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

Germany

28 August 2025

European Environment Agency

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Introduction and conclusions from the 2025 comprehensive review

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

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 Germany 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 Germany 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 25 issues with Germany during the initial check and comprehensive review (see Table 1). The TERT provided recommendations for 11 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. Germany provided 3 revised estimates, which were accepted by the TERT. Table 2 below summarises the revised estimates and further information is provided in the respective chapter of this report.
4. The TERT also deemed necessary a technical correction in the meaning of Article 38(2)(d) of Regulation (EU) No 2018/1999 and calculated such technical correction in consultation with Germany. The technical correction is presented in Table 2 of the present review report and is accompanied by evidence-based justification. In its response to the draft technical corrections, Germany stated that it does not agree with the technical correction, but they are planning to provide revised estimates for forest land remaining forest land mineral soils using the YASSO model in the next annual inventory submission.
5. The TERT identified recommendations in order to improve the national inventory data of Germany (see Table 3).
6. The TERT considers that it received a response from Germany that was sufficient in order to undertake the comprehensive review appropriately.

Table 1: Overview of issues raised with Germany

	Issues raised during the initial check	Issues raised during the comprehensive review	Recommendations	Revised estimates[1]	Technical corrections[2]
LULUCF	**5**	**20**	**11**	**3**	**1**

[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	DEU-CRT-2025-V0-4-DataEntry-20250317-161830	8 876.810	3 987.080	83 197.002	63 087.231	75 603.466	68 652.805
Difference between revised estimates and original estimates provided by Germany and accepted by the TERT[2]							
4G - Harvested wood products, CO_2, HWPs	DE-4G-2025-0002	-	-	-	-	-	3 469.497
4 Land (4E2 Land converted to Settlements and conversions from Settlements to other categories: 4A2d, 4B2d, 4C2d, 4D2d, 4F2e), Multiple GHG (CO_2, N_2O), Mineral soil	DE-4E2-2025-0002	288.751	310.731	333.143	394.768	402.340	411.283
4 Land (4E2 Land converted to Settlements and conversions from Settlements to other categories: 4A2d, 4B2d, 4C2d, 4D2d, 4F2e), CO_2, Living Biomass Gains and Losses	DE-4E2-2025-0001	5 011.985	4 934.932	4 767.710	4 138.992	3 749.411	3 423.088
Difference between technical corrections and original estimates deemed necessary by the TERT[2]							
4A1 Forest land remaining forest land, CO_2, Mineral soil	DE-4A1-2025-0002	-2 415.109	-3 346.316	-12 213.006	-24 169.112	-25 039.532	-20 179.673
Total net greenhouse gas emissions for the LULUCF sector including revised estimates and technical corrections		11 762.437	5 886.426	76 084.849	43 451.879	54 715.685	55 777.001

[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 and/or technical corrections, see Annex 1.

