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Report for the Stage 3 *ad-hoc* review of emission inventories submitted under the UNECE LRTAP Convention:

2024

GERMANY

FINAL REPORT

Contents

INTRODUCTION

1. The mandate and overall objectives for the emission inventory review process under the LRTAP Convention is given by the UNECE document 'Updated methods and procedures for the technical reviews of air pollutant emission inventories reported under the Convention'(1) – hereafter referred to as the 'Review Guidelines 2018'.

2. Paragraph 6 of the 'Review Guidelines 2018' specifies that submissions consist of both quantitative and qualitative information. Quantitative data should be reported using the EMEP reporting templates and in line with the Convention's Emissions and Projections Reporting Guidelines2 (hereafter referred to as the 'Reporting Guidelines 2023') and qualitative data, including methodologies used in calculating emissions, should be included in informative inventory reports (IIR) in line with the 'Reporting Guidelines 2023'.

3. Paragraph 7 (c) of the 'Review Guidelines 2018' defines that Stage 3 Reviews may be annual centralized reviews or ad hoc reviews. Paragraph 18 of the 'Review Guidelines 2018' further specifies that such ad hoc reviews could, for instance, focus on specific source sectors, specific pollutants such as heavy metals or persistent organic pollutants, gridded and projections data, or on other areas as requested by the Implementation Committee and that where appropriate, ad hoc reviews could be conducted in line with the present Methods and Procedures for the In-depth (Stage 3) review.

4. At its ninth joint session in September 2023, the Steering Body and the Working Group on Effects approved the plan that the in-depth review in 2024 focuses on review of the sector, the 'industrial processes and product use – solvents' with a special emphasis on NMVOC emissions; including gridded data. While the focus was set on NMVOC emissions, also all other pollutants covered by Air Convention and its protocols (i.e. SO_2, NO_x, NMVOC, NH_3, PM_{10}, $PM_{2.5}$, BC, priority HMs and POPS) have been checked for the time series years 1990 – 2022 to the extent possible. For these other pollutants especially completeness of reporting was assessed.

5. This report covers the results of the Stage 3 Review (ad hoc review) 2024 of Germany´s air emission inventory submitted under the UNECE LRTAP Convention. The review was coordinated by the EMEP Centre on Emission Inventories and Projections (CEIP) acting as Review Secretariat. The review took place between April

[1] Decision 2018/1 adopted by EB: *Updated methods and procedures for the technical review of air pollutant emission Inventories reported under the Convention*. ECE/EB.AIR/142/Add.1 http://www.unece.org/fileadmin/DAM/env/documents/2002/eb/air/EB%20Decisions/Decision_2018_1.pdf

[2] At its 42nd session (Geneva, 12-16 December 2022), the Executive Body for the Air Convention adopted the 2023 Reporting Guidelines for reporting emissions and projections data under the Convention (see EB Decision 2022/1). The Guidelines are available under: https://www.ceip.at/reporting-instructions

and June 2024 and was performed as a desk review between 15 April to 10 May 2024 and an in-person meeting between 3 and 7 June 2024 (centralized review).

6. The following team of nominated experts from the Roster of Experts performed the review.

‘Industrial processes and product use – solvents’ experts:

Mr. Lasha AKHALAIA (Georgia)

Ms. Elena CUZNETOV (Republic of Moldova)

Ms. Laureta DIBRA (Albania)

Ms. Ivana DUKIC (Serbia)

Mr. Roman DUMOULIN (Belgium)

Mr. Tommi FORSBERG (Finland)

Mr. Erik HONIG (the Netherlands)

Ms. Aleksandra NESTOROVSKA-KRSTESKA (North Macedonia)

Ms. Stella OHANYAN (Armenia)

Ms. Andjelka RADOSAVLJEVIC (Serbia)

Mr. Ben RICHMOND (United Kingdom)

Ms. Manuela WIESER (Austria)

Mr. Damian ZASINA (Poland)

Experts for gridded emission data:

Ms. Christine BRENDLE (Austria)

Mr. Christopher EVANGELIDES (United Kingdom)

Mr. Christian MIELKE (Germany)

Ms. Nadine ALLEMAND (France), Ms. Susana LOPEZ-APARICIO (EU/ETC(EEA)), Ms. Mirela POLJANAC (Croatia), Mr. Julien JABOT (Norway) were the lead reviewers. The review was coordinated by Ms. Sabine Schindlbacher, Mr. Oscar Redeyoff and Mr. Bernhard Ullrich (EMEP Centre on Emission Inventories and Projections - CEIP).

