Final Review Report 2021

Review of National Air Pollutant Emission Inventory Data 2021 under Directive 2016/2284 (National Emission reduction Commitment Directive) Service Contract No. 070201/2019/8159797/SER/ENV.C.3

Germany

29th October 2021

Reference: Service Contract No. 070201/2019/8159797/SER/ENV.C.3

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Abbreviations

AD	Activity data
BC	Black Carbon
C	Confidential
Cd	Cadmium
CLRTAP	Convention on Long-range Transboundary Air Pollution: the first international treaty to deal with air pollution on a broad regional basis signed by the UNECE in 1979. Currently named the Air Convention
CO	Carbon Monoxide
E-PRTR	European Pollutant Release and Transfer Register
EC	European Commission
EEA	European Environment Agency
EF	Emission factor
EIONET	European Environment Information and Observation Network
EMEP	The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (unofficially 'European Monitoring and Evaluation Programme' = EMEP)
EMRT-NECD	EEA Emission Review Tool (EMRT) for the National Emission reduction Commitments Directive (NECD)
EU	European Union
GHG	Greenhouse gas
HCB	Hexachlorobenzene
Hg	Mercury
HMs	Heavy metals
IEF	Implied emission factor
LPS	Large point sources
kt	Kilotonnes
NA	Not applicable
NECD	National Emission reduction Commitments Directive
NFR	Nomenclature for reporting
NH_3	Ammonia
NMVOC	Non-methane volatile organic compounds
NO_X	Nitrogen oxides
NR	Not relevant
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PCB	Polychlorinated biphenyls
PM_{10}	Fine particulate matter: particles with an aerodynamic diameter equal to or less than 10 micrometres (µm)

$PM_{2.5}$	Fine particulate matter: particles with an aerodynamic diameter equal to or less than 2.5 micrometres (µm)
POPs	Persistent Organic Pollutants
PTC	Potential technical correction
RE	Revised estimate
SO_2	Sulphur dioxide
SO_X	Sulphur oxides
TC	Technical correction
TERT	Technical expert review team
TSP	Total suspended particulates

I. Introduction

1. The review of the air pollution emission data submitted by Member States under the European Union's National Emissions reduction Commitments Directive (Directive (EU) 2016/2284[1]) is defined in Article 10(3):

"The Commission, assisted by the European Environment Agency and in consultation with the Member States concerned, shall review the national emission inventory data in the first year of reporting and regularly thereafter. That review shall involve the following:

(a) checks to verify the transparency, accuracy, consistency, comparability and completeness of information submitted;

(b) checks to identify cases where inventory data is prepared in a manner which is inconsistent with the requirements set out under international law, in particular under the LRTAP Convention;

(c) where appropriate, calculation of the resulting technical corrections necessary, in consultation with the Member State concerned.

Where the Member State concerned and the Commission are unable to reach an agreement on the necessity or on the content of the technical corrections pursuant to point (c), the Commission shall adopt a decision laying down the technical corrections to be applied by the Member State concerned."

2. The technical review of the National Emissions reduction Commitments Directive (NECD) inventories in 2021 (hereafter referred to as the '2021 NECD inventory Review') was undertaken in accordance with the NECD air emission inventory review guidelines established at the beginning of the project.

II. Objectives of the review

3. The general objective of the technical review of Member States' NECD inventories as reported in February 2021 (and updated before 1 May 2021) and for LPS and gridded data reported in May 2021 (and updated before 15 May 2021) is to provide elements for an improvement of transparency, consistency, comparability, completeness and accuracy of submitted data. As such the review will contribute to establishing accurate, reliable and verified emission inventories for all Member States.

4. The specific objectives of the 2021 NECD inventory review were:

- A detailed review to verify that Member States have integrated all of the recommendations, unquantified potential technical corrections, technical corrections and revised estimates from the 2020 NECD inventory review[2].
- A review of the recalculations between the 2020 and 2021 national inventory submissions for the pollutants NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ for the years 2000-2018 and for the pollutants PAHs (total and individual PAHs), dioxins/furans, PCBs, HCB, Cd, Hg, Pb for the years 1990, 2005, 2016-2018.

[1] DIRECTIVE (EU) 2016/2284 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC

[2] NECD inventory review 2020 reports are available at http://ec.europa.eu/environment/air/reduction/implementation.htm

- A review of the time series consistency between the years 2018 and 2019 for the pollutants: NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$, PAHs (total and individual PAHs), dioxins/furans, PCBs, HCB, Cd, Hg, Pb.
- A review of national gridded data of emissions and large point sources (LPS) for the year 2019 submitted until 15 May 2021.
- An in-depth review of national emission inventories of CO, PM_{10} and BC for the years 2000, 2005 and 2019, including technical corrections and recommendations.
- In accordance with the requirements of the NECD (Article 5 and Annex IV) and in line with the "Technical guidance for Parties making adjustment applications and for the expert review of adjustment applications (ECE/EB.Air/130)"[3], an expert review of:
    i. New adjustment applications submitted in 2021 for the first time. This includes the review of the supporting documentation as requested in part 4 of Annex IV of the NECD and an assessment of whether the adjustment application is consistent with the circumstances described therein.
    ii. The adjustment applications submitted in 2021, that were already submitted, reviewed, and accepted in 2020 or before under the NECD, with a focus on reviewing the consistency in the reporting of these adjustment applications over time.

III. Review approach, team and scope

5. The scope of the 2021 NECD inventory review is summarised in Table 1.

Table 1: Scope of the 2021 NECD inventory review (under Directive (EU) 2016/2284)

Element	Scope	Further information
Geographical coverage	EU geographical coverage of the Member States as of 1 February 2020[4]	Includes the geographical territory of the Member States, their exclusive economic zones and pollution control zones. Excludes the Canary Islands, the French overseas departments, Madeira, and the Azores
Years	**Main pollutants:** 2005, 2010, 2015-19 **CO, PM_{10} and Black Carbon** 2000, 2005 and 2019 **HMs and POPs:** 1990, 2005, 2016-19 **Gridded data:** 2019 **LPS data:** 2019	**Main pollutants, HMs and POPs:** In addition, time series consistency was reviewed between the years 2018 and 2019.

[3] Available at https://www.ceip.at/fileadmin/inhalte/ceip/4_adjustments/ece_eb_air_130_av_for_the_web.pdf

[4] The geographical coverage does not include the United Kingdom which withdrew from the EU on 31 January 2020.

Pollutants	**Main pollutants:** NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$, **CO, PM_{10} and Black Carbon** **HMs and POPs:** PAHs (total and individual PAHs), dioxins/furans, PCBs, HCB, Cd, Hg, Pb **Gridded data:** NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$, PM_{10}, BC, CO, Pb, Cd, Hg, dioxins/furans, total PAHs, HCB, PCBs **LPS data:** NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$, PM_{10}, CO, Pb, Cd, Hg, dioxins/furans, total PAHs, HCB, PCBs	According to NECD (Directive (EU) 2016/2284) Annex I
Categories	**Main pollutants, CO, PM_{10}, BC, HMs and POPs:** All NFR and GNFR categories, including selected memo items **Gridded data, LPS data:** All GNFR categories, excluding O_AviCruise, P_IntShipping, z_Memo	**Main pollutants, CO, PM_{10}, BC, HMs and POPs:** All NFR categories as listed in Annex 1 of reporting Guidelines including the following memo items: 1A3ai(ii) International aviation cruise (civil) 1A3aii(ii) Domestic aviation cruise (civil) 1A3di(i) International maritime navigation In addition the following items will be reviewed (1A3bi(fu), 1A3bii(fu), 1A3biii(fu), 1A3biv(fu), 1A3bv(fu), 1A3bvi(fu), 1A3bvii(fu)) – where a Member State uses fuel used for compliance purposes. **Gridded data:** Reported data based on fuel used will be considered in selected cases.
National totals	National total and National total for compliance	Rows 141 and 154 in Annex 1 of reporting Guidelines

6. The review was split into two phases:

   a) **Initial checks** were carried out by the project team under service Contract No. 070201/2019/8159797/SER/ENV.C.3. Significant findings from the initial checks that were not resolved within the initial checks phase were followed up by the technical expert review team during the desk review and centralised review.

   b) **A desk review and centralised review** were performed by the technical expert review team under Contract No. 070201/2019/8159797/SER/ENV.C.3. The technical expert review team consisted of the following experts:

- **Lead Reviewers:** Kevin Hausmann, Ole-Kenneth Nielsen, Kristina Saarinen
- **Energy:** Marlene Schmidt Plejdrup , Stephan Poupa, Robert Stewart
- **Transport:** Jean-Marc André, Matina Kastori, Katrina Young
- **IPPU:** Coralie Jeannot, Ils Moorkens, Michaela Titz
- **Agriculture:** Traute Köther, Bernard Hyde, Etienne Mathias

- **Waste:** Céline Gueguen, Sabino del Vento, Dirk Wever
- **Gridding:** Katie King, Jeroen Kuenen, Ioannis Tsagatakis
- **LPS:** Stijn Dellaert, Ben Pearson, Richard German

This year the desk review had two phases: an initial four weeks for sector experts to review inventories with one week for Member States to reply to questions; then a further two weeks for sector experts and lead reviewers to send follow-up questions with one week for Member States to reply. After this the one week the centralised review took place remotely. The review of LPS data and gridded data was one phased due to the later reporting deadline for these datasets but Member States had at least one week to reply to questions concerning LPS and gridded data before the start of the centralised review.

7. The desk review and centralised review were coordinated by the project team (led by Sabine Schindlbacher and Chris Dore).

