production in the only hydrogen-producing refinery. The ERT concluded that the previous recommendation has been followed because the Party also reported estimated CO_2 emissions from natural gas in hydrogen production in CRF table 1.A(d). For example, the 2018 submission reported the CO_2 emissions from non-energy use of natural gas as "NO" for 2016, but the 2020 submission reported those emissions as 517.11 kt CO_2 for 2016.
E.4	Feedstocks, reductants and other non-energy use of fuels – gaseous, liquid and solid fuels – CO_2 (E.5, 2018) (E.22, 2016) (E.22, 2015) Convention reporting adherence	Carry out QC checks for non-energy use of fuels, as prescribed in the 2006 IPCC Guidelines (vol. 3, chap. 1.4).	Not resolved. The Party did not carry out any QC checks for non-energy use of fuels according to the NIR, which did not document any such checks.
E.5	Feedstocks, reductants and other non-energy use of fuels – gaseous, liquid and solid fuels – CO_2 (E.6, 2018) (E.22, 2016) (E.22, 2015) Transparency	Provide information on non-energy use of LPG, naphtha and natural gas and indicate the categories under which the related emissions, if any, have been included.	Addressing. The Party reported the AD and estimated CO_2 emissions associated with non-energy use of LPG and naphtha in CRF table 1.A(d), together with information on the categories under which those emissions were included. However, information on CO_2 emissions from the non-energy use of natural gas was not reported in CRF table 1.A(d).
E.6	1.A Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O	Update the NIR to reflect that the methodologies and EFs from the 2006 IPCC Guidelines were used in the calculations.	Resolved. The Party updated the text in the NIR (pp.3-22 and 3-62–3-63) to reflect its use of EFs from the 2006 IPCC Guidelines rather than the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	(E.8, 2018) (E.23, 2016) (E.23, 2015) Transparency		
E.7	1.A Fuel combustion – sectoral approach – all fuels – CO_2 (E.9, 2018) (E.24, 2016) (E.24, 2015) Transparency	Explain the use of oxidation factors when country-specific or plant-specific oxidation factors are used.	Addressing. The Party reported using an oxidation factor of 1.00 in the majority of cases in its NIR (e.g. on pp.3-22 and 3-62–3-63). The ERT concluded that the previous recommendation has not yet been fully addressed because the Party continued to use oxidation factors lower than 1.00 for petroleum refining (NIR table 3.12) and did not justify that country-specific value. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
E.8	1.A.1 Energy industries – all fuels – CO_2 (E.10, 2018) (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.	Addressing. The Party reported its estimated country-specific EF for natural gas in the NIR (p.3-22). During the review, the Party clarified that it would not be possible to produce such an estimate for fuel oil because there is no specific national information for this fuel. In the case of hard coal, practically all coal burning facilities monitor the carbon content of burned fuel, so most emissions are estimated using tier 3 methods and facility-specific EFs. The ERT concluded that the previous recommendation has not yet been fully addressed because the Party has not developed a country-specific CO_2 EF for fuel oil. The ERT noted that CO_2 emissions from combustion of liquid fuels in this category are identified as key in CRF table 7 (level and trend).
E.9	1.A.1.c Manufacture of solid fuels and other energy industries – gaseous and liquid fuels – CO_2, CH_4 and N_2O (E.16, 2018) (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.	Resolved. The Party provided an explanation in the NIR (section 3.3.3.4, p.3-36) on feedstock consumed in city gas production. It reported that all consumption of oil products as feedstock is reported under a single category in the energy balance, which makes it difficult to isolate the quantities of feedstock used in city gas production.
E.10	1.A.1.c Manufacture of solid fuels and other energy industries – solid fuels – CO_2, CH_4 and N_2O (E.39, 2018) Transparency	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.	Resolved. The Party reported all emission streams for its iron and steel operations and provided in NIR table 4-31 information on all those streams, in addition to specifying in the NIR (p.4-66) the categories under which the emissions were reported and the rationale for their allocation.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.11	1.A.2 Manufacturing industries and construction – all fuels – CO_2, CH_4 and N_2O (E.20, 2018) (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.	Resolved. The Party updated the EFs, ensured that the NIR accurately reflects the EFs used (pp.3-62–3-63) and used an oxidation factor of 1.00 in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 1, table 1.4) for category 1.A.2.
E.12	1.A.2.a Iron and steel – all fuels – CO_2, CH_4 and N_2O (E.21, 2018) (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_2O 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 for National Greenhouse Gas Inventories*.	Resolved. The Party improved the description for this category by including information on the method used to calculate emissions from iron and steel production. It also revised the CO_2, CH_4 and N_2O emission estimates by updating the EFs to bring them in line with the 2006 IPCC Guidelines (see NIR pp.3-45 and 3-51).
E.13	1.A.2.a Iron and steel – liquid and gaseous fuels – CO_2 (E.40, 2018) Accuracy	(a) Use 1.00 as the oxidation factor or justify the use of oxidation factors lower than 1.00; (b) Recalculate all emissions where the oxidation factor has been revised; (c) Explain all recalculations and provide information on all oxidation factors used in the NIR.	Resolved. (a) The Party used 1.00 as the oxidation factor in its NIR (p.3-62); (b) The Party recalculated all emissions where the oxidation factor had been revised (CRF table 1.A(a)s2); (c) The Party explained all recalculations on all oxidation factors used in the NIR (chap. 3.4.6).
E.14	1.A.2.c Chemicals – other fossil fuels – CO_2, CH_4 and N_2O (E.23, 2018) (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. However, Portugal did not explain the allocation of these emissions in the NIR. The ERT concluded that the previous recommendation has not yet been fully addressed because during the review the Party clarified that it had acted on this recommendation for the 2019 submission and stated that more detailed information could be found in the 2019 NIR. In the 2020 NIR, minor changes to the text resulted in some information being lost, namely the reference to where these emissions are reported.
E.15	1.A.2.c Chemicals – liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.41, 2018) Transparency	Correct the information in NIR table 3.73 regarding the oxidation factors, the CO_2, CH_4 and N_2O EFs and the sources of the parameters used in the estimates.	Resolved. The Party used 1.00 as the oxidation factor and corrected the information in NIR table 3-33 (equivalent to NIR table 3.73 in the 2018 submission) on the CO_2, CH_4 and N_2O EFs and the sources of the parameters in its NIR (p.3-62).
E.16	1.A.2.f Non-metallic minerals – all fuels – CO_2, CH_4 and N_2O (E.25, 2018) (E.37,	Include explanations for the introduction of industrial waste and the rate of biogenic and fossil fuel use in the NIR.	Addressing. The Party reported in its NIR (p.3-65) an explanation for the introduction of industrial waste and the rate of biogenic and fossil fuel use. The Party reported the percentage of fossil carbon in different waste materials combusted in the cement industry, but those values are not explained.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	2016) (E.37, 2015) Transparency		
E.17	1.A.3.b Road transportation – liquid fuels – CO_2 (E.27, 2018) (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. The Party was not able to develop country-specific CO_2 EFs for gasoline and diesel oil for its 2020 submission. The Party reported in the NIR (section 3.5.2.8 and p.10-7) that it plans to investigate the possibility of using the results of the discussions on CO_2 from road transport by the EU climate change committee working group on annual inventories.
E.18	1.A.3.b Road transportation – liquid fuels – CO_2 (E.42, 2018) Transparency	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.	Addressing. The Party reported data gaps for the estimates of the vehicle fleet and distance travelled for 1990–2002 in its NIR (pp.3-83–3.87). However, Portugal did not explain the methodology used in its country-specific approach or the change in vehicle classes for 1990–2002. During the review, the Party clarified that the backcasting was based on data related to inspections, which are available for 2003 onward. Portugal's country-specific approach determines how many kilometres are covered per year for each class of vehicle depending on the vehicle's age. The Party also provided information on the vehicle classes light passenger vehicles, light commercial vehicles, heavy-duty trucks and buses.
E.19	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O (E.43, 2018) Transparency	Update the 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.	Resolved. The Party reported in the NIR (p.3-97) how information from the energy balance is considered in the methodology to quantify fuel consumption for domestic navigation.
E.20	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O (E.43, 2018) Transparency	Describe the results of efforts to disaggregate fuel consumption for small boats in the bottom-up emission quantification methodology for reporting.	Addressing. The Party reported in the NIR (p.3-95) that the disaggregation of fuel consumption for small boats from domestic navigation was discussed with DGEG and included in its methodological development plan. Portugal is investigating ways to separately report fuel consumption for small boats and plans to include a clarification in the next NIR.
E.21	1.A.3.e.ii Other (other transportation) – gaseous, liquid and solid fuels – CO_2, CH_4 and N_2O (E.31, 2018) (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.	Not resolved. The Party reported in the NIR (p.10-7) that it is investigating ways to separately report emissions from ground activities at airports and plans to include a clarification in the NIR of future submissions.

ID#	*Issue/problem classification[a, b]*	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.22	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.34, 2018) (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.	Resolved. The Party reported in its NIR (p.3-125) that Portuguese coal mines were closed in 1993–1994.
E.23	1.B.1.b Solid fuel transformation – solid fuels – CH_4 (E.44, 2018) Transparency	Report fugitive CH_4 emission estimates and document the methodology applied in the NIR. Alternatively, 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.	Resolved. The Party reported estimates of fugitive CH_4 emissions for category 1.B.1.b (solid fuel transformation) in CRF table 1.B.1 for 1990–2001 and documented the methodology applied in the NIR (p.3-126).
E.24	1.B.2.a Oil – liquid fuels – CH_4 (E.45, 2018) Transparency	For CH_4 emissions from oil transport (category 1.B.2.a.iii.3), correct the EF units and revise the emission estimates.	Addressing. Portugal reported 5.4 x 10^{-3} kg/1,000 m^3 crude as the EF in NIR table 3-90. CH_4 emissions from oil transport (category 1.B.2.a.iii.3) were reported as 0.08 kt CO_2 eq (CRF table 1.B.2). The AD reported in the same table were 0.015 Mt for 2018. The ERT concluded that the previous recommendation has not yet been fully addressed because during the review, the Party clarified that there had been a compilation error with regard to the AD unit reported in the CRF tables. The AD in CRF table 1.B.2 for category 1.B.2.a.3 (transport – crude consumption) should have been reported in m^3; however, Portugal selected Mt as the unit by mistake. This compilation error will be corrected in the next annual submission. The ERT noted that the error did not impact the emission estimates, which are reported correctly.
E.25	1.B.2.a Oil – liquid fuels – CH_4 (E.46, 2018) Completeness	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, 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.	Resolved. The Party reported fugitive CH_4 emissions from oil refining/storage in CRF table 1.B.2 and explained in the NIR (p.3-130) the estimation methodology used.
E.26	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.47, 2018) Transparency	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.	Resolved. Portugal explained that the NIR (p.3-138) contains several adjustment factors for estimating own consumption and leakage occurring along the national natural gas network, including the national natural gas transportation network (leakage during maintenance interventions or resulting from incidents affecting the infrastructure); reception, storage and regasification terminals for natural gas liquids (purges and natural gas burning);

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			underground storage (mostly own consumption); and distribution networks (gas released in safety valves, incidents on distribution networks).
E.27	1.B.2.d Other (oil, natural gas and other emissions from energy production) – CO_2 (E.38, 2018) (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. The Party did not report detailed information on the flows and operating regimes for geothermal energy production in its NIR. During the review, Portugal explained that it had contacted the relevant facilities with a view to obtaining further information.
E.28	1.B.2.d Other (oil, natural gas and other emissions from energy production) – liquid and gaseous fuels – CO_2 and CH_4 (E.48, 2018) Comparability	Report fugitive emissions from the production of city gas as "NE" and provide an explanation in CRF table 9 and in the NIR.	Resolved. The Party reported fugitive emissions from the production of city gas as "NE" until 2001 and as "NO" for 2002 onward, and provided an explanation in CRF table 9 (row 56) and the NIR (p.3-146).
IPPU			
I.1	2. General (IPPU) (I.1, 2018) (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. The Party reported in the NIR (p.10-12) that it had revised its backcasting methodology for some categories with a view to improving time-series consistency. Portugal indicated that it was addressing this issue in NIR table 10-1. During the review, Portugal clarified that it intends to revise the backcasting methodology followed for IPCC categories 2.A.2 (lime production), 2.A.3 (glass production) and 2.A.4.a (ceramics). The ERT concluded that the previous recommendation has not yet been fully addressed because the Party is in the process of improving time-series consistency for the IPCC categories for which EU ETS data are used. Moreover, further detail on QA/QC processes relating to time-series consistency was not provided in the NIR.
I.2	2. General (IPPU) (I.2, 2018) (I.2, 2016) (I.2, 2015) (54, 2014) (39, 2013) Transparency	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.	Addressing. The Party included new information on category-specific QC activities for iron and steel production. However, it did not provide in the NIR information on the category-specific QC activities carried out for numerous categories within the IPPU sector (category-specific QC activities are reported only for cement production and iron and steel production). Portugal indicated that this issue was being addressed in NIR table 10-1. The ERT concluded that the previous recommendation has not yet been fully addressed as the Party intends to include additional information on category-specific QC activities for some IPPU categories in future submissions.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			During the review, the Party clarified that it intends to prioritize the reporting of QA/QC activities for all categories identified as key.
I.3	2. General (IPPU) – indirect CO_2 (I.3, 2018) (I.10, 2016) (I.10, 2015) Accuracy	Report the correct values of indirect CO_2 emissions in CRF table 6 (CO_2 emissions for category 2.B.10.d (solvent use in plastic products manufacturing) were incorrectly considered as direct CO_2 emissions).	Resolved. The Party explained in the NIR (section 4.3.19) that there are no direct CO_2, CH_4 or N_2O emissions associated with category 2.B.10.d (solvent use in plastic products manufacturing) and notation keys were reported for the category in CRF table 2(I)A-Hs1. Portugal noted that indirect CO_2 emissions for this category were reported as indirect CO_2 emissions in CRF table 6. The ERT noted that this is in accordance with paragraph 29 of the UNFCCC Annex I inventory reporting guidelines. During the review, the Party shared the calculations it used to obtain the CO_2 emission estimates reported in CRF table 6. The ERT confirmed that the indirect CO_2 emissions from solvent use in plastic products manufacturing are included in the indirect CO_2 emissions reported in CRF table 6, consistently with the NMVOC emissions reported in CRF table 2(I)s1 for category 2.B.8. The ERT concluded that the previous recommendation has been addressed because the Party reported indirect CO_2 emissions from solvent use in plastic products manufacturing in CRF table 6 and described in the NIR (p.4-62) its reporting for category 2.B.10.d.
I.4	2. General (IPPU) – CO_2 (I.37, 2018) Transparency	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.	Addressing. Portugal stated in its NIR (table 10-1) that it is addressing this issue and included new information on time-series consistency for cement production (section 4.2.2.6). The ERT concluded that the previous recommendation has not yet been fully addressed because the reporting on time-series consistency for lime production, other process uses of carbonates and lead production has not improved since the 2018 submission. During the review, Portugal clarified that it intends to improve time-series consistency for lime and glass production by following up with facilities and national associations and establishing new contacts with a view to gathering new data. It plans to improve time-series consistency for lead production by contacting suppliers of national statistics to obtain information on secondary lead production for the whole time series.
I.5	2.A.2 Lime production – CO_2 (I.6, 2018) (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.	Resolved. The Party reported in its NIR (p.4-21) that as all LKD is recycled, it is accounted for in the emission estimates through a correction in the amount of carbonate-bearing materials. This correction is performed by each facility on the basis of the weight of carbonate-bearing materials before entering the kilns and a recirculation factor. The ERT concluded that the previous recommendation has been addressed because a recirculation factor of approximately 0.2 per cent was applied to the actual amount of carbonate-bearing materials entering lime kilns (see ID# I.33 in table 5).