7. The review was based on air emission data and the Informative Inventory Report (IIR) officially submitted by Germany under the Air Convention in 2024.

8. The EMEP/EEA Guidebook 2019 and 2023[3][4] were used as a base for the review.

9. The emission inventory of Germany was received on 14 February 2024 and thus before the 15 February deadline. The Informative Inventory Report was received on 15 March 2024 and thus by the 15 March deadline. Germany did not provide resubmissions of the emission inventory and the IIR, respectively, and no resubmissions were considered for the review.

PART A: GENERAL RECOMMENDATIONS FOR THE CHAPTER INDUSTRIAL PROCESSES AND PRODUCT USE – SOLVENTS

10. The ERT acknowledges the level of effort made by Germany in providing an inventory with a significant level of detail.

11. The IIR does not describe the methods used for the sector 'industrial processes and product use – solvents' transparently enough. The ERT considers the 'industrial processes and product use – solvents' part of the inventory submission to be of very good quality in terms of completeness, accuracy and comparability, and adequate quality in terms of consistency.

12. To improve the overall quality of reporting in the 'industrial processes and product use – solvents' sector the ERT recommends the Germany to

- Ensure that the time series are consistent (past years 1990-1993 and 1994-2022 for all categories included in 2D),
- Provide a detailed description of applied methodologies, data sources, choice of emission factors and activity data for all categories included in 2D in the IIR (Lack of transparency identified),

[3] EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2019, EEA Report No. 13/2019 European Environment Agency, Copenhagen. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2019 EU 2019

[4] EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2023, EEA Report No. 06/2023 European Environment Agency, Copenhagen. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2023

- Provide information on emission trends and drivers behind the trends for NMVOCs from 1990 to 2022 for all categories included in 2D in the IIR,
- Increase human resources of the air pollution inventory team in order to develop consistent time-series and provide information on the trends.

PART B: SPECIFIC RECOMMENDATIONS FOR THE SECTOR 'INDUSTRIAL PROCESSES AND PRODUCT USE – SOLVENTS'

13. Table 1 provides the findings from the 2024 technical review of air pollutant inventories reported under the Air Convention including those not implemented from previous reviews. While the focus was set on NMVOC emissions, also all other pollutants covered by the Air Convention and its protocols (i.e. SO_2, NO_x, NMVOC, NH_3, PM_{10}, $PM_{2.5}$, BC, priority HMs and POPS) have been checked for the years 1990 – 2022 to the extent possible, especially regarding the completeness of reporting. The implementation of the recommendations will be followed up in a future technical review of air pollutant inventories reported under the Air Convention.

Table 1: Findings from the technical review of air pollutant inventories reported under the Air Convention for the sector 'industrial processes and product use – solvents'[5]

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3a-1	NMVOC	2D3a	Yes	R	C_1

Observation

For category 2D3a Domestic solvent use including fungicides, for pollutant NMVOC and years 1990-2022, the ERT noted that the categories Construction/DIY and Pesticides are not covered in the IIR 2024.

In response to a question from the ERT, Germany replied that the NMVOC emissions related to the use of pesticides are allocated to SNAP code 060412 others in subcategory 2.D.3.i. The NMVOC emissions of construction/DIY are allocated to SNAP codes 060103 and 06014 in subcategory 2D3d. This is to conform to the emission guidebook 2023 for 2.D.3.a table 2-1 description for Pesticides and Construction/DIY. The emission calculation follows a product-based approach: NMVOC Emission = domestic consumption of a certain product * solvent content * specific emission factor. The emission factor for pesticides is 95% and therefore higher than the default value of the guidebook.

In a follow up question, the ERT requests Germany to specify what is meant with 'EF of 95%'. An EF is expected to be expressed in units [emission/AD].