8. The EEA Review Secretariat led by Federico Antognazza supported the 2021 NECD inventory review.

9. The review was performed on the basis of NECD emission data officially reported by Germany by 15 February 2021 for emission inventories and by 1 May 2021 for gridded emission inventory data and LPS data. The Informative Inventory Reports (IIR) reported by 15 March 2021 under the NECD were taken as a base for the review. For the review of emission inventories, resubmissions and other additional information officially submitted by Member States until 1 May 2021 were taken into account. For the review of gridded emission inventory data and LPS data, resubmissions were taken into account until 15 May 2021.

10. To avoid any potential conflicts of interest, the lead reviewers and sector experts did not review emission inventories of Member States 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. Reviewers who are nationals of the Member State whose inventory is concerned did not act as main sector expert for this Member State.

11. All sector experts signed confidentiality agreements in which they agreed to keep information received by Member States confidential.

12. Definitions for findings included in the Final Review Report can be found in Table 2.

13. This report includes the findings from:
    - the in-depth review of CO, PM10 and Black Carbon
    - the follow up review of NOX, NMVOC, SO2, NH3 and PM2.5
    - the follow up review of Heavy metals and POPs, and
    - the reviews of LPS and Gridded data.

There are separate sections in this report for the findings that relate to each of these groups. However, there can be occasions where a finding is relevant to more than one group. When this arises, the finding is located in the group that is considered to be the most appropriate. It is not duplicated in other sections. Consequently it may be that the list of findings in e.g. the section on heavy metals and POPs, does not include all findings relating to heavy metals and POPs.

Table 2: Definitions for finding classifications of the 2021 NECD inventory review.

Concluded Findings	
Recommendation	Findings where an identified issue has not been resolved during the course of the review but which is not above the threshold of significance.
RE	Revised Estimate: Findings for which a Member State has provided new estimates in response to an issue raised by the technical expert review team (TERT) during the course of the review.
UPTC	Unquantified Potential Technical Correction: Findings for which quantifying a technical correction is not currently possible for the technical expert review team. This is for cases where the expected impact is likely to exceed the determined thresholds of significance, but it is not possible to quantify the technical correction as part of the review. The situations where this may arise include but are not limited to situations where Tier 1 methods are used to make emission estimates for a key category
TC	Technical correction: Issued by the technical expert review team for findings identified which result in an over or under estimate of more than a 2% of the national total in one of the reported years under review and where Member States did not provide a revised estimate which was accepted by the technical expert review team (TERT).
Priority recommendation	Priority recommendations are assigned to issues in the LPS and gridded data submissions only, where it is not possible for the technical expert review team to calculate a Technical Correction. These recommendations are required either for correction of errors or for cases where best practice is not followed which may have a significant impact on reported data.

IV. Overall assessment of the quality of the submissions

14. The technical expert review team considers the inventory submission to be of good quality in terms of completeness and accuracy. The IIR describes the methods transparently.

15. The LSP data submission was adequate in terms of completeness and the background information was documented transparently. The accuracy of the LPS inventory was very good, however, there is need to improve the comparability of methods.

16. The completeness of the gridded data submission was very good as was the documentation of the background information while the accuracy and comparability of the data were good.

17. To improve the quality of these submissions, the technical expert review team suggests that Germany:

- ensure the completeness of the inventory, e.g. recommendations DE-1A2a-2021-0002, DE-1A2a-2021-0001, DE-1A5a-2021-0001, DE-2A3-2021-0001, DE-2B6-2017-0001, DE-2C3-2021-0001 and DE-2D3g-2018-0001;
- further improve the accuracy of the inventory, e.g. recommendations DE-1A2f-2021-0003, DE-1B1b-2021-0001, DE-2A1-2021-0001 and DE-2C1-2021-0001;
- improve the completeness of the LPS submission, e.g. recommendations DE-LPS-GEN-2020-0002, DE-LPS-GEN-2020-0001.

18. The technical expert review team considers that it received responses from Germany were sufficient in order to undertake the NECD inventory review 2021.

V. Findings and Conclusions from the technical expert review team for the in-depth review of CO, PM_{10} and Black Carbon

19. The TERT carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the CO, PM_{10}, BC inventories. The focus was on the years 2000, 2005 and 2019.

20. This assessment was based on the emission inventory submitted under the NECD in 2021 by Germany pursuant to Directive (EU) 2016/2284.

21. Resubmissions and other additional information provided by Member States during the review were taken into account until 1 May 2021.

22. Table 3 gives an overview of the number of recommendations, revised estimates, technical corrections and unquantified potential technical corrections for CO, PM10 and BC that are included in Table 4. The table also shows the range of recommendations, revised estimates, technical corrections and unquantified potential corrections that were included in the NECD inventory review reports for other Member States.

23. Table 4 provides all the recommendations, revised estimates, technical corrections and unquantified potential corrections from the technical expert review ream related to CO, PM_{10} and BC. The implementation of the recommendations will be followed up in the NECD inventory review 2022.

Table 3: Overview of the number of findings from the 2021 NECD inventory review CO, PM_{10} and BC

	Findings included in the 2021 Review Report (see Table 4 below)			
	TC*	RE*	UPTC*	Recom.*
Total from NECD inventory review 2021	0	1	0	9
(Range for All Member States)	(0-1)	(0-4)	(0-1)	(0-29)

*TC=Technical Correction, RE= Revised Estimate, UPTC= Unquantified Potential Technical Correction, Recom. = Recommendation

Table 4: All findings for CO, PM_{10} and Black Carbon from the 2021 NECD inventory review 2021

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A2f-2021-0003	Yes	1A2f Stationary Combustion in Manufacturing Industries and Construction: Non-Metallic Minerals, CO, 1990-2019	RE	RE
Recommendation For category 1A2f Stationary combustion in manufacturing industries and construction: Non-metallic minerals, all fuels and CO for all years, the TERT noted that the reported CO emissions are very high and based on very old national emission factors for lime production. In response to a question raised during the review, Germany explained that the values in 1990 come from an old plant park with furnace types and corresponding fuel use, which was substantially converted before 1995 and that Germany would consider whether applying the Tier2 GB default values is appropriate. Furthermore, Germany provided a revised estimate for years 2005, 2010 and 2015 to 2019 and stated that the method to estimate the whole time series and to allocate this under NFR 1A2f only for relevant lime burning has to be further developed for the next submission. The TERT agreed with the revised estimate provided by Germany. **The TERT recommends that Germany include the revised estimate or an improved estimate based on further analysis in its 2022 NFR submission and that the recalculations are explained in the IIR.**					
Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A1a-2021-0001	No	1A1a Public Electricity and Heat Production, HCB, BC, 1990-2019	No	No
Recommendation For categories 1A1a, 1A2gviii, 1A4 and 1B1, pollutants HCB and BC for all years the TERT noted that there is a lack of transparency regarding the use of EFs from the EMEP/EEA Guidebook, as Germany says in the IIR, that EFs from the 2016 EMEP/EEA Guidebook are used. In response to a question raised during the review Germany confirms that the description in the IIR is correct, and that the EMEP/EEA Guidebook version 2016 is used since these values are considered to be appropriate for the German inventory. Germany informs that it will be checked how default values according to the 2019 EMEP/EEA Guidebook can be used in subsequent submissions. The TERT noted that the issue is below the threshold of significance for a technical correction. **The TERT recommends that Germany update the emission factors which refer to the 2016 EMEP/EEA Guidebook either to the 2019 EMEP/EEA Guidebook or to country specific values based on the measurement project mentioned by Germany and provide the related documentation in the next submission in 2022.**					
Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A1b-2021-0001	No	1A1b Petroleum Refining, BC, 1990-2019	No	No

Recommendation

For category 1A1b Petroleum Refining, pollutant BC and years 1990-2014 the TERT notes that BC emissions decrease from a level of 0.18 kt (2000-2014) to a level around 0.06 kt (2015-2019) and that the BC IEF, when based on all activity, changes from a level around 0.6 g/GJ (2000-2014) to 0.2 (2015-2019). In response to a question raised during the review Germany explained that one reason for the decrease is a remarkable change in fuel mix from oil products to natural gas in this period. In addition, Germany informs that there seems to be an over-estimation for the years before 2015 due to an erroneous emission factor, which needs to be checked further until the next submission. The TERT noted that the issue is below the threshold of significance for a technical correction.

The TERT recommends that Germany checks the emission factor and in case of a revision, includes the corrected values with the related documentation and a description of the above mentioned fuel changes in the 2022 IIR.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A2a-2021-0002	Yes	1A2a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel, BC, 1990-1999	No	No

Recommendation

For category 1A2a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel, pollutant BC, years1990-1999 the TERT noted the notation key 'NR' is reported whilst a Tier 1 method is available in the 2019 EMEP/EEA Guidebook. The TERT notes that BC emissions for 1A2a is not available at the moment, but that Germany has made an inventory of BC emission for most NFR categories. Germany explains that Tier 2 method are used for reporting of emissions of particulate matters except BC and that Germany finds that the Tier 1 emission factors for BC in category 1A2a of the 2019 EMEP/EEA Guidebook do not fit with the national emission factors of $PM_{2.5}$. Using Tier 1 BC emission factors would result in too high BC emissions. Germany emphasizes that the methodology of emission estimation of combustion activities in large manufacturing plants in 1A2 in the emission Guidebook is based on smaller combustion plants as for example household cooking ovens (combustion of coal and pine wood) for the BC share. The portability to combustion processes in iron and steel production is not easily comprehensible. The data base of the BC emission factors in the EMEP/EEA Guidebook could not be examined as there is no useable reference in the EMEP/EEA Guidebook. Due to that, the mandatory prove whether an emission factor of the EMEP/EEA Guidebook could be used for national emission calculation could not be done. The note of table 3.2 says that the basis of the $PM_{2.5}$ emission factor for solid fuels could not be determined in the reference. On these grounds the Tier 1 method of the 2019 EMEP/EEA Guidebook seems to be not suitable for national BC emission calculation. Germany will prove how to integrate BC emission reporting in the existing national reporting scheme of particulate matters if the derivation of the proposed BC and the associated $PM_{2.5}$ emission factors are traceable. The TERT commends Germany's effort to investigate if the available methodology are useful for Germany.