Statement from Germany on the conclusions presented by the TERT

Germany 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)
DE-4A1-2025-0002	Yes	4A1 Forest land remaining forest land, CO_2, 1990-2023	For 4A1 Forest land remaining forest land (CO_2, mineral soils, 2014-2023) the TERT noted that in response to a question raised during the review, Germany acknowledged the TERT's concerns regarding the application of the Yasso model. Specifically, Germany acknowledged the TERT's concern regarding the assumption of constant C inputs from living trees and C inputs from mortality and forestry operations for the period from 2014 onwards based on average inputs from 2009 to 2013. Germany furthermore acknowledged that this could lead to an incorrect estimate of changes in mineral soil stocks in 2016–2018 and 2021–2023. Germany indicated that it will derive the relevant data and include it in the Yasso modelling. However, Germany explained that this will require a considerable amount of time and will therefore only be able to implement this with the next submission in 2026. Despite a potential technical correction being sent with a request for a revised estimate, Germany did not provide the TERT with a revised estimate. Germany did however indicate that a revised estimate may be submitted at a later stage. The TERT decided to calculate a technical correction for the years 2016, 2017, 2018, 2021, 2022 and 2023 which was not accepted by Germany. The estimates demonstrate that the issue is above the threshold of significance. The TERT recommends that Germany include a revised estimate in its next submission.	TC
DE-4E2-2025-0001	No	4E2 Land converted to settlements, CO_2, 1990-2023	For 4E2 Land converted to settlements (CO_2, biomass, all years), the TERT noted that in response to a question raised during the review, Germany provided a revised estimates that TERT disagreed with. In the initial observation, the TERT noted from the NID that a total vegetation fraction of 50% is assumed for Settlements based on a national study (Einig et al., 2009). According to equation 64 (page 574), half of the vegetated fraction is assumed herbaceous with gains estimated according to the biomass of "grassland in a strict sense subcategory" (gra1). This biomass stock is assumed to be gained and reach maturity in the first year after conversion and remain in equilibrium thereafter. For the second half of the vegetated Settlements fraction, it is assumed this vegetation is woody and biomass gains take place over the 20-year transition period following the biomass growth curve used for the "Grassland subcategories hedges and woody grassland" (gra2). The TERT noted a lack of transparency explaining the applicability of the methodology used. Page 574 of the NID acknowledges that no specific national data on biomass stocks in Settlements exist („Da über die Biomasse bzw. den	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			Kohlenstoffvorrat auf diesen Flächen keine spezifisch erhobenen Daten vorliegen…“). According to the respective Decision tree (Vol.4 ch. 2, Fig. 2.2, page 2.14) this potentially restricts the country applying country-specific factors for the “DelCg” term of the applied Gains-Loss method (equation 2.16 of the 2006 IPCC Guidelines, Vol.4 ch. 2, page 2.22). The TERT therefore requested the country to explain why the vegetated area of Settlements is split 50:50 between the gra1 and gra2 biomass gain models. Furthermore, the TERT requested the country to clarify why the gra2 biomass gain model was considered suitable for estimating the woody biomass gains for 4E2 Land converted to settlements and why the country removed the pollarding and pruning cuts (“Pflegeschnitt”) from gra2 for the purpose of Land converted to settlements? The TERT notes that the Biomass stock gains of gra2 applied for 4E2 are substantial and, on an area-equivalent basis (100% area coverage), the average biomass gains of gra2 over 20 years would be almost 8 t C ha^{-1} yr^{-1}, more than twice the annual carbon accumulation rates per ha tree crown cover given in Table 8.1 of Vol. 4 ch. 8 of the 2006 IPCC Guidelines (2.9 and 3.6 t C ha^{-1} yr^{-1}). In this context, the TERT noted that the average implied C stock change factor of Biomass Gains of Land converted to Settlements (ca. 2 t C ha^{-1} yr^{-1}) is comparable to the Biomass Gain factors given for afforestation areas in 4A2, which range from 0.28 to 3.22 t C ha^{-1} yr^{-1} (NID Table 349, page 624). The TERT finally noted the different growth conditions for vegetation in Settlements and Grasslands, as well as the likelihood that part of the initial growth of woody urban vegetation occurs outside of settlements before planting (e.g. in tree nurseries which are already accounted for in the inventory under Croplands). In response to the questions and requests made during the review relating to the above concerns, Germany acknowledged the over-estimation in Biomass C gains and provided revised estimates (for 4E2, as well as the subcategories associated with conversions from Settlements) based on a revised vegetation fraction (60% instead of the 50% originally reported) and a revised split of the gra1:gra2 fractions of the vegetation area (75 and 25% instead of the 50 and 50% originally reported). While the revised estimates were lower than original estimates of biomass C gains of 4E2 Land converted to Settlements, the TERT disagreed with the revised estimates. The revised vegetation fraction (“unsealed fraction” according to the revised estimate) of 60% is not – in the view of the TERT - supported by the cited BBSR report. According to this source, the average national 57% percent vegetation cover applied to administrative city areas. For Settlements as per land use (“Siedlungs- und Verkehrsfläche”), and not per municipal borders, the national average fraction given in the report is 35% (page 12 of the BBSR 2022 report). Furthermore, in response to another observation on varying sealing fractions cited in the NID (DE-4E2-2025-0003), Germany clarified that the unsealed fraction amounts to 50%. Finally, the main concern of the TERT is that Germany has yet to provide convincing and quantitative justification that the gra2 growth curves of agricultural hedges (adjusted by removing pruning cut losses) are representative of Settlement area covered by woody biomass, which includes not only hedges but likely also considerable areal	

