Final Review Report

2025 Comprehensive Review of National Greenhouse Gas Inventory Data

pursuant to Article 38(1a) of Regulation (EU) No 2018/1999 and Article 4(4) of Regulation (EU) No 2018/841

Portugal

28 August 2025

European Environment Agency

Reference: No 3502/B2025/EEA.60384

Contents

List of tables

Introduction and conclusions from the 2025 comprehensive review

This Final Review Report presents the findings from the 2025 review of the greenhouse gas (GHG) emission inventory of Portugal.

The comprehensive review was carried in accordance with Article 38(1a) of Regulation (EU) 2018/1999 ('Governance Regulation'). The purpose of the comprehensive review is to enable the Commission to set out the annual limit values of Portugal for the years from 2026 to 2030, in terms of tonnes of CO_2 equivalent, as required by Article 4(4) of Regulation (EU) No 2018/841 (the 'LULUCF Regulation').

The reviewers carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the national GHG inventory for the years 2016, 2017 and 2018 as well as 2021, 2022 and 2023 submitted in 2025 by Portugal pursuant to Articles 26 (4) of the Governance Regulation.

The initial checks were carried out on the draft inventory submissions submitted pursuant to Article 26(3) of the Governance Regulation. The review builds on the initial checks performed by the EU inventory team (European Environment Agency (EEA) and the European Topic Centre on Climate Change Mitigation (ETC/CM)). The comprehensive review was performed by a Technical Expert Review Team (TERT).

More information on the procedures for the 2025 comprehensive review is presented in the annexes of this review report.

Initial check and comprehensive review conclusions

1. The reviewers raised 23 issues with Portugal during the initial check and comprehensive review (see Table 1). The TERT provided recommendations for 10 of these issues. Other issues raised during the comprehensive review were clarified and are considered resolved.
2. The TERT identified cases where inventory data were prepared in a manner which is inconsistent with UNFCCC guidance documentation or Union rules. In particular, the TERT identified a number of under-estimates or over-estimates exceeding the threshold of significance pursuant to Article 31 of Commission Implementing Regulation (EU) No 2020/1208.
3. Portugal provided 2 revised estimates to which the TERT agreed. Table 2 below summarises the revised estimates and further information is provided in the respective chapter of this report. The TERT agreed to these revised estimates.
4. The TERT did not deem necessary any technical corrections in the meaning of Article 38(2)(d) of Regulation (EU) No 2018/1999.
5. The TERT identified recommendations in order to improve the national inventory data of Portugal (see Table 3).
6. The TERT considers that it received a response from Portugal that was sufficient in order to undertake the comprehensive review appropriately.

Table 1: Overview of issues raised with Portugal

	Issues raised during the initial check	Issues raised during the comprehensive review	Recommendations	Revised estimates[1]	Technical corrections[2]
LULUCF	**10**	**13**	**10**	**2**	**-**

[1] Revised estimates: changes in inventory estimates triggered by the review and provided by the country.

[2] Technical corrections: changes in inventory estimates triggered by the review and provided by the TERT.

National totals for the purpose of Article 4(4) of Regulation (EU) 2018/841 (LULUCF)

Table 2: Totals net LULUCF emissions for the purpose of Article 4(4) of Regulation (EU) No 2018/841

Emission source category	**Reference**	**Emission estimates (kt CO_2 equivalent)**[1]					
		2016	**2017**	**2018**	**2021**	**2022**	**2023**
Total net greenhouse gas emissions for the LULUCF sector, pursuant to Article 26(4) of Regulation (EU) No 2018/1999	PRT-CRT-2025-V0-6-DataEntry-20250314-154148	-310.984	15 051.510	-3 961.547	-2 634.018	-425.166	-2 032.672
Difference between revised estimates and original estimates provided by Portugal and accepted by the TERT[2]							
4E2 Land converted to settlements (4E2b Cropland converted to settlements 4E2c Grassland converted to settlements 4(III)E2b Cropland converted to settlements 4(III)E2c Grassland converted to settlements), Multiple GHG (CO_2, N_2O), Mineral soil	PT-4-2025-0008	429.598	399.804	370.010	281.880	253.337	224.795
4G Harvested Wood Products, CO_2	PT-4G-2025-0001	468.766	426.063	416.379	248.876	213.059	792.154
Total net greenhouse gas emissions for the LULUCF sector including revised estimates		587.380	15 877.376	-3 175.157	-2 103.262	41.231	-1 015.724

[1] The tables presented in this report show numbers rounded to three decimal places, although most numbers are available with greater precision. For all calculations all available decimal places were used. Therefore, the totals shown may slightly differ from calculation results where only three decimals are taken into account.