The TERT recommends that Germany continue the work and includes BC estimates for 1A2a in the 2022 submissions.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A2a-2021-0001	Yes	1A2a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel, BC, 2000-2019	No	No

Recommendation

For category 1A2a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel, pollutant BC, years 1990-1999 the TERT noted the notation key 'NE' is reported whilst a Tier 1 method is available in the 2019 EMEP/EEA Guidebook. The TERT notes that BC emissions for 1A2a is not available at the moment, but that Germany has made an inventory of BC emission for most NFR categories. Germany explains that Tier 2 method are used for reporting of emissions of particulate matters except BC and that Germany finds that the Tier 1 emission factors for BC in category 1A2a of the 2019 EMEP/EEA Guidebook do not fit with the national emission factors of $PM_{2.5}$. Using Tier 1 BC emission factors would result in too high BC emissions. Germany emphasizes that the methodology of emission estimation of combustion activities in large manufacturing plants in 1A2 in the emission Guidebook is based on smaller combustion plants as for example household cooking ovens (combustion of coal and pine wood) for the BC share. The portability to combustion processes in iron and steel production is not easily comprehensible. The data base of the BC emission factors in the EMEP/EEA Guidebook could not be examined as there is no useable reference in the EMEP/EEA Guidebook. Due to that, the mandatory prove whether an emission factor of the EMEP/EEA Guidebook could be used for national emission calculation could not be done. The note of table 3.2 says that the basis of the $PM_{2.5}$ emission factor for solid fuels could not be determined in the reference. On these grounds the Tier 1 method of the 2019 EMEP/EEA Guidebook seems to be not suitable for national BC emission calculation. Germany will prove how to integrate BC emission reporting in the existing national reporting scheme of particulate matters if the derivation of the proposed BC and the associated $PM_{2.5}$ emission factors are traceable. The TERT commends Germany's effort to investigate if the available methodology is useful for Germany.

The TERT recommends that Germany continue the work and includes BC estimates for 1A2a in the 2022 submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A2b-2021-0001	Yes	1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals, BC, 2000-2019	No	No

Recommendation

For category 1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals, pollutant BC, years 2000-2019 the TERT noted that there is a lack of transparency regarding use of the notation key 'NE' (not estimated) is used whilst a Tier 1 method is available in the 2019 EMEP/EEA Guidebook. This does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Germany explained that all particulate matter emissions from 1A2b are reported as process emissions under 2C, as described in the IIR chapter 1A2b - Emission factors, and that the notation keys for BC in 1A2b in the NFR-tables must be changed to 'IE' in order to harmonize the notation keys of all particulate matter. All categories under 2C in the NFR-tables contain the correct notation keys for BC. Germany informs that the calculation and documentation of BC emissions in the relevant categories under 2C will be examined for the next submission 2022.

The TERT recommends that Germany change the notation key to 'IE' as stated in their response and that Germany reviews the calculation and documentation of BC emissions in the relevant categories under 2C for the next submission in 2022.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A2e-2021-0001	Yes	1A2e Stationary Combustion in Manufacturing Industries and Construction: Food Processing, Beverages and Tobacco, BC, 2000-2019	No	No

Recommendation
For category 1A2e Stationary Combustion in Manufacturing Industries and Construction: Food Processing, Beverages and Tobacco, pollutant BC, years 2000-2019 the TERT noted that there is a lack of transparency regarding use of the notation key 'NE'. This does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Germany explained that combustion emissions for sector 1A2e, which are reported under 1A2gviii, includes BC emissions. Hence the notation key 'IE' should be reported for BC in 1A2e.
The TERT recommends that Germany change the notation key for 1A2e and include a description of the allocation of the emissions in the IIR in the 2022 submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A4bii-2021-0001	Yes	1A4bii Residential: Household and Gardening (Mobile), CO, 2019	No	Yes

Recommendation
For category 1A4bii Residential: Household and gardening, for CO, for 2019, the TERT noted that a Tier 1 method is used for a key category. In response to a question raised during the review, Germany explained that this issue is based on incorrect information provided in the IIR. Germany has already revised the information in the IIR, stating that Tier 1 refers only to SO_2 emissions and not to CO.
The TERT recommends that MS provide a clear explanation of the issue in the next submission of IIR.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A5a-2021-0001	Yes	1A5a Other, Stationary (Including Military), BC, 2000-2009	No	No

Recommendation
For 1A5a Other stationary (including military), all fuels, BC for years 2000-2007 and 2009, the TERT noted that the notation key 'NE' (not estimated) is used whilst a Tier 1 method is available in the 2019 EMEP/EEA Guidebook. In response to a question raised during the review Germany responded that the focus is on the main sources and that for military fuel use, wood combustion is the most important $PM_{2.5}$ emission source and correspondingly the most important BC emission source. However, wood combustion only started in 2010 (with a test in 2008). Prior to 2010 only natural gas and light fuel oil were used with low PM emission and hence even lower BC emissions. The TERT noted that the issue is below the threshold of significance for a technical correction. The TERT notes that default BC fractions are available for both gaseous and liquid fuels in the 2019 EMEP/EEA Guidebook.
The TERT recommends that Germany estimates emissions and includes them with relevant documentation in the next submission in 2022.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-2A3-2021-0001	Yes	2A3 Glass Production, BC, 2000-2019	No	No

Recommendation

The TERT noted that the notation key 'NA' (not applicable) is used for category 2A3 Glass Production for the years 1990-2019 and BC whilst a Tier 1 method is available in the 2019 EMEP/EEA Guidebook. In response to a question raised during the review Germany explained that the BC EF is very low and that BC emissions seem not relevant. The TERT also noted that 'IE' was used for combustion-related emissions but that this notation key was not explained in the IIR. Germany agreed with the TERT that the notation key 'NE' is more appropriate for the combustion-related emissions. The TERT noted that the issue is below the threshold of significance for a technical correction.

The TERT recommends that Germany estimate and report the missing emissions, or, change the notation key from 'NA' to 'NE' for BC and provide justification for this notation key in the IIR for the next submission.

VI. Findings and Conclusions from the technical expert review team for the follow-up review of national emission inventories for NO_X, NMVOC, SO_2, NH_3 and $PM_{2.5}$

24. The technical expert review team assessed the implementation of all findings from the 2020 NECD inventory review.

25. This assessment was based on the emission inventory submitted in 2021 by Germany pursuant to Directive (EU) 2016/2284 and on the German review report from the 2020 NECD inventory review.

26. Resubmissions and other additional information provided by Member States during the review were taken into account until 1 May 2021.

27. Table 5 gives an overview of the number of recommendations, revised estimates, technical corrections and potential technical corrections for NO_X, NMVOC, SO_2, NH_3 and $PM_{2.5}$ that are included in Table 6. It also indicates in which NECD inventory review these findings were raised for the first time. Further, it shows how many findings have been implemented by Germany in their inventory submission 2021. The table also shows the range of recommendations, revised estimates, technical corrections and potential technical corrections that were included in the 2021 NECD inventory review reports for other Member States.

28. Table 6 provides all the recommendations, revised estimates, technical corrections and unquantified potential technical corrections from the technical expert review team related to NO_X, NMVOC, SO_2, NH_3 and $PM_{2.5}$ including those additionally made during the 2021 NECD inventory review and those not implemented from the 2020 NECD inventory review. The implementation of the recommendations will be followed-up in the 2022 NECD inventory review.

Table 5: Overview of the number of findings from the 2021 NECD inventory review by year of first issue and assessment of implementation of findings related to NO_X, NMVOC, SO_2, NH_3 and $PM_{2.5}$[5]

		Findings included in the 2021 Review Report by year of origin (see Table 6 below)				Implemented findings
		TC*	RE*	UPTC*	Recom.*	
Finding first raised in:	NECD inventory review 2017	0	0	0	1	0
	NECD inventory review 2018	0	0	0	0	0
	NECD inventory review 2019	0	0	0	0	1
	NECD inventory review 2020	0	0	0	0	1
	NECD inventory review 2021	0	0	0	2	n/a
Total from NECD inventory review 2021		**0**	**0**	**0**	**3**	
(Range for All Member States)		(0-3)	(0-3)	(0-2)	(0-34)	

* TC = Technical Correction, RE = Revised Estimate, UPTC = Unquantified Potential Technical Correction, Recom. = Recommendation

[5] Numbers given in cells shaded orange indicate the number of findings found to not be implemented in the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued. Summing these findings by type with new findings given for the first time within the 2021 NECD inventory review (cells shaded white), gives the total number of findings issued as part of the 2021 NECD inventory review (given in the final row). Bracketed numbers in the final row present the relevant range of the number of findings by type for all Member States. Numbers given in cells shaded green indicate the number of findings that were found to be implemented within the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued.

