Final Review Report

2019

Third phase of review of national air pollution inventory data

pursuant to the Directive on the Reduction of National Emissions of Certain Atmospheric Pollutants (Directive (EU) 2016/2284 or 'NECD')

Germany

22 November 2019

Reference: Service Request No 4

under Framework Contract

No ENV.C.3/FRA/2017/0012

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Abbreviations

AD	Activity data
CLRTAP	Convention on Long-range Transboundary Air Pollution
E-PRTR	European Pollutant Release and Transfer Register
EC	European Commission
EEA	European Environment Agency
EF	Emission factor
EMRT	Emission Review Tool
EU	European Union
GHG	Greenhouse gas
HMs	Heavy Metals
IEF	Implied emission factor
kt	Kilotonnes
NECD	National Emissions Ceilings Directive
NFR	Nomenclature for Reporting
NH_3	Ammonia
NMVOC	Non-methane volatile organic compounds
NO_X	Nitrogen oxides
$PM_{2.5}$	Particulate matter equal to or less than 2.5 micrometres in diameter
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 Ceilings Directive (Directive (EU) 2016/2284) 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 third phase of the technical review of the National Emissions Ceilings Directive (NECD) inventories was undertaken in accordance with the NECD Review air emission inventory review guidelines under Service Request No 4 under Framework Contract No ENV.C.3/FRA/2017/0012

3. The technical review assessed the implementation of all recommendations, technical corrections and revised estimates from the NECD Review 2018. The review reports from the year 2018[1] were the base for this assessment. In addition the in-depth review of the national emission inventories of the POPs and heavy metals that had been initiated in 2018 was finalized. Further, in accordance with the requirements of the NECD (Article 5(8)), all new adjustment applications submitted in 2019 were reviewed in-depth and all adjustment applications submitted in 2019, that were already submitted, reviewed and accepted in 2018 were reviewed with a focus on reviewing the consistency in the reporting of these adjustment applications. For the review of the adjustment applications the Technical Guidance for Parties Making adjustment applications and for the expert review of adjustment applications (ECE/EB.Air/130)[2] was used.

II. Objectives of the review

4. The general objective of the third phase of the technical review of Member States' NECD inventories as reported in February 2019 (and updated before 15 March 2019) was an improvement of transparency, consistency, comparability, completeness and accuracy of submitted data and as such will contribute to establishing accurate, reliable and verified emission inventories for all Member States.

5. The specific objectives of the third phase of the technical review of Member States' NECD inventories were:

- a detailed review to verify that Member States have integrated the revised estimates, technical corrections and other relevant recommendations from the 2017 and 2018 (for Finland and Greece) in-depth review and additional findings from the 2018 follow-up review in their national emission inventories as reported by 15 February 2019;

[1] Available at http://ec.europa.eu/environment/air/reduction/implementation.htm
[2] Available at http://www.ceip.at/fileadmin/inhalte/emep/Adjustments/ECE_EB_AIR_130_AV_for_the_web.pdf

- carrying out an in-depth review - including the calculation of technical corrections and revised estimates - of the following persistent organic pollutants (POPs) and heavy metals: polycyclic aromatic hydrocarbons (PAHs) (total PAHs and benzo(a)pyrene), dioxins/furans, polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), cadmium (Cd), mercury (Hg) and lead (Pb) taking into account the latest reporting cycle and the output of the initial review carried out in 2018 under contract Ref. No.070203/2017/765105/SER/ENV.C.3.
- an expert review of
    i. new adjustment applications submitted in 2019, not submitted and reviewed yet in 2018 under the NECD, including 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 2019, that were already submitted, reviewed and accepted in 2018 under the NECD (and/or previously under CLRTAP), with a focus on reviewing the consistency in the reporting of these adjustment applications;

III. Review approach, team and scope

6. For the **Follow-up to the 2017 in-depth review**[3] the technical expert review team performed a consistent and detailed review to verify that all Member States have effectively integrated the revised estimates, technical corrections and other relevant recommendations from the 2017/2018 in-depth review and also the additional findings from the follow-up review in 2018 into their national emission inventories of sulphur dioxide (SO_2), nitrogen oxides (NO_X), particulate matter equal to or less than 2.5 micrometres in diameter ($PM_{2.5}$), non-methane volatile organic compounds (NMVOC) and ammonia (NH_3).

7. For the **second phase of the in-depth review of national emission inventories of POPs and heavy metals to be reviewed** the technical expert review team performed a consistent and detailed review to verify that all Member States had effectively integrated the recommendations from the first phase of the in-depth review into their national emission inventories of POPs and heavy metals. The review assessed transparency, accuracy, completeness, comparability and consistency in the emission reporting of PAHs, dioxins/furans, PCBs, HCB, Cd, Hg and Pb with special emphasis on the review of identified key categories. Where necessary the Member States where asked to send revised estimates and if necessary technical corrections were calculated by the technical expert review team.

8. The focus was on the years 1990 (most common reference year used for compliance with basic reduction obligations under the POPs and heavy metals protocols)[4] , on 2005, 2016 and 2017. However, the consistency of time series data was also checked for all reported years.

9. **Review of adjustment applications:** New adjustment applications submitted in 2019 were reviewed in depth. Adjustment applications submitted in 2019, that were already submitted, reviewed and accepted in 2018 under the new NECD (and/or previously under CLRTAP) were reviewed with a focus on consistency in the reporting of these adjustment. The review of adjustment applications followed the Review Guidance. The review was performed by relevant sector experts reviewing particular sectors and coordinated by the adjustment lead reviewer.

10. The scope of the NECD Review 2019 is summarised in Table 1.

[3] 2018 in-depth review for Finland and Greece
[4] Further information on Protocol on Heavy Metals: https://www.unece.org/env/lrtap/hm_h1.html. Further information on Protocol on POPs: https://www.unece.org/env/lrtap/pops_h1.html.