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.6	2.A.2 Lime production – CO_2 (I.7, 2018) (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. Regarding lime production in sugar mills, the Party stated in its NIR (chap. 4.2.6.4) that an estimate for emissions from sugar mills was developed for 1997–2008 but the emissions are below the significance threshold and the results of the estimate were not included in the NIR owing to confidentiality issues. The NIR also states that lime production in sugar mills does not occur from 2009 onward. Regarding artisanal production of lime for sanitation purposes or for whitewash, the Party reported in its NIR that the activity occurred in the country, but the emissions from this source are considered negligible. During the review, the Party shared the estimate of CO_2 emissions from lime production in sugar mills performed for 1997–2008 with the ERT and confirmed that these emissions had not been added to the emissions from category 2.A.2 and that they are below the level of significance. The Party indicated that these emissions will be included in the next inventory submission. Regarding CO_2 emissions from artisanal production of lime, during the review the Party indicated that these emissions are not estimated and clarified that a disproportionate amount of effort would be required to collect AD from artisanal production of lime for sanitation purposes or for whitewash, a category that would be insignificant in terms of the overall level and trend in national emissions. The ERT noted that the insignificance of emissions is a reason for reporting AD or emissions as "NE" for a category (para. 37(b) of the UNFCCC Annex I inventory reporting guidelines). However, the ERT considers that CO_2 emissions from artisanal production of lime are not an emission category but a part of the emissions of category 2.A.2 lime production and therefore these emissions are to be added to the totals of the category. The ERT noted that the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3) include several techniques to resolve data gaps. The ERT concluded that the previous recommendation has not yet been fully addressed because the Party has not included CO_2 emissions from sugar mills and from artisanal production of lime in the emissions of category 2.A.2.
I.7	2.A.2 Lime production – CO_2 (I.8, 2018) (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.	Resolved. The Party reported new information on the data and method used for subcategory 2.A.2 (lime production) in its NIR (sections 4.2.3–4.2.6).

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.8	2.A.2 Lime production – CO_2 (I.9, 2018) (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.	Resolved. The Party revised the backcasting methodology applied for lime production AD by using AD from a number of years (2010–2014) rather than just one year (2010) (see NIR p.4-22). The ERT noted that the backcasting methodology applied is in line with the surrogate method in the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3.3.2).
I.9	2.A.2 Lime production – CO_2 (I.10, 2018) (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.	Resolved. The Party revised the methodology used for the extrapolation of AD for 1995–2001 on the basis of average lime production in 1991–1994 instead of using AD from a single year (1994). However, the Party reported in NIR table 10-1 that this recommendation has not been implemented. The ERT noted that the forecasting methodology applied is in line with the surrogate method in the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3.3.2). During the review, the Party confirmed that the backcasting methodology was revised in line with the recommendation of the previous ERT, and the statement included in NIR table 10-1 is inaccurate. Portugal confirmed that it will update NIR table 10-1 in its next inventory submission.
I.10	2.A.2 Lime production – CO_2 (I.38, 2018) Consistency	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.	Addressing. Portugal recalculated the CO_2 IEF for 1990–2004 replacing the constant value of 0.39 t CO_2/t carbonate with values between 0.41 and 0.45. The trend for 2005 onward remains the same: the IEF steadily increases from 0.39 t CO_2/t carbonate for 2005 to 0.43 t CO_2/t carbonate for 2010 before steadily decreasing to 0.41 t CO_2/t carbonate for 2016, after which it remains almost constant until 2018. The range of default EFs from the 2006 IPCC Guidelines (vol. 3, chap. 2, table 2.1) is 0.38–0.52 t CO_2/t carbonate. The Party did not discuss IEF variability in the NIR. The Party indicated in NIR table 10-1 that it is addressing this issue, referring to NIR section 4.2.3.4. However, the ERT noted that the referenced section of the NIR contains no information on this issue. During the review, the Party shared with the ERT the IEF of CO_2 emissions from lime production for each facility between 1990 and 2018. The Party informed the ERT that it has contacted one facility to clarify its IEF trend. The ERT noted that the ongoing efforts to improve the time-series consistency of this category (i.e. contacting one facility) were not reported in the NIR. Despite the continued efforts to improve the time-series consistency of this category, the ERT concluded that the previous recommendation has not yet been fully addressed because the Party has not ensured the time-series consistency of lime production and has not included in the NIR information on the IEF variability and how the IEF was validated with the facilities.
I.11	2.A.2 Lime production – CO_2	Revise the description of carbon content referred to in the equation used to estimate emissions from lime	Resolved. The Party reported in the NIR (p.4-21) the equation (4-4) used to estimate emissions from lime production in line with the tier 3 equation from the 2006 IPCC Guidelines (vol. 3, chap. 2, equation 2.7). Furthermore, the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	(I.39, 2018) Transparency	production and in NIR table 4.5 and change it to EF, where appropriate.	tables provided in the NIR (section 4.2.3.1) related to lime production were revised in line with the recommendation of the previous ERT.
I.12	2.A.3 Glass production – CO_2 (I.12, 2018) (I.11, 2016) (I.11, 2015) Transparency	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 and provide 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 indicated in NIR table 10-1 that it is addressing this issue. The ERT concluded that the previous recommendation has not yet been fully addressed because the information needed to calculate CO_2 emissions from glass wool production (i.e. carbonate consumption by facilities) has not yet been collected. During the review, Portugal clarified that it is currently in contact with the relevant facilities in an effort to obtain reliable data on carbonate consumption, in addition to EFs and rock wool production data. Furthermore, the Party stated that it intends to finish gathering the available data in time to enable the inclusion of CO_2 emission estimates in its next inventory submission. The Party also demonstrated that the likely level of emissions (2.2–4.4 kt CO_2 eq for 2005 onward) is below the significance threshold, as it did in the previous review.
I.13	2.A.3 Glass production – CO_2 (I.13, 2018) (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.	Not resolved. The ERT concluded that the previous recommendation has not yet been addressed because the Party did not explain in its NIR why it only used 2005 as a reference year when backcasting carbonate consumption data for 1990–2004. During the review, the Party clarified that 2005 was used as a reference year because it was considered similar to the missing years in terms of fuel type, fuel and raw material consumption, and cullet incorporation. However, the Party reported that it would revise its backcasting methodology for future submissions and use additional reference years to backcast CO_2 emissions.
I.14	2.A.4 Other process uses of carbonates – CO_2 (I.40, 2018) Accuracy	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.	Addressing. The NIR (p.4-14) describes the recalculations performed for category 2.A.4.a (other uses of carbonates in ceramics), including the updated energy consumption values for ceramics by type of fuel for 2013–2014; biomass data for 1990–2010; and EU ETS data and CO_2 emissions for 1990–2014. The NIR (p.10-18) explains that there are still many ceramics facilities that are not included in the EU ETS and the Party intends to obtain more reliable data in order to address this issue in future submissions. The ERT concluded that the previous recommendation has not yet been fully addressed as efforts to improve raw material data are ongoing. During the review, the Party informed the ERT that it intends to obtain more reliable data on the consumption of carbonates for ceramics production for future inventory submissions.
I.15	2.A.4 Other process uses of carbonates (ceramics) – CO_2	Revise the description and explanation of carbon content referred to in the equation used to estimate	Resolved. The Party reported in the NIR (p.4-36) the equation (4-16) used to estimate emissions from carbonate use in ceramics. The description and explanation of carbon content referred to in the equation has been revised.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	(I.41, 2018) Transparency	emissions both in the NIR and in NIR table 4.11 and change it to EF, where appropriate.	
I.16	2.B.1 Ammonia production – CO_2 (I.18, 2018) (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 Party reported in NIR table 10-1 that it is addressing this issue. The Party reported using a tier 2 approach in the NIR (p.4-48), although the current estimate follows a tier 1 approach from the 2006 IPCC Guidelines. The ERT concluded that the previous recommendation has not been addressed. During the review, the Party confirmed that the description provided in the NIR does not correspond to the methodology used to estimate the emissions for this category. The Party shared the calculations made to estimate CO_2 emissions from ammonia for 1990–2008, confirming that a tier 1 approach is currently used to estimate the emissions of this category. Portugal informed the ERT that contact has been resumed with facilities to obtain the data needed to estimate CO_2 emissions using a tier 2 approach for the years in which this activity occurred in the country (1990–2008). Additionally, the Party informed the ERT that the methodological description of this category will be updated in the next NIR.
I.17	2.B.2 Nitric acid production – N_2O (I.20, 2018) (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.	Resolved. The Party reported in its NIR (p.4-51) new information on AD and EFs, including that they are based on continuous monitoring by the plants under EU ETS reporting. However, both the AD and EFs are confidential so they cannot be published in the NIR. The ERT concluded that the previous recommendation has been addressed because the approach followed for estimating N_2O emissions from nitric acid production is transparently described in the NIR.
I.18	2.B.8 Petrochemical and carbon black production (vinyl chloride monomer) – CO_2 and CH_4 (I.42, 2018) Transparency	(a) 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; (b) Demonstrate that the use of the proxy data is in accordance with the 2006 IPCC Guidelines.	Resolved. The Party reported in the NIR (p.4-58) the equation used for calculating the AD for vinyl chloride monomer production using national GDP as a proxy. The ERT noted that this method is in line with the surrogate data method described in the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3.3.2).
I.19	2.B.8 Petrochemical and carbon black production (methanol production) – CO_2 and CH_4 (I.43, 2018) Completeness	(a) Investigate the origin of the methanol used and, if it is determined that the methanol used was produced in Portugal, report the associated emissions; (b) 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.	Resolved. The Party explained in its NIR (p.10-38 and section 4.3.9) that it contacted the facility that used methanol in ammonia production and ascertained that imported methanol was used and there is no methanol production in the country.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.20	2.B.10 Other (chemical industry) – all gases (I.44, 2018) Transparency	Clarify in the 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.	Resolved. The Party stated in its NIR (p.4-62) that emissions from solvent use in plastic products manufacturing are included under category 2.B.8.g (other chemical industry products). The Party corrected its use of notation keys, replacing "NO" with "IE". The ERT concluded that the previous recommendation has been addressed because NMVOC emissions from solvent use in plastic products manufacturing are included in the inventory and described in the NIR.
I.21	2.C.1 Iron and steel production – CO_2 (I.28, 2018) (I.31, 2016) (I.31, 2015) Comparability	Reallocate emissions from on-site blast furnace gas combustion to category 2.C.1.	Resolved. The Party reported in its NIR section on recalculations for the category (p.4-73) that emissions from blast furnaces were allocated to category 2.C.1 in the inventory submission. In addition, all carbon materials used in the carbon balance were taken into account as process emissions for pig iron production and, therefore, allocated to category 2.C.1.
I.22	2.C.1 Iron and steel production – CO_2 (I.30, 2018) (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.	Resolved. The Party has recalculated the AD for 1995–2001 using alternative surrogate data, as recommended by the previous ERT. A description of the recalculation is provided in the NIR (pp.4-73–4-74).
I.23	2.C.1 Iron and steel production – CO_2 (I.31, 2018) (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 (for 2002 onward) between categories 2.C.1 and 1.A.2.a.	Addressing. The Party reported in NIR table 4-31 information on the allocation of emissions by process in the iron and steel industry for all years of the time series. However, the ERT found an inconsistency between the content of the table and the description provided in the section of the NIR on steelmaking in electric arc furnaces (p.4-67), which specifies that, for 2002 onward, combustion-related CO_2 emissions are reported under category 1.A.2.a, and process-related CO_2 emissions are reported under category 2.C.1.a. However, NIR table 4-31 reports that the combustion emissions were allocated under category 2.C.1.a. The ERT concluded that the previous recommendation has not yet been fully addressed owing to an error in the NIR related to the description of the allocation of emissions between the energy and IPPU sectors. During the review, the Party clarified that emissions from steelmaking in electric arc furnaces are reported in category 2.C.1.a (metal industry (steel)) and that no CO_2 emissions from steelmaking in electric arc furnaces are allocated under category 1.A.2.a. Portugal confirmed that the text on page 4-67 of the NIR referred to by the ERT contains an error and should specify that emissions associated with rolling mills, pot ovens and reheating ovens are reported under category 1.A.2.a. The Party stated that it will correct this issue in its next inventory submission.