[5] Note: There are four possible types of findings: R: Recommendation, TC: Technical Correction, PTC: Potential Technical Correction; RE : Revised Estimate

The findings have been assigned to one or more of the following criteria: TACCC T (Transparency), A (Accuracy), C_1 (Completeness), C_2 (Comparability), C_3 (Consistency) for definitions of these criteria see EMEP/EEA Guidebook 2019

As a response to this question, Germany replies that the emission factor is related to the amount of solvent in the product. For example an NMVOC emission factor of 95% means that 95% of the solvent (or 0,95 NMVOC t/ solvent) in the product will result in NMVOC emissions. As this is a follow-up to n product-based approach, the solvent quantity of the product must be calculated before.

However, the ERT still notes that an emission factor should be expressed in units [emission/AD].

Recommendation

The ERT agrees with the chosen allocation, but recommends Germany to allocate NMVOC emissions related to pesticides use to SNAP 060604 (other, other) instead of SNAP 060412. Table 3-17 of the 2023 guidebook chapter 2.D.3.i, 2.G, supplies an emission factor for pesticides. The ERT recommends Germany to describe emission factors as (guidebook) EF [emission / AD] * solvent content [%] in the next submission.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3a-2	NMVOC	2D3a	Yes	R	C_1

Observation

The ERT noted with reference to IIR section 2D3a and the data reported in the NFR tables that NMVOC emissions from 2D3a domestic solvent use including fungicides do not show a peak during the COVID-19 pandemic, which should be expected as result of the increased use of hand sanitizers. The ERT also noted that nothing about this is transparently documented in the IIR.

In response to a question from the ERT, Germany replied that the reason that there was no peak in NMVOC emissions of 2D3a during COVID-19 is due to the multitude of products (including hand sanitizers) included in 2D3a. The production statistics for other household cleaning agents containing hand sanitizers show a peak in 2020. But 20 different products are merged together in the production statistics, therefore, a simple look only at hand sanitizers is not possible. Solvents for hand sanitizers are ethanol, propanol-1 and propanol-2. But their production figures cannot be used for quantifying the COVID-19 effect. There are no official statistics for hand sanitizers and currently no human capacity to estimate it.

Recommendation

The ERT recommends Germany to either add human resources in order to find an AD source for hand sanitizers in category 2D3a or to transparently describe the issue of hand sanitizer use in more detail including evidence that (also during the pandemic) hand sanitizers are fully

included in 2D3a domestic solvent use including fungicides. Sources of relevant AD could be the association of soap and/or sanitizer producers or ESIG data.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3d-1	NMVOC	2D3d	Yes	R	C_3

Observation

For category 2D3d Coating applications, for pollutant NMVOC and years 1990-1993 the ERT noted that Germany identifies an inconsistency in the time series around 1994. Germany also describes the reason for the trend change, but states that recalculation is not possible due to a lack of AD before 1994. The ERT suggests that recalculating 1990-1993 using GDP or population data would be better than maintaining this inconsistent series. Maybe Germany already did so since in the IIR reference is made to expert judgement? However, the ERT notes that in the same section it is described that the emission levels for 1990-1993 are high because the paints and coating application industries had economically good years.

In response to a question from the ERT, Germany stated that the emission calculation for the years before 1994 was based on literature studies and questioning of associations and companies as a random sample and the result was expanded on national level. The expert judgment lies in the choice of that random sampling and the sort of expansion. Germany states that the use of population data is not better than that expert judgement for correlation as the population have been continuously growing since 1990. Also the GDP do not better fit, as the main contribution for the high emission level was due to the high need of paints and coating applications and other applications belonging to constructions after the reunion, which was not correlated with the GDP. Another reason for the impracticality of the GDP is that there is no robust GDP for both the new and the old Bundesländer in 1990.

The ERT agrees that GDP proxy is not appropriate. However, there is still the fact that the total series is not consistent because it consists of 2 parts that are not comparable, even the fact that for both subseries the best available method is used.