Table 1: Scope of the comprehensive technical review NECD 2019 (under Directive (EU) 2016/2284[5])

Element	Scope	Further information
Member States	EU geographical coverage of the Member States	This Directive shall apply to emissions of the pollutants referred to in Annex I from all sources occurring in the territory of the Member States, their exclusive economic zones and pollution control zones. This Directive does not cover emissions in the Canary Islands, the French overseas departments, Madeira, and the Azores.
Years	**Main pollutants:** 2005, 2010, 2015-17 **HMs and POPs:** 1990, 2005, 2016-17	In addition, time series consistency was reviewed across the whole time series. **Main pollutants:** Open issues from 2018 review included 2005, 2010, 2015-16. New issues from 2019 review included 2017. **HMs and POPs:** Open issues from 2018 review and new issues from 2019 review included 1990, 2005, 2016-17.
Pollutants	NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$, PAHs (total PAHs and benzo(a)pyrene), dioxins/furans, PCBs, HCB, Cd, Hg, Pb	According to NECD Article 1(1)
Categories	All NFR categories, including selected memo items	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 1A3 Transport (fuel used) - where a Member State uses fuel used for compliance purposes.
National totals	National total and National total for compliance	Rows 141 and 144 in Annex I to reporting Guidelines

11. The review was split into two phases:

a) **Initial checks** were carried out (by the project team) under service request No 4 under Framework Contract No ENV.C.3/FRA/2017/0012 and by the EU inventory team. Significant findings from the initial checks that were relevant for the third phase of the technical review and that were not resolved within the initial check 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 Service Request No 4 under Framework Contract No ENV.C.3/FRA/2017/0012. The technical expert review team consisted of the following experts:

[5] 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

- *Lead Reviewers*: Kevin Hausmann, Anne Misra, Ole-Kenneth Nielsen and Kristina Saarinen
- *Energy*: Stijn Dellaert, Stephan Poupa, Dirk Wever and Katrina Young
- *Transport*: Melanie Hobson, Matina Kastori, Yvonne Pang, and Giannis Papadimitriou
- *IPPU*: Rianne Dröge, Laetitia Nicco, Maria Purzner, and Robert Stewart
- *Agriculture*: Michael Anderl, Bernard Hyde, Mette Mikkelsen and Beatriz Sánchez
- *Waste*: Céline Gueguen and Elisabeth Kampel.

12. The desk review and centralised review were coordinated by the project team (Markus Amman, Sabine Schindlbacher, Chris Dore and Emma Salisbury).

13. The EEA Review Secretariat consisting of Federico Antognazza, Anke Lükewille and Kirsten May supported the third phase of the technical review of Member States' NECD inventories.

14. The review was performed on the basis of NECD emission data officially reported by Germany by 15 February 2019 and the Informative Inventory Report (IIR) reported by 15 March 2019 under the revised NEC Directive. Resubmissions and other additional information provided by Member States during the review were taken into account until 30 April 2019.

15. 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.

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

IV. Findings and Conclusions from the Technical Expert Review Team for the follow-up to the 2017 and 2018 in-depth EU review for SO_2, NO_X, $PM_{2.5}$, NMVOC and NH_3

17. The technical expert review team assessed the implementation of all recommendations, technical corrections and revised estimates from the NECD Review 2018. This assessment was based on the emission inventory submitted under the NECD in 2019 by Germany pursuant to (Directive (EU) 2016/2284) and their review report from the NECD Review 2018.

18. Resubmissions and other additional information provided by Member States during the review were taken into account until 30 April 2019.

19. Table 2 summarises the conclusions of the technical expert review team in relation to the recommendations from the NECD Review 2018 that have not been implemented. Table 3 summarises the additional recommendations made during the NECD Review 2019 for NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$.

20. The technical expert review team noted that Germany correctly implemented 44% of the NECD Review 2018 recommendations. Member States have fully implemented between 15% and 100% of the NECD Review 2018 recommendations. The technical expert review team recommends that Germany implements all remaining recommendations by the 2020 submission. The technical expert review team flags that:

- For 5 recommendations this is the third year these recommendations have been made
- For 0 recommendations this is the second year these recommendations have been made.

21. The technical expert review team noted that Germany did not have any technical corrections or revised estimates from the NECD Review 2018.

22. The technical expert review team assessment for the follow-up to the 2017 and 2018 in-depth EU review for SO_2, NO_X, $PM_{2.5}$, NMVOC and NH_3 resulted in Germany having:

- 0 technical corrections (with Member States having between 0 and 3 technical corrections)
- 0 revised estimates (with Member States having between 0 and 2 revised estimates)
- 0 potential technical corrections (with Member States having between 0 and 4 potential technical corrections)
- 5 other recommendations (with Member States having between 0 and 30 other recommendations).

23. In addition to the follow-up to the 2017 and 2018 in-depth EU review for SO_2, NO_X, $PM_{2.5}$, NMVOC and NH_3, the technical expert review team assessment resulted in Germany having:

- 0 technical corrections (with Member States having between 0 and 2 technical corrections)
- 0 revised estimates (with Member States having between 0 and 2 revised estimates)
- 0 potential technical corrections (with Member States having between 0 and 3 potential technical corrections)
- 3 other recommendations (with Member States having between 2 and 28 other recommendations).

24. The technical expert review team noted that the inventory is of good quality in terms of completeness, comparability, consistency and transparency, and that the accuracy is excellent. The ERT also noted that some minor emissions are missing (transport).

25. The technical expert review team considers that it received responses from Germany that were sufficient in order to undertake the follow-up to the 2017/2018 in-depth EU review.

Table 2: Recommendations from the NECD Review 2018 for NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ that have not been implemented in the inventory submission 2019

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE or TC in 2018	RE, TC or PTC in 2019	Tier 1 used for Key Category
2017 (3)	DE-1A1-2017-0001	No	1A1 Energy Production, NH_3, 2005-2017	No	No	No
Recommendation made in previous review report For category 1A1, 1A2, 1A4, pollutant NH_3, all years, the TERT noted that there is a lack of transparency regarding the emission factors and a potential under-estimate of emissions due to emission factors significantly lower than the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Germany explained the development of the country specific emission factor and justification of the values over the defaults. The TERT recommends that Germany includes a summary of the explanatory information provided of the emission factor in their 2019 submission, even if the emission factor itself is not included.						
Assessment of Implementation For categories 1A1 Energy Industries, 1A2 Manufacturing Industries and Construction, 1A4 Small Combustion, pollutant NH_3 and all years, the TERT noted that there is a lack of transparency regarding the emission factors and a potential under-estimate of emissions due to emission factors being significantly lower than those presented in the 2016 EMEP/EEA Guidebook. This was raised in the 2017 and 2018 NECD reviews. In response to a question raised during the 2018 review, Germany explained the development of the country specific emission factor and justification of the values over the defaults. In response to a question raised during the 2019 review, Germany explained that it is planned to publish an additional comprehensive documentation on NO_X, SO_2, PM, TSP, CO, Hg and NH_3 which will be implemented as a link in the IIR. **The TERT recommends that Germany includes a short description of the report in the IIR and a link to the compendium for increased transparency 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 or TC in 2018	RE, TC or PTC in 2019	Tier 1 used for Key Category
2017 (3)	DE-1A1a-2017-0003	No	1A1a Public Electricity and Heat Production, SO_2, NO_X, NH_3, $PM_{2.5}$, 2005, 2010	No	No	No
Recommendation made in previous review report For category 1A1a and pollutants SO_X, NO_X, $PM_{2.5}$, years 2005 and 2010, the TERT noted that there was a potential over-estimation of emissions, in relation to DE-1A1a-2017-0003 from the 2017 NECD Review, due to a revision of biogas data. In response to a question raised during the review, Germany explained that a project is ongoing, and expect to be able to implement the updates in the 2020 submission. The TERT notes that the potential over-estimation is below the threshold of significance for a technical correction. The TERT recommends that Germany update the emissions based on the revised biogas data from the working group on renewable energy statistics for the 2020 submission, transparently documenting the changes, or else provide an update on the revision and when implementation is planned.						