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I.24	2.C.1 Iron and steel production – CO_2 (I.32, 2018) (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.	Addressing. The Party estimated emissions from the use of limestone and dolomite in iron and steel production and reported these emission estimates under category 2.A.2 (lime production). This allocation is consistent with the 2006 IPCC Guidelines (vol. 3, chap. 2, section 2.3.1.4) provided that the Party assumed the consumption of carbonates only occurred for lime production and there were no other uses for limestone or dolomite in iron and steel facilities. The ERT concluded that the previous recommendation has not yet been fully addressed because the Party needs to clarify in the NIR whether limestone or dolomite were used for purposes other than lime production. During the review, the Party clarified that, for 1990–2001, there was only one integrated iron and steel facility producing lime from limestone or dolomite in the country. Portugal assumed that all carbonate consumption in this facility was due to lime production and that the facility had no other uses for limestone or dolomite. Portugal also stated that it had already contacted the facility to clarify whether limestone or dolomite were used for purposes other than lime production, but it has not yet received any information. The Party informed the ERT that it will resume contact with the facility in future to clarify this issue.
I.25	2.C.1 Iron and steel production (sinter production) – CO_2 (I.45, 2018) Transparency	(a) 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; (b) Change the text on page 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".	Resolved. The Party performed relevant recalculations for the iron and steel production category and updated the descriptive information on sinter production provided in the NIR (p.4-63). The issues identified in the previous review report in relation to sinter have been resolved. Furthermore, the notation keys provided in CRF table summary 3s1 have been corrected to include the use of a tier 1 method for category 2.C.
I.26	2.D Non-energy products from fuels and solvent use (urea used as catalyst) – CO_2 (I.47, 2018) Transparency	Either include, in the IPPU chapter of the NIR, a cross reference to the section in the energy sector where the estimation of CO_2 emissions from urea used as a catalyst are included or simply move the explanations of the estimation to chapter 4 of the NIR.	Resolved. The Party included in the NIR (p.4-87) a cross reference to information on CO_2 emissions from urea used as a catalyst, referring to the section on emissions from road transport (category 1.A.3.b).
I.27	2.E.1 Integrated circuits or semiconductors – HFCs, PFCs, SF_6 and NF_3 (I.34, 2018) (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 and provide 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	Addressing. The Party reported emissions for subcategory 2.E.1 (integrated circuits or semiconductors) as "NE". The ERT concluded that the previous recommendation has not yet been fully addressed because the Party has not ascertained the occurrence of the activity or provided any justification of the insignificance of the source in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. However, the ERT did not identify any information that indicates that the activity may occur in the country. During the review, the Party clarified that it is investigating the issue

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		guidelines, use the appropriate notation key ("NE") in the CRF tables, providing a qualitative and quantitative justification in the NIR.	and plans to report its progress in future inventory submissions. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
I.28	2.E.2 Thin-film transistor flat-panel displays – PFCs, SF_6 and NF_3 (I.35, 2018) (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 and provide 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 emissions for subcategory 2.E.2 (thin-film transistor flat-panel displays) as "NE". The ERT concluded that the previous recommendation has not yet been fully addressed because the Party has not ascertained the occurrence of the activity or provided any justification of the insignificance of the source in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. However, the ERT did not identify any information that indicates that the activity may occur in the country. During the review, the Party clarified that it is investigating the issue and plans to report its progress in future inventory submissions. The ERT believes that future ERTs should consider this issue further to ensure that emissions for this category are not underestimated.
I.29	2.F Product uses as substitutes for ozone-depleting substances – HFCs, PFCs and SF_6 (I.36, 2018) (I.37, 2016) (I.37, 2015) Transparency	Explain how the estimates for categories 2.F.1–2.F.4 are calculated, including detailed information on the AD and EFs used and their sources.	Addressing. NIR table 10-1 states that NIR chapter 4.7.1 contains an explanation of the estimates for categories 2.F.1–2.F.4, including detailed information on the AD and EFs used and their sources. The ERT noted that the AD used and their sources are detailed for categories 2.F.1–2.F.4 in chapter 4.7 of the NIR, together with information on the EFs used for these categories. However, the NIR does not specify the source of the EFs used for categories 2.F.1–2.F.4. During the review, the Party provided the ERT with detailed information on the sources of the EFs used for categories 2.F.1–2.F.4. The Party stated that it will include this information in its next inventory submission.
I.30	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.48, 2018) Transparency	Replace the notation keys "IE, NO" with the correct estimation method for all subcategories under category 2.F in CRF table summary 3s1.	Resolved. The Party updated the notation keys reported for category 2.F in CRF table summary 3s1 from "IE, NO" by removing "IE" and reporting the method used as tier 2 or "NO", as appropriate.
Agriculture			
A.1	3.A Enteric fermentation – CH_4 (A.2, 2018) (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).	Resolved. The Party reported in its NIR the growth profile of non-dairy cattle (table 5.7) and of sheep and goats (table 5.11). The ERT concluded that the previous recommendation has been addressed because the data-gathering and analysis process had been completed by mid-2019. The recalculated CH_4 emissions are lower for the entire series (e.g. by 5.8 per cent for 2016).

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A.2	3.A Enteric fermentation – CH_4 (A.8, 2018) Convention reporting adherence	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.	Addressing. The Party reported the values of the uncertainty of diet digestibility estimates for dairy and non-dairy cattle in its NIR (section 5.2.5, p.5-27). The ERT concluded that the previous recommendation has not yet been fully addressed because, although the Party reported the calculated value of uncertainty of diet digestibility estimates for dairy and non-dairy cattle, no information or documentation was provided to facilitate the replication of the reported values. The ERT noted that, according to the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.32), the accurate estimation of DE% is crucial. During the review, the Party clarified that the uncertainty calculation of DE% for dairy and non-dairy cattle was based on the results of a chemical and nutritional analysis that was carried out by INIAV experts specializing in the chemical and nutritive evaluation of animal feed and examined each food component of the diet of cattle, and on the expert judgment on nutrition and animal production provided by experts from INIAV and the University of Évora, which covered the food components of the diets of dairy and non-dairy cattle. Portugal calculated the uncertainties using the error propagation approach from the 2006 IPCC Guidelines (vol. 1, chap. 3, section 3.2.3.1). IPCC equations 3.1–3.2 were used to combine the uncertainties of food components with their proportion in each diet.
A.3	3.B Manure management – CH_4 (A.9, 2018) Transparency	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.	Not resolved. The ERT concluded that the previous recommendation has not yet been addressed because the NIR does not explicitly state 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 (vol. 4, chap. 10, table 10.17), respectively. During the review, the Party clarified that its national designations and classifications for MMS are in accordance with the terms and the definitions contained in the 2016 EMEP/EEA guidebook, which are also used in the Portuguese informative inventory report submitted under the Convention on Long-range Transboundary Air Pollution. The Party also provided a clear, detailed explanation stating that lagoon systems and tanks/earthen ponds correspond to the categories liquid/slurry with and without natural crust cover, respectively.
A.4	3.G Liming 3.H Urea application – CO_2 (A.10, 2018) Transparency	Revise NIR figure 5.4 to include categories 2.G (liming) and 2.H (urea application).	Resolved. The Party reported that it revised NIR figure 5.5 (p.5-12), which corresponds to figure 5.4 of the 2018 NIR. The ERT confirmed that the Party included CO_2 emissions from liming and urea application in NIR figure 5.5.

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LULUCF			
L.1	4. General (LULUCF) – AD (L.2, 2018) (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) and provide all methodological updates as soon as the NFI6 is officially published, in accordance with the 2006 IPCC Guidelines.	Not resolved. The Party reported in its NIR (p.10-22) that the recommendation has not yet been implemented. During the review, the Party clarified that, although the work of NFI6 concluded in 2020 after a substantial delay, it was not completed in time to include the results in the 2020 annual submission. The Party stated that it will strive to update the NIR with the information derived from the NFI6 for its 2021 submission, or, if that is not possible, for its 2022 submission.
L.2	4. General (LULUCF) – CO_2, N_2O and CH_4 (L.11, 2018) Transparency	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.	Not resolved. The Party reported in its NIR (p.10-24) that the recommendation has not yet been implemented.
L.3	4. General (LULUCF) (L.12, 2018) Comparability	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.	Not resolved. There are still categories in summary table 3s2 for which the Party has not included information on the methods and EFs used (e.g. CO_2 emissions from cropland, grassland, wetlands).
L.4	4. General (LULUCF) (L.13, 2018) Convention reporting adherence	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 (vol. 1, chap. 4.2, and vol. 4, chap. 1.3), and provide in the NIR detailed information on the results of this analysis.	Not resolved. The Party reported in its NIR (p.10-25) that the recommendation has not yet been implemented.
L.5	4. General (LULUCF) (L.15, 2018) Accuracy	(a) Revise the land-use classification scheme so that the land category other land includes only land without significant carbon stocks and land areas that do not fall within any other land-use category; (b) 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; (c) Report on the impact of this reallocation on the associated emissions and removals in the land-use categories affected, namely grassland and, if necessary, forest land and cropland.	Not resolved. No reallocations of shrubland were reported in the 2020 submission. The Party reported in its NIR (p.10-26) that the recommendation has not yet been implemented. During the review, the Party clarified that although efforts to revise land-use cartography and produce new maps were concluded in 2020, time did not allow for the results to be included in the 2020 submission. Revised land-use maps for 1995, 2007 and 2010 have recently been made available, along with new maps for 2015 and 2018. The Party plans to update all area-related AD on the basis of this new set of maps for its 2021 submission.

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L.6	4. General (LULUCF) – CO_2 (L.16, 2018) Transparency	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.	Resolved. The Party reported in its NIR (section 6.1.3.4) the data source of the litter carbon stocks, the reason for using that information and its methods for estimating litter carbon stocks. The ERT analysed the additional information and concluded that sufficient information had been provided to address the previous recommendation.
L.7	4. General (LULUCF) – CO_2 (L.17, 2018) Completeness	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 (vol. 4, chaps. 2.3.3, 4.3.3, 5.3.3, 6.2.3 and 6.3.3) for settlements converted to forest land, grassland and settlements converted to cropland, grassland remaining grassland before 2008, and cropland and settlements converted to grassland.	Not resolved. Portugal continued to report carbon stock changes in the soil organic matter pool as "NO" in CRF tables 4.A–4.E. The Party reported in its NIR (p.10-27) that the recommendation has not yet been implemented. During the review, the Party clarified that it intends to update the content of future submissions in the light of the data on Portugal's soils that were added to the LUCAS topsoil database in 2020 (see ID# L.21 below).
L.8	Land representation (L.18, 2018) Accuracy	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 response design and the results of the accuracy assessment.	Not resolved. The Party reported in its NIR (p.10-28) that the recommendation has not yet been implemented. During the review, the Party explained that it intends to update all area-related AD for its next submission in accordance with a new set of maps (see ID# L.5 above).
L.9	Land representation (L.19, 2018) Accuracy	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 land-use map of the Portuguese Directorate-General for Territory (for 1990, 1995, 2007, 2010 and 2015).	Not resolved. The Party reported in its NIR (p.10-29) that the recommendation has not yet been implemented. During the review, the Party clarified that it plans to update all area-related AD for its 2021 submission following the publication of a new set of maps (see ID# L.5 above).
L.10	Land representation (L.19, 2018) Accuracy	Use the available updated land cover information for Madeira from the Coordination of Information on the Environment programme and use the same data sources for the Azores to enhance consistency in the land representation between the two archipelagos' units.	Not resolved. The Party reported in its NIR (p.10-29) that the recommendation has not yet been implemented. During the review, the Party clarified that it plans to update all area-related AD for its 2021 submission following the publication of a new set of maps (see ID# L.5 above).
L.11	Land representation (L.20, 2018) Accuracy	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: (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;	Not resolved. The Party reported in its NIR (p.10-29) that the recommendation has not yet been implemented. During the review, the Party clarified that it intends to update all area-related AD for its 2021 submission following the publication of a new set of maps (see ID# L.5 above).

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		(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; (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; (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.	
L.12	4.A Forest land – AD (L.3, 2018) (L.16, 2016) (L.16, 2015) Transparency	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.	Not resolved. The Party reported in its NIR (p.10-22) that the recommendation has not yet been implemented. During the review, the Party explained that the NFI6 had been delayed and efforts would be made to ensure that future submissions reflect the findings (see ID# L.1 above).
L.13	4.A Forest land – CO_2, CH_4 and N_2O (L.21, 2018) Transparency	Include detailed information on the differences between the NFIs and the land-use map of the Portuguese Directorate-General for Territory 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.	Not resolved. The Party reported in its NIR (p.10-31) that the recommendation has not yet been implemented.
L.14	4.A Forest land – CO_2 (L.22, 2018) Accuracy	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.	Not resolved. The Party reported in its NIR (p.10-31) that the recommendation has not yet been implemented.
L.15	4.A Forest land – CO_2 (L.23, 2018) Accuracy	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.	Not resolved. The Party reported in its NIR (p.10-31) that the recommendation has not yet been implemented. During the review, the Party explained that the NFI6 had been delayed and efforts would be made to ensure that future submissions reflect the findings (see ID# L.1 above).
L.16	4.A.1 Forest land remaining forest land – CO_2	Complete the NFI6 to report updated estimates based on the new inventory information, for example for	Not resolved. The Party reported in its NIR (p.10-22) that the recommendation has not yet been implemented. During the review, the Party clarified that the NFI6 had been delayed and efforts would be made to ensure that future

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	(L.4, 2018) (L.6, 2016) (L.6, 2015) (80, 2014) Accuracy	changes in forest areas caused by site fertility, the average volume per hectare and average MAI data.	submissions reflect the findings (see ID# L.1 above). The ERT concluded that the previous recommendation has not yet been addressed because the NFI6 results were not included in the inventory estimates.
L.17	4.A.1 Forest land remaining forest land – CO_2 (L.5, 2018) (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 expert judgments or replace them with specific measurements.	Not resolved. The Party reported in its NIR (p.10-23) that the recommendation has not yet been implemented.
L.18	4.A.1 Forest land remaining forest land – CO_2 (L.6, 2018) (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.	Not resolved. The Party reported in its NIR (p.10-23) that the recommendation has not yet been implemented.
L.19	4.A.1 Forest land remaining forest land – CO_2 (L.24, 2018) Transparency	Include in the NIR information on the justification of the expert judgment applied to estimate the MAI values reported in NIR table 6.10 and an explanation stating that these MAI values do not include loss due to mortality.	Not resolved. During the previous review, the Party 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 were not used directly but rather reduced on the basis of expert judgment to reflect temporarily unstocked areas and burned areas undergoing regeneration. The Party considered this approach to be a conservative estimate of forest growth that will not lead to CO_2 removals being overestimated. Also, the Party clarified that the MAI values do not include loss due to mortality as that type of biomass loss is estimated separately. However, this information was not provided in the NIR. The Party reported in its NIR (p.10-32) that the recommendation has not yet been implemented.
L.20	4.A.1 Forest land remaining forest land – CO_2 (L.25, 2018) Accuracy	(a) Include detailed information on how the country-specific BCEF values were derived; (b) Demonstrate that applying the same country-specific average BCEF values to growing stock, net annual increment and wood removals ensures that CO_2 removals and emissions are neither over- nor underestimated, using NFI information. Alternatively, apply the country-specific BCEF values to the growing stock and apply IPCC default BCEF values to net annual increment and wood removals.	Not resolved. The Party reported in its NIR (p.10-32) that the recommendation has not yet been implemented.
L.21	4.A.2 Land converted to forest land – CO_2 (L.8, 2018) (L.12, 2016)	Develop further the sampling and estimation system and the application of the sampling system when	Not resolved. The Party reported in its NIR (p.10-23) that the recommendation has not yet been implemented. During the review, the Party clarified that new data from the LUCAS topsoil database were released in 2020, including data on