Table 6: All recommendations including those additionally made during the 2021 NECD inventory review and those not implemented from previous reviews, for NO_X, NMVOC, SO_2, NH_3 and $PM_{2.5}$

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1A3ei-2021-0001	No	1A3ei Pipeline Transport, $PM_{2.5}$, 1995-2019	No	No	No
Recommendation For category 1A3ei Pipeline Transport, for $PM_{2.5}$, for the years 1995-2019, the TERT noted that the $PM_{2.5}$ estimate is equal to the estimate of PM_{10}. In response to a question raised during the review, Germany explained that only natural gas is used in compressor stations and no gas oil and that as a result, TSP=PM_{10}=$PM_{2.5}$. In the absence of a specific Guidebook chapter on 1.A.3.ei, information on gas turbines in Chapter 1A1a is used and specifically the EMEP/EEA Guidebook suggests that TSP, PM_{10} and $PM_{2.5}$ are the same. **The TERT recommends that Germany include explicit information concerning this issue in the next IIR submission, making clear the reason why $PM_{2.5}$ estimates are equal to PM_{10}.**						
Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2017 (5)	DE-2B6-2017-0001	No	2B6 Titanium Dioxide Production, NO_X, CO, TSP, 1990-2018	No	No	No
Assessment of the implementation of the initial recommendation For category 2B6, for pollutants NO_X, SO_X, TSP, for the whole time series, the TERT noted the recommendation raised during the 2017, 2018, 2019 and 2020 NECD inventory review was not implemented. The 2021 review noted that according to the IIR the issue has been included in the list of improvements and the recommendation will be addressed in the next submissions. **The TERT reiterates the recommendation that Germany provides estimates or provide information on the progress of this improvement with steps and schedule in the IIR of the next submission.**						
Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-5-2021-0001	Yes	5 Waste, 1990-2019	No	No	No
Recommendation For all waste categories (NFR 5) the TERT noted that there is a lack of transparency regarding the version of the EMEP/EEA Guidebook used in the calculation. Indeed, in the DE IIR 2021, the 2016 EMEP/EEA Guidebook is referred to, whereas there is a 2019 version of the EMEP/EEA Guidebook. This does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Germany explained that 'in the next submission the version of the EMEP/EEA Guidebook will be changed to the correct version (2019)'. **The TERT recommends that Germany applies the 2019 EMEP/EEA GB, paying attention to that, even if the majority of the EFs are the same in both versions, some have been updated (e.g. NH_3 from 5B2 and PAHs from 5C2).**						

VII. Findings and Conclusions from the technical expert review team for the follow-up review of national emission inventories of POPs and heavy metals

29. The technical expert review team assessed the implementation of findings from the 2020 NECD inventory review. This assessment was based on the emission inventory submitted under the NECD in 2021 by Germany pursuant to Directive (EU) 2016/2284 and on their review report from the 2020 NECD inventory review.

30. Resubmissions and other additional information provided by Member States during the review were taken into account until 1 May 2021.

31. Table 7 gives an overview of the number of recommendations, revised estimates, technical corrections and unquantified potential technical corrections for heavy metals and POPs that are included in Table 8. It also indicates in which NECD inventory review these findings were raised for the first time. Further, it shows how many findings have been implemented by Germany with their inventory submission 2021. The table also shows the range of recommendations, revised estimates, technical corrections and unquantified potential technical corrections that were included in the 2021 NECD inventory review reports for other Member States.

32. Table 8 provides all the findings from the technical expert review team related to POPs and HMs including those additionally made during the 2021 NECD inventory review and those not implemented from the 2020 NECD inventory review. The implementation of the recommendations will be followed-up in the 2022 NECD inventory review.

Table 7: Overview of the number of findings from the 2021 NECD inventory review by year of first issue and assessment of implementation of findings related to POPs and HMs[6]

		Findings included in the 2021 Review Report by year of origin (see Table 8 below)				Implemented findings
		TC*	RE*	UPTC*	Recom.*	
Finding first raised in:	NECD inventory review 2017	0	0	0	0	0
	NECD inventory review 2018	0	0	0	**3**	1
	NECD inventory review 2019	0	0	0	0	1
	NECD inventory review 2020	0	0	0	0	1
	NECD inventory review 2021	0	3	0	1	n/a
Total from NECD inventory review 2021		**0**	**3**	**0**	**4**	
(Range for All Member States)		(0-2)	(0-3)	(0-4)	(0-15)	

* TC = Technical Correction, RE = Revised Estimate, UPTC = Unquantified Potential Technical Correction, Recom. = Recommendation

[6] Numbers given in cells shaded orange indicate the number of findings found to not be implemented in the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued. Summing these findings by type with new findings given for the first time within the 2021 NECD inventory review (cells shaded white), gives the total number of findings issued as part of the 2021 NECD inventory review (given in the final row). Bracketed numbers in the final row present the relevant range of the number of findings by type for all Member States. Numbers given in cells shaded green indicate the number of findings that were found to be implemented within the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued.

Table 8: All findings including those additionally made during the 2021 NECD inventory review and those not implemented from previous reviews, for heavy metals and POPs

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-1B1b-2021-0001	Yes	1B1b Fugitive Emission From Solid Fuels: Solid Fuel Transformation, PAHs, 1990-1993	No	RE	No
Recommendation For 1B1 Fugitive Emission from Solid Fuels: Solid Fuel Transformation and CO for 1990-1993, the TERT noted that the reported total PAHs does not equal the sum of the reported estimates from benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)Fluoranthene and indeno(1,2,3-cd)pyrene. In response to a question raised during the review, Germany explained that only total PAH emissions (PAH-16) were available for lignite based coke production. The TERT noted that the current reporting is therefore substantially overestimating the total PAH emission. Germany provided a revised estimate for 1990-1994 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Germany. **The TERT recommends that Germany include the revised estimate in its 2022 NFR submission and describe the recalculation in the IIR.**						
Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-2A1-2021-0001	Yes	2A1 Cement Production, PAHs, 1992-2019	No	RE	No
Recommendation For category 2A1 Cement Production, for PAHs, for years 1990-2019 the TERT noted that the reported total PAHs do not equal to the sum of individually reported PAHs. In response to a question raised during the review, Germany explained that different sources were used for estimating BaP and PAH emissions ("research projects and expert judgements"). Germany provided a revised estimate for years 1990, 2005, 2016-19 and stated that the methodology is under development, and that new research results are expected for the next submission. The TERT agreed with the revised estimate provided by Germany. **The TERT recommends that Germany include the revised estimate in its 2022 NFR and provides the details of the methodology used for BaP and for 1-4 total PAHs estimates in the 2022 IIR.**						
Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-2C1-2021-0001	Yes	2C1 Iron and Steel Production, PAHs, 1990-2005	No	RE	No
Recommendation For category 2C1 Iron and Steel Production, for PaHs, for years 1990-2019 the TERT noted that the reported total PAHs not equal to the sum of individually reported PAHs. In response to a question raised during the review, Germany explained that different sources were used for estimating BaP and PAH emissions. Germany provided a revised estimate for years 1990, 2005, 2016-19. The TERT agreed with the revised estimate provided by Germany. **The TERT recommends that Germany include the revised estimate in its 2022 NFR and IIR submission.**						

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2018 (4)	DE-1A4cii-2018-0001	No	1A4cii Agriculture/Forestry/Fishing: Off-Road Vehicles and Other Machinery, Cd, 2007-2018	No	No	No

Assessment of the implementation of the initial recommendation

For category 1A4cii agriculture & forestry machinery, for Cd, the TERT noted an erratic trend in the emissions and IEF of Cd since 2007. This was raised during 2018, 2019 and 2020 NECD inventory reviews. In response to a question raised during the review, Germany explained that the activity data estimated from the annual inland fuel deliveries cannot be revised without a previous revision of the underlying statistics and that this revision cannot be executed or demanded by the inventory compiler.

The TERT recommends that MS keep on working on the issue, correcting the erratic trends in emissions and IEF, and explicitly clarify in the next IIR submission the recalculations and the actions that took place and for any remaining issues inform of the progress in the issue with clear steps and schedule.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2018 (4)	DE-1A4ciii-2018-0001	No	1A4ciii Agriculture/Forestry/Fishing: National Fishing, SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, PAHs, PCBs, Cd, Hg, Pb, PCDD/F, 2016	No	No	No

Assessment of the implementation of the initial recommendation

For 1A4ciii category, for all fuels, for year 2015, 2016 the TERT noted that there is a lack of transparency regarding the large increase in AD. This was raised during the 2018, 2019 and 2020 NECD inventory review. In response to a question raised during the review, Germany explained that the model revision planned for 2020 was postponed due to the pandemic but also due to technical restrictions and staffing issues and that the recalculation is planned for the next annual submission.

The TERT recommends that Germany recalculates the time series and provides the relevant documentation in 2022 submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2021 (1)	DE-2C3-2021-0001	Yes	2C3 Aluminium Production, PAHs, 1990-2001	No	No	No

Recommendation

For category 2C3, for PAH and BaP, for the whole time series, the TERT noted that there is a lack of transparency regarding the description of the methodology applied in the IIR and the consistency between the IIR and the NFR tables. This does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Germany explained that the IIR has been corrected accordingly to the questions of the TERT, and that the methodology, EFs applied and references for the decrease of the EFs through time have been added to the IIR which will then be revised in the 2022 submission. The TERT commends that.

The TERT recommends that Germany improves the transparency of the IIR for PAH and BaP emissions estimates in the next submission in a consistent way regarding the answers provided during the review. Moreover, in line with the IIR, chapter 1.8, the TERT recommends that Germany assesses the use of default EFs for the 3 other PaHs (B[b]F, B[k]F, I[1,2,3-c,d]P, currently reported 'NE'), and includes the missing estimates to the next submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or UPTC in 2020	RE, TC, or UPTC in 2021	Tier 1 used for Key Category
2018 (4)	DE-2D3g-2018-0001	Yes	2D3g Chemical Products, PAHs, 1990-2018	No	No	No

Assessment of the implementation of the initial recommendation

For category 2D3g, for PAHs and for the whole time series, the TERT noted that there is a lack of transparency regarding the notation key 'NA' which is still reported while a 2019 Guidebook Tier 2 methodology is available (for asphalt blowing). This was raised during the 2018, 2019 and 2020 NECD inventory reviews. The 2021 review also noted that the IIR states that the issue has been included in the list of improvements and that the recommendation will be addressed in the 2022 submission. The TERT notes that the issue likely is below the threshold of significance for a technical correction. In response to a question raised during the review, Germany answered that they still aim to report PAH emissions in the next submission 2022, or change the notation key with regards to the results of the project which will be conducted.