[2] A positive difference indicates an increase compared to reported emissions or decrease in reported removals. A negative difference indicates a decrease compared to reported emissions or increase in reported removals. For more information on revised estimates, see Annex 1.

Statement from Portugal on the conclusions presented by the TERT

Portugal agrees with the aggregated GHG emission inventory estimates presented in Table 2.

Recommendations from the TERT, considering revised estimates and technical corrections deemed necessary by the TERT

Table 3: Recommendations from TERT (RE = Revised estimate; TC = Technical correction)

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
PT-4-2025-0008	No	4E2 Land converted to settlements, CO_2, 1990-2023	For 4E2 Land converted to Settlements, mineral soils pool, and CO_2 for the years 2016, 2017, 2018, 2021, 2022, and 2023, the TERT noted that, as described in the NID (Section 6.1.3.3 and Table 6-15), Portugal reported a carbon stock gain in the SOC pool for several land-use conversions to settlements. This was due to the use of a high average SOC value (88 t C/ha) for the settlement category, derived from the ICP Forests grid, the Biosoil Project, and the LUCAS 2009 soil assessment. The TERT noted that this value was higher than the values used for most other land-use subcategories and that the methodology did not differentiate between sealed and non-sealed soils or justify how this value reflected post-conversion conditions. As a result, the reported estimates were inconsistent with the Tier 1 method in the 2006 IPCC Guidelines and with typical patterns reported by other Member States, which generally show a carbon stock loss in land converted to settlements. The TERT identified this as a potential under-estimation of emissions and calculated a draft technical correction for the years 2016, 2017, 2018, 2021, 2022, and 2023. Portugal was invited to provide revised estimates or confirm agreement with the TERT correction. In response, Portugal submitted revised estimates for the affected category. The revised estimates were calculated using the same methodological approach as the TERT's draft correction, specifically applying a 20 % reduction of soil organic carbon for conversions to settlements in accordance with the 2006 IPCC Guidelines but based on disaggregated information on land use conversions. Portugal provided revised estimates for the years 2016, 2017, 2018, 2021, 2022, and 2023 and stated that they would be included in the next submission. The TERT agreed with the revised estimate provided by Portugal. The TERT recommends that Portugal include the revised estimate in its next submission.	RE
PT-4G-2025-0001	Yes	4G Harvested wood products, CO_2, 1990-2023	For 4G Harvested wood products, carbon pool, and CO_2 for the years 2016, 2017, 2018, 2021, 2022, and 2023, the TERT noted that CRT Table 4G and the NID did not initially provide a time series initialized from 1900, as recommended by the 2006 IPCC Guidelines (Vol. 4, Chapter 12). Instead, the original submission started in 1970, despite the availability of data from 1961 (FAOSTAT) and 1964 (UNECE), potentially resulting in over- or under-estimation of emissions or removals with a significant impact on total emissions. In response to a question raised during the review, Portugal acknowledged the inconsistency with the 2006 IPCC Guidelines and provided revised estimations extending the time	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			series back to 1900, using UNECE data for 1964–1969, FAOSTAT data for 1961–1963 and 2023, and the 2006 IPCC Guidelines procedure to extrapolate inputs from 1900 to 1960. Portugal provided revised estimates for the years 2016, 2017, 2018, 2021, 2022, and 2023 and stated that they would be included in the next submission. The TERT agreed with the revised estimate provided by Portugal. The TERT recommends that Portugal include the revised estimate in its next submission.	
PT-4-2025-0005	No	4 Land use, land-use change and forestry, CO_2, 1990-1994	The TERT notes with reference to the NID (section 6.1.2.3 Mainland Portugal), for land representation in all land uses, and for the years 1990–1994, that the requirement related to the use of Approach 3 for land-use changes according to the Governance Regulation, Annex V, Part III, is not fulfilled. In response to a question raised during the review, Portugal explained that only non-spatially explicit data (Approach 1) are available for this period, due to the absence of national wall-to-wall spatial data prior to 1995. Although CORINE Land Cover (CLC) data exist for 1990, Portugal indicated that their use is limited by differences in spatial resolution and classification compared to the current dataset, which may introduce inconsistencies into the time series. As Approach 1 does not allow geographically explicit tracking of land-use changes, its application for the years 1990-1994 is not in line with the requirements of Annex V, Part III. To ensure that the reporting of LULUCF is compliant with the requirements in the LULUCF Regulation, the TERT recommends that Portugal use activity data that meets the requirements of Approach 3 according to the 2006 IPCC Guidelines (e.g. repeated sampling approach on a spatially defined grid and/or repeated wall-to-wall mapping sufficiently comprehensive to detect land-use changes) in future submissions.	No
PT-4-2025-0009	No	4A Forest land, CO_2, 1990-2023	For 4A Forest Land, dead wood pool, CO_2, and the years 1990-2023, the TERT noted that Portugal reports the dead wood pool using the notation key "included elsewhere" (IE), as explained in Section 6.1.3.4 of the NID. The NID states that the two main sources of dead wood—harvesting residues and dead trees from fire—are accounted for as emissions under losses from living biomass (harvest) and indirect emissions from fire, respectively. However, the TERT found that the NID does not provide sufficient methodological detail or documentation to demonstrate how emissions from dead wood components such as stumps, coarse woody debris, and fire-killed trees are estimated and included elsewhere in the inventory. In response to a question raised during the review, Portugal clarified that emissions from the entire tree, including above and below-ground biomass, are accounted for at the time of harvest or post-fire mortality, and that this approach implicitly covers emissions that would otherwise occur from the dead wood pool over