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	(L.12, 2015) (95, 2014) Accuracy	developing carbon stock change estimates for mineral soils.	soils in Portugal for 2015. The Party is taking steps to ensure that information is updated in the light of the LUCAS soil survey in its 2021 submission, or, if that is not possible, in its 2022 submission.
L.22	4.B.1 Cropland remaining cropland – CO_2 (L.26, 2018) Completeness	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 (vol. 4, chap. 5.2.1), taking into account the biomass growth and biomass losses associated with harvest, gathering or disturbance.	Not resolved. The Party reported in its NIR (p.10-33) that the recommendation has not yet been implemented.
L.23	4.B.1 Cropland remaining cropland – CO_2 (L.27, 2018) Accuracy	Do not consider below-ground biomass in annual crops, in line with the IPCC default assumption (2006 IPCC Guidelines, vol. 4, chap. 5, p.5.10).	Not resolved. The Party reported in its NIR (p.10-33) that the recommendation has not yet been implemented.
L.24	4.B.1 Cropland remaining cropland – CO_2 (L.27, 2018) Accuracy	Correct the root–shoot values used, revise the carbon stock change estimates and explain in the NIR the reason for the recalculations.	Not resolved. The Party reported in its NIR (p.10-33) that the recommendation has not yet been implemented.
L.25	4.B.1 Cropland remaining cropland – CO_2 (L.28, 2018) Transparency	Provide information to support the 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 CO_2 emissions from organic soils under the LULUCF sector, and the associated N_2O emissions under the agriculture sector, in CRF table 3.D.	Resolved. The Party reported the area of organic soils as "NO" in CRF tables 3.D and 4.B. Portugal included new information in its NIR (annex J) to support its statement that organic soils do not occur in the country.
L.26	4.C.1 Grassland remaining grassland – CO_2 (L.10, 2018) (L.14, 2016) (L.14, 2015) (97, 2014) Transparency	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.	Resolved. The ERT concluded that the previous recommendation has been addressed because the information requested has been included in annex E to the NIR. The Party reported in the NIR 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". Data on the expansion of the activity and information on the system of financing biodiverse sowing in the country were also reported.
Waste			
W.1	5.A Solid waste disposal on land – CH_4 (W.3, 2018) (W.6, 2016)	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	Resolved. To demonstrate consistency of data between the waste groups as reported for the time series 1960–2003 and those as reported for 2004–2014, the Party provided information in NIR table 7-5 (p.7-17), which provides

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	(W.6, 2015) Accuracy	groups as reported for 2004–2014 (i.e. how consistency is ensured for the different waste groups reported for 1960–2003 and 2008–2014).	detailed information on composition of waste disposed to SWDS and DOC for the entire time series 1960–2014, and NIR table 7-6 (p.7-19) on industrial waste composition and DOC for selected waste groups. The Party reported in its NIR (pp.7-17–7-19) that, although data were initially limited, this has improved over time, and it provided information on DOC and all fermentable waste in all waste groups disposed to SWDS and industrial waste landfills.
W.2	5.A Solid waste disposal on land – CH_4 (W.7, 2018) Transparency	Report the amount of waste treated by all treatment methods in the time series in the NIR.	Resolved. The NIR (pp.7-17–7-19) provides detailed information on the different industrial waste treatment methods, including waste valorization across the time series. NIR section 7.2.2.2.4 describes the composition of industrial waste and NIR figure 7-9 shows the amounts of industrial waste by treatment type from 2008: between 2008 and 2018, the total amount of industrial waste increased from 7.81 to 10.55 Mt; the amount disposed to SWDS decreased from 2.14 to 1.03 Mt; and the recovered waste increased from 4.69 to 8.70 Mt. The Party reported that it revised NIR table 7-6 on industrial organic waste composition and DOC in order to better demonstrate the relationships between the different waste categories.
W.3	5.A Solid waste disposal on land – CH_4 (W.8, 2018) Consistency	Describe in the NIR the relationship between all waste categories for 1993–2003 and 2004–2016 to demonstrate the time-series consistency of the estimates.	Resolved. The Party included additional information in NIR table 7-6 on industrial organic waste composition and DOC, which provides a breakdown of the waste types reported for 1999–2003 and 2004–2016. The Party reported in its NIR (pp.7-16–7-19) that both data sets (for 1999–2003 and 2004–2016) have been slightly revised in order to take into account specific guidance from the 2006 IPCC Guidelines (vol. 5, chap. 3, section 3.2.3) on waste defaults and categories. For example, paper and textiles is now considered as two separate categories. NIR figure 7-9 on total industrial waste by treatment type includes the amount of waste for all treatment methods for 2008–2018. The ERT concluded that the previous recommendation has been addressed because the Party has explained how the time series was generated and described the relationship between all waste categories for 1993–2003 and 2004–2016.
W.4	5.A Solid waste disposal on land – CH_4 (W.9, 2018) Transparency	Make efforts to obtain information on the industrial waste growth rate from other experts in line with the 2006 IPCC Guidelines (vol. 1, annex 2A.1, p.2.20) and transparently report the expert judgment in the NIR, demonstrating compliance with the 2006 IPCC Guidelines.	Not resolved. The Party did not attempt to solicit additional expert judgment to inform the industrial waste growth rate. Consequently, the expert judgment reported by Portugal is not in accordance with the 2006 IPCC Guidelines (vol. 1, annex 2A.1, p.2.20), which state that expert judgments should be independently obtained from two or more experts. The Party reported in its NIR (p.7-18) that the amount of industrial waste for 1960–1998 was calculated using annual growth rates developed on the basis of expert judgment. The ERT concluded that the previous recommendation has not yet been addressed because the Party has not elicited expert judgment from at least two experts or included a clear explanation of the approach used. During the review, the Party clarified that it is yet to implement the recommendation from the ERT.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
W.5	5.A Solid waste disposal on land – CH_4 (W.10, 2018) Transparency	Provide in the NIR background information on SWDS and the climatic conditions used to determine the country-specific value of the CH_4 generation rate.	Resolved. The Party explained in detail that the value used for the CH_4 generation rate was estimated as a function of Portugal's national climatic conditions using a geographic information system. The Party reported that a geographical database containing information on licensed universal landfill sites (SWDS) in Portugal was cross-referenced with maps for the following climatological variables, using data from the Portuguese Institute for Sea and Atmosphere: annual potential evapotranspiration, mean annual temperature and mean annual precipitation. Each SWDS was classified according to its climatic conditions and a corresponding CH_4 generation rate value was produced on the basis of the recommended default values from the 2006 IPCC Guidelines (vol. 5, chap. 3, table 3.3) (see NIR p.7-19).
W.6	5.B Biological treatment of solid waste – CH_4 and N_2O (W.11, 2018) Transparency	Transparently report the amount of waste treated by composting and anaerobic digestion separately in the time series in the NIR.	Resolved. The Party provided separate figures for waste treated by composting and waste treated by anaerobic digestion across the time series (1990–2018). NIR figure 7-12, which illustrates quantities of municipal waste composted or digested and related emissions, provides a clear visual representation of trends in the biological treatment of solid waste. The Party reported the quantities of municipal waste composted and digested separately along with related emissions (see section 7.4 (biological treatment of solid waste), figure 7-12 (methodological issues) and annex G (waste background data)). The ERT concluded that the separate reporting allowed for better evaluation of emission trends and improved transparency.
W.7	5.D.1 Domestic wastewater – N_2O (W.12, 2018) Accuracy	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.	Resolved. The Party reported sewage sludge spread in the environment under the waste sector and sewage sludge applied to agricultural soils under agricultural recovery, providing an accompanying explanation in the NIR (pp.7-40–7-42) and a summary in NIR figure 7-17, where sludge applied to agricultural soils is now considered under sludge accounted for in other pathways. The ERT concluded that the previous recommendation has been addressed because the Party has accurately reported the quantity of sewage sludge spread in the environment under the waste sector and that of sewage sludge applied to agricultural soils under the agriculture sector. During the review, the Party clarified that it had considered this issue and conducted further analysis for the 2020 submission. Explanations of the AD and parameters used were included in the NIR (section 7.5.2.1.2). From its analysis, Portugal concluded that this recommendation results from the weak justifications previously provided and, in particular, from an erroneous column heading in table 7-20 of the 2019 NIR, namely "sludge spread in the environment". In fact, this column refers not only to the fraction of sewage sludge spread in the environment, but also to other primary destinations of sludge, including sludge agriculture recovery, energy recovery, landfill and composting and/or co-composting with solid urban waste (municipal solid

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			waste). In the 2020 NIR this column heading has been corrected to "sludge accounted in other pathways", and includes agricultural recovery, energy recovery, landfill and composting.
KP-LULUCF			
KL.1	General (KP-LULUCF) – CO_2 (KL.1, 2018) (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. The Party reported in its NIR (p.10-34) that the recommendation has not yet been implemented.
KL.2	General (KP-LULUCF) – CO_2 (KL.2, 2018) (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. The Party reported in its NIR (p.10-35) that the recommendation has not yet been implemented.
KL.3	General (KP-LULUCF) (KL.10, 2018) Accuracy	Use the available updated land cover information from the Coordination of Information on the Environment programme for Madeira and incorporate the same data sources for the Azores when developing the land transition matrix for KP-LULUCF.	Not resolved. The Party reported in its NIR (p.10-35) that the recommendation has not yet been implemented. During the review, the Party clarified that it plans to update all area-related AD for its 2021 submission following the publication of a new set of maps (see ID# L.5 above).
KL.4	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.11, 2018) Accuracy	(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) under KP-LULUCF; (b) Revise the land transition matrix accordingly; (c) Report the associated GHG emissions and removals from shrubland under KP-LULUCF; (d) Explain in the NIR the reasons for recalculating the associated GHG emissions and/or removals as a result of the reallocation of shrubland.	Not resolved. The Party reported in its NIR (p.10-35) that the recommendation has not yet been implemented. With regard to item (b) of the recommendation, during the review, the Party clarified that it plans to update all area-related AD for its next submission on the basis of a new set of maps (see ID# L.11 above). The other items are linked to the finalization of item (b).
KL.5	General (KP-LULUCF) (KL.12, 2018) Accuracy	(a) 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"	Not resolved. The Party reported in its NIR (p.10-35) that the recommendation has not yet been implemented.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		column in year X, and revise the associated GHG emissions and/or removals for these activities; (b) 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.6	General (KP-LULUCF) – CO_2 (KL.13, 2018) Completeness	In cases where the Party chooses not to report the carbon stock changes from a pool, provide transparent and verifiable information demonstrating that the pool is not a source, in accordance with decision 2/CMP.7, annex, paragraph 26.	Not resolved. The Party reported in its NIR (p.10-36) that the recommendation has not yet been implemented. During the review, the Party explained that it intends to update the information in its 2021 submission, or, if that is not possible, its 2022 submission, to reflect the data on Portugal's soils that were added to the LUCAS topsoil database in 2020 (see ID# L.21 above).
KL.7	General (KP-LULUCF) – CO_2 (KL.13, 2018) Completeness	Estimate the carbon stock changes in the soil organic matter pool for KP-LULUCF where the following land uses and land-use conversions correspond: settlements converted to forest land (AR); grassland and settlements converted to cropland (CM); grassland remaining grassland before 2008 (GM); and cropland and settlements converted to grassland (GM).	Not resolved. The Party reported in its NIR (p.10-36) that the recommendation has not yet been implemented. During the review, the Party clarified that it intends to update the content of future submissions in the light of the data on Portugal's soils that were added to the LUCAS topsoil database in 2020 (see ID# L.21 above).
KL.8	Deforestation – CO_2, CH_4 and N_2O (KL.6, 2018) (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.	Not resolved. The Party reported in its NIR (p.10-35) that the recommendation has not yet been implemented.
KL.9	Deforestation – N_2O (KL.14, 2018) Completeness	Report direct N_2O 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.	Addressing. The Party reported in its NIR (p.10-36) that CRF table 4(KP-II)3 reports areas where mineralization is taking place, and explained that this table may report smaller areas than CRF table NIR-2 owing to the consideration of a 20-year transition period for mineralization of soil organic matter. In other words, CRF table 4(KP-II)3 refers to areas where deforestation has occurred over the last 20 years, while CRF table NIR-2 refers to all areas where deforestation has occurred since 1990. However, the ERT noted that for 1990 CRF table 4(KP-II)3 reports a larger area for deforestation activities than CRF table NIR-2 (121.54 and 32.73 kha, respectively). This shows that the areas reported in CRF table 4(KP-II)3 for that year include areas deforested before 1990, which is not consistent with the definition of deforestation under KP-LULUCF (decision 2/CMP.7, annex, para. 2). In addition, during the review, the Party shared the calculation sheets with the ERT and the ERT identified a one-year offset (and therefore incorrect reporting) in the areas reported for 2013–2018 in CRF table 4(KP-II)3. For example, the area reported for 2018 in the CRF table (98.22 kha) is given as the area for 2017 in the calculation sheets.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			The explanation provided in NIR table 10.1 facilitates an understanding of why CRF table 4(KP-II)3 reports smaller areas than CRF table NIR-2 for 2013–2018, as the former only includes areas where mineralization is taking place. However, the calculation needs to be revised to correct the one-year offset in the reporting of areas in CRF table 4(KP-II)3 and to ensure that the table reports the areas deforested since 1990 (where mineralization is taking place). During the review, the Party confirmed that it would correct those errors for its next submission.
KL.10	Deforestation – N_2O (KL.14, 2018) Completeness	Include indirect N_2O emission estimates in CRF table 4(KP-II)3.	Not resolved. The Party did not provide additional information in the NIR or the CRF tables to indicate whether indirect N_2O emissions are considered in CRF table 4 (KP-II)3. During the review, the Party clarified that this will be addressed in its 2021 or 2022 submission.
KL.11	FM – CO_2 (KL.9, 2018) (KL.11, 2016) (KL.11, 2015) Transparency	Review the question of identifying the drivers of or reasons for the high losses in above-ground biomass and provide more transparent information in the NIR.	Not resolved. The Party reported in its NIR (p.10-35) that the recommendation has not yet been implemented.
KL.12	FM – CO_2, N_2O and CH_4 (KL.15, 2018) Transparency	(a) 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 to estimate the background level and the margin; (b) Demonstrate how the expectation of net credits or net debits is avoided; (c) Report how emissions from forest fires were included in the FMRL.	Addressing. The Party reported in its NIR (section 11.1.7) additional information about natural disturbances. (a) Addressing. The Party included information on the methodology used to estimate the background level and the margin for AR and FM in the NIR (section 11.1.7), but did not include the time series of emissions used in the estimations; (b) Resolved. The Party indicated that it used the default methodology from the Kyoto Protocol Supplement (chap. 2, pp.2.48–2.49) to calculate the background level and the margin, and stated that the application of this approach does not lead to the expectation of net credits or net debits. As stated in the Kyoto Protocol Supplement (section 2.3.9.6), any approach (default or alternative) will avoid the expectation of net credits or net debits so long as it complies with the different criteria listed in that section; (c) Not resolved. The Party indicated that the background level includes only information relative to forest fires and that other types of disturbance were not considered. However, it did not explain how emissions from forest fires were included in the FMRL.
KL.13	FM – CO_2, N_2O and CH_4 (KL.16, 2018) Accuracy	Report the correct value for the FMRL technical correction in CRF table 4(KP-I)B.1.1.	Resolved. The Party revised the FMRL value and the numbers contained in the NIR (section 11.4.5) are consistent with those given in CRF table 4(KP-I)B.1.1.