Recommendation

The ERT recommends Germany to merge the two time-series in one unique consistent series by using methods to resolve data gap and merge two series. These methods are described in paragraph 1.2.3 « splicing techniques » and 1.2.4 « overlap » of chapter « Time series consistency » of the 2023 EMEP/EEA guidebook. They are also described in Volume 1, chapter 5 of the IPCC guidelines which can be applied for other emissions than greenhouse gas emissions.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3e-1	NMVOC	2D3e	Yes	R	C_3

Observation

The ERT noted with reference to IIR section 2D3e Degreasing and the data reported in the NFR tables for NMVOC emissions from this category, that the IIR describes a decreasing trend after 1999 for category 2D in general, with no explanation for 2D3e specifically and no trend explanation for this specific category. The emission data in the NFR shows an equal high emission level for 1990-1993, with a very sharp decrease in 1994, remaining nearly constant from 1994 to 2022. Maybe the high emission levels for 1990-1993 are the result of the rough estimation for those years, as also explained in the IIR.

In response to a question from the ERT, Germany replied that there is a short notice in the IIR that the emission level remained constant for a long time, and that there are no obvious reasons for that. It seems that it is a very stable industrial application, also belonging to confidentiality. Only a rough estimation could be made for the years 1990-1993. It is possible that the rough estimation leads to higher emissions in 1990-1993 but it could not be verified. It should be kept in mind that 2D3e and 2D3f are treated as one source group just until 1999 and that the splitting backwards is error-prone. Furthermore, Germany explains that there is no obvious reason for the emission level being stable after 1994. Germany explains that calculation is performed by multiplying AD, solvent content, application conditions and EF, but also there is confidentiality about the AD.

In a follow up question, the ERT requests Germany to explain whether is meant that there is no AD data available, or that it is available but confidential.

In a response to this question, Germany replies that the answer of the follow-up question is related to question 2. In 2022 the solvent sector expert was economized, therefore the inventory compiler has no access anymore to information related to emission calculation before the year 2000 and to trend descriptions in general, e.g. as the outcome of legislative framework.

The ERT interprets this answer as there is no AD data available anymore.

Recommendation

The ERT recommends Germany to merge these two subseries together to one consistent series by using methods to resolve data gap and

merge two series, because using two different approaches before and after 1994 results in a total series that is not consistent, because it consists of 2 parts that are not comparable. These methods are described in paragraph 1.2.3 « splicing techniques » and 1.2.4 « overlap » of chapter « Time series consistency » of the 2023 EMEP/EEA guidebook. They are also described in Volume 1, chapter 5 of the IPCC guidelines which can be applied for other emissions than greenhouse gas emissions.

Furthermore, the ERT recommends Germany to put effort in obtaining some trend explanation from this source, maybe by using the data that was available before 2000 and merge the subseries before and after 2000, maybe using a proxy.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3f-1	NMVOC	2D3f	No	R	C_3

Observation

The ERT noted with reference to IIR section 2D3f Dry cleaning and the data reported in the NFR tables for NMVOC emissions from this category, that the IIR describes a decreasing trend after 1999 for category 2D in general, with no explanation for 2D3f specifically.

In response to a question from the ERT, Germany replied that there is a short notice in the IIR for the emission trend of 2D3f ("NMVOC emissions from solvent-based products and remained stable in the last 15 years."). The reasons for that could be the same as for 2D3e.

However, the ERT is not able to identify how these emission data is calculated. Germany explains that calculation is performed by multiplying AD, solvent content, application conditions and EF. Then a trend explanation should be possible.

As a follow up question, the ERT asks Germany why a trend explanation is not possible by investigations from the AD source when there is AD data available, regarding that Germany explains that calculation is performed by multiplying AD, solvent content, application conditions and EF.

As a response to this question, Germany replies that the answer is related to question 2. In 2022 the solvent sector expert was economized. Therefore the inventory compiler has no access anymore to information related to emission calculation before the year 2000 and to trend descriptions in general, e.g. as the outcome of legislative framework.