Assessment of Implementation

For category 1A1a Public Electricity and Heat Production and pollutants SO_X, NO_X, $PM_{2.5}$, years 2005 and 2010, the TERT noted that there was a potential over-estimation of emissions, in relation to DE-1A1a-2017-0003 from the 2017 NECD Review, due to a revision of biogas data. This was raised during the 2017 and 2018 NECD reviews. In response to a question raised during the 2019 review, Germany explained final data on biogas is available now from the working group on renewable energy balance and will be implemented in next submission. The TERT notes that the potential over-estimation is below the threshold of significance for a technical correction.

The TERT recommends that Germany update the emissions based on the revised biogas data from the working group on renewable energy statistics for the next submission, transparently documenting the changes.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE or TC in 2018	RE, TC or PTC in 2019	Tier 1 used for Key Category
2017 (3)	DE-2B3-2017-0001	No	2B3 Adipic Acid Production, NO_X, 1990-2017	No	No	No

Recommendation made in previous review report

The TERT reiterates recommendation DE-2B3-2017-0001 from the 2017 NECD Review that Germany includes NO_X emissions from 2.B.3 Adipic Acid Production emissions in the next submission, preferably by using a country specific method to account for the specific technologies and abatement equipment applied. During the 2018 NECD Review, Germany confirmed that the recommendation would be addressed for the 2019 submission.

Assessment of Implementation

For category 2B3 Adipic Acid Production and NO_X for all years the TERT noted that NO_X emissions are not reported. This was raised during the 2017 and 2018 NECD reviews. In response to a question raised during the review Germany reiterated difficulty in obtaining data but that it is committed to resolve the issue in time for the 2020 submission. The TERT noted that the issue is likely below the threshold of significance for a technical correction.

The TERT recommends that Germany seeks to resolve this issue and provide this data with documentation in the 2020 submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE or TC in 2018	RE, TC or PTC in 2019	Tier 1 used for Key Category
2017 (3)	DE-2B6-2017-0001	No	2B6 Titanium Dioxide Production, NO_X, CO, TSP, 1990-2017	No	No	No

Recommendation made in previous review report

The TERT reiterates recommendation DE-2B6-2017-0001 from the 2017 NECD Review. The TERT recommends that Germany includes the emissions in the next submission. During the 2018 NECD Review, Germany confirmed that it expects to be able to address the recommendation in its next submission.

Assessment of Implementation

For category 2B6 Titanium Dioxide Production, pollutants NO_X, CO and TSP for 1990-2017 the TERT noted that improvement work was expected to be completed for the 2019 submission. This was raised during the 2017 and 2018 NECD reviews. In response to a question raised during the 2019 review Germany indicated that related text in the IIR will be updated and that Germany is in direct contact with the producer to collect the data needed to implement emission estimates. The TERT noted that the issue is likely below the threshold of significance for a technical correction.

The TERT recommends that Germany includes the emissions with documentation in the next submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE or TC in 2018	RE, TC or PTC in 2019	Tier 1 used for Key Category

2017 (3)	DE-5A-2017-0001	No	5A Biological Treatment of Waste - Solid Waste Disposal on Land, NMVOC, $PM_{2.5}$, 2005;2010;2015	No	No	No

Recommendation made in previous review report

The 2017 review report recommended that Germany include an estimation of emissions for NMVOC and $PM_{2.5}$ emissions from category 5A for the full time series in its next submission (recommendation DE-5A-2017-0001). The TERT noted that, in the 2018 submission, emissions are not reported although default EFs are provided in the 2016 EMEP/EEA Guidebook. In 2017 Germany provided sufficient evidence to show that NMVOC and $PM_{2.5}$ are below the threshold of significance. In response to a question, Germany indicated that NMVOC and $PM_{2.5}$ emissions will be added during the following submissions. The TERT recommends that Germany include these emissions its next submission.

Assessment of Implementation

The 2017 review report recommended that Germany include an estimation of emissions for NMVOC and $PM_{2.5}$ emissions from category 5A Biological Treatment of Waste - Solid Waste Disposal on Land for the full time series in its next submission. The TERT noted that, in the 2018 and 2019 submission, emissions are not reported although default EFs are provided in the 2016 EMEP/EEA Guidebook. In 2017 Germany provided sufficient evidence to show that NMVOC and $PM_{2.5}$ emissions are below the threshold of significance for a technical correction. In response to a question raised during the 2019 review, Germany indicated that NMVOC and $PM_{2.5}$ emissions will be added during the following submissions.

In order to increase the completeness and the comparability of the inventory, the TERT recommends that Germany includes NMVOC and $PM_{2.5}$ emissions from category 5A Waste Disposal on Land its next submission.

Table 3: Additional recommendations made during the NECD Review 2019 for NO_x, NMVOC, SO_2, NH_3, $PM_{2.5}$

Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-1A4bii-2019-0001	No	1A4bii Residential: Household and Gardening (Mobile), NO_x, NH_3, NMVOC, $PM_{2.5}$, SO_2, 2009	No	No
Recommendation For category 1A4bii Residential: Household and Gardening (Mobile) and all pollutants, the TERT noted that the amount of fuel consumed fluctuates significantly from year to year. For example, between 2008 and 2009, fuel consumption increases by more than 50%. In response to a question raised during the review, Germany explained that the activity data is derived from national statistics by excluding the known amounts for large sources such as road transport and then allocating the remainder to sectors such as this. This leads to large fluctuations from year to year in the estimated amount of fuel consumed. **The TERT agreed with the explanation provided by Germany but recommends that improvements are made to the way activity data is calculated for small sources like this and that this issue is added to Germany's improvement plan along with a timescale for implementation and presented in the 2020 IIR.**				
Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-3B-2019-0001	Yes	3B Manure Management, NMVOC, 2005, 2010, 2015, 2016, 2017	No	Yes
Recommendation For category 3B Manure Management, NMVOC emissions and years 2005, 2010, 2015, 1016 and 2017 the TERT noted that emissions are estimated using a Tier 1 methodology, while NFR 3B1a Dairy Cattle and NFR 3B1b Non-Dairy Cattle are key categories. In response to a question raised during the review, Germany explained that a Tier 2 approach will be used to estimate NMVOC emissions from dairy cattle and non-dairy cattle for the Submission 2020. **The TERT recommends that Germany applies a Tier 2 approach for these categories for the next submission.**				
Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-5D2-2019-0001	No	5D2 Industrial Wastewater Handling, NMVOC, 1990-2017	No	No
Recommendation For NMVOC emissions from category 5D2 Industrial Wastewater Handling the TERT notes that 'NA' is reported although an EF is proposed in the 2016 EMEP/EEA Guidebook for wastewater handling. In response to a question raised during the review Germany indicated that it will review its previous technical assessment that NMVOC emissions have no relevance in industrial wastewater, due to the low relevance of potential emissions. However, Germany planned to conduct an assessment up until the next submission and the results will be reported in the next IIR. The TERT noted that the issue is below the threshold of significance for a technical correction. **In order to increase the completeness and comparability of the inventory, the TERT recommends that Germany includes NMVOC emissions from NFR 5D2 Industrial Wastewater Handling in its next submission.**				