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			coverage of street-, park- and garden trees. Consequently, the TERT decided to calculate a technical correction for the years 2016, 2017, 2018, 2021, 2022 and 2023 which was not accepted by Germany. Germany subsequently provided a revised estimate which was accepted by the TERT. The TERT recommends that Germany include a revised estimate for the complete time series in its next submission.	
DE-4E2-2025-0002	No	4E2 Land converted to settlements, CO_2, N_2O, 1990-2023	For 4E2 Land converted to settlements (CO_2 and N_2O, mineral soils, all years), as well as the subcategories relevant for conversions of Settlements to other land uses, the TERT noted from the methodological descriptions in the NID (pages 542-545; German language version) that due to national legislation on construction and surface sealing, soil material does not leave the Settlement area but is rather translocated within it, i.e. moved laterally from the sealed area to neighbouring unsealed areas. The methodology nonetheless considers that the disturbance process does lead to a loss of soil carbon to the atmosphere and based on a time-response function from a scientific study of soil organic carbon (SOC) changes following Grassland conversion to Cropland (Poeplau et al., 2011), 11% of the mineral SOC stock of the previous land use category is lost from the construction process and occurs entirely in the year of the conversion to Settlements. The TERT notes that this country-specific methodology as described in the NID is not consistent with the 2006 IPCC Guidelines for developing and applying T2 methods for SOC stock changes (Vol.4 Ch. 2.3.3.1, Decision Tree given in Figure 2.4, page 2.32), which requires country-specific data on the said soil C stock changes due to land use and management for mineral soils. As described in the NID (page 542) there are no national, scientific data with respect to mineral SOC losses associated with the construction of Settlement areas (“Es liegen keine spezifisch erhobenen wissenschaftlichen Daten über infolge von Baumaßnahmen verursachte Kohlenstoffverluste der organischen Substanz von Oberböden vor“). Furthermore, the methodology is not consistent with the specific IPCC guidance on T2 SOC stock changes for Land converted to Settlements (Vol.4 Ch. 8.3.3.2, pages 8.24-25), as well as the generic guidance in Vol.4 Ch. 2.3.3, that derived mineral SOC stocks are applied consistently across land uses. The TERT noted that despite the above methodology assuming an 11% loss of mineral SOC after conversion to Settlements, the country calculates the resulting mineral SOC stocks for Settlements (used for calculations for conversions of Settlements to other land categories) based again on the mineral SOC stock of the previous category, but assuming that the mineral SOC under the sealed area fraction (0.4) is zero (equation 36, page 545). This mineral SOC stock for Settlements (60% the stock of the previous land-use) thus implies 40% of the previous SOC stock was lost upon conversion to Settlements and not 11%. In response to a question raised during the review, Germany provided further justification for assumptions behind the 11% mineral SOC loss upon conversion to Settlements. The TERT notes that this methodology, while not explicitly based on observations of mineral SOC stocks in German	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			settlement areas but rather a function derived from a scientific study of SOC changes following Grassland conversion to Cropland (Poeplau et al., 2011), produces similar results to the IPCC Tier 1 methodology (8 % loss based on the Fm factor of 0.8 multiplied by the sealing fraction of 0.4 in the NID). Moreover, the TERT notes the scientific literature on mineral SOC stocks in Settlements cited in the NID, comparing Settlement non-sealed stocks to those of local non-Settlement land-uses, indicating that a 100% loss of mineral SOC stocks from the sealed fraction would over-estimate associated CO_2 emissions. Nonetheless, in the same response, Germany acknowledged the inconsistent calculation of Settlement mineral SOC stocks (assuming 100% loss of mineral SOC stocks from the sealed fraction) applied to calculations of conversions of Settlement to other land uses. Germany furthermore noted a small error in the 4E2 calculations due to an area factor, leading to a <11% loss in mineral SOC stock. Germany provided a revised estimate of CO_2 and N_2O emissions for the years 2016, 2017, 2018, 2021, 2022 and 2023, associated with mineral SOC stock changes occurring in 4E2 Land converted to settlements, as well as 4A2d Settlements converted to forest land, 4B2d Settlements converted to cropland, 4C2d Settlements converted to grassland, 4D2d Settlements converted to Wetlands and 4F2e Settlements converted to other land. The TERT agreed with the revised estimate provided by Germany. The TERT recommends that Germany include the revised estimate in its next submission. Furthermore, the TERT recommends that Germany apply the corrected methodology, ensuring consistent treatment of mineral SOC stocks for Settlements involved in conversions to and from other land use categories, to the whole time series in the next submission. The TERT furthermore encourages Germany to explicitly justify the 0.89 stock change factor for conversions to Settlements in the NID of the next submission, by referencing scientific studies of Settlement and non-Settlement mineral SOC stocks (ideally of German Settlement areas) that provide evidence of the on-average, 11%-lower mineral SOC stocks of Settlements compared to local, non-settlement land uses.	