time. The TERT notes that this issue does not relate to an over- or under-estimate of emissions. However, the TERT notes that this approach deviates from the more common practice of explicitly estimating dead wood carbon stock changes. While the TERT agrees that the use of the 'IE' notation is appropriate in this context, it considers that the current	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			explanation in the NID is not sufficiently transparent to demonstrate full consistency with the 2006 IPCC Guidelines and the requirements of Article 8(5) of Regulation (EU) 2018/841, particularly for the managed forest land category. The lack of estimation files, methodological descriptions, or clear allocation of carbon flows between pools in the NID impedes full understanding and traceability of the estimates. The TERT recommends that Portugal revise the NID to provide a more detailed explanation of the methodological approach applied to the dead wood pool. This should include: • A clear rationale for the use of the 'IE' notation; • A description of how emissions from dead wood components are implicitly captured through other pools; • Clarification of how time dynamics of carbon losses are reflected or approximated in the current approach; and • An explanation of how the approach ensures compliance with Article 8(5) of the LULUCF Regulation.	
PT-4-2025-0007	No	4 Land use, land-use change and forestry, CO_2, 1990-2023	For land-use conversions, biomass pool, CO_2, and the years 1990-2023, the TERT notes a lack of transparency regarding the methodology used to assign biomass carbon stock losses in cases where the biomass stock varies with vegetation age (e.g., shrublands, permanent crops, and forest land). In response to a question raised during the review, Portugal clarified that, in such cases, biomass carbon stock losses are estimated using the average biomass stock for the relevant land-use category in the year of conversion. This approach applies to conversions from shrublands, permanent crops, and forest land, for which biomass stocks vary according to vegetation age. The average stock is calculated based on the carbon stocks of all areas within the relevant subcategory. For shrublands, permanent crops in the initial years of the time series, where age data for individual polygons are not available, Portugal assumes that all areas correspond to the 50-year age class. For forest land, Portugal further explained that the biomass carbon loss upon conversion is based on the average biomass stock for that year, derived from the living biomass estimates reported under forest land remaining forest land. Although Portugal clarified during the review that these averages are calculated from an annually updated time series, reflecting gains, losses, and changes in land area, this explanation is not fully documented in the NID. While the TERT considers that the overall approach is consistent with the 2006 IPCC Guidelines, the lack of methodological detail in the NID, particularly regarding the derivation of initial carbon stocks, the implementation of time-dynamic updates, and the allocation of average values to land-use transitions, limits transparency and traceability. The TERT recommends that Portugal revise the NID to enhance transparency regarding the estimation of biomass carbon stock losses upon land-use conversion. This should include: • A detailed explanation of how average biomass stocks are calculated and updated over time;	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			• Clarification of how initial stock values are established, particularly for the early years of the time series; and • A description of the procedure used to apply average stock values to land-use polygons lacking age-specific information.	
PT-4-2025-0006	No	4 Land use, land-use change and forestry, CO_2, 1990-2023	The TERT notes with reference to the NID (section 6.1.2.4 Autonomous Region of Azores and Autonomous Region of Madeira), for land representation in all land uses, in the Autonomous Region of the Azores and the Autonomous Region of Madeira, and for the years 1990–2023, that the requirement related to the use of Approach 3 for land-use changes according to the Governance Regulation, Annex V, Part III, is not fulfilled. In response to a question raised during the review, Portugal explained that land representation in these regions is based on successive CORINE Land Cover (CLC) wall-to-wall maps, which are spatially explicit and applied consistently throughout the time series. However, to align the CLC data with national statistical systems, Portugal disaggregated land uses, specifically Forest Land and Cropland, into sub-categories using percentage shares from national forest inventories and the agricultural census. This disaggregation is done at the polygon level using national-level proportions, rather than observed spatial characteristics. The TERT notes that this method of disaggregation results in a loss of geographic explicitness for the sub-categories concerned, and therefore no longer fulfils the definition of Approach 3 under the 2006 IPCC Guidelines. While the CLC data alone are suitable for Approach 3 reporting at the land-use category level, the applied disaggregation introduces a step away from spatially explicit land representation, as required under Annex V, Part III. The TERT notes that one possible solution would be for Portugal to revise the land representation for the Azores and Madeira by maintaining the spatially explicit CLC-based classification at the land use category level (e.g. Forest Land, Cropland), and applying category-level weighted parameters for emissions and removals based on national forest inventories and agricultural census data. This approach would retain the spatially explicit nature of the land-use representation while ensuring consistency with regional datasets. To ensure that the reporting of land-use categories is compliant with the requirements in the LULUCF Regulation, the TERT recommends that Portugal use activity data that meets the requirements of Approach 3 according to the 2006 IPCC Guidelines (e.g. repeated sampling approach on a spatially defined grid and/or repeated wall-to-wall mapping sufficiently comprehensive to detect land-use changes) in future submissions.	No