ID#	*Issue/problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
KL.14	CM – CO_2 (KL.17, 2018) Completeness	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.	Not resolved. The Party reported in its NIR (p.10-38) that the recommendation has not yet been implemented.
KL.15	CM and GM – CO_2, CH_4 and N_2O (KL.18, 2018) Transparency	Describe and report, in accordance with the Kyoto Protocol Supplement, the consequences of excluding emissions and removals 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 second commitment period of the Kyoto Protocol.	Not resolved. The Party reported in its NIR (p.10-38) that the recommendation has not yet been implemented.
KL.16	GM – CO_2, N_2O and CH_4 (KL.19, 2018) Transparency	Provide transparent information on how the GM area is estimated in NIR section 6.1.2.8, including the equations used in the estimations.	Not resolved. The Party reported in its NIR (p.10-38) that the recommendation has not yet been implemented.
KL.17	Biomass burning – CO_2 (KL.20, 2018) Completeness	(a) Report CO_2 emissions from woody biomass burning for the deforestation, CM and GM activities; (b) For activities for which CO_2 emissions from biomass burning are not estimated but burning does occur, correct the notation key to "NE" in CRF table NIR-1.	Not resolved. The Party reported in its NIR (p.10-38) that the recommendation has not yet been implemented.
KL.18	Harvested wood products – CO_2 (KL.21, 2018) Transparency	Provide transparent quantitative information on the time series of AD and the half-life values for the harvested wood products categories that were used to estimate the contribution of this pool to KP-LULUCF, as required by decision 2/CMP.8, annex II, paragraph 2(g)(i–ii).	Resolved. The Party reported in its NIR (section 11.1.8 and annex K) additional information on AD for harvested wood products. Portugal indicated in the NIR (section 11.1.8.2) that it used default half-lives from the 2006 IPCC Guidelines (vol. 4, chap. 12, table 12.2) for paper products, sawnwood and wood panels for the purposes of reporting and accounting under the Kyoto Protocol.

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

[b] The report on the review of the 2019 annual submission of Portugal was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2018 annual review report. For the same reason, 2019 and 2017 are excluded from the list of review years in which issues could have been identified.

IV. Issues and problems identified in three or more 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 and/or problems included in table 4 have been identified in three or more successive reviews, including the review of the 2020 annual submission of Portugal, and had not been addressed by the Party at the time of publication of this review report.

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

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
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.	4 (2014–2020)
G.5	Provide information on QC activities and their results.	4 (2014–2020)
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.	4 (2014–2020)
E.4	Carry out QC checks for non-energy use of fuels, as prescribed in the 2006 IPCC Guidelines (vol. 3, chap. 1.4).	3 (2015/2016–2020)
E.5	Provide information on non-energy use of LPG, naphtha and natural gas and indicate the categories under which the related emissions, if any, have been included.	3 (2015/2016–2020)
E.7	Explain the use of oxidation factors when country-specific or plant-specific oxidation factors are used.	3 (2015/2016–2020)
E.8	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.	3 (2015/2016–2020)
E.14	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.	3 (2015/2016–2020)
E.16	Include explanations for the introduction of industrial waste and the rate of biogenic and fossil fuel use in the NIR.	3 (2015/2016–2020)
E.17	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.	4 (2014–2020)
E.21	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.	4 (2014–2020)
E.27	Provide detailed information on the flows and operating regimes for geothermal energy production, and on how the CO_2 EFs are derived.	3 (2015/2016–2020)

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
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 used only for some years in 1990–2012.	4 (2014–2020)
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.	5 (2013–2020)
I.6	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.	3 (2015/2016–2020)
I.12	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 and provide 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.	3 (2015/2016–2020)
I.13	Describe in the NIR the detailed methodology and assumption considered in the CO_2 emission estimates of glass production.	3 (2015/2016–2020)
I.16	Review the methodology used, given that estimating CO_2 emissions based only on feedstock consumption is not in line with the 2006 IPCC Guidelines.	3 (2015/2016–2020)
I.23	Include information on the types of fuel used for the CO_2 emission estimates and how CO_2 emissions are allocated (for 2002 onward) between categories 2.C.1 and 1.A.2.a.	3 (2015/2016–2020)
I.24	Estimate emissions from the use of limestone and dolomite and report these estimates under category 2.C.1.	3 (2015/2016–2020)
I.27	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 and provide 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.	3 (2015/2016–2020)
I.28	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 and provide 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.	3 (2015/2016–2020)
I.29	Explain how the estimates for categories 2.F.1–2.F.4 are calculated, including detailed information on the AD and EFs used and their sources.	3 (2015/2016–2020)
Agriculture	No issues identified.	

ID#	*Previous recommendation for the issue*	*Number of successive reviews issue not addressed*[a]
LULUCF		
L.1	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) and provide all methodological updates as soon as the NFI6 is officially published, in accordance with the 2006 IPCC Guidelines.	3 (2015/2016–2020)
L.12	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.	3 (2015/2016–2020)
L.16	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.	4 (2014–2020)
L.17	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 expert judgments or replace them with specific measurements.	4 (2014–2020)
L.18	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.	4 (2014–2020)
L.21	Develop further the sampling and estimation system and the application of the sampling system when developing carbon stock change estimates for mineral soils.	4 (2014–2020)
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.	4 (2014–2020)
KL.2	Develop the estimation system for carbon stock changes in mineral soils, as indicated in paragraph 95 of the 2014 ARR.	4 (2014–2020)
KL.8	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.	3 (2015/2016–2020)
KL.11	Review the question of identifying the drivers of or reasons for the high losses in above-ground biomass and provide more transparent information in the NIR.	3 (2015/2016–2020)

[a] The reports on the reviews of the 2017 and 2019 annual submissions of Portugal have not yet been published. Therefore, 2017 and 2019 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2020 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2020 annual submission of Portugal that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2020 annual submission of Portugal

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
General			
G.9	CPR	The Party reported the calculation of the CPR in the NIR (section 12.5). Although the ERT found this calculation to be correct, the calculation process is not described in full in the NIR. The CPR is not fixed in the report to facilitate the calculation of its assigned amount for the second commitment period of the Kyoto Protocol and must be recalculated for every submission. Each Party included in Annex I with a commitment inscribed in the third column of Annex B in the Doha Amendment to the Kyoto Protocol is required to maintain, in its national registry, a CPR that should not drop below 90 per cent of its assigned amount calculated pursuant to Article 3, paragraphs 7 bis, 8 and 8 bis, of the Kyoto Protocol, or 100 per cent of eight times the national total in the last year of its most recently reviewed inventory, whichever is lowest (as per decision 11/CMP.1, annex, para. 6, in conjunction with decision 1/CMP.8, para. 18). Therefore, for every submission, each Party should calculate two values: 90 per cent of its assigned amount, and eight times the national total in the last reported year of the latest reviewed inventory (for this review, that of 2018). The Party should identify and report the lowest of these two values. For the Party's 2020 submission, the value of the CPR as 90 per cent of the assigned amount (0.9 x 429,581,969 t CO_2 eq) is 386,623,773 t CO_2 eq; the value of the CPR as eight times 67,416,792 t CO_2 (the national emissions for 2018 excluding LULUCF and including indirect emissions; from CRF summary table 2) is equal to 539,334,336 t CO_2 eq. The lower of these two values is 386,623,773 t CO_2, which is the value reported by Portugal. During the review, the Party clarified that the full calculation process will be included in its next NIR. The ERT recommends that the Party include a description of the full calculation process for the CPR in its NIR.	Yes. KP reporting adherence
G.10	Inventory planning	The Party reported in its NIR (p.1-24) that future inventory improvements are defined for each sector by the relevant inventory compiler and collated in a methodological development plan, which is updated and agreed every year. However, the NIR does not include the likely implementation dates of the improvement activities or the expected scope of the work involved. To enhance the transparency of the list of Portugal's planned inventory improvement activities, the ERT encourages the Party to provide in its NIR more detail on the processes involved in the methodological development plan, including the likely implementation dates of the improvement activities and the expected scope of the work involved.	Not an issue/problem
G.11	QA/QC and verification	In its NIR, Portugal reported on the use of several tier 3 models for its inventory, including those used to estimate emissions from jet kerosene for categories 1.A.3.a (domestic aviation) and 1.D.1 (international aviation) (section 3.5.1.2); non-CO_2 emissions from road transportation (section 3.5.2.2); emissions from cement production (section	Not an issue/problem

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		4.2.2.2); and emissions from lime production in the iron and steel category (section 4.2.4.4). The ERT noted that, according to paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, Parties included in Annex I to the Convention that prepare their estimates of emissions and/or removals using higher-tier (tier 3) methods and/or models are to provide in the NIR verification information in accordance with the 2006 IPCC Guidelines. During the review, the Party confirmed that tier 3 methodologies were used for those categories, rather than country-specific methods. The Party noted that the tier 3 approaches it applied, which were developed and calibrated for application in Europe, including Portugal, stem from methods that have been agreed on a European or international level and are described in European Union regulations or relate to recommended models for which information is publicly available. Furthermore, the methodologies were established or developed in response to UNFCCC reporting requirements and are aimed at ensuring consistency with IPCC methodologies. The ERT encourages Portugal to enhance the transparency of its reporting by including a simple reference to the sections of the methodological documents that describe the approaches used. The methodologies relate to the estimates for jet fuel (NIR section 3.5.1.2), which should reference the 2016 EMEP/EEA guidebook; road transportation (non-CO_2 emissions) (NIR section 3.5.2.2), which should reference COPERT 5, version 5.2.0, August 2018 (see https://copert.emisia.com/); and cement production (NIR section 4.2.2.2) and lime production in iron and steel (NIR section 4.2.4.4), which should both reference Method A (kiln input based) from European Union regulation 601/2012, annex IV, paragraph 9 (see https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32012R0601).	
G.12	Uncertainty analysis	The Party reported the results of the uncertainty analysis in table L.1 of its 2018 NIR (pp.L-2–L-9) without specifying which categories were key categories. The 2018 ERT noted that this reporting is not in line with the UNFCCC Annex I inventory reporting guidelines (para. 42), which state that Parties included in Annex I to the Convention should indicate in the tables reporting uncertainties the key categories identified in their inventories. Portugal has modified its reporting for the 2020 submission and included a key category field in annex H to the NIR on the uncertainty assessment (table H-1).	Not an issue/problem
G.13	Uncertainty analysis	In general, the methodology for the uncertainty analysis for the LULUCF sector is clearly explained in the NIR. However, in some cases the NIR does not contain information on the underlying assumptions. The overall uncertainty of the sector seems to be calculated correctly, but many statements introduce information from unknown sources. For example, in the NIR (section 6.14.4) the Party stated that uncertainties of estimates of carbon stock changes in litter were 25 per cent for all categories under forest land and shrubland and 40 per cent for all other land uses, and the uncertainty of the 20-year transition period was assumed to be 20 per cent. However, the NIR does not present the sources of these assumptions. It is important to accurately quantify and reduce uncertainty, as far as possible, in key categories such as category 4.A.1 (forest land remaining forest land). During the review, the Party clarified its approach to quantifying the uncertainty of individual parameters (AD and/or EFs), which involved the following elements: (1) measured uncertainty, which was possible in a limited number of cases, such as for the national forest inventory and soil carbon data, where error estimates or standard deviations were known; (2) uncertainties from the 2006 IPCC Guidelines for default values, where these defaults were used in the calculations; (3) expert judgment, when no other information was available. The Party explained its approach to using expert judgment, which ensures that several criteria are taken into consideration, including the credibility of the data provider, the reliability of the methodology generating the EF and the extent to which the data set or EF is representative at national level. Portugal explained the uncertainty was set to a relatively low value,	Yes. Transparency

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		typically below 5 per cent, whenever those criteria were all met; as the criteria fell below "ideal", the assigned uncertainty became progressively higher. The ERT found this approach to be logical and thorough. However, the ERT noted that the current level of detail of the reporting is not in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 3, section 3.5), which state that the information reported should be sufficient to provide the key assumptions, choice of methods and detailed results. The ERT recommends that the Party report its thorough work to quantify the assumptions used when defining the uncertainty of parameters for the LULUCF sector, including the key assumptions, choice of methods and detailed results, in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 3, section 3.5).	
Energy			
E.29	1.A.1.c Manufacture of solid fuels and other energy industries – solid fuels – CO_2, CH_4 and N_2O	The Party reported in the NIR (p.4-66) all emission streams for its iron and steel operations and provided in tabular format information on all those emission streams, in addition to specifying the categories under which the emissions were reported and giving the rationale for their allocation (see ID# E.10 in table 3). The ERT encourages the Party to include in chapter 3 of its NIR information on all those emission streams, the categories under which the emissions are reported and the rationale for their allocation, or include a cross reference to NIR table 4-31.	Not an issue/problem
E.30	1.A.2 Manufacturing industries and construction – biomass – CO_2, CH_4 and N_2O	The Party reported biomass fuel consumption for the entire time series 1990–2018 in category 1.A.2 (manufacturing industries and construction). The amount of biomass decreased drastically in 2011, especially for categories 1.A.2.c (chemical), 1.A.2.e (food processing, beverages and tobacco) and 1.A.2.f (non-metallic minerals). In addition, biomass consumption dropped to zero (and was reported as "NO") in category 1.A.2.g (rubber) for 2003–2005 and 2010. During the review, the Party explained that in 2011 it introduced a new methodology for producing the energy balance which relies on data reported by the facilities in the EU ETS report and the annual survey on industrial production carried out by Statistics Portugal. This change in methodology led to a series break in biomass consumption in the industrial sector. Regarding the rubber and the clothing sectors, the Party also explained that biomass consumption stopped occurring in 2003 and only resumed in 2011, according to data from the EU ETS and the annual survey on industrial production. Although the inventory team did not have information to confirm what may have happened in 2003, it assumed, as that year was associated with an economic crisis that saw a decrease in GDP, that the Party assumed that biomass consumption stopped on the basis of information about the closure of some companies in these sectors. The ERT recommends that the Party analyse the differences between the previous methodology and the new methodology introduced in 2011 to enhance consistency and recalculate biomass consumption for before 2011, if necessary.	Yes. Consistency
E.31	1.A.2.b Non-ferrous metals – all fuels – CO_2, CH_4 and N_2O	The Party reported emissions (CO_2, CH_4, and N_2O) from non-ferrous metals (subcategory 1.A.2.b) as "IE" in CRF table 1.A(a)s2. CRF table 9 explains that these emissions are allocated to manufacturing of machinery (subcategory 1.A.2.g.i) and the Party reported that it was not possible to separate the non-ferrous metals data from the metallurgy industries data in the energy balance. However, the NIR does not contain detailed information on this matter.	Yes. Comparability