DE-4G-2025-0002	Yes	4G Harvested wood products, CO_2, 2023	For 4G Harvest wood products (CO_2, 2023), the TERT noted from page 726 of the 2025 NID that the extrapolation approach applied to not-yet-available 2023 FAO HWP production statistics may have led to over-estimated HWP CO_2 removals in the year 2023 that exceed the threshold of significance. The TERT noted the assumption, that 2023 production levels remained at 2022 levels, was potentially not justified, given that other indicators such as German harvest statistics suggest that production actually declined between 2022 and 2023 by a considerable amount. In response to a question raised during the review, the country provided the now-available FAO statistics confirming the TERT's assumption that 2023 Gains to the HWP pool were over-estimated. Germany nonetheless responded by justifying that its original extrapolation approach was consistent with the 2006 IPCC Guidelines, as these guidelines suggest that “new estimates should be extrapolated based on available data, and then	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			recalculated when new data become available." (2006 IPCC Guidelines Vol 1 Ch 5.3.1). The TERT indeed notes the principal validity of the "Trend extrapolation" approach as per Vol 1 Ch 5.3.3.4 of the 2006 IPCC Guidelines; however, the TERT notes the guidance in Vol 1 Ch 5.3.3.6 2006 IPCC Guidelines on "Selecting the most appropriate technique" which states in Table 5.1 page 5.14 that trend extrapolation is "most reliable if the trend over time is constant"; and "should not be used if the trend is changing (in this case, the surrogate method may be more appropriate)". The TERT therefore considered in this case that the trend extrapolation approach was not justified and provided a potential technical correction (PTC) using the "Surrogate data" approach as per Vol 1 Ch 5.3.3.2 of the 2006 IPCC Guidelines based on the then-available harvest statistics. While the PTC, based on a correction of the 2023 HWP Gains estimates, provided a better approximation of the 2023 HWP emissions/removals (compared to the original estimate), Germany rejected the PTC and provided a revised estimate of 2023 HWP emissions/removals based on the now available FAO statistics for 2023, using the same HWP methodology as described in its NID. The TERT agreed with the revised estimate provided by Germany. The TERT recommends that Germany include the revised estimate in its next submission. In addition, the TERT encourages Germany to re-evaluate its extrapolation approach applied to 4G Harvest wood products in years when FAO data are not available/accessible at the time of inventory compilation.	
DE-4-2025-0006		4 Land use, land-use change and forestry, CO_2, N_2O, 1990-2023	For 4B1 Cropland remaining cropland and 4C1 Grassland remaining grassland (mineral soils, CO_2 and associated N_2O, all years) the TERT noted that the country introduced a Tier 3 methodology to estimate agricultural mineral SOC stock changes using the model RothC. With respect to calibration and validation - good practice elements in the application of Model-based Tier 3 methodologies according to 2006 IPCC Guidelines (Vol. 4, Ch. 2.5.2) - the TERT found only the sentence on page 535 of the NID - "Das Modell wurde an Langzeitsexperimenten und Bodendauerbeobachhtungsflächen evaluiert [The model was evaluated against long-term experimental and observation sites] (Dechow et al., 2019, Riggers et al., 2019)." The TERT furthermore, noted that the given references with respect to calculating C inputs to the soil detailed various methods for calculating the C inputs, thus making it unclear which method(s) was applied in the German inventory. The TERT, therefore, requested information from the country on how the model had been calibrated and validated, and how the C inputs were calculated. Germany responded with detailed information on all aspects of the above, detailing *inter alia* the Bolinder et al. (2007) extension of the Franko et al. (2011) approach to estimate carbon inputs from crop residues, the calibration of the model at long term sites in Germany and Sweden (Dechow et al. 2019), and the Riggers et al. (2019) paper detailing the validation of the calibrated model against independent German observation data. The TERT thus noted that this issue does not relate to an over- or under-estimate of emissions and concluded the issue relates only to	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			transparency. The TERT therefore recommends that Germany include explicit information in the NID of its next submission, detailing how the model was calibrated and validated, and how the C inputs were calculated.	
DE-4-2025-0008		4 Land use, land-use change and forestry, CO_2, N_2O, 1990-2023	For 4B1 Cropland remaining cropland and 4C1 Grassland remaining grassland (mineral soils, CO_2 and associated N_2O, all years) the TERT noted that the country introduced a Tier 3 methodology to estimate agricultural mineral SOC stock changes using the model RothC. The TERT noted from the methodological descriptions (NID 2025 chapter 6.1.2.1, pages 531-541) and elsewhere in the NID, that there was neither adequate explanation of what climatic and management effects were driving the derived mineral soil carbon stock change factors (-0.14 t C ha yr for Cropland and -0.02 t C ha yr for Grassland), nor adequate explanation of how these factors, derived from simulations restricted to 2005-2015, are representative of the whole time series. Germany responded with detailed, plausible regional explanations of the trends relating e.g. decreases in livestock management and cover crop growth. Germany furthermore explained and acknowledged drawbacks in limiting the simulations to 10 years and extrapolating to the rest of the time series. The TERT subsequently could not identify a potential over- or under-estimate above the significance threshold. The TERT furthermore acknowledges the planned improvements outlined in the response to extend the spatial resolution- and temporal coverage of the modelling with RothC using inter alia data from IACS. Nonetheless, the TERT recommends, independent of the improvements applied, that Germany 1) transparently explain in the NID of its next submission the underlying driving factors behind the simulated mineral SOC stock changes; and 2) transparently explain the adequacy of any applied extrapolation methodologies relating to mineral SOC stock changes in 4B1 Cropland remaining cropland and 4C1 Grassland remaining grassland.	No