PT-4A-2025-0001	No	4A Forest land, CO_2, 1990-2023	For 4A Forest Land (remaining and in conversion), biomass pool, CO_2, and the years 1990–2023, the TERT noted that there is a lack of transparency in the NID regarding the methodology used to estimate living biomass. With reference to Section 6.1.3.1 of the NID (pages 6-18, 6-27, and 6-31),	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			Table 6-3, and Equations 6-10 and 6-11, the TERT found that the documentation provided does not clearly explain the rationale for the growth rates applied, their consistency with National Forest Inventory (NFI) data, or how the method ensures time series consistency and accuracy. This lack of transparency impedes full understanding and reproducibility of the estimates reported in CRT Table 4A. The TERT also noted that Forest Land remaining Forest Land is reported as a net sink for most years in the time series (1995–2022), resulting in a continuous increase in estimated carbon stocks in living biomass. However, as shown in Table 6-3 of the NID, the carbon stock values reported from the NFIs (NFI4: 1995; NFI5: 2005; NFI6: 2015) are relatively stable over the same period: 70.036 kt C in 1995, 70.556 kt C in 2005, and 70.448 kt C in 2015. This apparent discrepancy was not transparently explained in the NID and raised questions regarding the consistency of reported growth with inventory data. The TERT notes that this issue does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Portugal provided detailed explanations on the methodology used to estimate living biomass and their compatibility with NFI data. Portugal also clarified that carbon stock losses from disturbances such as forest fires are fully accounted for and allocated in Table 4(IV), not in Table 4A. The TERT agrees that the approach is consistent and that total carbon stock changes, including losses, are correctly included. The TERT recommends that Portugal improve transparency by including in the next submission all relevant methodological explanations provided during the review. This should include a clear justification for methodology and assumptions used for estimating living biomass pool, an explicit comparison with NFI-derived stock change data, and clarification of how losses are allocated between CRT Tables 4A and 4(IV).	
PT-4A1-2025-0001	Yes	4A1 Forest land remaining forest land, CO_2, 1990-2023	For 4A1 Forest Land remaining Forest Land, living biomass pool and CO_2, for the years 1990-2023, the TERT noted that there is a lack of transparency regarding the methods used to estimate gains and losses in living biomass under different forest dynamics, as described in the NID (Section 6.2.1.2). In particular, the TERT was unable to determine whether biomass gains are estimated for forest areas that change their original forest type, and whether the approach to estimating losses in areas with forest type change adequately distinguishes between clear-cut transitions and gradual ecological changes. The TERT notes that this issue does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Portugal explained that for areas where there is a change in forest species, losses in the first year are estimated as the average biomass of the previous forest type, regardless of the process that led to the species change. Portugal acknowledged that changes in dominant species may occur due to harvesting, fire, or gradual ecological shifts, but indicated that the first processes are considered the main drivers in the country. The TERT recommends that Portugal provide a clearer explanation in future submissions on how gains are estimated in areas where the forest type remains unchanged. The TERT also recommends that	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			Portugal improve transparency by explicitly addressing whether and how the estimation of biomass losses in areas undergoing forest type change accounts for the nature of the transition — distinguishing between abrupt (e.g. harvest/fire-driven) and gradual ecological processes.	
PT-4B1-2025-0001	Yes	4B1 Cropland remaining cropland, CO_2, 1990-2023	For 4B1 Cropland remaining Cropland, mineral soils, CO_2, for the years 1990-2023, the TERT noted that in response to a question raised during the review Portugal explained that changes in management practices within cropland subcategories are not taken into account in the estimation of soil organic carbon (SOC) stock changes due to a lack of consistent or spatially explicit data at national level. Portugal did not provide any assessment of the potential impact of this exclusion or evidence to support that the impact is below the threshold of significance. The TERT noted that due to the absence of relevant activity data, it is not possible to determine whether the exclusion of management changes leads to a significant under-estimation of emissions or removals in soil carbon pool. The TERT recommends that Portugal prioritise the collection or development of national data on relevant cropland management practices (e.g. tillage, cover cropping, crop rotations, organic amendments), and assess whether their inclusion would significantly affect SOC stock change estimates. If found to be significant, such effects should be included in future submissions.	No
PT-4D1-2025-0001	No	4D1 Wetlands remaining wetlands, CO_2, 1996-2023	For the category Other Wetlands remaining other Wetlands (4D1, gas CO_2, years 1996–2023), the TERT noted that there is an inconsistency between the methodological description in the NID (Section 6.5.1, pg. 6-38) and the emissions reported in the CRT. The NID states that the default assumption of no net changes was applied to all pools in this category, implying zero emissions, whereas CRT Table 4D includes reported CO_2 emissions. The NID does not define the Other Wetlands subcategory in Table 6-1 either, which reduces transparency. In response to a question raised during the review, Portugal explained that the reported emissions correspond to land-use transitions from WT1 (flooded areas) to WT2 (wetlands), and that emissions in such cases were estimated using the 2006 IPCC Guidelines (Vol. 4, Ch. 7) and default emission factors. It was further clarified that the omission of this explanation and the inconsistent nomenclature in the NID will be corrected in the next version. The TERT notes that this issue does not relate to an over- or under-estimate of emissions. The TERT recommends that Portugal revise the NID to clearly define the subcategory Other Wetlands, ensure consistency in nomenclature, and clarify the methodological approach used to estimate emissions from transitions between wetlands subcategories.	No