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		During the review, the Party clarified that, as stated in CRF table 9, emissions for subcategory 1.A.2.b (non-ferrous metals) are allocated to subcategory 1.A.2.g.i (manufacturing of machinery). The Portuguese energy balance does not contain disaggregated information for the industrial subcategory non-ferrous metals. When asked where emissions for this subcategory were reported, DGEG clarified that these emissions would have been included in the subcategory corresponding to the metallurgy industry. Since it is impossible to determine the share of emissions for the industrial subcategory non-ferrous metals included under the metallurgy industries subcategory, Portugal considered that reporting emissions for subcategory 1.A.2.b as "IE" and allocating them to subcategory 1.A.2.g.i was the most appropriate approach.	
		The ERT recommends that the Party make efforts to report emissions for subcategory 1.A.2.b (non-ferrous metals) separately or include in the NIR the reasons for reporting the industrial subcategory non-ferrous metals as "IE" and including the associated emissions in subcategory 1.A.2.g.i (manufacturing of machinery).	
E.32	1.A.2.f Non-metallic minerals – gaseous fuels – CO_2, CH_4 and N_2O	The Party reported in its NIR (pp.3-53–3-54) that the transition to natural gas began at different times for each subcategory under this category. During the review, the Party clarified that the introduction of natural gas was a milestone in fossil fuel consumption for Portuguese industry. However, this does not explain why the transition occurred at different times for the subcategories. Portugal concluded that the explanation on the cement industry contained in the NIR may be unclear or even incorrect, and therefore provided a diagram detailing the transition to natural gas for the subcategories glass industry, ceramics industry, cement industry and lime production. The ERT noted that CO_2 emissions from gaseous fuels for category 1.A.2 were identified as key by the Party (see NIR tables 1.5–1.6).	Yes. Transparency
		The ERT recommends that the Party explain in the NIR why the glass industry was the first to adopt natural gas, and why adoption was slower for the cement industry subcategory.	
E.33	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O	The Party reported in its NIR (pp.3-66–3.67) that emissions from off-road vehicles and other machinery (subcategory 1.A.2.g.vii) were estimated for the first time for its 2020 submission. The ERT noted that the NIR does not contain a description of the methodology used.	Yes. Transparency
		During the review, the Party clarified that the off-road vehicle subcategory only includes emissions from machinery used in the steel industry and construction and that it intends to extend the disaggregation of data for stationary and mobile combustion to other sectors of industry for future submissions. Portugal explained that it applied the thermal use split developed by the Joint Research Centre Integrated Database of the European Energy System to distribute diesel consumption in this sector between the subcategories mobile (diesel engine) and stationary, and a default EF.	
		The ERT commends Portugal's efforts to disaggregate data and recommends that the Party include information on its methodology for estimating emissions from off-road vehicles and other machinery in its NIR.	
E.34	1.A.3.c Railways – solid fuels – CO_2, CH_4 and N_2O	The Party reported in its NIR (p.3-92) that the majority of combustible energy is associated with the use of gas oil and some very limited coal and coke use until 1996. The ERT noted that the Party reported a constant value for consumption of solid fuel for 1998–2012 (0.84 TJ) that is much higher than the 1997 value (0.13 TJ). This seems to be inconsistent with the information reported in the NIR. During the review, the Party clarified that coal consumption in rail transport decreased between 1990 and 1997 as the railway network underwent the process of electrification. The sudden increase from 1998 onward is due to a locomotive that operated exclusively for tourism purposes in 1998–2012 on the Douro line. The consumption of this locomotive would be in the order of 1.5 t	Not an issue/problem

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		coal/trip, with around 20 trips/year, so Portugal assumed a consumption of 20 toe/year for the activity of this vehicle. The ERT encourages the Party to explain the trend in solid fuel consumption for railways in the NIR, including how the Douro line changed the trend between 1998 and 2012.	
E.35	1.A.3.c Railways – biomass – CO_2, CH_4 and N_2O	In its 2019 submission, the Party reported biomass consumption and emissions for railways in CRF table 1.A(a)s3 for 2006–2017. However, in the 2020 submission, these were reported as "NO" in CRF table 1.A(a)s3 for 1990–2018. During the review, the Party explained that the biomass emissions reported in category 1.A.3.c for 2006–2017 in its 2019 submission concerned the percentage of biodiesel incorporated in diesel consumed by locomotives. The fuel consumption data used to estimate emissions are taken from the energy balance, which considers that only diesel is consumed in the rail transport sector. The amount of biomass previously considered was estimated assuming the rate of incorporation of biodiesel that is used in road transport. For the 2020 submission, following a small update to the sector, Portugal considered that it did not have enough information to assume that the diesel consumed by locomotives incorporates biodiesel or to establish an incorporation rate. During the review, Portugal explained that it intends to clarify the issue of the incorporation of biofuels in rail transport, but until it confirms whether or not biofuel is used, Portugal prefers to use the data as reported in the energy balance. The ERT recommends that the Party clarify the issue of the use of biodiesel in rail transport and explain any recalculation in the NIR.	Yes. Accuracy
E.36	1.B.2.a Oil – gaseous fuels – CO_2	The ERT noted that CO_2 emissions from steam reforming (reported under category 1.B.2.a.4 (refining/storage)) were much higher for 2013 onward than previous years (see NIR figure 3-62). During the review, the Party clarified that further investigation showed that CO_2 emissions from steam reforming increased significantly in 2013 and subsequent years owing to a new hydrocracking unit entering full operation in 2013. In effect, hydrogen production units from Sines refinery provide the hydrogen required for the desulfurization of gas oils and gasolines and for the new hydrocracking unit. The ERT recommends that the Party include in its NIR the explanation of the effect of hydrogen production units from Sines refinery on the reported emissions for the entire time series.	Yes. Transparency
E.37	1.B.2.c Venting and flaring – gaseous and liquid fuels – CO_2 and CH_4	Although the Party reported in the NIR (section 3.8.5) on flaring in the oil industry, it did not provide information about venting. During the review, the Party clarified that venting activities do not occur in Portugal. The ERT recommends that the Party clarify in its NIR that venting activities do not occur in the country.	Yes. Transparency
E.38	1.B.2.c Venting and flaring – gaseous and liquid fuels – N_2O	The Party reported N_2O emissions from flaring in CRF table 1.B.2. Although the NIR describes the methodology for estimating CO_2 and CH_4 emissions (chap. 3.8.5.2) and the CO_2 and CH_4 EFs for flaring (table 3-97), it does not report the methodology or EF used to estimate N_2O emissions. During the review, the Party clarified that it estimated N_2O emissions for subcategory 1.B.2.c.2.i (flaring oil) using a tier 1 approach from the 2006 IPCC Guidelines (vol. 2, chap. 4, equation 4.2.1). In accordance with this equation, the activity value used is the total amount of crude throughput (t), which was obtained from refineries for the whole time series. The N_2O EF (6.4E-07 $Gg/10^3$ m^3 oil) was taken from the 2006 IPCC Guidelines (vol. 1, chap. 4, table	Yes. Transparency

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		4.2.4). The Party assumed an average density of 0.850 kg/m^3 for crude oil at a temperature between 30 and 40 ºC. Portugal stated that this methodology will be described in the next NIR. The ERT recommends that the Party explain in its NIR the methodology it used to estimate N_2O emissions from flaring for category 1.B.2.c.2.i (flaring oil).	
E.39	1.B.2.c Venting and flaring – gaseous and liquid fuels – CO_2, CH_4 and N_2O	For category 1.B.2.c flaring (gas), the Party reported AD as "NO" but provided estimates for CO_2, CH_4 and N_2O emissions. During the review, the Party clarified that the use of "NO" to report category 1.B.2.c flaring (gas) is in fact correct, as flaring of natural gas and waste gas/vapour streams at gas facilities does not occur in the country. However, the Party acknowledged that the CO_2, CH_4 and N_2O emissions reported originated from the combustion of waste gases from the petrochemical industry and were incorrectly allocated to category 1.B.2.c flaring (gas). Portugal indicated that it intends to correct this error by reporting these emissions in category 1.A.2.c in the next submission. The ERT recommends that the Party reallocate the emissions from combustion of waste gases from the petrochemical industry from category 1.B.2.c flaring (gas) to category 1.A.2.c (chemicals).	Yes. Comparability
E.40	1.B.2.d Other (oil, natural gas and other emissions from energy production) – gaseous and liquid fuels – CO_2, CH_4 and N_2O	The Party reported on three geothermal plants in the NIR (p.3-145). It reported that the AD are related to geothermal production and the time series was constructed using data from the Azores regional authority for each plant starting from 1994, 2000 and 2017, respectively, although it did not specify when these plants entered into operation or describe how the AD for the time series were calculated. During the review, the Party clarified that the three power plants started operation in 1980 (Pico Vermelho), 1994 (Ribeira Grande) and 2017 (Pico Alto). The inventory uses two different sources of data to build the time series of electricity production from geothermal energy, namely the energy balance produced by Portugal's national energy authority (for 1990–2000) and the Azorean regional authority (for 2000–2018). In 2005, the Pico Vermelho plant was modified, increasing the installed power from 3 to 10 MW. As the plant resumed operation in December 2006, the impact was only felt from 2007 onward. The ERT recommends that the Party include in its NIR additional information on the geothermal plants, including the sources of the AD, the AD used for the emission estimates and the trend in emissions since 1990.	Yes. Transparency
IPPU			
I.31	2. General (IPPU) – all gases	Under a number of categories, Portugal reported "NO" for activities that occur within the country but do not result in emissions or removals of a specific gas. According to the UNFCCC Annex I inventory reporting guidelines, these activities should be reported as "NA". The ERT identified this issue for categories 2.D.1 lubricant use (CH_4, N_2O, nitrogen oxides, carbon monoxide, NMVOCs, sulfur dioxide); 2.D.2 paraffin wax use (CH_4, N_2O, nitrogen oxides, carbon monoxide, NMVOCs, sulfur dioxide); and 2.E electronics industry (NF_3). During the review, the Party confirmed that the notation key "NO" was sometimes misused. Furthermore, the Party informed the ERT that this issue would be corrected in the CRF tables of its next submission. The ERT recommends that the Party use "NA" to report in the CRF tables the following activities that occur within the country but do not result in emissions of a specific gas: 2.D.1 lubricant use (CH_4, N_2O, nitrogen oxides, carbon monoxide, NMVOCs, sulfur dioxide); 2.D.2 paraffin wax use (CH_4, N_2O, nitrogen oxides, carbon monoxide, NMVOCs, sulfur dioxide); and 2.E electronics industry (NF_3).	Yes. Comparability