DE-4A-2025-0001		4A Forest land, CH_4, CO_2, N_2O, 1990-2023	For 4A Forest land (all pools, all gases and all years), the TERT noted from the NID (chapters 6.4.2.2 and 6.4.2.3) that stock change factors for e.g. Biomass and Deadwood were derived from the national forest inventory (NFI) while the areas of Forest land, as well as afforestation and deforestation areas are derived from the countries 100 x 100 m GIS sampling system based primarily on the national DLM spatial dataset on land use (NID chapter 6.3.1). The TERT noted that the 2022 total Forest land area of 10,875 kha deviates from the area estimate of the national forest inventory (NFI) of 11,500 kha for 2022 (https://www.bmel.de/DE/themen/wald/wald-in-deutschland/bundeswaldinventur.html). The TERT furthermore noted that since 2012, the country reports a net Forest land increase of 65 kha which is 4 times larger than the respective estimate of the NFI (15 kha increase since 2012). In response to a question raised during the review, Germany explained that these (and other) area discrepancies are partially due to the different sampling resolutions of the two systems (1 ha of the	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			GHG inventory vs 4 x 4 km of the NFI). Furthermore, Germany clarified that the definition of Forest land applied in the GHG inventory deviates from the definition of forest as per the NFI, which in contrast to the Forest land definition includes areas that are counted as forest by the NFI but are recorded in the forest category "non-forest area" (Nichtholzboden). Based on the information provided in the NID and during the review, the TERT could not identify a potential bias in areas of Forest land, afforestation and/or deforestation causing a potential over- or under-estimate of emissions exceeding the threshold of significance for technical correction. Nonetheless, the TERT recommends that Germany transparently explain in the NID of its next submission, why the reported areas for Forest land, afforestation and/or deforestation deviate from those of the national forest inventory. Moreover, the TERT recommends that the country explain in the next NID why these deviations in areas do not lead to over- or under-estimates of Biomass and/or Dead wood carbon stock changes, given carbon stock change factors derived from the NFI are multiplied with areas that deviate from the respective areas of the NFI.	
DE-4D1-2025-0001	No	4D1 Wetlands remaining wetlands, CO_2, 1990-2023	For 4D1a Peat extraction remaining peat extraction (organic soils, CO_2, 1990-2023), the TERT noted that chapter 6.7.2.1 of the NID provides information on the source of the peat production activity data, but does not provide a table/figure of this activity data time series. Given the subcategory is a substantial source of emissions (3298 kt CO_2, of which 1802 kt CO_2 is contributed by the off-site emissions) and is a key category, the TERT noted a lack of transparency and requested the activity data from the country. Germany responded with the provision of the time series of activity data of peat extraction volumes and a thorough explanation thereof. The country furthermore explained that for legal reasons not all data for all years are publicly available. The country also elaborated on the method used to derive the annual time series. Acknowledging the legal barriers to publishing certain data, the TERT nonetheless recommends that Germany enhance transparency in its next submission and include a more detailed description on how the annual activity data are compiled in the NID. Furthermore, to the extent that is legally possible, the TERT recommends that the country document and describe the trend in the activity data on annual extracted peat volumes.	No
DE-4D1-2025-0002	No	4D1 Wetlands remaining wetlands, CO_2, 1990-2023	For 4D1a Peat extraction remaining peat extraction (organic soils, CO_2, 1990-2023), the TERT noted from the NID (equation 96, page 708-709) that the country uses the IPCC Tier 1 CO_2 emission factor for off-site emissions. Noting that 4D Wetlands: CO_2 is a key category (NID, 2025, pages 102 and 702) and extracted peat is a significant pool, the TERT requested Germany to provide information on ongoing or planned improvements to implement a higher tier methodology for this source. Germany responded citing studies from Central, Western and Northern Europe showing that other estimates of carbon stock of peat for horticultural purposes that do not vary significantly – at least with respect to	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2025 (RE/TC/no)
			uncertainties - from the IPCC Tier 1 factor. The TERT notes that this issue does not relate to an over- or under-estimate of emissions. Nonetheless, noting Annex V Part 3 of the Governance Regulation that at least Tier 2 methodologies shall be used for a carbon pool contributing at least 25% of the emissions or removals in a source or sink category that is identified as a key category, the TERT recommends that Germany apply a higher Tier methodology for estimating off-site CO_2 emissions from 4D1a Peat extraction remaining peat extraction.	
DE-4E2-2025-0003	No	4E2 Land converted to settlements, CO_2, N_2O, 1990-2023	For 4E2 Land converted to settlements (biomass and soil, CO_2 und associated N_2O, all years) the TERT noted that the NID referenced two different sealing fractions for the calculations related to biomass (50% sealing fraction) and mineral soil (60% sealing fraction) in the same subchapter, 6.2.5. In response to a question raised during the review, Germany acknowledged the inconsistency in the NID and explained that the two different values stem from a previous calculation on mineral stocks in the two subcategories of Settlements – traffic areas and non-traffic settlement areas. Germany furthermore noted "the explanatory texts in the NID will of course be revised and adapted to the current methodology". The TERT simply reiterates the planned improvement and recommends that Germany apply-, and document in its NID, a consistent sealing fraction to its calculations relating to biomass and mineral soil C stock changes in 4E2 Land converted to settlements. Potential over-/under-estimates of emissions with respect to 4E2 Land converted to settlements are addressed in separate observations (DE-4E2-2025-0001, DE-4E2-2025-0002).	No
DE-4G-2025-0001	Yes	4G Harvested wood products, CO_2, 1990-2023	For 4G Harvest wood products, CO_2, years 1990, 1994, 1995-2000, 2003-2006, 2008, 2010 and 2020 the TERT noted that in CRT Table4.Gs1, the annual net change in the Solid Wood IU pool of HWP produced and consumed domestically deviates - at times considerably - from the balance between the respective gains and losses in the Solid Wood IU pool of HWP produced and consumed domestically. 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, Germany explained that there was an error in the submitted data for gains in domestically produced and consumed wood panels; however, the annual change in stocks and reported emissions/removals were not affected. The TERT nonetheless recommends that Germany correct the issue in the next submission, ensuring accuracy in-, and consistency between the reported harvested wood product pool gains and losses on one hand, and the net changes and emissions/removals on the other.	No