Revised estimates provided by Portugal and accepted by the TERT[1]

#		
1	EMRT ID:	PT-4-2025-0008
	EMRT URL:	https://emrt-esd.eionet.europa.eu/2025/PT-4-2025-0008
	Country:	Portugal
	Land use category:	4E2 Land converted to settlements (4E2b Cropland converted to settlements, 4E2c Grassland converted to settlements, 4(III)E2b Cropland converted to settlements, 4(III)E2c Grassland converted to settlements)
	Gases:	CO_2 (and N_2O for table 4(III) for 4E2)
	Pool:	Mineral soil
	Completed by LULUCF Expert:	Juan José Rincón Cristóbal
	Reviewed by Thematic Counterpart Expert:	
	Reviewed by Lead Reviewer:	Marina Vitullo
	Reviewed by Quality Controller:	Bernd Gugele
	The underlying problem:	The TERT notes, with reference to the NID (Section 6.1.3.3 and Table 6-15: Average C-stock 0–40 cm per land use), that there may be an under-estimation of emissions in the SOC pool for the category Land converted to Settlements, in particular for Cropland converted to Settlements (CL to SL) and Grassland converted to Settlements (GL to SL). In its initial review finding PT-4E2-2025-0002, the TERT raised concerns regarding the high average SOC stock value of 88 t C/ha assigned to the Settlements category, which results in reported carbon stock gains following land-use conversion from Cropland and Grassland. These estimates are inconsistent with the default expectations of the 2006 IPCC Guidelines, which indicate that such conversions typically result in carbon stock losses due to soil sealing and degradation. Portugal explained during the review that the SOC stock value for Settlements was based on data from LUCAS 2009, the Biosoil Project, and the ICP Forests grid, but acknowledged that this value may not represent post-conversion conditions accurately and that data to distinguish sealed and non-sealed soils within the Settlements category are not currently available. In response to the follow-up request, Portugal clarified that it had revised the methodology and now applies a 20% SOC stock reduction for land converted to Settlements, in line with guidance from the 2006 IPCC Guidelines (Vol. 4, Ch. 8). However, for Settlements converted to other land uses, Portugal applies the default 2006 IPCC Guidelines value for HAC soil in Warm Temperate Climate (mean of moist and dry) in table 2.3 (Vol 4; Chapter 2). The TERT notes that this revised approach introduces an inconsistency in the application of IPCC default values and results in methodological asymmetry in conversions involving Settlements. Specifically, it leads to different assumptions depending on the direction of conversion (to or from Settlements), which is not in line with the default IPCC approach and undermines time series consistency and comparability. Furthermore, although Portugal indicated that updated estimates have been prepared, the file sent only included the revised emission and removal values without the estimation procedure (e.g. activity data). Therefore, the TERT could not assess for accuracy or consistency in the revised estimates. In light of the above, the TERT disagreed with the revised estimates provided by Portugal. The TERT decided to calculate a technical correction for the years 2016, 2017, 2018, 2021, 2022 and 2023. The difference between the technical correction estimates and the CRT data exceed the threshold of significance defined under Regulation (EU) 2018/1999 only for CL to SL and GL to SL. Therefore, the technical correction includes only revised estimates for these two conversion subcategories, including both mineral soils carbon stock changes and direct and indirect N_2O emissions for N mineralization/immobilization associated with loss/gain of soil organic matter. In response, Portugal submitted revised estimates for the affected category. The revised estimates were calculated using the same methodological approach as the TERT's draft correction, specifically applying a 20% reduction of soil organic carbon for conversions to settlements in accordance with the 2006 IPCC Guidelines but based on disaggregated information on land use conversions. Portugal provided revised estimates for the years 2016, 2017, 2018, 2021, 2022, and 2023 and stated that they would be included in the next submission. The TERT agreed with the revised estimate provided by Portugal.
	Summarise the methodology used:	The TERT notes that activity data (AD) on land-use conversions are available only at the aggregated level reported in the CRT tables (i.e., total area of Cropland converted to Settlements and Grassland converted to Settlements per year). No disaggregated information is available at the subcategory level (e.g., CL1, CL2, etc.). In contrast, information on mineral soil carbon stocks is provided by Portugal in the NID at the subcategory level. To overcome this data gap and enable the estimation of emissions and removals associated with land-use conversions to Settlements, the TERT applied the following methodology: 1. Estimation of original carbon stocks (pre-conversion): For each land-use category subject to conversion (i.e., Cropland and Grassland), the TERT calculated the average carbon stock in mineral soils by taking the mean of the subcategory-level values