Recommendation

The ERT recommends Germany to add human resources in order to gain better insight in trend explanation in the next submission, which

should be possible because AD data seems to be available, as follows from the calculation description from Germany. Maybe this could be done by using the data that was available before 2000 and merge the subseries before and after 2000, maybe using a proxy.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3g-1	NMVOC	2D3g	Yes	R	C_3

Observation

The ERT noted with reference to IIR section 2D3g Chemical products and the data reported in the NFR tables for this category, that the IIR describes that for NMVOC emissions since 2000, a more detailed data collection procedure enables to follow the development of different applications. This may lead to an inconsistent time series before and after year 2000. The ERT notes that the change in procedure coincides with a sharp reduction in emissions.

In response to a question from the ERT, Germany replied that no statement about the reasons for the decrease in emissions in the year 2000 can be provided due to a lack of human resources in inventory compiling for this sector.

The ERT identifies that using two different approaches before and after 2000 results in a total series that is not consistent because it consists of 2 parts that are not comparable.

Recommendation

The ERT recommends Germany to merge these two subseries together to one consistent series by using methods to resolve data gap and merge two series, because using two different approaches before and after 1994 results in a total series that is not consistent, because it consists of 2 parts that are not comparable. These methods are described in paragraph 1.2.3 « splicing techniques » and 1.2.4 « overlap » of chapter « Time series consistency » of the 2023 EMEP/EEA guidebook. They are also described in Volume 1, chapter 5 of the IPCC guidelines which can be applied for other emissions than greenhouse gas emissions.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3h-1	NMVOC	2D3h	Yes	R	C_3

Observation

The ERT noted with reference to IIR section 2D3h Printing and the data reported in the NFR tables for this category that the NFR shows a sharp decrease in emissions in the year 2000, but is not able to find the reason of this decrease.

In response to a question from the ERT, Germany replied that no statement about the reasons for the decrease in emissions in the year 2000 can be provided due to a lack of human resources in inventory compiling for this sector.

Recommendation

The ERT recommends Germany to add human resources in order to gain better insight in trend explanation in the next submission.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3a-3	NMVOC	2D3a	Yes	R	T

Observation

The ERT noted that for 2D3a uses of domestic products including fungicides, pollutant NMVOC and years 1990-2022, the methods used to calculate the emissions are not transparently described in the IIR2024. The IIR2024 mentions "In this approach, solvent-based products or solvents are allocated to the source category, and then the relevant NMVOC emissions are calculated from those solvent quantities via specific emission factors". The IIR 2024 mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs but no specific AD and EF are supplied. Also it is not clear whether the information from reference 1, dated from 1996, had been updated.

In response to a question from the ERT, Germany replied that the general calculation procedure valid for all solvent applications is described in every subcategory in the section general procedure. Each emission is calculated as domestic consumption of a certain product * solvent content of that product * EFproduct. But the national solvent inventory is very complex, containing a large number of products from the national product statistics associated to many product groups of the foreign trade statistics. Beside figures of the national statistical office, several other sources are used, e.g. Federal Office for Economic Affairs and Export Control or the Federal Office of Consumer Protection and Food Safety. Also there is contact to more than 35 industrial associations and enterprises for actualization of emission calculation data. Evidence for the need to update solvent content factors and emission factors of certain product groups are based on the knowledge of experts in the federal environment agency and the former mentioned associations. To update emission calculation data extensive surveys in the market segments

or inquiries of association are done. Whether the information from reference 1 was updated cannot be confirmed, since currently no sector expert for this area in the federal environment agency is available.

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology and evolution of EF over the years for the different categories of domestic products considered in 2D3a and how the impact of regulations mentioned in the IIR 2024 has been determined. The ERT recommends Germany to explain whether the information from the reference 1 dated from 1996, has been updated.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3d-2	NMVOC	2D3d	Yes	R	T

Observation

The ERT noted that for 2D3d coating applications, pollutant NMVOC and years 1990-2022, the methods used to calculate the emissions are not transparently described in the IIR 2024. The IIR 2024 contains some general information and mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs but no specific AD and EF are supplied. It is mentioned in the IIR 2024 that an emission factor of 95% was allocated to all open applications (e. g. all decorative coating applications), and for installation-related industrial applications specific emission factors were assessed and applied but no further explanations and figures are provided. Further explanation could consist of more detailed information how the impact of regulations for industrial plants (the former EU directive 1999/13 and the EU Directive 2010/75 on industrial emissions) is taken in account, maybe through the use of abatement technique penetration rates? For decorative coatings there could be further detail how the impact of regulations related to products (EU directive 2004/42 as example) has been determined.