V. Findings and Conclusions from the Technical Expert Review Team for the second phase of the in-depth review of national emission inventories of POPs and heavy metals to be reviewed

26. The technical expert review team checked the national inventory submitted under the NECD in 2019 by Germany pursuant to (Directive (EU) 2016/2284). The technical expert review team assessed the implementation of all recommendations from the NECD Review 2018 in the 2019 emission inventory and their review report from the NECD Review 2018.

27. Resubmissions and other additional information provided by Member States during the review were taken into account until 30 April 2019.

28. Table 4 summarises the conclusions of the technical expert review team in relation to the recommendations from the NECD Review 2018 that have not been implemented. Table 5 summarises the additional recommendations made during the NECD Review 2019 for POPs and heavy metals.

29. The technical expert review team carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the HMs and POPs inventory. The focus was on the years 1990, 2005, 2016 and 2017.

30. The technical expert review team noted that Germany correctly implemented 50% of the NECD Review 2018 recommendations. Member States have fully implemented between 20% and 100% of the NECD Review 2018 recommendations. The technical expert review team recommends that Germany implements all remaining recommendations by the 2020 submission. The technical expert review team flags that for 5 recommendations this is the second year these recommendations have been made.

31. The technical expert review team assessment for the second phase of the in-depth review of national emission inventories of POPs and heavy metals resulted in Germany having:

- 0 technical corrections (with Member States having between 0 and 3 technical corrections)
- 0 revised estimates (with Member States having between 0 and 5 revised estimates)
- 0 potential technical corrections (with Member States having between 0 and 2 potential technical corrections)
- 13 other recommendations (with Member States having between 2 and 37 other recommendations).

32. The technical expert review team noted that the transparency, completeness, comparability, consistency and accuracy of the inventory are good, while some minor emissions are missing (waste).

33. The technical expert review team considers that it received responses from Germany that were sufficient to undertake the second phase of the in-depth review of national emission inventories of POPs and heavy metals appropriately.

Table 4: Recommendations from the NECD Review 2018 of POPs and heavy metals that have not been implemented in the inventory submission 2019

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
2018 (2)	DE-1A4cii-2018-0001	No	1A4cii Agriculture/Forestry/Fishing: Off-Road Vehicles and Other Machinery, Cd, 2007-2017	No	No
Recommendation made in previous review report For category 1A4cii Agriculture/ Forestry/ Fishing: Off-road vehicles and Other Machinery and Cd emissions the TERT noted an erratic trend in IEF since 2007. In response to a question raised during the review, Germany explained that this is strongly influenced by the trend in gasoline consumption for which the EF are higher than for diesel consumption, but it was also aware of an issue in the primary activity data for gasoline consumption as provided in the National Energy Balance, showing a remarkable decrease in 2012 and an increase in 2015. Germany is checking this most likely faulty trend in gasoline consumption for NFR 1A4cii with the NEB provider and expects corrected activity data and emissions to be provided in the next annual submission. The TERT notes that this issue does not relate to an over or under-estimate and recommends that this issue on the trend in primary activity data for gasoline consumption for NFR 1A4cii is resolved with the national energy statistics for correcting in the next submission. The TERT also notes that whilst the activity data provided for liquid fuels and biomass provided in the NFR tables are consistent with the figures shown in the wiki IIR for NFR 1A4cii as a whole, the NFR figures for liquid fuels are not consistent with the sum of the liquid fuels data shown in the individual tables for agricultural machinery and forestry machinery separately. The same is the case in the figures for biomass (sum of figures in tables for agriculture plus forestry not being the same as figures shown in table for agriculture & forestry combined). The TERT recommends that this minor inconsistency in the IIR tables is resolved for the next submission.					
Assessment of Implementation For category 1A4cii Agriculture/ Forestry/ Fishing: Off-Road Vehicles and Other Machinery and for Cd emissions the TERT noted an erratic trend in IEF since 2007. In response to a question raised during the review, Germany explained that this is strongly influenced by the trend in gasoline consumption for which the EFs are higher than for diesel consumption, but it was also aware of an issue in the primary activity data for gasoline consumption as provided in the National Energy Balance, showing a remarkable decrease in 2012 and an increase in 2015. Germany is checking this most likely faulty trend in gasoline consumption for NFR 1A4cii with the NEB provider and expects corrected activity data and emissions to be provided in the next annual submission. The TERT notes that this issue does not relate to an over- or under-estimate and recommends that this issue on the trend in primary activity data for gasoline consumption for NFR 1A4cii is resolved with the national energy statistics for correcting in the next submission. The TERT also notes that whilst the activity data for liquid fuels and biomass provided in the NFR tables are consistent with the figures shown in the wiki IIR for NFR 1A4cii as a whole, the NFR figures for liquid fuels are not consistent with the sum of the liquid fuels data shown in the individual tables for agricultural machinery and forestry machinery separately. The same is the case in the figures for biomass (sum of figures in tables for agriculture plus forestry not the same as figures shown in table for agriculture & forestry combined). **The TERT recommends that this minor inconsistency in the IIR tables is resolved for the next submission. The 2019 review found that no consideration of this recommendation could be found in the IIR and the IEFs still look highly variable. The TERT recommends that the Cd emissions and activity data are revised for this source in the 2020 submission if appropriate and that an explanation for the change is provided 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 PTC in 2019	Tier 1 used for Key Category
2018 (2)	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

Recommendation made in previous review report

For category 1A4ciii Agriculture/ Forestry/ Fishing: National Fishing, the TERT noted a large increase in activity data from 2015 to 2016 when in all previous years the activities had shown a steady slow downward trend. This observation was noted in the German IIR, and in response to a question raised during the review, Germany stated that the fuel consumption in national maritime fishery has been estimated based mainly on Automatic Identification System and fleet data within the BSH model maintained at the Federal Maritime and Hydrographic Agency (Bundesamt für Seeschifffahrt und Hydrographie), but the large increase cannot be explained. Germany stated that this will be looked at in advance of the next submission. The TERT notes that this issue does not relate to an over or under-estimate and recommends that this unexpected trend in AD between 2015 and 2016 is investigated for the next submission.