provided in the NID (Table 6-15). This average represents the initial carbon stock prior to conversion.

2. Estimation of carbon stocks post-conversion:

In line with the default approach in the 2006 IPCC Guidelines (Vol. 4, Ch. 8), the carbon stock following conversion to Settlements was assumed to be 80% of the original value, thereby applying a 20% reduction in SOC as a default for land converted to Settlements.

3. Time period for transition between equilibrium states:

The transition between the pre-conversion and post-conversion equilibrium carbon stocks was assumed to occur over 20 years, in accordance with the guidance of the 2006 IPCC Guidelines.

4. Estimation of the carbon stock changes: using the methodology provided by the 2006 IPCC Guidelines, in particular eq. 2.25.

5. Identification of categories exceeding the threshold of significance:

This methodology was applied to all land-use categories converted to Settlements. However, only conversions from Cropland to Settlements (CL to SL) and Grassland to Settlements (GL to SL) were found to exceed the threshold of significance established for technical corrections under the LULUCF review protocol. Therefore, only these two subcategories are included in this technical correction.

6. Estimation of associated N_2O emissions:

Given that the conversions from CL and GL to SL result in a net loss of C in mineral soils, the TERT also estimated associated direct and indirect N_2O emissions from mineralization and immobilization of nitrogen. These were calculated following the 2006 IPCC Guidelines (Vol. 4, Ch. 11), specifically using equations 11.8 and 11.10 and the relevant default parameters. Details on parameter values used can be found in the "Parameters" sheet of the supporting spreadsheet file.

This approach is fully consistent with the 2006 IPCC Guidelines and enables the estimation of revised emissions and removals for the relevant conversion categories, addressing the identified under-estimation of emissions due to the original methodological assumptions.