The TERT recommends that, according to the results of the project mentioned in the improvement plan, Germany reports PAH emissions, or changes the notation key from 'NA' to 'NE' in the NFR tables, and provide justification on the notation key used (NA or 'NE') in the IIR for the next submission 2022.

VIII. Findings and Conclusions from the technical expert review team for the LPS data

33. The technical expert review team performed a review of the LPS data submitted by 1 May 2021. Resubmissions up until 15 May 2021 were taken into account for the review. Additional information provided by Member States during the review was taken into account until 15 May 2021.

34. The technical expert review team carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the most recent submission of LPS data for the year 2019.

35. Table 9 gives an overview of the number of recommendations and priority recommendations for LPS data that are included in Table 10. The table also shows the range of recommendations and priority recommendations that were included in the NECD inventory review reports for other Member States.

36. Table 10 provides all the findings from the technical expert review team related to the LPS data including those additionally made during the 2021 NECD inventory review and those not implemented from the 2020 NECD inventory review.

Table 9: Overview of the number of findings from the 2021 NECD inventory review by year of first issue and assessment of implementation of findings related to LPS data[7,8]

		Findings included in the 2021 Review Report by year of origin (see Table 10 below)		Implemented findings
		Recom.*	Priority Recom.*	
Finding first raised in:	NECD inventory review 2020	0	1	5
	NECD inventory review 2021	0	2	n/a
Total from NECD inventory review 2021		**0**	**3**	
(Range for All Member States)		(0-7)	(0-3)	

* Recom. = Recommendation, Priority Recom. = Priority Recommendation

[7] Numbers given in cells shaded orange indicate the number of findings found to not be implemented in the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued. Summing these findings by type with new findings given for the first time within the 2021 NECD inventory review (cells shaded white), gives the total number of findings issued as part of the 2021 NECD inventory review (given in the final row). Bracketed numbers in the final row present the relevant range of the number of findings by type for all Member States. Numbers given in cells shaded green indicate the number of findings that were found to be implemented within the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued.

[8] Findings issued as revised estimates or unquantified potential technical corrections from the 2020 NECD Inventory review of LPS and gridded data have been re-assigned as 'priority recommendations' for the 2021 NECD Inventory review of LPS and gridded data.

Table 10: All findings including those additionally made during the 2021 NECD inventory review and those not implemented from previous reviews of LPS data[9]

Review year of initial recommendation (number of years it has been recommended)	Observation	GNFR sector, Pollutant(s), Year(s)	Priority recommendation in 2020	Priority recommendation in 2021
2021 (1)	DE-LPS-GEN-2021-0002	General, 2018	No	Yes
Recommendation The TERT noted that the LPS data submitted in 2021 related to reference year 2018, rather than 2019 as specified in the NEC Directive (2016/2284/EU) Annex 1 table C. The TERT noted the explanation provided in the IIR that 2018 data are provided because the German LPS submission is based on E-PRTR reporting, and that E-PRTR data for 2019 are not yet available. In response to a question on the issue Germany explained that software for reporting PRTR (and LCP) data is still being adapted to work with the new formats required. Thus, E-PRTR data for 2019 will be available later in this year. The TERT thanks Germany for this explanation, and for the assurance that this is a transient problem which should not affect the next LPS submission of 2023 data in 2025. The TERT confirms that there is no further deadline for submissions (other than 01-May-2025), but for users of the data (e.g. modelers, scientists) it would be of value to have access to the corrected data sooner. **In this context, the TERT recommends that Germany ensures that this issue does not recur in the LPS data submission in 2025 and encourages Germany to provide a corrected version of the current dataset as soon as possible.**				
Review year of initial recommendation (number of years it has been recommended)	Observation	GNFR sector, Pollutant(s), Year(s)	Priority recommendation in 2020	Priority recommendation in 2021
2020 (2)	DE-LPS-GEN-2020-0001	General, PAHs, PCBs, $PM_{2.5}$, 2015	No	Yes
Assessment of the implementation of the initial recommendation The TERT noted with reference to recommendation DE-LPS-GEN-2020-0001 raised in the 2020 review, that $PM_{2.5}$, PCBs and PAHs were not reported in the 2021 LPS submission. In response to a question raised in the review, Germany identified that some emission values for PCBs and PAHs were missing in the table uploaded, and in response to question DE-LPS-GEN-2021-0001 attached an updated Annex VI table including emissions of PCBs and PAHs ('DE_2021_Annex_VI_LPS_2018 _corrected.xlsx'). Emissions of $PM_{2.5}$ could not be included, as that is not reported in the E-PRTR. However, the TERT notes that completeness of the LPS submission takes precedence over consistency with the E-PRTR, and where the E-PRTR does not provide sufficient information the inventory team should seek to gap-fill this, as is already undertaken with assignment of GNFR codes and stack heights. The TERT recommends that Germany uploads file 'DE_2021_Annex_VI_LPS_2018 _corrected.xlsx' to the CDR and includes the missing emissions to the next submission at the latest. The TERT recommends that the inventory team continues to pursue efforts to gap-fill $PM_{2.5}$ emissions in the LPS submission. For example, Germany could investigate whether any of the LPS reporting PM_{10} can reasonably be used to estimate $PM_{2.5}$ using e.g. the particle size distribution from the EMEP/EEA Guidebook. **In case of any missing emissions, the TERT recommends that in the next edition of the IIR in 2022, Germany includes an explanation of the reason for those being missing from the LPS submission, and details of planned improvements with a schedule to address this issue.**				
Review year of initial recommendation (number of years it has been recommended)	Observation	GNFR sector, Pollutant(s), Year(s)	Priority recommendation in 2020	Priority recommendation in 2021
2021 (1)	DE-LPS-GEN-2021-0001	General, PCDD/F, 2018	No	Yes

[9] Findings issued as revised estimates or unquantified potential technical corrections from the 2020 NECD Inventory review of LPS and gridded data have been re-assigned as 'priority recommendations' for the 2021 NECD Inventory review of LPS and gridded data.

Recommendation

The TERT noted that for the year 2018, no LPS emissions were reported for PCDD/F (dioxins and furans). In response to a question raised during the review Germany explained that PCDD/F emissions had been accidentally omitted from the uploaded LPS Annex VI reporting template. The TERT thanks Germany for this clarification, and notes that as part of the response Germany provided a file with an updated LPS Annex VI file for 2018.

The TERT confirms that there is no further deadline for submissions (other than 01-May-2025), but for users of the data (e.g. modelers, scientists) it would be value to have access to the corrected data sooner.

In this context, the TERT recommends that Germany ensures that this issue does not recur in the LPS data submission in 2025 and encourages Germany to provide a corrected version as soon as possible.

IX. Findings and Conclusions from the technical expert review team for gridded data

37. The technical expert review team performed an in-depth review of the gridded data submitted by 1 May 2021. Resubmissions up until 15 May 2021 were taken into account for the review. Additional information provided by Member States during the review was taken into account until 15 May 2021.

38. The technical expert review team carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the most recent submission of gridded data for the year 2019.

39. Table 11 gives an overview of the number of recommendations and priority recommendations for the gridded data that are included in Table 12. The table also shows the range of recommendations and priority recommendations that were included in the NECD inventory review reports for other Member States.

40. Table 12 provides all the findings from the technical expert review team related to the gridded data including those additionally made during the 2021 NECD inventory review and those not implemented from the 2020 NECD inventory review.

Table 11: Overview of the number of findings from the 2021 NECD inventory review by year of first issue and assessment of implementation of findings related to gridded data[10,11]

		Findings included in the 2021 Review Report by year of origin (see Table 10 below)		Implemented findings
		Recom.	Priority Recom.*	
Finding first raised in:	NECD inventory review 2020	0	0	1
	NECD inventory review 2021	1	0	n/a
Total from NECD inventory review 2021		**1**	**0**	
(Range for All Member States)		(0-2)	(0-5)	

* Recom. = Recommendation, Priority Recom. = Priority Recommendation

[10] Numbers given in cells shaded orange indicate the number of findings found to not be implemented in the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued. Summing these findings by type with new findings given for the first time within the 2021 NECD inventory review (cells shaded white), gives the total number of findings issued as part of the 2021 NECD inventory review (given in the final row). Bracketed numbers in the final row present the relevant range of the number of findings by type for all Member States. Numbers given in cells shaded green indicate the number of findings that were found to be implemented within the 2021 NECD inventory submission, split by row into the respective review year in which the finding was originally issued.

[11] Findings issued as revised estimates or unquantified potential technical corrections from the 2020 NECD Inventory review of LPS and gridded data have been re-assigned as 'priority recommendations' for the 2021 NECD Inventory review of LPS and gridded data.