Assessment of Implementation

For category 1A4ciii Agriculture/ Forestry/ Fishing: National Fishing, the TERT noted a large increase in activity data from 2015 to 2016 when in all previous years the activities had shown a steady slow downward trend. This observation was noted in the German IIR, and in response to a question raised during the review, Germany stated that the fuel consumption in national maritime fishery has been estimated based mainly on Automatic Identification System and fleet data within the BSH model maintained at the Federal Maritime and Hydrographic Agency (Bundesamt für Seeschifffahrt und Hydrographie), but the large increase cannot be explained. Germany stated that this will be looked at in advance of the next submission. The TERT notes that this issue does not relate to an over- or under-estimate and recommends that this unexpected trend in AD between 2015 and 2016 is investigated for the next submission. The 2019 review has noted the sharp increase in activity data still remains and similar text is provided in the IIR explaining the situation.

The TERT recommends that this issue is resolved in time for the 2020 submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
2018 (2)	DE-2C1-2018-0001	No	2C1 Iron and Steel Production, HCB, 1990, 2005, 2016	No	No

Recommendation made in previous review report

The TERT notes for category 2C1 Iron and Steel Production, for HCB emissions and years 1990, 2005 and 2016 there may be an under-estimate of emissions since the notation key 'NA' is reported while there is an activity occurring and a method and EF exist in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review Germany explained that the EF in the 2016 EMEP/EEA Guidebook was not appropriate and that no other measurement data were available. Germany indicated that it will consider measurements-based estimates but that these can be expected no earlier than for the submission in 2020. For the next submission, Germany will consider changing the notation key from 'NA' to 'NE'. The TERT recommends that Germany update its notation key and considers the development of measurement-based estimates for future submissions.

Assessment of Implementation

For category 2C1 Iron and Steel Production, for HCB, and years 1990, 2005 and 2016 the TERT notes that there may be an under-estimate of emissions since the notation key 'NA' is reported while there is an activity occurring and a method and EF exist in the 2016 EMEP/EEA Guidebook. This was raised during the 2018 NECD review. In response to a question raised during the 2019 review, Germany accepted the notation key error and indicated that there was work underway to develop an emission estimate.

The TERT recommends that Germany addresses this issue in time for the next submissions and includes the emissions into the 2020 submission.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
2018 (2)	DE-2D3a-2018-0001	No	2D3a Domestic Solvent Use Including Fungicides, Hg, 1990-2017	No	No

Recommendation made in previous review report

Following a question during the review, Germany provided an explanation of its rationale for not estimating emissions from category 2D3a. Germany indicated that it will consider changing the notation key from 'NA' to 'NE'. Germany also highlighted that fluorescent tubes can still contain mercury and could therefore lead to mercury emissions. They noted that a project is planned for the next year for data acquisition of actual fluorescent tubes quantities and that they will try to use that data to estimate mercury emissions and implement the results in the submission 2020. The TERT recommends that Germany provides this clarification in its IIR and works towards estimating any relevant emissions for its 2020 submission.

Assessment of Implementation

For NFR 2D3a Domestic Solvent Use Including Fungicides and pollutant Hg (release from fluorescent tubes) the TERT notes that the emissions are reported as 'NA'. This review is undertaken against the 2016 EMEP/EEA Guidebook which includes an EF for Hg. However, the TERT is aware that this EF will not be included in the 2019 version of the Guidebook, and therefore it is not currently sensible to add this source.

The TERT recommends that Germany review their inventory against the 2019 version of the Guidebook and update it, if necessary, before their next submission. Please also see DE-2D3a-2019-0001 on same subject.

Review year of initial recommendation (number of years it has been recommended)	Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
2018 (2)	DE-2D3g-2018-0001	Yes	2D3g Chemical Products, PAHs, 1990-2017	No	No

Recommendation made in previous review report

The TERT notes that Germany reported “NA” for PAHs, from category 2D3g Chemical products, for 1990, 2005, 2016. The TERT also notes that there exists a Tier 2 method and EF in the 2016 EMEP/EEA Guidebook (Tables 3-9 and 3-10 of 2.d.3.g Chemical products), for the PAH species benzo(a)pyrene. The TERT noted that at the moment, the EF given in this table is wrong, but it will be replaced with a correct EF in the 2019 EMEP/EEA Guidebook. The TERT recommends Germany to collect AD for this emission source and to calculate PAHs emissions and to document the methodology as soon as the corrected EF becomes available.

Assessment of Implementation

The TERT notes that for PAHs from category 2D3g Chemical Products and years 1990-2017 Germany reports 'NA' and that there may be an under-estimate of emissions. The TERT notes that this review is undertaken against the 2016 EMEP/EEA Guidebook which includes an EF for benzo(a)pyrene from NFR 2D3g. However, the TERT is aware that this EF will be updated in the 2019 version of the Guidebook.

The TERT thus recommends that Germany review their inventory against the 2019 version of the Guidebook and update the benzo(a)pyrene emissions in NFR 2D3g before their next submission (based on the 2019 version of the Guidebook).

Table 5: Additional recommendations made during the NECD Review 2019 for POPs and heavy metals

Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-1A2a-2019-0001	No	1A2a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel, Cd, Pb, 1990, 2005, 2016, 2017	No	No
Recommendation For category 1A2a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel for pollutants Cd (1990, 2005, 2016, 2017) and Pb (2005, 2016, 2017) the TERT noted that the notation key 'NE' (not estimated) is used whilst a Tier 1 method is available in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Germany explained that the heavy metal emission factors used for emissions calculation are based on real stack emission data from individual plants. As combustion and process emissions are emitted via the same stacks it is not possible to distinguish them. Hence wherever plant-based EFs were available, which is the case for Cd and Pb, all emissions are reported under NFR 2.C.1. Germany acknowledged that the notation key should be corrected to 'IE'. **The TERT recommends that Germany correct the notation key to 'IE' and transparently document this in the 2020 submission.**				
Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-1A2b-2019-0002	No	1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals, Cd, Pb, PCDD/F, 1990, 2005, 2016, 2017	No	No
Recommendation For category 1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals for pollutants Cd (1990, 2005), Pb (2005, 2016, 2017) and PCDD/F (2016-2017) the TERT noted that the notation key 'NE' (not estimated) is used whilst a Tier 1 method is available in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Germany explained that through research projects it was determined that these emissions from processes and emissions from energy supply cannot be separated. It was decided for that research project to assign all emissions primarily to the process and to indicate with the notation key 'IE' in the NFR 1A2b that the emissions of the energy supply are included in the process data. Germany acknowledged that this was not done and stated that they will correct the notation key in the future. **The TERT recommends that Germany correct the notation key to 'IE' and transparently document this in the 2020 submission.**				
Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-1A2b-2019-0001	No	1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals, HCB, 1990	No	No
Recommendation For category 1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals for the year 1990 and pollutant HCB the TERT noted that the notation key 'NA' (not applicable) is used whilst a Tier 1 method is available in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Germany explained that the two Tier 1 HCB EFs in the Guidebook do not represent the real national circumstances and would not be suitable to use in the inventory. **The TERT agrees with Germany and recommends that Germany develops national methods to estimate emissions and reports the emissions and documents the methods transparently or provides a plan with a timeline to include these emissions in the next submission.**				
Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category