In response to a question from the ERT, Germany replied that since currently there is no sector expert for this topic available, it is not possible to explain how regulations for industrial plants have an effect on the derivation process for the solvent content and the emission factors for industrial coating applications, and how the impact of regulations related to products is considered in deriving solvent content and emission factors for decorative coatings.

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology

and evolution of EF and AD over the years for the different sub-activities considered in 2D3d and how the impact of regulations mentioned in the IIR 2024 has been determined.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3e-2	NMVOC	2D3e	Yes	R	T

Observation

The ERT noted that for 2D3e degreasing, pollutant NMVOC and years 1990-2022, the methods used to calculate the emissions are not transparently described in the IIR 2024. The IIR 2024 contains some general information and mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs, but no specific AD and EF are supplied. The Guidebook 2023 EFs seem not used, as country specific data are used, but there is no information in the IIR 2024 on how the EF were derived, and about their evolution over the years for the different sub categories (Metal degreasing, Electronic component manufacturing and Other industrial cleaning). Also there is no information about the AD of all these subcategories, and how the impact of regulations has been determined (is it, as example, through the use of abatement technique penetration rates)? The types of activity data available is not detailed: are they a consumption of certain solvents such as TRI, PER, XYL... or other type of activity data.

In response to a question from the ERT, Germany replied that since currently there is no sector expert for this topic available, it is not possible to supply more information on the evolution of emission factors.

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology and evolution of EF and AD over the years for 2D3e and how the impact of regulations mentioned in the IIR 2024 has been determined.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3f-2	NMVOC	2D3f	No	R	T

Observation

The ERT noted that for 2D3f Dry cleaning, pollutant NMVOC and years 1990-2022, the methods used to calculate the emissions are not transparently described in the IIR 2024. The IIR 2024 contains some general information and mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs but no specific AD and EF are supplied, neither is there information about their evolution over the years. The Guidebook 2023 EFs seem not used as country specific data are used, but there is no information in the IIR 2024

how these EF were derived. The types of activity data available is not detailed: are they a consumption of certain solvents such as PER or another type of activity data. Also it is not clear how the impact of regulations (the former EU directive 1999/13 and the EU Directive 2010/75 on industrial emissions) has been determined.

In response to a question from the ERT, Germany replied that since currently there is no sector expert for this topic available, it is not possible to supply more information on the evolution of emission factors and how these evolutions are influenced by certain regulations.

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology and evolution of EF and AD over the years for 2D3f and how the impact of regulations mentioned in the IIR 2024 has been determined.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3g-2	NMVOC	2D3g	Yes	R	T

Observation

The ERT noted that for 2D3g chemical products, pollutant NMVOC and years 1990-2022, the methods used to calculate the emissions are not transparently described in the IIR 2024. The IIR 2024 contains some general information and mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs but no specific AD and EF are supplied, neither is there information about their evolution over the years. The use of the guidebook 2023 is not mentioned except for bitumen blowing. Also it is not clear how the impact of regulations has been determined (rate of penetration of reduction techniques, changes of processes...?).

In response to a question from the ERT, Germany replied that since currently there is no sector expert for this topic available, it is not possible to supply more information on the evolution of emission factors and how these evolutions are influenced by certain regulations.

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology and evolution of EF and AD over the years for 2D3g and how the impact of regulations mentioned in the IIR 2024 has been determined.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3h-2	NMVOC	2D3h	Yes	R	T

Observation

The ERT noted that for 2D3h printing, pollutant NMVOC and years 1990-2022 the methods used to calculate the emissions are not transparently described in the IIR 2024. The IIR 2024 contains some general information and mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs, but no specific AD and EF are supplied, neither is there information about their evolution over the years for the different categories of printing activities considered. Also it is not clear how the impact of regulations (the former EU directive 1999/13 and the EU Directive 2010/75 on industrial emissions) has been determined.