2

	Original estimate (kt CO_2e)				**Notes**
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-222.472		4.856	-217.616	Only emissions from the categories listed above (CL and GL to SL). The other conversions are under the threshold are not included.
2017	-205.462		4.635	-200.827	
2018	-188.452		4.413	-184.039	
2021	-138.241		3.752	-134.489	
2022	-122.051		3.534	-118.517	
2023	-105.861		3.316	-102.544	

	Revised Estimate received from country (kt CO_2e)				**Notes**
Year	CO_2	CH_4	N_2O	Total GHG	
2016	196.346		15.636	211.982	
2017	184.300		14.676	198.977	
2018	172.254		13.717	185.971	
2021	136.519		10.871	147.391	
2022	124.876		9.944	134.821	
2023	113.234		9.017	122.251	

	Difference between RE and OE (kt CO_2e)			
Year	CO_2	CH_4	N_2O	Total GHG
2016	418.819		10.779	429.598
2017	389.762		10.042	399.804
2018	360.706		9.304	370.010
2021	274.760		7.120	281.880
2022	246.927		6.410	253.337
2023	219.094		5.701	224.795

1	EMRT ID:	PT-4G-2025-0001
	EMRT URL:	https://emrt-esd.eionet.europa.eu/2025/PT-4G-2025-0001
	Country:	Portugal
	Land use category:	4G Harvested Wood Products
	Gases:	CO_2
	Pool:	HWPs
	Completed by LULUCF Expert:	Juan José Rincón Cristóbal
	Reviewed by Thematic Counterpart Expert:	
	Reviewed by Lead Reviewer:	Marina Vitullo
	Reviewed by Quality Controller:	Bernd Gugele
	The underlying problem:	The TERT notes that Portugal initializes the HWP time series from 1970, rather than from 1900 as recommended in the 2006 IPCC Guidelines. Although production data are available from 1961 (FAOSTAT) and 1964 (UNECE), these earlier data are not used. The omission of pre-1970 inputs may result in a significant over- or under-estimation of emissions or removals.
	Summarise the methodology used:	Estimations were recalculated extending the time series until 1900, based on UNECE data (1964-1969), FAOSTAT data (1961-1963; and 2023) and the 2006 IPCC GL procedure to extrapolate to 1900.

2

	Original estimate (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-607.987			-607.987	
2017	-440.829			-440.829	
2018	-525.767			-525.767	
2021	-503.906			-503.906	
2022	-360.952			-360.952	
2023	-264.552			-264.552	

	Revised Estimate received from country (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-139.220			-139.220	
2017	-14.766			-14.766	
2018	-109.388			-109.388	
2021	-255.030			-255.030	
2022	-147.893			-147.893	
2023	527.602			527.602	

	Difference between RE and OE (kt CO_2e)			
Year	CO_2	CH_4	N_2O	Total GHG
2016	468.766			468.766
2017	426.063			426.063
2018	416.379			416.379
2021	248.876			248.876
2022	213.059			213.059
2023	792.154			792.154

[1] Carbon stock changes (in kt C) from the CRT tables have been converted into kt CO_2 by multiplying by -44/12.

Annex I: Legal background and procedures of the 2025 comprehensive review

The LULUCF Regulation (EU) 2018/841 sets net emission removal targets for 2030 and net emission budgets in the period 2026 to 2029. In Article 4(5) of the LULUCF Regulation, the Commission is required to adopt decision setting out the annual limit values for net greenhouse gas removals for each year in the period from 2026 to 2029, for which it shall carry out a comprehensive review.

The Governance Regulation (EU) 2018/1999 lays down annual reporting obligations, compliance checks and a review process to ensure that the compliance with annual GHG emission limits is assessed in a credible, consistent, transparent and timely manner.

The requirements for the review of the national inventory data submitted by countries are set out in Article 38 of Regulation (EU) 2018/1999. The details concerning the review process, such as the timing and steps of conducting of the annual and comprehensive reviews are set out in Chapter V and Annex XXII of the Commission Implementing Regulation (EU) No 2020/1208.

The 2025 reviews were thus held as a comprehensive review in line with Article 38(1a) of Regulation (EU) 2018/1999in concert with the reviews required by the LULUCF Regulation.

Objectives

The objectives of the comprehensive review of countries' GHG emission inventories in 2025 are:

a) to support the European Commission by ensuring it has accurate, reliable and verified information on annual GHG emissions for
    - determining the budget for the period 2026-2029 according to Article 4(4) of Regulation (EU) 2018/841.

b) to assist countries in improving the quality of their GHG inventories.

Procedures

The scope of the 2025 comprehensive review is presented in Table A-1. The checks carried out during the 2025 comprehensive review are presented in Annex II.

The initial checks were carried out by the EEA with support from the ETC/CM. All findings from the initial checks that were partly resolved or not resolved within the initial check phase were followed up in the comprehensive review.

The EEA LULUCF experts consisted of the following experts:

- Sector experts: Raul Abad-Viñas and Peter Iversen (EEA)
- Quality coordinator: Lucia Perugini (EEA)

The comprehensive review 2025 was performed by a Technical Expert Review Team (TERT) under service contract **No 3502/B2025/EEA.60384** implementing Framework service contract No EEA/CET/24/002 of the European Environment Agency. The lead reviewers and sector review experts did not review emission inventories of countries where these individuals have themselves contributed to the compilation of that inventory, or presently are or have been any part of the decision-making process related to the compilation of that inventory.