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I.32	2.A.2 Lime production – CO_2	The Party reported in the NIR (p.4-24) that it intends to improve the time-series consistency of CO_2 emissions from lime production. The ERT noted that Portugal used different data sources for different timespans, which could lead to problems with time-series consistency. During the review, the Party shared with the ERT the AD and EFs used to calculate CO_2 emissions from lime production for each facility. The ERT found that the IEF of one facility increased from 0.31 t CO_2/t carbonate in 2009 to more than 1 t CO_2/t carbonate in 2010–2013 (1.09, 1.14, 1.07 and 1.06 t CO_2/t carbonate, respectively). The Party clarified that there are two different sources of information for carbonate consumption for that facility for 2009–2013 (the Pollutant Release and Transfer Register and the EU ETS), which might explain the significant increase in the IEF. The Party stated that further analysis is required to resolve this issue and that it has contacted the facility in question to confirm the reasons for the trend. The ERT recommends that the Party clarify the CO_2 EF for lime production with the facility for which the IEF increased from 0.31 t CO_2/t carbonate in 2009 to more than 1 t CO_2/t carbonate in 2010–2013 (1.09, 1.14, 1.07 and 1.06 t CO_2/t carbonate, respectively). If Portugal does not obtain additional information from the facility, the ERT recommends that the Party ensure the time-series consistency of CO_2 emissions by using one of the splicing techniques described in the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3.3).	Yes. Consistency
I.33	2.A.2 Lime production – CO_2	The Party reported in its NIR (p.4-21) that all LKD is recycled and therefore accounted for in the emission estimates through a correction in the amount of carbonate-bearing materials, which is performed by each facility and is based on the weight of carbonate-bearing materials before entering the kilns and a recirculation factor. However, the ERT noted that information on the recirculation factor applied was not provided in the NIR. During the review, the ERT confirmed with the Party that a recirculation factor of approximately 0.2 per cent was applied to the actual amount of carbonate-bearing materials entering lime kilns and concludes that this approach is in line with the 2006 IPCC Guidelines. However, the ERT noted that the Party could enhance the transparency of the information reported in the NIR by specifying the 0.2 per cent recirculation factor applied in the calculations. The ERT recommends that the Party include in its NIR information on the recirculation factor applied in the calculations to estimate CO_2 emissions from lime production.	Yes. Transparency
I.34	2.B.2 Nitric acid production – N_2O	The Party reported in the NIR (p.4-51) that it did not include in the NIR the EFs used to calculate N_2O emissions from nitric acid production owing to confidentiality issues. During the review, the Party provided the ERT with the AD and EFs used by facilities to estimate N_2O emissions from nitric acid production. The ERT noted that the IEFs of one facility increased sharply in 2013. The Party clarified that there are two different sources of information for this facility: one for 2010–2012 (Pollutant Release and Transfer Register) and another for 2013 onward (EU ETS). The Party stated that the lack of consistency stems from the use of these two data sources and explained that it has already contacted the facility in question to address this issue. The ERT recommends that the Party clarify the N_2O IEF for nitric acid production with the facility for which the N_2O IEF increased sharply in 2013, noting that the actual data are confidential and cannot be reported in the NIR. If additional information from the facility is not obtained, the ERT recommends that Portugal ensure the time-series consistency of N_2O emissions by using one of the splicing techniques described in the 2006 IPCC Guidelines (vol. 1, chap. 5, section 5.3.3).	Yes. Consistency
I.35	2.D.3.a Solvent use – CO_2	The Party reported in the NIR (p.4-82) that there were no direct CO_2, CH_4 or N_2O emissions for category 2.D.3.a solvent use. However, direct CO_2 emissions were reported for this category in CRF table 2(I).A-Hs2 (e.g. 132.04 kt	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		CO_2 for 2018). The NIR does not include a transparent description of the Party's reporting of direct CO_2 emissions for this category. During the review, the Party clarified that the direct CO_2 emissions reported under subcategories 2.D.3.a solvent use and 2.D.3.b road paving with asphalt in CRF table 2(I).A-Hs2 correspond to indirect CO_2 emissions. The Party explained that this allocation is designed to ensure consistency with the information it reported in the first commitment period of the Kyoto Protocol, when indirect CO_2 emissions were reported as direct CO_2 emissions in sectoral CRF tables. The Party stated that many European Union member States took this approach with a view to ensuring consistency between Kyoto Protocol commitment periods.	
		During the review, the Party shared an Excel file containing a breakdown of the emissions reported in CRF tables 2(I).A-Hs2 and 6. The indirect CO_2 emissions reported in CRF table 6 correspond to indirect CO_2 emissions for categories 2.B.6 (titanium dioxide production), 2.B.8.b (ethylene), 2.B.8.c (ethylene dichloride and vinyl chloride monomer), 2.B.8.g.i–2.B.8.g.vii, 2.B.8.g.ix, 2.C.1 (iron and steel), 2.H.2 (food and beverages industry) and 2.H.3.a (chipboard production). The ERT ascertained that the indirect CO_2 emissions reported in CRF table 6 are additional to the indirect CO_2 emissions from solvent use reported as direct CO_2 emissions in CRF table2(I)s2, meaning that there is no double counting of emissions. However, as stated in the previous paragraph, some indirect emissions were not reported as such but rather as direct emissions, and therefore the Party's reporting is not in line with the UNFCCC Annex I inventory reporting guidelines (para. 29), as Parties that decide to report indirect CO_2 should present the national totals with and without indirect CO_2.	
		The ERT recommends that the Party report all indirect CO_2 emissions from solvent use as indirect CO_2 emissions in CRF table 6 only, without reporting those emissions in CRF tables 2(I)s2 and 2(I).A-Hs2. The ERT also recommends that the Party specify and explain in the NIR the activities leading to the indirect CO_2 emissions reported in CRF table 6.	
I.36	2.E.3 Photovoltaics 2.E.4 Heat transfer fluid – HFCs, PFCs and SF_6	The Party reported HFC, PFC and SF_6 emissions as "NE" for categories 2.E.3 and 2.E.4 in CRF table 2(II). The Party reported in the NIR (sections 4.6.4–4.6.5) that efforts to research the occurrence of these activities in the country are under way. During the review, the ERT did not find any information to indicate that activities for categories 2.E.3 or 2.E.4 occur in the country.	Yes. Completeness
		The ERT recommends that Portugal complete its research on the occurrence of activities under categories 2.E.3 and 2.E.4 in the country since 1990 and report AD and emissions as "NO" if an activity has not occurred, or, if corresponding activities occur in the country, either estimate and report AD or emissions, or, if considered insignificant, report them as "NE" and demonstrate that the likely level of emissions is below the significance threshold established in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	
I.37	2.F.1 Refrigeration and air conditioning – HFCs and PFCs	Portugal provided information on the blends used in assembled units within air conditioning and refrigeration (category 2.F.1) in NIR tables 4-48, 4-55, 4-57 and 4-71. However, the NIR does not specify the HFC or PFC content of these blends. As the composition of the blends can fluctuate from country to country, the amount of fluorinated gases contained in the blends cannot be ascertained on the basis of the information currently reported in the NIR.	Yes. Transparency
		During the review, the Party clarified that the blends reported in the inventory use the compositions provided in the 2006 IPCC Guidelines (vol. 3, chap. 7, table 7.8). The Party confirmed that it intends to report information on the composition of the blends in its next inventory submission.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party explain in its NIR the HFC and PFC composition of the blends used in refrigeration and air-conditioning equipment in the country.	
I.38	2.F.1 Refrigeration and air conditioning – HFCs and PFCs	Portugal described in the NIR (p.4-92) how it estimated emissions during equipment lifetime. However, the NIR does not contain a description of how the parameters "amount of fluid banked in existing systems in year t (t of fluid)" (referred to as "Bt") and "HFCy banked in existing equipments (%)" (referred to as "HFCy") were calculated. During the review, the Party clarified that the former parameter refers to the total amount of fluid banked in existing systems, regardless of the type of gas or blend used. Portugal explained that this parameter was estimated by multiplying the number of pieces of equipment by the amount of fluid charged into each appliance. Furthermore, Portugal clarified that the latter parameter corresponds to the percentage of each gas or blend in the bank, and explained that the sources of this information are the national fluorinated gas tool for 2014 onward and the entrepreneurial association of the sector for 1995–2004. Portugal informed the ERT that it intends to include all this information in its next inventory submission. The ERT recommends that the Party include the equation used to calculate the bank of gases in use by gas and application, specifying the assumptions made regarding the gas composition of the bank and the Party's source of information.	Yes. Transparency
I.39	2.F.3 Fire protection – HFCs	The Party reported in the NIR (section 4.7.9) the methodology it followed when estimating HFC emissions for subcategory 2.F.3 (fire protection). Equation 4-69 of the NIR (p.4-118) is not consistent with the EFs provided in NIR table 4-80. During the review, the Party acknowledged that the information reported in the NIR lacked transparency and provided detailed information on the approach used to estimate HFC emissions for this subcategory, which is consistent with the tier 2a approach provided in the 2006 IPCC Guidelines. The information provided to the ERT is in line with the methodologies contained in the 2006 IPCC Guidelines (vol. 3, chap. 7, equation 7.4) and is consistent with the EFs and assumptions reported in NIR table 4-80. The ERT recommends that the Party replace equation 4-69 of the NIR with the equations it followed when estimating the bank of gases in use, operating emissions and disposal emissions, in line with the tier 2a approach provided in the 2006 IPCC Guidelines (vol. 3, chap. 7, equation 7.4) for estimating emissions from fire protection.	Yes. Transparency
Agriculture			
A.5	3.A Enteric fermentation – CH_4	The Party reported that the ratio of net energy available in diet for maintenance to digestible energy consumed was calculated by applying equation 10.14 from the 2006 IPCC Guidelines (vol. 4, chap.10). The results are contained in NIR table 5.5. However, the value of the ratio for 2017 is different from that for other years (0.53 instead of 0.54). During the review, the Party clarified that the ratio value for 2017 in NIR table 5-5 should be 0.54 rather than 0.53, and explained that a typing error had occurred when the table was being completed. The ERT noted that this issue did not affect the estimates reported in the CRF tables. The ERT recommends that Portugal correct the ratio of net energy available in diet for maintenance to digestible energy consumed value for 2017 in NIR table 5.5 from 0.53 to 0.54.	Yes. Convention reporting adherence
A.6	3.A.1 Cattle – CH_4	The Party reported an estimated EF of 130.5 kg CH_4/head/year for dairy cows for 2018 and stated in its NIR (p.5-17) that this value is comparable with the IPCC default value of 128 kg CH_4/head/year. The ERT noted that this value is	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		not in accordance with the 2006 IPCC Guidelines, which give 128 kg CH_4/head/year as the North American default EF for dairy cattle (vol. 4, chap. 10, p.10.29, table 10.11). The ERT asked Portugal to clarify why it had selected the North American default EF. During the review, the Party clarified that milk production in Portugal (more than 8,000 kg/head/year) exceeds the value indicated for Western Europe and is much higher than the one indicated for Eastern Europe (2,550 kg/head/year), but is closer to that of North America (8,400 kg/head/year). Therefore, the Party used for the comparison the default IPCC EF for North America (128 kg CH_4/head/year) instead of the value for Western Europe (117 kg CH_4/head/year) or Eastern Europe (99 kg CH_4/head/year) (2006 IPCC Guidelines, vol. 4, chap. 10, table 10.11). The ERT agrees with the response provided by the Party. The ERT recommends that Portugal justify in its NIR the CH_4 EF used for dairy cows (130.5 kg CH_4/head/year) by comparing milk production per cow in the country with the milk production and default CH_4 EF for different regions included in the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.11).	
A.7	3.D.a Direct N_2O emissions from managed soils – N_2O	The values reported by the Party for direct N_2O emissions from managed soils in its NIR (p.5-55, table 5-38) and CRF table 3.D for 2018 are very similar, but not identical (5.83 and 5.82 kt N_2O, respectively). During the review, following a request from the ERT to explain the reasons for this inconsistency and clarify which value is correct, the Party stated that the value in CRF table 3.D is correct, and the value in NIR table 5-38 should be 5.82 kt N_2O rather than 5.83 kt N_2O. Portugal explained that a typing error had occurred when the NIR table was being compiled. The ERT recommends that Portugal correct the value for direct N_2O emissions from managed soils for 2018 in NIR table 5-38 to match the values reported in CRF table 3.D.	Yes. Convention reporting adherence
A.8	3.B.5 Indirect N_2O emissions – N_2O	The Party reported that it has no country-specific value for the N fraction leached into the soil from solid storage manure; therefore, on the basis of what is described in the 2006 IPCC Guidelines (note b to table 10.23, p.10.67), a leached fraction for solid storage systems was derived from the default values in tables 10.23 and 10.22 of the 2006 IPCC Guidelines in combination. Per animal category, the fraction leached was obtained by subtracting from the total N losses fraction (losses N volatile + loss N from leaching and run-off) in table 10.23 the N loss fraction due to volatilization from table 10.22 for the same animal category, as reported in the NIR (section 5.5.2.4) and CRF table 3.B(b). The ERT noted that this is not in accordance with the 2006 IPCC Guidelines because table 10.23 presents the default values for total N losses from MMS, not just the sum of the N volatile plus N loss from leaching and run-off as in the Party's assumption. The ERT also noted that the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.56) provide a tier 2 methodology that could be used if country-specific information on the fraction of N loss due to leaching and run-off from MMS is available. When a tier 2 method is not available for N leaching from MMS, the Party should report "NE" in the CRF table for N lost due to leaching and N_2O emissions due to leaching. During the review, the Party clarified that it does not have a country-specific $Frac_{leachMS}$ or cannot determine at present a national value for estimating N leaching from MMS. The ERT recommends that the Party estimate indirect N_2O emissions from MMS due to leaching and run-off by using a tier 2 approach, in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 10, figure 10.4), and by developing a value for $Frac_{leachMS}$ on the basis of country-specific data on N run-off and leaching from MMS.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
A.9	3.D.b.1 Atmospheric deposition – N_2O	The Party estimated indirect N_2O emissions due to volatilization/atmospheric deposition of N added to soils using equation 11.9 from the 2006 IPCC Guidelines, as reported in the NIR (p.5.65) and CRF table 3.D. During the review, the Party clarified that its estimation of indirect N_2O emissions due to volatilization/atmospheric deposition of N added to soils was not correct because of a formula error (bug) in the calculation file. The Party provided unofficial estimates that showed that the officially reported emissions were overestimated for the entire time series by 15.1–22.1 kt CO_2 eq (e.g. 17.9 kt CO_2 eq for 2018). The ERT recommends that the Party revise the estimates of indirect N_2O emissions due to volatilization/ atmospheric deposition of N added to soils reported in the CRF tables and explain the recalculation in the NIR.	Yes. Accuracy
A.10	3.D.b.1 Atmospheric deposition – N_2O	The Party reported different values of $Frac_{gasM}$ for 2018 in its NIR (table 5-47) (0.146) and in CRF table 3.D (0.142). The ERT noted that there is inconsistency in the time series between the NIR and the CRF table. During the review, the Party clarified that the value of $Frac_{gasM}$ reported in CRF table 3.D is not correct, and the value was preliminarily estimated by the Party to be 0.1027. The Party explained that the emissions reported officially were overestimated. The ERT recommends that the Party report the correct value of $Frac_{gasM}$ (0.1027) for 2018 in NIR table 5-47 and CRF table 3.D, revise the associated N_2O emissions and explain the recalculation in the NIR.	Yes. Accuracy
A.11	3.D.b.2 N leaching and run-off – N_2O	The Party calculated indirect N_2O emissions from leaching and run-off originating from synthetic fertilizer, organic N amendments, N excreta deposited by grazing animals, and N from above- and below-ground crop residues using equation 11.10 from the 2006 IPCC Guidelines, as reported in its NIR (p.5.67) and CRF table 3.D. The Party reported 1.0106 kt N_2O emissions from N leaching and run-off for 2018. However, the ERT calculated a different value for those emissions (1.00987 kt N_2O) using equation 11.10 from the 2006 IPCC Guidelines. The ERT noted that the emission estimates reported by the Party in CRF table 3.D are overestimated. During the review, the Party clarified that there was an overestimation of indirect N_2O emissions due to N leaching and run-off for 2018: the error was in calculating the fraction leached from N sewage sludge applied to soils in that year and the overestimation is about 0.295 kt CO_2 eq (0.0004 per cent of total emissions excluding LULUCF). The ERT recommends that the Party revise the indirect N_2O emissions and the fraction leached from N sewage sludge applied to soils reported for 2018 for this category in the NIR and CRF table 3.D and explain this recalculation in the NIR.	Yes. Accuracy
A.12	3.A Enteric fermentation – CH_4	The Party reported the uncertainty of diet digestibility estimates for dairy and non-dairy cattle in its NIR (section 5.2.5, p.5-17). During the review, the Party clarified that the uncertainty calculation of DE% diets for dairy cattle and non-dairy cattle was derived from the results of the chemical and nutritional analysis of each food component of the diet, carried out by experts on chemical and nutritive evaluation of animal feed at INIAV, and from the expert judgment on nutrition and animal production of the experts from INIAV and the University of Évora for the food components of each diet for dairy and non-dairy cattle. The ERT encourages the Party to provide the results of the chemical and nutritional analysis of the food components of each diet in an annex to the NIR.	Not an issue/problem

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
A.13	3.B Manure management – CH_4	The Party reported that it revised NIR table 5-25 and explained in the NIR (section 5.3.3, table 5-23) that the country-specific categories MMS lagoon systems and tanks/earthen ponds correspond to the IPCC categories liquid/slurry with and without natural crust cover, respectively. During the review, the Party clarified that its national designations or classifications of MMS are in accordance with the terms and definitions in the 2016 EMEP/EEA guidebook (p.34, table 3-13), which are also used for the informative inventory report submitted under the Convention on Long-range Transboundary Air Pollution. The Party provided to the ERT an explicit and detailed explanation of how lagoon systems and tanks/earthen ponds correspond to the IPCC categories liquid/slurry with and without natural crust cover, respectively. Therefore, MMS lagoon systems and tanks/earthen ponds are in fact not country-specific but rather IPCC categories. The ERT encourages the Party to determine country-specific MMS.	Not an issue/problem
LULUCF			
		No findings for the LULUCF sector additional to those included in table 3 were made by the ERT during the review.	
Waste			
		No findings for the waste sector additional to those included in table 3 were made by the ERT during the review.	
KP-LULUCF			
		No findings for KP-LULUCF additional to those included in table 3 were made by the ERT during the review.	

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

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments for the 2020 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 elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF is not applicable to the 2020 review.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2020 annual submission.