Table 12: All findings including those additionally made during the 2021 NECD inventory review and those not implemented from previous reviews for gridded data[12]

Review year of initial recommendation (number of years it has been recommended)	Observation	GNFR sector, Pollutant(s), Year(s)	Priority recommendation in 2020	Priority recommendation in 2021
2021 (1)	DE-GRID-G-2021-0001	G Shipping, NO_X, 2019	No	No
Recommendation The TERT notes with reference to G_shipping for NO_X in 2019 an issue in the Gridding submission which does not follow best practice. The TERT has found that coastal shipping emissions are missing from the distributions reported. In response to a question in the review Germany has acknowledged this error and said that improvements will be made. For the sources that are located in the sea, the Member State should make use of the shapefile 'Grid for the whole new EMEP domain' (located at the end of the list in https://www.ceip.at/the-emep-grid/grid-definiton). **The TERT recommends that Germany improve the distribution of NO_X emissions from G_shipping and that Germany submit a correction of the 2019 gridded data by addressing this issue.**				

[12] Findings issued as revised estimates or unquantified potential technical corrections from the 2020 NECD Inventory review of LPS and gridded data have been re-assigned as 'priority recommendations' for the 2021 NECD Inventory review of LPS and gridded data.

X. Effect of revised estimates, technical corrections and adjustments recommended to be approved on the national total and national total for compliance

41. The tables below show the direct changes in response to the 2021 NECD inventory review. These changes include all revised estimates, technical corrections and adjustment assessments. The tables also show the impact that these changes have on the National total (row 141, Annex I) and National Total for Compliance (row 154, Annex I). The National Emission Ceilings as defined by Directive 2001/81/EC [13] are provided in the tables for reference, where relevant.

Table 13: National totals as reported and, where relevant national totals including revised estimates (RE) and technical corrections (TC) for CO, PM_{10} and Black Carbon [14]

Description	Reference	Pollutant estimates (kt)		
		2000	2005	2019
CO				
National total (row 141)	Annex I, 09/02/2021	5 134.942	3 915.552	2 882.738
National Total for Compliance (row 154)	Annex I, 09/02/2021	5 134.942	3 915.552	2 882.738
Difference between original estimate and revised estimate provided by Germany and accepted by the TERT				
1A2f Stationary Combustion in Manufacturing Industries and Construction: Non-Metallic Minerals	DE-1A2f-2021-0003	-	-111.102	-128.841
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		5 134.942	3 804.448	2 753.899
National Total for Compliance (row 154) estimate including revised estimates, technical corrections accepted by Germany and adjustments recommended (by technical expert review team) to be accepted by EC (calculated using data above)		5 134.942	3 804.448	2 753.899
PM_{10}				
National total (row 141)	Annex I, 09/02/2021	302.678	247.944	203.607
National Total for Compliance (row 154)	Annex I, 09/02/2021	302.678	247.944	203.607
BC				
National total (row 141)	Annex I, 09/02/2021	39.081	31.543	11.711
National Total for Compliance (row 154)	Annex I, 09/02/2021	39.081	31.543	11.711

[13] Available at https://eur-lex.europa.eu/eli/dir/2001/81/2018-07-01

[14] 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 would be taken into account.

Table 14: National totals as reported and, where relevant national totals including revised estimates (RE), technical corrections (TC) and adjustments for NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ and National Emission Ceilings[15]

Description	Reference	Pollutant estimates (kt)						
		2005	2010	2015	2016	2017	2018	2019
NO_X								
National total (row 141)	Annex I, 09/02/2021	1 642.172	1 470.975	1 363.900	1 340.624	1 292.312	1 210.497	1 136.788
National Total for Compliance (row 154)	Annex I, 09/02/2021	1 245.655	1 059.053	962.355	963.565	949.906	915.191	879.781
Adjustment provided Germany and recommended to be accepted by the technical expert review team								
1A3b Road Transport	DE-1A3b-2018-0002	-	-296.114	-274.854	-250.898	-221.079	-179.619	-144.771
3B Manure Management, 3D Crop Production and Agricultural Soils, 3I Agriculture Other	DE-3B-2018-0002	-	-115.808	-126.692	-126.161	-121.327	-115.687	-112.236
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		1 642.172	1 470.975	1 363.900	1 340.624	1 292.312	1 210.497	1 136.788
National Total for Compliance (row 154) estimate including revised estimates, technical corrections accepted by Germany and adjustments recommended (by technical expert review team) to be accepted by EC (calculated using data above)		1 245.655	1 059.053	962.355	963.565	949.906	915.191	879.781
2010 National Emission Ceiling		n/a	1 051.000	1 051.000	1 051.000	1 051.000	1 051.000	1 051.000
NMVOC								
National total (row 141)	Annex I, 09/02/2021	1 486.300	1 361.420	1 147.284	1 141.921	1 147.270	1 125.016	1 121.231
National Total for Compliance (row 154)	Annex I, 09/02/2021	1 179.482	1 055.104	831.995	829.158	836.588	819.333	816.845
Adjustment provided Germany and recommended to be accepted by the technical expert review team								
3B Manure Management, 3D Crop Production and Agricultural Soils	DE-3B-2018-0003	-	-306.315	-315.289	-312.763	-310.682	-305.682	-304.386

[15] 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 would be taken into account.

Description	Reference	Pollutant estimates (kt)						
		2005	2010	2015	2016	2017	2018	2019
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		1 486.300	1 361.420	1 147.284	1 141.921	1 147.270	1 125.016	1 121.231
National Total for Compliance (row 154) estimate including revised estimates, technical corrections accepted by Germany and adjustments recommended (by technical expert review team) to be accepted by EC (calculated using data above)		1 179.482	1 055.104	831.995	829.158	836.588	819.333	816.845
2010 National Emission Ceiling		n/a	995.000	995.000	995.000	995.000	995.000	995.000
SO_2								
National total (row 141)	Annex I, 09/02/2021	477.478	405.409	336.002	311.526	302.893	291.782	263.532
National Total for Compliance (row 154)	Annex I, 09/02/2021	477.478	405.409	336.002	311.526	302.893	291.782	263.532
2010 National Emission Ceiling		n/a	520.000	520.000	520.000	520.000	520.000	520.000
NH_3								
National total (row 141)	Annex I, 09/02/2021	607.151	618.915	640.690	638.201	624.078	601.242	586.686
National Total for Compliance (row 154)	Annex I, 09/02/2021	595.774	578.605	580.929	578.789	565.433	543.415	528.859
Adjustment provided Germany and recommended to be accepted by the technical expert review team								
3D Crop Production and Agricultural Soils, 3I Agriculture Other	DE-3D-2018-0001	-	-40.311	-59.762	-59.412	-58.644	-57.827	-57.827
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		607.151	618.915	640.690	638.201	624.078	601.242	586.686
National Total for Compliance (row 154) estimate including revised estimates, technical corrections accepted by Germany and adjustments recommended (by technical expert review team) to be accepted by EC (calculated using data above)		595.774	578.605	580.929	578.789	565.433	543.415	528.859
2010 National Emission Ceiling		n/a	550.000	550.000	550.000	550.000	550.000	550.000
$PM_{2.5}$								
National total (row 141)	Annex I, 09/02/2021	137.503	119.740	102.517	96.940	95.737	94.660	91.945
National Total for Compliance (row 154)	Annex I, 09/02/2021	137.503	119.740	102.517	96.940	95.737	94.660	91.945

Table 15: National totals as reported and national totals including revised estimates (RE) and technical corrections (TC) for PAHs (total PAHs and benzo(a)pyrene), dioxins/furans, PCBs, HCB, Cd, Hg and Pb [16]

Description	Reference	Unit	Pollutant estimates					
			1990	2005	2016	2017	2018	2019
PCDD/PCDF (dioxins/furans)								
National total (row 141)	Annex I, 09/02/2021	(g I-TEQ)	814.953	154.915	125.029	123.580	119.800	118.720
National Total for Compliance (row 154)	Annex I, 09/02/2021	(g I-TEQ)	814.953	154.915	125.029	123.580	119.800	118.720
PAHs (total)								
National total (row 141)	Annex I, 09/02/2021	(t)	177.424	58.704	73.223	75.288	75.707	76.791
National Total for Compliance (row 154)	Annex I, 09/02/2021	(t)	177.424	58.704	73.223	75.288	75.707	76.791
Difference between original estimate and revised estimate provided by Germany and accepted by the TERT								
1B1b Fugitive Emission From Solid Fuels: Solid Fuel Transformation	DE-1B1b-2021-0001	(t)	-35.052	-	-	-	-	-
2A1 Cement Production	DE-2A1-2021-0001	(t)	-6.898	-5.885	-5.710	-6.046	-5.965	-5.992
2C1 Iron and Steel Production	DE-2C1-2021-0001	(t)	0.016	0.014	0.014	0.014	0.014	0.013
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(t)	135.490	52.833	67.527	69.256	69.756	70.812
National Total for Compliance (row 154) estimate including revised estimates, technical corrections accepted by Germany and adjustments recommended (by technical expert review team) to be accepted by EC (calculated using data above)		(t)	135.490	52.833	67.527	69.256	69.756	70.812
benzo(a) pyrene								
National total (row 141)	Annex I, 09/02/2021	(t)	27.937	11.726	15.286	15.657	15.836	16.088
National Total for Compliance (row 154)	Annex I, 09/02/2021	(t)	27.937	11.726	15.286	15.657	15.836	16.088
HCB								
National total (row 141)	Annex I, 09/02/2021	(kg)	2 898.384	15.251	15.862	18.538	12.823	12.663

[16] 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 would be taken into account.