The TERT consisted of the following experts:

- Iordanis Tzamtzis, Lora Stoeva, Rosie Brook, Carmen Schmid, Boštjan Mali, Andis Lazdiņš, Sven van Baren, Bradley Matthews, Valentin Bellassen, Aldis Butlers, Mattias Lundblad, Juan José Rincón Cristóbal, Etienne Mathias, Erwin Moldaschl and Mélanie Juillard;
- Lead reviewers: Peter Weiss, Kevin Black, Sandro Federici and Marina Vitullo.

The comprehensive review was coordinated by Bernd Gugele and Justin Goodwin.

The EEA review secretariat consisting of Claire Qoul, Lærke Callisen, Peter Iversen and Roxy Cottey prepared and coordinated the comprehensive review as foreseen in Article 30 of Commission Implementing regulation (EU) No 2020/1208 and Article 42 of the Governance Regulation (EU) 2018/1999.

The comprehensive review was performed on the basis 15 April submissions of GHG emission data and the national inventory document (NID) under the Governance Regulation.

Where relevant, the TERT calculated technical corrections for over- or under-estimates identified in a mandatory category in the countries' GHG inventories that exceed the threshold of significance. Technical corrections have been calculated only for the years 2016-2018 and 2021-2023. If the technical correction exceeds the threshold of significance for at least one year of the inventory under review (2021-2023) but not for all the years, the technical correction was calculated only for those years where the technical correction exceeds the threshold of significance.

Table A-1: Scope of the comprehensive review 2025

Element	Scope	Further information
Countries	EU geographical coverage of the Member States, Norway and Iceland	
Years	2016, 2017, 2018, 2021, 2022 and 2023	According to GovReg Article 38(1a) According to LULUCF Article 4(4)
Gases	CO_2, CH_4 and N_2O	
Sectors	LULUCF	

Annex II: Checks carried out during the 2025 initial checks and review

The checks carried out during the 2025 initial checks are pursuant to Article 37(4) of Regulation (EU) 2018/1999 and Article 6 of Commission Delegated Regulation (EU) 2020/1044 and the comprehensive review following Article 38(1a) of Regulation (EU) 2018/1999 and Article 30 of the Commission Implementing Regulation (EU) No 2020/1208.

Initial checks may include:

1. Assessment whether all emission source categories and gases required under Regulation (EU) No 2018/841 are reported;
2. Assessment whether emissions data time series are consistent;
3. Assessment whether implied emission factors across Member States/countries are comparable taking the IPCC default emission factors for different national circumstances into account;
4. Assessment of the use of 'Not Estimated' notation keys where IPCC Tier 1 methodologies exist and where the use of the notation key is not justified in accordance with point 32 of the Annex to Decision 18/CMA.1;
5. Analysis of recalculations performed for the inventory submission, including whether the recalculations are based on methodological changes;
6. Assessment whether issues from earlier Union initial checks and reviews as well as recommendations from UNFCCC reviews have been implemented by the Member State;
7. Assessment of the accuracy of Member States' emissions by sources and removals by sinks estimates in relation to Union key categories;
8. Assessment of the transparency and completeness of the methodological descriptions reported by Member States for the Union key categories;
9. Assessment of monitoring and reporting of emissions by sources and removals by sinks in the land use, land use change and forestry (LULUCF) sector pursuant to Part 3 of Annex V to Regulation (EU) 2018/1999, including the assignment of key categories, Tier methodology applied, and a comparison of reported land use and land use change activity data with information derived from the Union and Member State programmes and surveys.

Comprehensive review checks:

1. Detailed examination of the inventory estimates including methodologies used by the Member State in the preparation of inventories;
2. Detailed analysis of the Member State's implementation of recommendations related to improving inventory estimates as listed in its most recent UNFCCC annual review report made available to that Member State before the submission under review where recommendations have not been implemented;
3. Detailed analysis of the justification provided by the Member State for not implementing them;
4. Detailed assessment of the time series consistency of the greenhouse gas emissions estimates;
5. Detailed assessment whether the recalculations made by a Member State in the given inventory submission as compared to the previous one are transparently reported and made in accordance with the greenhouse gas inventory guidelines;
6. Follow-up on the results of the initial checks and on any additional information submitted by the Member State under review in response to questions from the technical experts review team and other relevant checks;
7. Other relevant checks complementing the initial checks;
8. Check that all gases and pools are reported under LULUCF.