In response to a question from the ERT, Germany replied that since currently there is no sector expert for this topic available, it is not possible to supply more information on the evolution of emission factors and how these evolutions are influenced by certain regulations. Germany stated also that due to confidentiality, no detailed information about activity data and emission factors of all categories of printing activities can be given

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology and evolution of EF and AD over the years for 2D3h and how the impact of regulations mentioned in the IIR 2024 has been determined. Furthermore, the ERT recommends Germany to use the procedure that is available, according to which a party provides confidential information to the ERT under strict conditions.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3i-1	NMVOC	2D3i	Yes	R	T

Observation

The ERT noted that for 2D3i, pollutant NMVOC and years 1990-2022 the methods used to calculate the emissions are not transparently described in the IIR. The IIR 2024 contains some general information and mentions that the emission estimations are based on a tier 2 method, national statistics and country specific EFs but no specific AD and EF are supplied, neither is there information about their evolution over the years for the different sub activities considered (Glass and mineral wool induction, Fat, edible and non-edible oil extraction, Subcategory other, etc). The use of the guidebook 2023 is not mentioned. Also it is not clear how the impact of regulations (the former EU directive 1999/13 and the EU Directive 2010/75 on industrial emissions) has been determined (rate of penetration of reduction techniques? changes of processes?).

In response to a question from the ERT, Germany replied that since currently there is no sector expert for this topic available, it is not possible to supply more information on the evolution of emission factors and how these evolutions are influenced by certain regulations.

Recommendation

The ERT recommends Germany to add human resources for the next submission to provide more pieces of information on its methodology and evolution of EF and AD over the years for 2D3i and how the impact of regulations mentioned in the IIR 2024 has been determined.

ID	Pollutants	NFR category	Key Category	Type	$TAC_1C_2C_3$
DE-2024-2D3e-3	NMVOC	2D3e	Yes	R	C_3

Observation

For 2D3e Degreasing, 1990-2021 the TERT notes that previous recommendation to investigate the possibility to use surrogate data to create more realistic estimate for 1990-1993 was not implemented nor that it is included in the list of improvements. The TERT notes that in the section 'Investigated Review Findings' it is stated that this issue has not been treated but without further explanation. This was raised during the 2023 NECD inventory review. The TERT is unable to determine whether there is an over/under-estimate that may be above the threshold of significance.

In response to a question from the ERT, Germany stated that f using surrogate data for a more realistic estimate like industrial GDP, the question remains whether it is suitable for a trend description and whether it allows for a consistent trend description after 1993 changing the calculation method. Germany also replied that the inventory compiler has no resources to do so.

This follow up question is related to question DE-2024-2D3e-1.

Recommendation

The ERT recommends Germany to consider this issue when implementing the recommendation for question DE-2024-2D3e-1.

PART C: SPECIFIC RECOMMENDATIONS FOR THE GRIDDED EMISSION DATA FOR THE SECTOR 'INDUSTRIAL PROCESSES AND PRODUCT USE – SOLVENTS'

14. For the 2024 review of the gridded emission data only NMVOC emissions were reviewed. Germany submitted gridded data in 2021. This submission was used as a base for the review.

15. The methods used by Germany to grid sectoral emissions are described transparently in the IIR.

16. The description includes data sources that have been used for spatial distribution. The main data sources used for GNFR E_Solvents are predominantly statistical data at district level,

17. Gridded emissions reported for GNFR E_Solvents are consistent with the corresponding NFR categories reported in Annex I.

18. The ERT noted with reference to IIR 2024 that information on the gridding parameters and LPS data used are well described.

REVISED ESTIMATES AND TECHNICAL CORRECTIONS CONSIDERED AND/OR CALCULATED BY ERT

19. In the Appendix of the 'EMEP/UNECE Review Guidelines 2018[6]' it is stated that if the ERT considers that emissions are significantly under- or overestimated, the Party is during the review invited to submit 'revised estimates' that address the issue raised. Should the Party decline to do this, or should it not be possible to agree on the quantification of a revised estimate i.e. the ERT does not accept a revised estimate provided by the Party, the ERT may calculate a 'technical correction'. The threshold for significance for a technical correction for the in-depth review in 2024 was set at 2% of the national total, i.e. a finding that has been identified to result in an over- or under-estimate of emissions of more than 2% of the national total. The methods for calculating technical corrections are set up in the 'EMEP/UNECE Review Guidelines 2018' and use the EMEP/EEA Emission 'Inventory Guidebook' as a reference for methods and emission factors.