DE-1A3b-2019-0001	No	1A3b Road Transport, PCBs, 2000-2017	No	No

Recommendation

For category 1A3b Road Transport, for PCB emissions and all years, the TERT noted that PCB emissions were not estimated for any years for the road transport sector while an emission factor is provided in the Guidebook. In response to a question raised during the review, Germany provided revised estimates and showed that the issue was below the threshold of significance for a technical correction. The TERT agreed with Germany's findings.

The TERT recommends that Germany include PCB emission estimates from road transport with documentation in their 2020 submission.

Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-1A3c-2019-0001	No	1A3ai Aviation (LTO), PCBs, HCB, 2000-2017	No	No

Recommendation

For category 1A3ai Aviation LTO, for PCB and HCB emissions and all years, the TERT noted that the notation key 'NE' had been used while the 2016 EMEP / EEA Guidebook reports this as 'NA'. In response to a question raised during the review, Germany agreed that the notation key 'NA' should be used and that this will be amended in the next submission.

The TERT recommends that Germany use the notation key 'NA' for HCB and PCB emissions from NFRs 1A3aii(i) Aviation - Domestic LTO and 1A3ai(i) International Aviation LTO in their 2020 submission.

Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-1A4ai-2019-0001	Yes	1A4ai Commercial/Institutional: Stationary, PAHs, PCDD/F, 2005, 2016, 2017	No	No

Recommendation

For category 1A4ai Commercial/Institutional: Stationary for pollutants PAHs (2005) and PCDD/F (2016, 2017) the TERT noted that the implied emission factor (IEF) ratios of the pollutants when compared to PM_{10} are outliers (at a 95% confidence interval) when compared to other Member States. In response to a question raised during the 2019 review, Germany explained the reasons behind low PM emission factors. The TERT agrees that this explains Germany's high IEF ratios compared to other countries.

The TERT recommends that Germany include this transparency information in the next IIR regarding the low PM emission factors in NFR 1A4ai due to German regulation of small combustion plants.

Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category
DE-2D3a-2019-0001	No	2D3a Domestic Solvent Use Including Fungicides, Hg, 2017	No	No

Recommendation

For NFR 2D3a Domestic Solvent Use Including Fungicides and pollutant Hg (release from fluorescent tubes) the TERT notes that emissions are not estimated. This review is undertaken against the 2016 EMEP/EEA Guidebook which includes an EF for Hg. However, the TERT is aware that this EF will not be included in the 2019 version of the Guidebook, and therefore it is not currently sensible to add this source.

The TERT recommends that Germany review their inventory against the 2019 version of the Guidebook and update it, if necessary, before their next submission.

Observation	Key Category	NFR, Pollutant(s), Year(s)	RE, TC or PTC in 2019	Tier 1 used for Key Category

DE-5C2-2019-0001	No	5C2 Open Burning of Waste, PCDD/F, Pb, Cd, 2005, 2016, 2017	No	No

Recommendation

For PCDD-F, Pb and Cd emissions from category 5C2 Open Burning the TERT noted that emissions are reported as 'NE' although default EFs are proposed in the 2016 EMEP/EEA Guidebook and that emissions from other pollutants are estimated using country specific EFs. In response to a question raised during the review Germany provided evidence that the impact is below the threshold of significance for a technical correction. Germany also indicated that the estimate will be implemented in the 2020 submission.

The TERT recommends that Germany include estimates of PCDD-F, Pb and Cd emissions from 5C2 Open Burning in its next submission.

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

34. The tables below show the direct changes in response to the NECD Review 2019. 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 144, Annex I).

Table 6: National totals as reported and national totals including revised estimates (RE), technical corrections (TC) and adjustments for NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ [6]

Description	Reference	Pollutant estimates (kt)				
		2005	2010	2015	2016	2017
NO_X						
National total (row 141)	Annex I, 12/03/2019	1584.081	1356.144	1249.634	1223.916	1187.502
National Total for Compliance (row 144)		1464.968	1068.240	968.212	972.722	968.031
Adjustment provided by Germany and recommended to be accepted by the TERT						
1A3b Road transport	DE-1A3b-2018-0002	0	-172.332	-148.783	-123.270	-93.679
3B Manure management, 3D Crop production and agricultural soils, and 3I Agriculture other	DE-3B-2018-0002	0	-115.572	-132.638	-127.924	-125.792
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		1584.081	1356.144	1249.634	1223.916	1187.502
National Total for Compliance (row 144) 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)		1464.968	1068.240	968.212	972.722	968.031
Description	**Reference**	**Pollutant estimates (kt)**				
		2005	**2010**	**2015**	**2016**	**2017**
NMVOC						
National total (row 141)	Annex I, 12/03/2019	1349.319	1257.461	1041.901	1043.145	1068.758
National Total for Compliance (row 144)		1146.211	1056.234	834.937	839.008	866.351
Adjustment provided by Germany and recommended to be accepted by the TERT						
3B Manure management and 3D Crop production and agricultural soils	DE-3B-2018-0003	0	-201.227	-206.964	-204.137	-202.407

[6] 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.