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

1	EMRT ID:	DE-4G-2025-0002
	EMRT URL:	https://emrt-esd.eionet.europa.eu/2025/DE-4G-2025-0002
	Country:	Germany
	Land use category:	4G - Harvested wood products
	Gases:	CO_2
	Pool:	HWPs
	Completed by LULUCF Expert:	Bradley Matthews
	Reviewed by Thematic Counterpart Expert:	
	Reviewed by Lead Reviewer:	Kevin Black
	Reviewed by Quality Controller:	Justin Goodwin
	The underlying problem:	Inflow to the harvested wood product pools in 2023 was estimated by extrapolating the FAO 2022 production values to 2023, despite the harvest statistics available at the time of compilation indicating a very likely and very substantial reduction in production between 2022 and 2023, which indeed was confirmed by the FAO statistics which became available after the inventory submission.
	Summarise the methodology used:	The TERT initially performed a technical correction using methodology transparently outlined in a file (DE-4G-2025-0002_LULUCF Corrected Estimate_Ger_JM_JG.xlsx) and provided this to Germany. The method adopts a "Trend extrapolation" approach for deriving HWP for years where FAO data is not yet available. Germany rejected the PTC and provided a revised estimate using the now available 2023 FAO data.

2

	Original estimate (kt CO_2e)				**Notes**
Year	CO_2	CH_4	N_2O	Total GHG	
2016					
2017					
2018					
2021					
2022					
2023	-4 604.491			-4 604.491	

	Revised Estimate received from country (kt CO_2e)				**Notes**
Year	CO_2	CH_4	N_2O	Total GHG	
2016					
2017					
2018					
2021					
2022					
2023	-1 134.994			-1 134.994	

	Difference between RE and OE (kt CO_2e)			
Year	CO_2	CH_4	N_2O	Total GHG
2016				
2017				
2018				
2021				
2022				
2023	3 469.497			3 469.497