20. The ERT did not calculate any technical corrections for Germany and Germany did not provide any revised estimates.

[6] https://www.ceip.at/fileadmin/inhalte/ceip/3_review/advance_version_ece_eb.air_142_add.1.pdf

LIST OF MATERIALS PROVIDED TO ERT

1. Germany Annex I reporting template
2. Germany Stage 2 S&A report
3. Germany Stage 1 report 2024
4. Germany IIR 2024
5. Repdab-Report
6. Extended checks

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Responses to the question raised by ERT during the review
2. Material received from Germany during the Review
    - No additional information was provided by Germany either before or during the review

ABBREVIATIONS

This list includes abbreviations commonly used in the review reports

AD	Activity data
BaP	Benzo[a]pyrene
BC	Black Carbon
C	Confidential
Cd	Cadmium
CEIP	Centre on Emission Inventories and Projections
CLRTAP	Convention on Long-range Transboundary Air Pollution – 'the Air Convention'
CO	Carbon Monoxide
E-PRTR	European Pollutant Release and Transfer Register
EEA	European Environment Agency
EF	Emission factor
EMEP	The co-operative program for monitoring and evaluation of the long-range transmission of air pollutants in Europe (unofficially 'European Monitoring and Evaluation Programme' = EMEP)
ERC	Emission Reduction Commitment
ERT	Expert Review Team
GHG	Greenhouse gas
GIS	Geo Information System
GNFR	NFR Aggregation for Gridding and LPS
HCB	Hexachlorobenzene
Hg	Mercury
HM	Heavy metals
IEF	Implied emission factor
IIR	Informative Inventory Report
kt	Kilotons
LPS	Large Point Sources
NA	Not applicable
NE	Not Estimated
NECD	National Emission reduction Commitments Directive
NFR	Nomenclature for reporting
NH_3	Ammonia
NMVOC	Non-methane volatile organic compounds
NO	Not Occurring
NO_x	Nitrogen oxides
NR	Not relevant/Not Reported
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PCB	Polychlorinated biphenyls

PCDD/F	Polychlorinated dibenzo-p-dioxins and dibenzofurans
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
TSP	Total suspended particulates

LIST OF REFERENCES AND SUPPORTING DOCUMENTS

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

2. ECE/EB.AIR/111/Add.1: Decision 2012/3: Adjustments under the Gothenburg Protocol to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them https://unece.org/DAM/env/documents/2013/air/ECE_EB.AIR_111_Add.1__ENG_DECISION_3.pdf

3. ECE/EB.AIR/113/Add.1: Decision 2012/12: 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://unece.org/DAM/env/documents/2012/EB/Decision_2012_12.pdf

4. 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

5. ECE/EB.AIR/127/Add.1: Decision 2014/1: 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://unece.org/DAM/env/documents/2014/AIR/EB/Decision_2014_1.pdf

6. 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

7. ECE/EB.AIR/142/Add.1: Decision 2018/1: Updated methods and procedures for the technical reviews of air pollutant emission inventories reported under the Convention https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2019/decision_2018_1_advance_version_ece_eb.air_142_add.1.pdf

8. ECE/EB.AIR/GE.1/2022/20− ECE/EB.AIR/WG.1/2022/13: Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution. United Nations Economic Commission for Europe https://unece.org/sites/default/files/2022-08/ECE_EB.AIR_GE.1_2022_20-2210473E.pdf

9. EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2019, EEA Report No. 13/2019 European Environment Agency, Copenhagen. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2019 EU 2019

10. EMEP/EEA: EMEP/EEA air pollutant emission inventory guidebook 2023, EEA Report No. 06/2023 European Environment Agency, Copenhagen. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2023

11. TFEIP (2022): “Inventory adjustments in the context of emission reduction commitments (ERC)” available at: https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2022/technical_guidance_for_erc_adjustments_issue1.1.pdf