Annex I

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Portugal in its 2020 annual submission

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

Table I.1

Total greenhouse gas emissions for Portugal, base year[a]–2018

(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions[b]*		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)[c]*	*KP-LULUCF (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–6 830.00
Base year	59 826.60	58 678.13	59 914.64	58 766.18	4 276.76		4 795.15	
1990	59 707.07	58 558.61	59 795.11	58 646.65				
1995	63 870.38	68 546.69	64 060.96	68 737.28				
2000	75 845.95	81 528.17	76 034.53	81 716.75				
2010	57 547.93	68 749.86	57 747.64	68 949.57				
2011	56 291.24	67 356.05	56 471.42	67 536.23				
2012	56 633.11	65 466.54	56 821.34	65 654.77				
2013	55 596.92	63 611.12	55 765.22	63 779.43		–1 305.48	390.31	–7 430.18
2014	53 910.27	63 520.26	54 069.07	63 679.06		–1 504.56	380.90	–8 981.86
2015	59 045.97	67 698.41	59 213.05	67 865.49		–1 352.35	316.74	–8 048.99
2016	61 092.63	65 865.83	61 249.38	66 022.58		–408.26	256.62	–1 452.70
2017	80 280.33	70 447.04	80 472.20	70 638.91		1 754.25	253.80	10 031.56
2018	60 992.88	67 280.28	61 129.40	67 416.79		–850.97	227.71	–3 433.42

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

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, 1995 for HFCs, PFCs and SF_6, and 2000 for NF_3. The base year for CM and GM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Portugal. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

[b] The Party reported indirect CO_2 emissions in CRF table 6.

[c] The value reported in this column relates to GHG emissions from conversion of forests (deforestation) in 1990 as contained in the report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of the Party.

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

Table I.2

Greenhouse gas emissions by gas for Portugal, excluding land use, land-use change and forestry, 1990–2018

(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	45 171.01	9 590.33	3 885.30	NO, NA	NO, NA	NO, NA	NO, NA	NO
1995	54 641.35	10 106.27	3 870.13	105.60	NO, NA	NO, NE	13.93	NO
2000	65 715.17	11 121.32	4 436.92	425.59	1.13	NO, NE	16.61	NO
2010	53 189.09	10 153.62	3 460.79	2 103.42	7.95	NO, NE	34.69	NO
2011	51 972.83	10 049.81	3 196.64	2 278.88	9.07	NO, NE	28.99	NO
2012	50 150.85	9 806.39	3 213.80	2 443.03	10.22	NO, NE	30.48	NO
2013	48 330.18	9 566.38	3 223.44	2 617.02	11.40	NO, NE	30.99	NO
2014	48 107.23	9 435.55	3 347.06	2 750.75	12.65	NO, NE	25.81	NO
2015	52 461.15	9 220.02	3 238.08	2 909.10	13.96	NO, NE	23.18	NO
2016	50 612.32	9 142.25	3 165.75	3 063.23	15.40	NO, NE	23.62	NO
2017	54 911.85	9 168.20	3 249.92	3 266.38	17.02	NO, NE	25.55	NO
2018	51 619.00	9 126.42	3 216.74	3 411.84	19.07	NO, NE	23.72	NO
Percentage change 1990–2018	**14.3**	**–4.8**	**–17.2**	**NA**	**NA**	**NA**	**NA**	**NA**

Note: Emissions and removals reported in the sector other (sector 6) are not included in this table.

[a] Including indirect CO_2 emissions as reported in CRF table 6.

Table I.3

Greenhouse gas emissions by sector for Portugal, 1990–2018

(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	40 706.05	6 236.82	7 149.50	1 148.46	4 554.28	NO, NA
1995	49 768.44	6 675.67	7 065.40	–4 676.31	5 227.77	NA
2000	60 082.04	8 003.56	7 490.78	–5 682.22	6 140.36	NA
2010	49 023.16	7 616.96	6 504.69	–11 201.93	5 804.76	NA
2011	48 306.59	7 032.03	6 460.38	–11 064.81	5 737.22	NA
2012	46 839.68	6 783.62	6 497.50	–8 833.44	5 533.98	NA
2013	44 663.86	7 276.82	6 481.50	–8 014.20	5 357.24	NA
2014	44 067.23	7 771.72	6 618.53	–9 609.99	5 221.58	NA
2015	48 528.93	7 845.12	6 612.27	–8 652.44	4 879.18	NA

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2016	47 352.08	7 307.57	6 640.17	–4 773.20	4 722.76	NA
2017	51 429.91	7 800.04	6 756.27	9 833.29	4 652.69	NA
2018	48 573.85	7 474.27	6 798.76	–6 287.39	4 569.91	NA
Percentage change 1990–2018	**19.3**	**19.8**	**–4.9**	**–647.5**	**0.3**	**NA**

Notes: (1) Portugal did not report emissions or removals in the sector other (sector 6); the corresponding cells in the CRF tables were left blank; (2) totals include indirect CO_2 emissions reported in CRF table 6.

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year[a]–2018, for Portugal

(kt CO_2 eq)

	Article 3.7bis as contained in the Doha Amendment[b]	*Activities under Article 3.3 of the Kyoto Protocol*		*FM and elected activities under Article 3.4 of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–6 830.00				
Technical correction				3 260.79				
Base year	4 276.76				3 352.406	1 442.744	NA	NA
2013		–3 430.08	2 124.60	–7 430.18	347.010	43.304	NA	NA
2014		–3 605.08	2 100.52	–8 981.86	358.351	22.545	NA	NA
2015		–3 427.94	2 075.59	–8 048.99	356.339	–39.596	NA	NA
2016		–2 466.94	2 058.68	–1 452.70	356.761	–100.144	NA	NA
2017		–313.76	2 068.01	10 031.56	400.683	–146.881	NA	NA
2018		–2 836.17	1 985.19	–3 433.42	359.74	–132.03	NA	NA
Percentage change base year–2018					**–89.3**	**–109.2**	**NA**	**NA**

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

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

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

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

Table I.5
Key relevant data for Portugal under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2020 annual submission

Parameter	*Data values*
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM: commitment period accounting (d) CM: commitment period accounting (e) GM: commitment period accounting (f) RV: not elected (g) WDR: not elected
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	CM and GM
Election of application of provisions for natural disturbances	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, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	NA
2. Deforestation	NA
3. FM	NA
4. CM	NA
5. GM	NA

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.6 include the information to be included in the compilation and accounting database for Portugal. Data shown are from the Party's annual submission, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table II.1
Information to be included in the compilation and accounting database for 2018, including on the commitment period reserve, for Portugal
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CPR	**386 623 773**	**–**	**–**	**386 623 773**
Annex A emissions				
CO_2	51 618 997	–	–	51 618 997
CH_4	9 126 420	–	–	9 126 420
N_2O	3 216 741	–	–	3 216 741
HFCs	3 411 842	–	–	3 411 842
PFCs	19 073	–	–	19 073
Unspecified mix of HFCs and PFCs	NO, NE	–	–	NO, NE
SF_6	23 718	–	–	23 718
NF_3	NO	–	–	NO
Total Annex A sources	**67 416 792**	**–**	**–**	**67 416 792**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 836 167	–	–	–2 836 167
Deforestation	1 985 194	–	–	1 985 194
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 433 420	–	–	–3 433 420
CM	359 740	–	–	359 740
CM for the base year	3 352 406	–	–	3 352 406
GM	–132 031	–	–	–132 031
GM for the base year	1 442 744	–	–	1 442 744

Table II.2
Information to be included in the compilation and accounting database for 2017 for Portugal
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	54 911 845	–	–	54 911 845
CH_4	9 168 196	–	–	9 168 196
N_2O	3 249 916	–	–	3 249 916
HFCs	3 266 380	–	–	3 266 380
PFCs	17 022	–	–	17 022
Unspecified mix of HFCs and PFCs	NO, NE	–	–	NO, NE
SF_6	25 553	–	–	25 553
NF_3	NO	–	–	NO
Total Annex A sources	**70 638 912**	–	–	**70 638 912**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–313 761	–	–	–313 761
Deforestation	2 068 006	–	–	2 068 006

	Original submission	*Revised submission*	*Adjustment*	*Final value*
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	10 031 558	–	–	10 031 558
CM	400 683	–	–	400 683
CM for the base year	3 352 406	–	–	3 352 406
GM	–146 881	–	–	–146 881
GM for the base year	1 442 744	–	–	1 442 744

Table II.3
Information to be included in the compilation and accounting database for 2016 for Portugal
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	50 612 321	–	–	50 612 321
CH_4	9 142 252	–	–	9 142 252
N_2O	3 165 754	–	–	3 165 754
HFCs	3 063 232	–	–	3 063 232
PFCs	15 398	–	–	15 398
Unspecified mix of HFCs and PFCs	NO, NE	–	–	NO, NE
SF_6	23 623	–	–	23 623
NF_3	NO	–	–	NO
Total Annex A sources	**66 022 580**	**–**	**–**	**66 022 580**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 466 938	–	–	–2 466 938
Deforestation	2 058 682	–	–	2 058 682
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–1 452 696	–	–	–1 452 696
CM	356 761	–	–	356 761
CM for the base year	3 352 406	–	–	3 352 406
GM	–100 144	–	–	–100 144
GM for the base year	1 442 744	–	–	1 442 744

Table II.4
Information to be included in the compilation and accounting database for 2015 for Portugal
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	52 461 147	–	–	52 461 147
CH_4	9 220 024	–	–	9 220 024
N_2O	3 238 084	–	–	3 238 084
HFCs	2 909 098	–	–	2 909 098
PFCs	13 962	–	–	13 962
Unspecified mix of HFCs and PFCs	NO, NE	–	–	NO, NE
SF_6	23 179	–	–	23 179
NF_3	NO	–	–	NO
Total Annex A sources	**67 865 494**	–	–	**67 865 494**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–3 427 938	–	–	–3 427 938
Deforestation	2 075 593	–	–	2 075 593
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–8 048 988	–	–	–8 048 988
CM	356 339	–	–	356 339

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CM for the base year	3 352 406	–	–	3 352 406
GM	–39 596	–	–	–39 596
GM for the base year	1 442 744	–	–	1 442 744

Table II.5
Information to be included in the compilation and accounting database for 2014 for Portugal
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	48 107 229	–	–	48 107 229
CH_4	9 435 554	–	–	9 435 554
N_2O	3 347 065	–	–	3 347 065
HFCs	2 750 750	–	–	2 750 750
PFCs	12 647	–	–	12 647
Unspecified mix of HFCs and PFCs	NO, NE	–	–	NO, NE
SF_6	25 812	–	–	25 812
NF_3	NO	–	–	NO
Total Annex A sources	**63 679 057**	**–**	**–**	**63 679 057**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–3 605 076	–	–	–3 605 076
Deforestation	2 100 516	–	–	2 100 516
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–8 981 863	–	–	–8 981 863
CM	358 351	–	–	358 351
CM for the base year	3 352 406	–	–	3 352 406
GM	22 545	–	–	22 545
GM for the base year	1 442 744	–	–	1 442 744

Table II.6
Information to be included in the compilation and accounting database for 2013 for Portugal
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	48 330 183	–	–	48 330 183
CH_4	9 566 383	–	–	9 566 383
N_2O	3 223 442	–	–	3 223 442
HFCs	2 617 021	–	–	2 617 021
PFCs	11 404	–	–	11 404
Unspecified mix of HFCs and PFCs	NO, NE	–	–	NO, NE
SF_6	30 992	–	–	30 992
NF_3	NO	–	–	NO
Total Annex A sources	**63 779 425**	–	–	**63 779 425**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–3 430 080	–	–	–3 430 080
Deforestation	2 124 603	–	–	2 124 603
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 430 185	–	–	–7 430 185
CM	347 010	–	–	347 010
CM for the base year	3 352 406	–	–	3 352 406
GM	43 304	–	–	43 304
GM for the base year	1 442 744	–	–	1 442 744

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which estimation 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 the reporting in the Party's inventory are the following:

(a) 2.A.2 lime production – CO_2 emissions (see ID# I.6 in table 3);

(b) 2.C.1 iron and steel production – CO_2 emissions from use of limestone and dolomite in iron and steel production (see ID# I.24 in table 3);

(c) 2.E.1 integrated circuits or semiconductors – HFC, PFC, SF_6 and NF_3 emissions (see ID# I.27 in table 3);

(d) 2.E.2 thin-film transistor flat-panel displays – PFC, SF_6 and NF_3 emissions (see ID# I.28 in table 3);

(e) 2.E.3 photovoltaics and 2.E.4 heat transfer fluid – HFC, PFC and SF_6 emissions (see ID# I.36 in table 5);

(f) 4. LULUCF sector – CO_2 emissions from carbon stock changes in the soil organic matter pool for settlements converted to forest land, grassland and settlements converted to cropland, grassland remaining grassland before 2008, and cropland and settlements converted to grassland (see ID# L.7 in table 3);

(g) 4.B.1 cropland remaining cropland – CO_2 emissions and removals from carbon stock changes in living biomass for perennial cropland types (see ID# L.22 in table 3);

(h) KP-LULUCF activities – carbon stock changes in a pool for the appropriate activity (see ID# KL.6 in table 3);

(i) KP-LULUCF activities – CO_2 emissions and removals from carbon stock changes in the soil organic matter pool for the appropriate activity (see ID# KL.7 in table 3);

(j) KP-LULUCF activities – CO_2 emissions from biomass burning for deforestation, CM and GM (see ID# KL.17 in table 3);

(k) Deforestation – direct N_2O emissions from N mineralization/immobilization due to loss/gain of soil organic carbon (see ID# KL.9 in table 3);

(l) Deforestation – indirect N_2O emissions from N mineralization/immobilization due to loss/gain of soil organic carbon (see ID# KL.10 in table 3);

(m) CM – CO_2 emissions and removals from carbon stock changes in living biomass for perennial cropland types (see ID# KL.14 in table 3).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

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

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at https://www.ipcc.ch/publication/2013-revised-supplementary-methods-and-good-practice-guidance-arising-from-the-kyoto-protocol/.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. E Calvo Buendia, K Tanabe, A Kranjc, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

B. UNFCCC documents

Annual review reports

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

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/sites/default/files/resource/AGI%202020_final.pdf.

Annual status report for Portugal for 2020. Available at https://unfccc.int/sites/default/files/resource/asr2020_PRT.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Teresa Costa Pereira (Climate Change Department of the Portuguese Environmental Agency), including additional material on the methodology and assumptions used. The following references have been reproduced as received:

EEA. 2016. *EMEP/EEA air pollutant emission inventory guidebook 2016*. Luxembourg: Publications Office of the European Union. Available at https://www.eea.europa.eu/publications/emep-eea-guidebook-2016.