Description	Reference	Unit	Pollutant estimates					
			1990	2005	2016	2017	2018	2019
National Total for Compliance (row 154)	Annex I, 09/02/2021	(kg)	2 898.384	15.251	15.862	18.538	12.823	12.663
PCBs								
National total (row 141)	Annex I, 09/02/2021	(kg)	1 735.483	196.490	230.083	227.980	219.325	215.782
National Total for Compliance (row 154)	Annex I, 09/02/2021	(kg)	1 735.483	196.490	230.083	227.980	219.325	215.782
Pb								
National total (row 141)	Annex I, 09/02/2021	(t)	1 900.350	232.490	161.410	166.840	162.180	160.780
National Total for Compliance (row 154)	Annex I, 09/02/2021	(t)	1 900.350	232.490	161.410	166.840	162.180	160.780
Cd								
National total (row 141)	Annex I, 09/02/2021	(t)	29.101	12.183	12.197	12.369	11.945	10.847
National Total for Compliance (row 154)	Annex I, 09/02/2021	(t)	29.101	12.183	12.197	12.369	11.945	10.847
Hg								
National total (row 141)	Annex I, 09/02/2021	(t)	35.469	13.961	8.620	8.509	8.296	7.206
National Total for Compliance (row 154)	Annex I, 09/02/2021	(t)	35.469	13.961	8.620	8.509	8.296	7.206

XI. Statement from Germany on the conclusions presented by the technical expert review team

42. Germany did not raise any issues with the calculated estimates in Table 13 .

43. Germany did not raise any issues with the calculated estimates in Table 14.

44. Germany did not raise any issues with the calculated estimates in Table 15.

XII. Technical expert review team response to the statement from Germany

45. Germany did not raise any issues with the calculated estimates presented in Tables 13-15 and therefore no response from the TERT is required.

ANNEX I Technical corrections deemed necessary by the technical expert review team and revised estimates provided by Germany

46. Germany did not have any Technical Corrections and had 4 Revised Estimates in the NECD inventory review 2021.

47. The technical expert review team calculated technical corrections for cases

- where it did not agree with the way that a revised estimate or technical correction from the 2020 NECD inventory review was implemented and where no revised estimate was accepted by the technical expert review team during the review
- and where the suggested recommendation of the technical expert review team would change the National Total by more than 2% and where no revised estimate was accepted by the technical expert review team during the review.

48. The methods for calculating the technical corrections are set up in the "Guidance on technical corrections" and are based on the basic adjustment methods referred in the revised UNECE Reporting Guidelines and UNFCCC Adjustment guidance[17] and use the EMEP/EEA inventory guidebook as a reference for methods and emission factors.

[17] Technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol

Table A1: Summary tables of Revised Estimates and Technical Corrections

1

EMRT ID:	DE-1A2f-2021-0003
EMRT URL:	https://emrt-necd.eionet.europa.eu/2021/DE-1A2f-2021-0003
Member State:	Germany
Sector:	1A2f Stationary combustion in manufacturing industries and construction: Non-metallic minerals
Pollutants:	CO
Completed by (SE):	Marlene Schmidt Plejdrup
Reviewed by (LR):	Kristina Saarinen
Reviewed by (Counterpart):	Stephan Poupa
Reviewed by (Quality Controller):	Chris Dore

The underlying problem:	Germany estimates emissions from lime production using very high emission factors from the 1990s leading to a substantial over-estimation of emissions, which is above the threshold for 2005 and 2019.
Summarise the methodology used:	Germany provided a revised estimate using the Tier 2 emission factor for lime production available from the 2019 EMEP/EEA Guidebook.

2

Details of the corrected estimate

	Original Estimate (kt)			Notes
Year	PM_{10}	CO	BC	
2000				
2005		127.048		
2019		142.356		

	Revised Estimate received from MS (kt)			Notes
Year	PM_{10}	CO	BC	
2000				
2005		15.945		
2019		13.515		

	Difference between Original Estimate and Revised Estimate (kt)			Notes
Year	PM_{10}	CO	BC	
2000				
2005		-111.102		
2019		-128.841		

1

EMRT ID:	DE-1B1b-2021-0001
EMRT URL:	https://emrt-necd.eionet.europa.eu/2021/DE-1B1b-2021-0001
Member State:	Germany
Sector:	1B1b Fugitive emission from solid fuels: Solid fuel transformation
Pollutants:	PAHs
Completed by (SE):	Marlene Schmidt Plejdrup
Reviewed by (LR):	Kristina Saarinen
Reviewed by (Counterpart):	Stephan Poupa
Reviewed by (Quality Controller):	Chris Dore

The underlying problem:	The TERT noted that the reported PAHs emission did not match the sum of the four individual PAH. This was caused by only PAH-16 being available for coke production based on lignite that had been reported.
Summarise the methodology used:	Germany used the national emission factors available combined with the ratio of the four individual PAHs emission factors available in the 2019 EMEP/EEA Guidebook.

Details of the corrected estimate

	Original Estimate								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						42.028			
2005									
2016									
2017									
2018									
2019									

2

	Revised Estimate received from MS								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						6.976			
2005									
2016									
2017									
2018									
2019									

	Difference between Original Estimate and Revised Estimate								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						-35.052			
2005									
2016									
2017									
2018									
2019									

1

EMRT ID:	DE-2A1-2021-0001
EMRT URL:	https://emrt-necd.eionet.europa.eu/2021/DE-2A1-2021-0001
Member State:	Germany
Sector:	2A1 Cement production
Pollutants:	PaHs
Completed by (SE):	Coralie Jeannot
Reviewed by (LR):	Kristina Saarinen
Reviewed by (Counterpart):	Michalea Titz
Reviewed by (Quality Controller):	Chris Dore

The underlying problem:	Reported total PAHs not equal to the sum of individually reported PAHs.
Summarise the methodology used:	Germany provided a revised estimate of 1-4 total PaH based on the sum of individual PaH reported: BaP, and will conduct new research to apply a potential new methodology next year.

Details of the corrected estimate

	Original Estimate								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						6.927			
2005						5.909			
2016						5.734			
2017						6.072			
2018						5.990			
2019						6.017			

2

	Revised Estimate received from MS								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						0.029			
2005						0.025			
2016						0.024			
2017						0.025			
2018						0.025			
2019						0.025			

	Difference between Original Estimate and Revised Estimate								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						-6.898			
2005						-5.885			
2016						-5.710			
2017						-6.046			
2018						-5.965			
2019						-5.992			

EMRT ID:	DE-2C1-2021-0001
EMRT URL:	https://emrt-necd.eionet.europa.eu/2021/DE-2C1-2021-0001
Member State:	Germany
Sector:	2C1 Iron and steel production
Pollutants:	PaHs
Completed by (SE):	Coralie Jeannot
Reviewed by (LR):	Kristina Saarinen
Reviewed by (Counterpart):	Michalea Titz
Reviewed by (Quality Controller):	Chris Dore

1

The underlying problem:	Reported total PAHs not equal to the sum of individually reported PAHs.
Summarise the methodology used:	Germany provided a revised estimate for PAH using a conservative approach for the sub-processes where there was no EF available for PAH: pig iron production. Germany's methodology used: "Apply a consistent methodology in reporting of PAH emissions in 2C1-iron and steel production. As there is not enough data available to report individual PAHs Germany will follow the TERT recommendation to only report total-PAHs for the whole time series in the next submission 2022. Only for pig iron production a national total-PAH emission factor is missing. For that source the national inventory solely include BaP emissions. Due to the limitation of data the total-PAH emission factor for pig iron production will be derived from the BaP emission factor as follows: Emissions of PAH depend on the coating material used. The emission factor in table 3.8 of the actual emission guidebook 2019 for pig iron production (2,500 mg/t) is only valid for tar containing coating material and excluded abatement technics. Both assumptions are not appropriate for Germany. As tar-free materials are used for coating PAH emissions should not play any role (according to the emission guidebook 2019 on page 18 even the assumption of zero emissions is allowed in that case). And the blast furnace gas is conducted and used. But PAH emissions could not be surely ruled out as the very low BaP emission factor of 0.05 mg/t demonstrate. In order to avoid an under-estimation of PAH emissions in pig iron production the emission factor for total-PAH is set to the 10-fold of the BaP emission factor. That is a conservative approach and do not change the overall PAH emission trend."

2

Details of the corrected estimate

	Original Estimate								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						10.666			
2005						3.566			
2016						3.075			
2017						3.374			
2018						3.220			
2019						3.272			

	Revised Estimate received from MS								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	

1990						10.683			
2005						3.580			
2016						3.089			
2017						3.388			
2018						3.234			
2019						3.285			

	Difference between Original Estimate and Revised Estimate								Notes
Year	Pb (t)	Cd (t)	Hg (t)	PCDD/F (g I-TEQ)	BaP (t)	PAHs (t)	HCB (kg)	PCBs (kg)	
1990						0.016			
2005						0.014			
2016						0.014			
2017						0.014			
2018						0.014			
2019						0.013			

ANNEX II Review of the 2021 adjustment application of Germany – technical expert review team report for the EC

Table A2: Summary Information on submitted adjustment application, Germany 2021

Source Sector	Years	Pollutant	Application type	Outcome of Adjustment Review
3D Crop Production and Agricultural Soils 3I Agriculture Other	2010-2019	NH_3	Previously accepted (first submitted in 2017)	**Accept**
3B Manure Management 3D Crop Production and Agricultural Soils	2010-2019	NMVOC	Previously accepted (first submitted in 2017)	**Accept**
1A3b Road Transport	2010-2019	NO_X	Previously accepted (first submitted in 2017)	**Accept**
3B Manure Management 3D Crop Production and Agricultural Soils 3I Agriculture Other	2010-2019	NO_X	Previously accepted (first submitted in 2017)	**Accept**

I. Introduction

Article 5(8) of the NECD (Directive (EU) 2016/2284) explains that "The Commission, when exercising its powers under paragraphs 6 and 7 (reviewing the use of flexibilities), shall take into account the relevant guidance documents developed under the Air Convention" Article 8 (4) and Part 4 of Annex IV to the NECD further specify that Member States that opt for the adjustment flexibility must include supporting information in the Informative Inventory Report, including a demonstration that the use of the adjustment procedure fulfils the relevant conditions set out in Article 5(1) and Part 4 of Annex IV. The minimum supporting information required is highlighted in Part 4.1 of Annex IV. In the chapeau of Annex IV it is further specified that adjusted emission inventories should be prepared using the EMEP reporting guidelines, while also adding that reliance upon these EMEP reporting guidelines is without prejudice to the additional arrangements specified in Part 4 of Annex IV. Consequently, the review of adjustment applications under the NECD will in principle follow the process for reviewing adjustment applications made under the Air Convention (as presented in relevant EB decisions), however without prejudice to the additional arrangements specified in Part 4 of Annex IV to the NECD.[18] It allows inter alia the submission of additional information during the review, necessary for a proper and full assessment of the adjustment application.