National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		1349.319	1257.461	1041.901	1043.145	1068.758
National Total for Compliance (row 144) 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)		1146.211	1056.234	834.937	839.008	866.351
Description	**Reference**	**Pollutant estimates (kt)**				
		2005	**2010**	**2015**	**2016**	**2017**
SO_2						
National total (row 141)	Annex I, 12/03/2019	471.795	409.184	343.178	319.501	315.477
National Total for Compliance (row 144)		471.795	409.184	343.178	319.501	315.477
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		471.795	409.184	343.178	319.501	315.477
National Total for Compliance (row 144) 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)		471.795	409.184	343.178	319.501	315.477
Description	**Reference**	**Pollutant estimates (kt)**				
		2005	**2010**	**2015**	**2016**	**2017**
NH_3						
National total (row 141)	Annex I, 12/03/2019	639.565	641.322	689.199	681.079	673.251
National Total for Compliance (row 144)		628.292	601.383	628.166	620.397	611.641
Adjustment provided by Germany and recommended to be accepted by the TERT						
3B Manure management and 3I Agriculture other	DE-3D-2018-0001	0	-39.939	-61.034	-60.683	-61.609
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		639.565	641.322	689.199	681.079	673.251
National Total for Compliance (row 144) 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)		628.292	601.383	628.166	620.397	611.641
Description	**Reference**	**Pollutant estimates (kt)**				
		2005	**2010**	**2015**	**2016**	**2017**
$PM_{2.5}$						
National total (row 141)	Annex I, 12/03/2019	138.890	122.332	103.579	100.726	99.056
National Total for Compliance (row 144)		138.890	122.332	103.579	100.726	99.056

National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)	138.890	122.332	103.579	100.726	99.056
National Total for Compliance (row 144) 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)	138.890	122.332	103.579	100.726	99.056

Table 7: 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 [7]

Description	Reference	Pollutant estimates				
		Units	1990	2005	2016	2017
PCDD/ PCDF (dioxins/ furans)						
National total (row 141)	Annex I, 12/03/2019	(g I-TEQ)	805.914	150.596	118.635	118.759
National Total for Compliance (row 144)		(g I-TEQ)	805.914	150.596	118.635	118.759
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(g I-TEQ)	805.914	150.596	118.635	118.759
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(g I-TEQ)	805.914	150.596	118.635	118.759
Description	**Reference**	**Pollutant estimates**				
		Units	**1990**	**2005**	**2016**	**2017**
PAHs(total)						
National total (row 141)	Annex I, 12/03/2019	(t)	375.044	143.500	182.208	176.818
National Total for Compliance (row 144)		(t)	375.044	143.500	182.208	176.818
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(t)	375.044	143.500	182.208	176.818
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(t)	375.044	143.500	182.208	176.818
Description	**Reference**	**Pollutant estimates**				
		Units	**1990**	**2005**	**2016**	**2017**
benzo(a) pyrene						
National total (row 141)	Annex I, 12/03/2019	(t)	139.262	23.870	29.758	28.806
National Total for Compliance (row 144)		(t)	139.262	23.870	29.758	28.806
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(t)	139.262	23.870	29.758	28.806
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(t)	139.262	23.870	29.758	28.806
Description	**Reference**	**Pollutant estimates**				

[7] 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.

		Units	1990	2005	2016	2017
HCB						
National total (row 141)	Annex I, 12/03/2019	(kg)	2897.482	14.419	15.178	15.067
National Total for Compliance (row 144)		(kg)	2897.482	14.419	15.178	15.067
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(kg)	2897.482	14.419	15.178	15.067
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(kg)	2897.482	14.419	15.178	15.067
Description	**Reference**	**Pollutant estimates**				
		Units	**1990**	**2005**	**2016**	**2017**
PCBs						
National total (row 141)	Annex I, 12/03/2019	(kg)	1735.471	197.569	230.133	236.360
National Total for Compliance (row 144)		(kg)	1735.471	197.569	230.133	236.360
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(kg)	1735.471	197.569	230.133	236.360
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(kg)	1735.471	197.569	230.133	236.360
Description	**Reference**	**Pollutant estimates**				
		Units	**1990**	**2005**	**2016**	**2017**
Pb						
National total (row 141)	Annex I, 12/03/2019	(t)	2285.154	304.443	232.228	235.037
National Total for Compliance (row 144)		(t)	2285.154	304.443	232.228	235.037
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(t)	2285.154	304.443	232.228	235.037
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(t)	2285.154	304.443	232.228	235.037
Description	**Reference**	**Pollutant estimates**				
		Units	**1990**	**2005**	**2016**	**2017**
Cd						
National total (row 141)	Annex I, 12/03/2019	(t)	30.447	12.959	12.876	13.088
National Total for Compliance (row 144)		(t)	30.447	12.959	12.876	13.088
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(t)	30.447	12.959	12.876	13.088

National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(t)	30.447	12.959	12.876	13.088
Description	**Reference**	**Pollutant estimates**				
		Units	**1990**	**2005**	**2016**	**2017**
Hg						
National total (row 141)	Annex I, 12/03/2019	(t)	35.532	14.000	9.639	9.357
National Total for Compliance (row 144)		(t)	35.532	14.000	9.639	9.357
National total (row 141) including revised estimates and technical corrections accepted by Germany (calculated using data above)		(t)	35.532	14.000	9.639	9.357
National Total for Compliance (row 144) estimate including revised estimates, technical corrections accepted by Germany		(t)	35.532	14.000	9.639	9.357

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

35. Germany did not raise any issues with the calculated estimates in Table 6 and Table 7.

VIII. Findings and Conclusions from the technical expert review team for the Review of adjustment applications

36. Germany submitted 4 **adjustment applications** in 2019 that underwent review under this contract.

37. The technical expert review team concluded that the applications meet all the requirements laid out in Decision 2012/12 of the Executive Body of the CLRTAP, and therefore recommends that the European Commission **ACCEPT** these adjustment applications. Details on the review of adjustment applications are given in Annex II.

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

38. The technical expert review team did not deem it necessary to calculate any technical corrections. France did not provide the technical expert review team with any revised estimates.

39. 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 NECD Review 2018 was implemented and where no revised estimate was accepted by the technical expert review team during the review
- and for POPs and heavy metals where the suggested recommendation of the technical expert review team would change the National Total by more than 2%.

40. 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[8] and use the EMEP/EEA Inventory guidebook as a reference for methods and emission factors.

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

ANNEX II Review of 2019 Adjustment applications of Germany

Table A1 Summary of the review of the submitted adjustment applications

Source Sector	Years	Pollutant	Application type	Outcome of Adjustment Review
1A3b Road transport	2010-2017	NO_X	Previously accepted (first submitted in 2017)	**Accept**
3B Manure management 3D Crop production and agricultural soils 3I Agriculture other	2010-2017	NO_X	Previously accepted (first submitted in 2017)	**Accept**
3B Manure management 3D Crop production and agricultural soils	2010-2017	NMVOC	Previously accepted (first submitted in 2017)	**Accept**
3D Crop production and agricultural soils 3I Agriculture other	2010-2017	NH_3	Previously accepted (first submitted in 2017)	**Accept**

1 Introduction

Article 5.8 of the NECD text (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 LRTAP Convention." Article 8.4 and Part 4 of Annex IV of the NECD text 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 CLRTAP (as presented in relevant EB decisions), however (formally) without prejudice to the additional arrangements specified in Part 4 of Annex IV of the new NECD.[9] It allows inter alia the submission of additional information during the review, necessary for a proper and full assessment of the adjustment application.

