2.B.10.a - Other Chemicals

Short description

In sub-category *2.B.10.a - Other Chemicals*, emissions from the production of organic chemicals,sulphuric acid, carbon black, fertilizers and from the chlor-alkali industry are reported. Relevant pollutants are NMVOC, CO, PCDD/F, SO_x, NH_3, $PM_{2.5}$, PM_{10}, TSP and Hg.

Table 1: Overview of emission sources covered

Emission sources	Pollutants	Method	AD	EF	Key Category
Large Volume Organic chemicals	NMVOC (PCDD/F $_{\text{only for Ethylene Dichloride}}$)	T2	NS	CS	
Carbon Black	CO, SO_2, TSP, PM_{10}, $PM_{2.5}$, BC	T2	NS	D, CS	
Fertilizers	TSP, PM_{10}, $PM_{2.5}$, NH_3	T2	-	D, CS	
Sulphuric acid	SO_2	T2	NS	CS	L
Chlor-alkali industry	Hg	T3	PS	-	

Method(s) applied	
D	Default
T1	Tier 1 / Simple Methodology *
T2	Tier 2*
T3	Tier 3 / Detailed Methodology *
C	CORINAIR
CS	Country Specific
M	Model
* as described in the EMEP/EEA Emission Inventory Guidebook - 2019, in category chapters.	
(source for) Activity Data	
NS	National Statistics
RS	Regional Statistics
IS	International Statistics
PS	Plant Specific
As	Associations, business organisations
Q	specific Questionnaires (or surveys)
M	Model / Modelled
C	Confidential
(source for) Emission Factors	
D	Default (EMEP Guidebook)
CS	Country Specific
PS	Plant Specific
M	Model / Modelled
C	Confidential

Method

Large volume organic chemicals

The annual production volumes for all large volume organic chemicals are extracted from national production statistics by the Federal Statistical Office [1)].

These chemicals comprise:

- Acrylonitrile
- Ethylene
- Ethylbenzene
- Ethylene Dichloride

- Ethylene Oxide
- Formaldehyde (Methanal)
- Methanol
- Phthalic Anhydride
- Propene
- Styrene
- Vinyl Chloride
- Polyethylene (LD/HD)
- Polypropylene
- Polystyrene
- Polyvinyl Chloride
- Styrene Copolymeres

The emission factors for the production of organic chemicals as shown in Tables 2 and 3 are derived from best reference documents for polymers and LVOC mostly for the early years. For later years, plant-specific data on an aggregated level were used.

Table 2: National NMVOC emission factors for the production of organic chemicals, in kg/t

	Acrylonitrile	**Ethylbenzene**	**Ethylene**	**Ethylene Dichloride**	**Ethylene Oxide**	**Formaldehyde (Methanal)**	**Methanol**	**Phthalic Anhydride**	**Propene**	**Styrene**	**Vinyl Chloride**
1990-1994	5	0.6	5	C	5	5	0.04	5	2.5	0.02	0.2
1995	0.07	0.02	0.4	C	0.06	0.02	0.04	0.2	0.2	0.02	0.2
1996	0.05	0.015	0.3	C	0.045	0.015	0.04	0.15	0.15	0.02	0.15
1997	0.05	0.015	0.3	C	0.045	0.015	0.04	0.15	0.15	0.02	0.15
1998	0.04	0.012	0.25	C	0.04	0.012	0.04	0.12	0.12	0.02	0.12
1999	0.04	0.012	0.25	C	0.04	0.012	0.04	0.12	0.12	0.02	0.12
from 2000	0.035	0.01	0.2	C	0.03	0.01	0.04	0.1	0.1	0.02	0.1

Table 3: National NMVOC emission factors for the production of polymers, in kg/t

	Polyethylene (PE)		**Polypropylen (PP)**	**Polystyrene (PS)**	**Polyvinyl Chloride (PVC)**	**Styrene Copolymeres**
	Low density (LD)	High density (HD)				
1990-1994	8	6	8	1	0.25	5
1995	2.2	1	1	0.6	0.25	0.6
1996	1.6	0.75	0.75	0.4	0.25	0.5
1997	1.6	0.75	0.75	0.4	0.25	0.5
1998	1.3	0.6	0.6	0.32	0.25	0.4
1999	1.3	0.6	0.6	0.32	0.25	0.4
from 2000	1.1	0.5	0.5	0.27	0.14	0.3

Carbon Black

The figures for carbon black production in the new German Länder in 1990 were taken from the Statistical Yearbook (Statistisches Jahrbuch) for the Federal Republic of Germany; the production for 1991 and 1992 were estimated, due to confidentiality requirements. The other data for carbon-black production as of 1990 were obtained from national production statistics.

From 2005 onwards, Germany uses activity data, which is calculated from the CO_2 emissions of the Emission Trading System (ETS), delivered by the German emission trading authority (DEHSt), and the default CO_2 emission factor from the IPCC Guidelines 2006, for carbon black production. A comparison of the statistical data and the emission trading data leads to the conclusion that the statistical data is most probably overestimated.