1		
	EMRT ID:	DE-4E2-2025-0002
	EMRT URL:	https://emrt-esd.eionet.europa.eu/2025/DE-4E2-2025-0002
	Country:	Germany
	Land use category:	4 Land (4E2 Land converted to Settlements and conversions from Settlements to other categories: 4A2d, 4B2d, 4C2d, 4D2d, 4F2e)
	Gases:	Multiple GHGs (CO_2, N_2O)
	Pool:	Mineral soil
	Completed by LULUCF Expert:	Bradley Matthews
	Reviewed by Thematic Counterpart Expert:	
	Reviewed by Lead Reviewer:	Kevin Black
	Reviewed by Quality Controller:	Justin Goodwin
	The underlying problem:	Mineral SOC losses due to Land conversion to settlements calculated as a 11% loss of the previous land-use in the year of the conversion; however, the country estimates the SOC stock of Settlements - which inform mineral SOC changes of conversions from Settlements - as 60% of the previous category, based on a sealed:nonsealed ratio of Settlements of 40:60. This is an issue, because 1) it implies the loss of SOC is much higher than that what is reported and 2) the exchange with the country in the EMRT revealed that the correct sealing fraction is 50%
	Summarise the methodology used:	The country justified the 11% loss of SOC upon conversion to Settlements and thus resolved the inconsistency by recalculating the mineral SOC stock changes associated with conversions from Settlements to other categories. This was done be re-calculating the starting mineral SOC stocks in settlements to be consistent with the 11% reduction compared to the pre-settlement SOC stock. The country furthermore, removed a previous area factor in the mineral SOC stock changes for 4E2, meaning a consistent 11% loss was calculated for conversions to Settlements

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	Original estimate (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-248.398		83.689	-164.709	
2017	-256.008		83.995	-172.013	
2018	-267.260		84.223	-183.037	
2021	-334.460		77.659	-256.800	
2022	-291.355		77.908	-213.447	
2023	-252.664		78.126	-174.538	

	Revised Estimate received from country (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	37.949		86.094	124.042	
2017	52.346		86.372	138.717	
2018	63.513		86.592	150.105	
2021	57.255		80.713	137.968	
2022	108.096		80.797	188.893	
2023	155.806		80.939	236.745	

	Difference between RE and OE (kt CO_2e)			
Year	CO_2	CH_4	N_2O	Total GHG
2016	286.347		2.405	288.751
2017	308.354		2.377	310.731
2018	330.774		2.369	333.143
2021	391.715		3.054	394.768
2022	399.451		2.889	402.340
2023	408.470		2.813	411.283

1	EMRT ID:	DE-4E2-2025-0001
	EMRT URL:	https://emrt-esd.eionet.europa.eu/2025/DE-4E2-2025-0001
	Country:	Germany
	Land use category:	4 Land (4E2 Land converted to Settlements, 4E1 Settlements remaining settlements and conversions from Settlements to other categories: 4A2d, 4B2d, 4C2d, 4D2d, 4F2e)
	Gases:	CO_2
	Pool:	Living biomass (Gains)
	Completed by LULUCF Expert:	Bradley Matthews
	Reviewed by Thematic Counterpart Expert:	
	Reviewed by Lead Reviewer:	Kevin Black
	Reviewed by Quality Controller:	Justin Goodwin
	The underlying problem:	The TERT identified a potential under-estimate of emissions exceeding the threshold of significance for 4E2 Land converted to settlements in the years 2016, 2017, 2018, 2021, 2022, and 2023. The potential under-estimate relates to potentially over-estimated biomass gains for 4E2 and is a case for a potential technical correction. Biomass C gains due to Land conversion to settlements calculated with two CSC factors - gra1 for low vegetation and gra2 for woody vegetation - applied respectively to 25 and 25 % of the area undergoing conversion. The TERT reached the conclusion that the gra2 factor for woody urban biomass leads to a substantial over-estimate of the biomass gains. The gra2 factor is in itself a much too high estimate and was not justified in the NID or in the exchange via the EMRT - average biomass gains of gra2 over 20 years would be almost 8 t C ha-1 yr-1, more than twice the annual carbon accumulation rates per ha tree crown cover given in Table 8.1 of Vol. 4 ch. 8 of the 2006 IPCC Guidelines (2.9 and 3.6 t C ha-1 yr-1). Furthermore, the TERT noted that the country implemented 1:1 split of the vegetated Settlement area between gra1:gra2 stock changes does not appear to be substantiated by the BBSR report, which in contrast reports low vegetation (grass): high vegetation (trees) area ratios ranging from ca. 2:1 to 4:1. The country provided revised estimates based on a revised estimates of vegetation coverage (as well as revised split between herbaceous (gra1) and woody (gra2) plant types) in Settlements based on German data, as well as revised estimates of the biomass stocks and stock changes in Settlements that were derived from a review of relevant scientific literature.
	Summarise the methodology used:	Based on the 2022 BBSR report cited during the review, the country revised the vegetation fraction coverage of trees (gra2) and low vegetation (gra1) in Settlements to 8 and 38%, respectively. Furthermore, the country revised its estimates of carbon stock and stock changes in the biomass of gra2 based on a review of relevant literature of urban tree growth in the US (Studies of Nowak et al), utilising only data from temperate climate zones considered representative of German conditions. Based on expert judgement on planting age (3 years) and age when urban trees reach maturity/equilibrium (43), the country conducted the respective, spatially-explicit calculations of biomass carbon stock changes in Settlement vegetation. The revised estimates thus effect CO_2 emissions and removals for 4E2, 4E1 as well as all occuring land conversions of Settlements to other land uses. The calculations are contained in the sheet "Calculations" and described in further detail in word document provided in attachment with the country's response (Germany_2nd_revised estimate_ESD-review_2025_07_24_en_final.docx)