2 Adjustment process

Member States may apply to adjust their inventory data or emission reduction commitments **if they are in non-compliance with their emission ceilings** established in NEC Directive 2001/81/EC (in accordance with article 21(2) of new NECD). 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 States should be informed that in accordance with the intent of the adjustment procedure, **recommendation for approval will be limited to adjustments necessary to bring 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

[9] 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).

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, the finalised 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.

3 Technical expert review team

In 2019 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 – Dirk Wever, Stephan Poupa
- Energy: Transport and off-road – Giannis Papadimitriou, Melanie Hobson, Matina Kastori, Yvonne Pang
- Industrial processes and product use – Maria Purzner
- Agriculture – Beatriz Sánchez, Bernard Hyde, Mette Mikkelsen

4 Review of adjustments approved prior to 2019

Germany had 4 adjustments granted prior to 2019, details of which can be found in Table A2. Germany included information on these adjustments in its submission under the National Emissions Ceilings Directive (Directive (EU) 2016/2284) of 15/02/2018, reporting sectoral level data in Annex VII to the reporting guidelines and in line 143 of Annex I. Germany did not submit the "Declaration on consistency" with a short summary of recalculations of these granted adjustments.

The review of previously accepted adjustment applications focuses on checking that any recalculations performed have been done so 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.

5 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 2019 for NO_X emissions from 1A3b Road transport, 3B Manure management, 3D Crop production and agricultural soils and 3I Agriculture other, NMVOC emissions from 3B Manure management, 3D Crop production and agricultural soils, NH_3 emissions from 3D Crop production and agricultural soils and 3I Agriculture other.

The review of the submitted applications followed the requirements as set out 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 A2 Recommendations following the 2019 review of adjustment applications

Source Sector	Years	Pollutant	Application type	Basis of Adjustment	Impact on National Total[10]	Recommendation
1A3b Road transport	2010-2017	NO_x	Previously accepted (first submitted in 2017)	Significantly different EFs	-7.9% in 2017	**Accept**
Conclusion text The TERT reviewed the information submitted by Germany on the previously accepted adjustment for NO_X from 1A3b. The TERT did not find it necessary to ask Germany for clarifications. The IIR indicates that there are only very minor changes from last year's submission (less than 0.1 ktonne in any year reported). Following the review of the information made available prior to 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 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	2010-2017	NO_x	Previously accepted (first submitted in 2017)	New source	-10.6% in 2017	**Accept**
Conclusion text The TERT reviewed the information submitted by Germany on the previously accepted adjustment for 3B, 3D, 3I and pollutant NO_X and years 2010-2017. The TERT did not find it necessary to ask Germany for clarifications regarding recalculations, and Germany did answer these questions satisfactorily. Following the review of the information made available prior to and during the review, the TERT concludes that the adjustment, does 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 pollutant.						
Source Sector	Years	Pollutant	Application type	Basis of Adjustment	Impact on National Total	Recommendation
3B Manure management 3D Crop production and agricultural soils	2010-2017	NMVOC	Previously accepted (first submitted in 2017)	New source	-18.9% in 2017	**Accept**
Conclusion text The TERT reviewed the information submitted by Germany on the previously accepted adjustment for NMVOC under category 3B, 3D. 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 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 these sources and pollutant.						

[10] The national total used in this calculation excludes adjustments and is based on fuel sold. The data are presented for context only, and not for compliance purposes.

Source Sector	Years	Pollutant	Application type	Basis of Adjustment	Impact on National Total	Recommendation
3D Crop production and agricultural soils 3I Agriculture other	2010-2017	NH_3	Previously accepted (first submitted in 2017)	New source and significantly different EFs	-9.2% in 2017	**Accept**

Conclusion text

For NOX and NH3 from 3D Crop production and agricultural soils and 3.I Storage of digested energy crops NH_3 emissions the TERT noted that there is a lack of transparency regarding the recalculations performed. This does not relate to an over- or under-estimate of emissions. This was raised during the 2018 NECD review. In response to a question raised during the 2019 review, Germany explained that recalculations are explained in chapter "3-Agriculture" of its IIR (https://iir-de.wikidot.com/3-agriculture) and in Rösemann et.al. (2019), Chapter 3.5.2. In addition, the statement on sewage sludge was incorrectly taken from IIR 2018 and that the sentence will be removed from the current IIR and a link will be set to the agriculture webpage. The TERT recommends that Germany include transparent information of the section of the reference document (Rösemann et.al. (2019)) where reasons for recalculations can be found and carefully check the consistency and update of the information provided in the IIR. The TERT also recommends that, at least for the main recalculations Germany includes a comparison of the previous and current values used in the estimates, the reason for and the impacts of those changes.

References and Supporting Documents

2014 Reporting Guidelines (ECE/EB.AIR/125) for Estimating and Reporting Emission Data under CLRTAP
http://www.ceip.at/ms/ceip_home1/ceip_home/reporting_instructions/

Annex I emission reporting template
http://www.ceip.at/ms/ceip_home1/ceip_home/reporting_instructions/

Decision 2012/3 (ECE/EB.AIR/111/Add.1): Adjustments under the Gothenburg Protocol to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://www.unece.org/fileadmin/DAM/env/documents/2013/air/eb/ECE.EB.AIR.114_ENG.pdf

Decision 2012/12 (ECE/EB.AIR/113/Add.1): Guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://www.unece.org/fileadmin/DAM/env/documents/2012/EB/ECE_EB.AIR_113_Add.1_ENG_1_.pdf

Decision 2014/1 (ECE/EB.Air/127/Add.1) Improving the guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them
https://www.unece.org/fileadmin/DAM/env/documents/2014/AIR/EB/Decision_2014_1.pdf

ECE/EB.AIR/130: Technical Guidance for Parties Making Adjustment Applications and for the Expert Review of Adjustment Applications, 14 April 2015
http://www.ceip.at/fileadmin/inhalte/emep/Adjustments/ECE_EB_AIR_130_AV_for_the_web.pdf

EEA 2019. NEC Directive reporting status 2019. European Environment Agency, Copenhagen.
https://www.eea.europa.eu/themes/air/national-emission-ceilings/nec-directive-reporting-status-2019

EMEP/EEA, 2016 EMEP/EEA air pollutant emission inventory guidebook - 2016 EEA technical report No. 21/2016 European Environment Agency, Copenhagen
http://www.eea.europa.eu//publications/emep-eea-guidebook-2016

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http://ec.europa.eu/environment/air/pdf/Air%20Emission%20Inventory%20Review%20Guidelines_v1.pdf

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