Table 4: Emission factors of carbon black in Germany, in kg/t

	CO	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
1990	4.80	19.16	0.28		
1991	4.60	19.01	0.28		
1992	4.40	18.50	0.27		
1993	4.20	18.00	0.26		

	CO	SO_2	TSP	PM_{10}	$PM_{2.5}$
1994	4.00	17.50	0.25		
1995	3.75	17.00	0.25	0.23	0.12
1996	3.50	16.00	0.25	0.23	0.12
1997	3.25	15.00	0.25	0.23	0.12
1998	3.00	14.00	0.25	0.23	0.12
1999	2.90	13.40	0.25	0.23	0.12
2000	2.80	12.80	0.25	0.23	0.12
2001	2.70	12.54	0.25	0.23	0.12
2002	2.65	12.28	0.25	0.23	0.12
2003	2.60	12.00	0.25	0.23	0.12
2004	2.55	11.70	0.25	0.23	0.12
2005	2.50	11.50	0.25	0.23	0.12
2006	2.50	11.20	0.24	0.22	0.12
2007	2.50	10.90	0.23	0.21	0.11
2008	2.50	10.60	0.22	0.20	0.11
2009	2.50	10.30	0.21	0.19	0.10
from 2010	2.50	10.00	0.20	0.18	0.10

Fertilizer production

The activity data is also extracted from national production statistics by the Federal Statistical Office[2)] and consists of mono and multicomponent fertilizers.

The emission factors are country specific values derived from Jörß et al. (2006)[3)] and are presented in the following table.

Table 5: Emission factors of fertilizers in Germany

	PM_{10}	$PM_{2.5}$	TSP
1990	NA	NA	1.420376946
1991-1994	NA	NA	2
from 1995	0.115938	0.0781395	0.1695

Urea production

The activity data is from the federal statistical office of Germany (GP 2015 31 300). The amount of urea is reported there in t-N. As the emission factor is in kg/t urea, the reported amount of urea in t-N is multiplied with the molar mass of urea and divided with the molar mass of nitric (60.06/14).

AR of urea (in t) = AR of urea (in t-N) * (molar mass of urea)/ (molar mass of N)

The emission factor of 2.5 kg/t urea is a tier 2 default value from the EMEP/EEA Guidebook 2023[4)].

Sulphuric acid

The activity data for sulphuric acid production is from the Federal Statistical Office of Germany.

A survey for the EF of SO_x for sulphuric acid production was made in 2019. The producers were directly requested to provide information by the association. Based on the data obtained from producers, new EFs for the years 2017 and 2018 were developed.

All emissions were measured by the producers respectively or limit values are specified in the permit decision for the installation. The derived (implied) EF is weighted by the amount of H_2SO_4 produced. Therefore, large producers have a greater influence on the (implied) EF.

However, due to significant process optimizations and technology improvements implemented since 1990, the applied country-specific EF is well below the default value.

Chlor-alkali industry

For the mercury (Hg) losses from the Chlor-alkali industry, Germany used to apply the data annualy published by OSPAR [5)] on plant specific production capacity for the AD and plant specific emissions from the chlor-alkali industry.

Because of the BAT (best available technique) conclusion for the Chlor-alkali industry, the production based upon the amalgam process has stopped in 2017. Most production sites switched to membrane technology.

However, Hg emissions are still ocurring because two production sites still continue to use the amalgam process for the production of certain alcoholates not regulated by the BAT conclusions for Chlor-alkali production. Before 2018, these Hg-emissions were reported together with the Hg from Chlor-alkali production. But the OSPAR convention does not request the Hg emissions from alcoholate production to be reported, so CEFIC does no longer report these emissions to OSPAR. Therfore, as of 2018, PRTR data is used to determine mercury emissions belonging to the alcoholate production.

Recalculations

For SO_2 emissions from sulphuric acid production, and for Hg emissions from chlor-alkali industry, the emissions of the two last years are always actualized. This is because the emissions of the last year are always a prediction, as the final emissions are still not published by the time of reporting.

From Submission 2022 onwards, the SO_2 emissions from titanium dioxide production are no longer confidential and are therefore reallocated back to category 2.B.6. Since then, the SO_2 emissions reported here are only from the sulphuric acid production. Besides, Germany reports the NH_3 and TSP emissions from urea production instead of from nitric fertilizer production based on the Emep/EEA Guidebook method by using statistical data from the federal statistical office.

Otherwise no recalculations of SO_2 from the sulphuric acid production, NH_3 und TSP from urea production are necessary compared to last year's submission.

For **pollutant-specific information on recalculated emission estimates for Base Year and 2022**, please see the pollutant specific recalculation tables following chapter 9.1 - Recalculations.

Planned improvements

At the moment, no category-specific improvements are planned.

[1)] DESTATIS, Fachserie 4, Reihe 3.1, Produzierendes Gewerbe, Produktion im Produzierenden Gewerbe (“manufacturing industry; production in the manufacturing industry”)
[2)] Federal Statistical Office (Statistisches Bundesamt - Destatis): Fachserie 4, Reihe 3.1, Produzierendes Gewerbe, Produktion im Produzierenden Gewerbe (“manufacturing industry; production in the manufacturing industry”), Wiesbaden, 2024
[3)] Jörß et al. (2007): Jörß, W.; Handke, V. (Institut für Zukunftsstudien und Technologiebewertung (IZT), Berlin) mit Beiträgen von Lambrecht, U., Dünnebeil, Fr. (Institut für Energie und Umweltforschung Heidelberg (ifeu)): Emissionen und Maßnahmenanalyse Feinstaub 2000–2020. Annex A, chapter A.2.4.8, UBA-TEXTE Nr. 38/200; https://www.umweltbundesamt.de/publikationen/emissionen-massnahmenanalyse-feinstaub-2000-2020; on behalf of the Umweltbundesamt; Dessau-Roßlau, 2007.
[4)] EMEP/EEA (2023): European Environment Agency: EMEP/EEA air pollutant emission inventory guidebook 2023, Part B: sectoral guidance chapters, 2.B Chemical industry (Oct 2023): chapter 3.3.2, pp.32, table 3-29, Copenhagen, 2019
[5)] ODIMS (OSPAR Data & Information Management System); https://odims.ospar.org/en/search/?dataset=chlor_alkali_data