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	Original estimate (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-3906.032			-3906.032	
2017	-3806.916			-3806.916	
2018	-3855.761			-3855.761	
2021	-3450.162			-3450.162	
2022	-3087.910			-3087.910	
2023	-2692.132			-2692.132	

	Revised Estimate received from country (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	1105.953			1105.953	
2017	1128.016			1128.016	
2018	911.950			911.950	
2021	688.830			688.830	
2022	661.500			661.500	
2023	730.956			730.956	

	Difference between RE and OE (kt CO_2e)			
Year	CO_2	CH_4	N_2O	Total GHG
2016	5011.985			5011.984924
2017	4934.932			4934.932026

2018	4767.710			4767.710385	
2021	4138.992			4138.99163	
2022	3749.411			3749.410828	
2023	3423.088			3423.088242	

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

Technical corrections deemed necessary by the TERT[1]

1	EMRT ID:	DE-4A1-2025-0002
	EMRT URL:	https://emrt-esd.eionet.europa.eu/2025/DE-4A1-2025-0002
	Country:	Germany
	Land use category:	4A1 Forest land remaining forest land
	Gases:	CO_2
	Pool:	Mineral soil
	Completed by LULUCF Expert:	Bradley Matthews
	Reviewed by Thematic Counterpart Expert:	
	Reviewed by Lead Reviewer:	Kevin Black
	Reviewed by Quality Controller:	Justin Goodwin
	The underlying problem:	Mineral SOC stock changes in 4A1 are estimated with the Yasso model. To run the model, the country estimates annual C inputs up to 2013 taking into account inter alia mortality and harvest. For 2014 onwards a constant input has been used, based on the average inputs between 2009-2013. Due to the substantial changes in German forests with respect to mortality and harvest since 2013, this extrapolation is very likely causing a bias in the mineral stock changes in recent years
	Summarise the methodology used:	The TERT initially performed a technical correction using methodology transparently outlined in a file (LULUCF Corrected Estimate Template_DE-4A1-2025-0002_TC_JG_JM (1).xlsx) provided to Germany. Given that the underlying Ziche 2019 paper shows that annual estimated C inputs to the model depend strongly on harvests, the TERT has calculated a regression between the annual C inputs from the Ziche paper and the official German harvest statistics, and used this linear model to estimate corrected C inputs. As such, additional C inputs (corrected inputs minus the previously assumed constant inputs) have been derived. The calculation furthermore calculates additional losses given that the increased inputs lead to increased stocks, and losses are a function of the stock size. Consequently, an additional net input t C per ha per year is calculated and added to the reported implied carbon stock change factor and used to calculate corrected mineral SOC stocks changes for 4A1. The TERT acknowledges this is an approximate correction of a non-linear system modelled with Yasso. Nonetheless, the TERT must conclude that the model run with constant inputs since 2014 is very likely causing substantial biases that are higher than the likely errors in the PTC.

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	Original estimate (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-7 478.696			-7 478.696	
2017	-4 115.625			-4 115.625	
2018	-3 409.065			-3 409.065	
2021	-10 064.511			-10 064.511	
2022	-6 389.114			-6 389.114	
2023	-128.628			-128.628	

	Technical Correction calculated by TERT (kt CO_2e)				Notes
Year	CO_2	CH_4	N_2O	Total GHG	
2016	-9 893.805			-9 893.805	
2017	-7 461.941			-7 461.941	
2018	-15 622.071			-15 622.071	
2021	-34 233.622			-34 233.622	
2022	-31 428.646			-31 428.646	
2023	-20 308.301			-20 308.301	

	Difference between TC and OE (kt CO_2e)			
Year	CO_2	CH_4	N_2O	Total GHG
2016	-2 415.109			-2 415.109
2017	-3 346.316			-3 346.316
2018	-12 213.006			-12 213.006
2021	-24 169.112			-24 169.112
2022	-25 039.532			-25 039.532
2023	-20 179.673			-20 179.673

[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/24/002of 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.