[18] See the following overview and guidance documentation: ECE/EB.AIR/111/Add.1, ECE/EB.AIR/113/Add.1, ECE/AB.AIR/127/Add.1 and ECE/EB.AIR/130).

II. Adjustment process

Member States may apply to adjust their inventory data **if they are in non-compliance with their emission ceilings** established in NEC Directive 2001/81/EC (in conjunction with Article 21(2) of the NEC Directive (EU)2016/2284). If a Member State applies for more than one adjustment and not all these adjustments are required to bring that Member State into compliance, that Member State should be informed that in accordance with the intent of the adjustment procedure, **recommendation for approval will be limited to adjustments necessary to bring the Member State into compliance and be invited to withdraw one or more of its adjustments.** In making an adjustment application, Member States must demonstrate that extraordinary circumstances have given rise to revisions to their emissions estimates. These extraordinary circumstances fall into three broad categories:

a) Emission source categories are identified that were not accounted for at the time when the emission reduction commitments were set; or

b) For a particular source, the emission factors used to estimate emissions for the year in which emissions reduction commitments are to be attained are significantly different to those used when the emission reduction commitments were set; or

c) The methodologies used for determining emissions from specific source categories have undergone significant changes between the time when emission reduction commitments were set and the year they are to be attained.

"Technical corrections" and "revised estimates" arise when the review team identifies substantial quality issues with the emissions inventory. The emissions inventory data is revised during the review to address the issue. Consequently, technical corrections and revised estimates change the national emission totals, which may impact on the validity of an adjustment submission. Therefore, to the extent possible, the outcome of the work on technical corrections and revised estimates is established before the review of an associated adjustment application can be completed.

The review of an adjustment application can recommend acceptance or rejection. In the case of a rejection, the recommendation may be accompanied by information explaining that the principle of the adjustment is considered appropriate but that the quantification has not been determined correctly, or it has not been possible to adequately assess the quantification in the time available for the review. Consequently, it may be appropriate for Member States to consider resubmitting selected rejected applications at a future date.

Any Member State submitting an application for an adjustment to its inventory is required to notify the European Commission by 15 February at the latest.

III. Technical expert review team

In 2021 the reviewers undertook a detailed technical review of newly submitted adjustment applications. Information provided regarding adjustments that were accepted in previous years was also reviewed. Reviews are undertaken in cooperation with the EEA and recommendations from the review on the acceptance or rejection of an adjustment are communicated to the European Commission. The reviews of submitted adjustments were performed by the following technical expert review team:

- Adjustment Lead Reviewers – Chris Dore, Ole-Kenneth Nielsen

- Energy: Stationary and fugitives – Stephan Poupa
- Energy: Transport and off-road –Jean-Marc André and Katrina Young
- Industrial processes and product use – Michaela Titz
- Agriculture – Anais Durand, Bernard Hyde, Etienne Mathias

IV. Review of adjustments approved prior to 2021

Germany had 4 adjustments granted prior to 2021, details of which can be found in Table A2. Germany included information on these adjustments in its submission under the National Emissions reduction Commitments Directive (Directive (EU) 2016/2284) of 15 March 2021, reporting sectoral level data in Annex VII to the reporting guidelines and in line 143 of Annex I. Germany provided a "Declaration on consistent reporting of Approved Adjustments", by the deadline of 15 February 2021, stating that criteria and methodologies used for the calculation of relevant emissions for the 2021 submission are the same as in the most recent year in which the adjustments were approved (2020).

The review of previously accepted adjustment applications focuses on checking that any recalculations performed have been done using a methodology that follows best practice, and that transparent supporting information has been provided. A check is made that the adjustment is still "necessary" to ensure compliance, but no check is made on the basis of the application - as this was checked in detail during the review when the adjustment application was first made.

Conclusions and Recommendations of technical expert review team concerning adjustment applications

The reviewers have undertaken a full and thorough assessment of the applications of adjustments approved prior to 2021 for NH_3 emissions from 3D Crop Production and Agricultural Soils, 3I Agriculture Other, NMVOC emissions from 3B Manure Management, 3D Crop Production and Agricultural Soils, NO_X emissions from 1A3b Road Transport, and 3B Manure Management, 3D Crop Production and Agricultural Soils, 3I Agriculture Other.

The review of the submitted applications followed the requirements as set in the NECD. The findings of the reviewers are described in detail in sections above of this report. Table A2 below provides a summary of the adjustment applications received from Germany, and the subsequent recommendations made by the reviewers to the European Commission.

Table A3: Recommendations following the 2021 review of adjustment applications already approved prior to 2021[19]

Source Sector	Years	Pollutant	Application Type	Basis of Adjustment	Impact on National Total	Recommendation
3D Crop Production and Agricultural Soils 3I Agriculture Other	2010-2019	NH_3	Previously accepted (first submitted in 2017)	New source/Significantly different EFs	-9.9% in 2019	**Accept**
Conclusion text The TERT reviewed the information submitted by Germany on the previously accepted adjustment for NFRs 3D and 3I, for NH_3 and for all years since 2010. The TERT did not find it necessary to ask Germany for clarifications. The TERT did not find it necessary to ask Germany to recalculate the quantification of the adjustment. Following the review of the information made available prior to and during the review, the TERT concludes that the adjustment continues to meet the requirements stated in the NECD for an adjustment, and therefore recommends that the European Commission does continue to accept the most recent submission as a valid adjustment for these sources and pollutants.						
Source Sector	Years	Pollutant	Application Type	Basis of Adjustment	Impact on National Total	Recommendation
3B Manure Management 3D Crop Production and Agricultural Soils	2010-2019	NMVOC	Previously accepted (first submitted in 2017)	New source/Significantly different EFs	-27.1% in 2019	**Accept**
Conclusion text The TERT reviewed the information submitted by Germany on the previously accepted adjustment for NFRs 3B and 3D, for NMVOC and for all years since 2010. The TERT did not find it necessary to ask Germany for clarifications. The TERT did not find it necessary to ask Germany to recalculate the quantification of the adjustment. Following the review of the information made available prior to and during the review, the TERT concludes that the adjustment, taking into account recalculations to the adjustment quantification made within this review, continues to meet the requirements stated in the NECD for an adjustment, and therefore recommends that the European Commission does continue to accept the most recent submission as a valid adjustment for these sources and pollutants.						
Source Sector	Years	Pollutant	Application Type	Basis of Adjustment	Impact on National Total	Recommendation
1A3b Road Transport	2010-2019	NO_X	Previously accepted (first submitted in 2017)	New source/Significantly different EFs	-12.7% in 2019	**Accept**

[19] The Impact on National Total column is calculated using the national total based on fuel sold, excluding adjustments. The data are presented for context only, and not for compliance purposes.

Conclusion text

The TERT reviewed the information submitted by Germany on the previously accepted adjustment for 1A3b Road transport category, for NO_X, for 2010-2019. The TERT did not find it necessary to ask Germany for clarifications. The TERT did not find it necessary to ask Germany to recalculate the quantification of the adjustment. Following the review of the information made available prior to and during the review, the TERT concludes that the adjustment does continue to meet the requirements stated in the NECD for an adjustment, and therefore recommends that the European Commission does continue to accept the most recent submission as a valid adjustment for this source and pollutant.

Source Sector	Years	Pollutant	Application Type	Basis of Adjustment	Impact on National Total	Recommendation
3B Manure Management 3D Crop Production and Agricultural Soils 3I Agriculture Other	2010-2019	NO_X	Previously accepted (first submitted in 2017)	New source/Significantly different EFs	-9.9% in 2019	**Accept**

Conclusion text

The TERT reviewed the information submitted by Germany on the previously accepted adjustment for NFRs 3B, 3D and 3I, for NO_X and for all years since 2010. The TERT did not find it necessary to ask Germany for clarifications. The TERT did not find it necessary to ask Germany to recalculate the quantification of the adjustment. Following the review of the information made available prior to and during the review, the TERT concludes that the adjustment, taking into account recalculations to the adjustment quantification made within this review, continues to meet the requirements stated in the NECD for an adjustment, and therefore recommends that the European Commission does continue to accept the most recent submission as a valid adjustment for these sources and pollutants.

References and Supporting Documents

Annex I emission reporting template. Available at https://www.ceip.at/reporting-instructions

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ECE/EB.AIR/125: 2014 Reporting Guidelines for Estimating and Reporting Emission Data under CLRTAP https://unece.org/fileadmin/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf

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ECE/EB.AIR/130: Technical Guidance for Parties Making Adjustment Applications and for the Expert Review of Adjustment Applications, 14 April 2015 https://unece.org/DAM/env/documents/2014/AIR/EB/ECE_EB_AIR_130_ENG.pdf

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NEC Directive 2001, DIRECTIVE 2001/81/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ,of 23 October 2001 on national emission ceilings for certain atmospheric pollutants http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02001L0081-20130701&from=EN

NEC Directive 2016, DIRECTIVE (EU) 2016/2284 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2016.344.01.0001.01.ENG