# 2.B.10.a - Other Chemicals

## Short description

In sub-category *2.B.10.a - Other Chemicals*, emissions from the production of organic chemicals, titanium dioxide, 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, $PM_{10}$, $PM_{2.5}$ | T2 | NS | D, CS | |
| Fertilizers | TSP, $PM_{10}$, $PM_{2.5}$, $NH_3$ | T2 | - | D, CS | |
| Sulphuric acid | $SO_2$ | T2 | NS | CS | L & T |
| Chlor-alkali industry | Hg | T3 | PS | - | T |

**T** = key source by Trend **L** = key source by Level

| Methods | |
|---|---|
| **D** | Default |
| **RA** | Reference Approach |
| **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/CORINAIR Emission Inventory Guidebook - 2007, in the group specific chapters.

| AD - Data Source for Activity Data | |
|---|---|
| **NS** | National Statistics |
| **RS** | Regional Statistics |
| **IS** | International Statistics |
| **PS** | Plant Specific data |
| **AS** | Associations, business organisations |
| **Q** | specific questionnaires, surveys |

| EF - Emission Factors | |
|---|---|
| **D** | Default (EMEP Guidebook) |
| **C** | Confidential |
| **CS** | Country Specific |
| **PS** | Plant Specific data |

# Methodology

### Large Volume Organic chemicals

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

[Jens: Text einfügen]

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 table 2 and 3 are derived from best reference documents polymers and LVOC mostly for the early years. For later years, plant-specific data on an aggregated level were used.

[Jens: Text einfügen]

Table 2: national NMVOC emission factors for producing organic chemicals, in kg/t

| Product | Acrylonitrile | Ethylbenzene | Ethylene | Ethylene Dichloride | Ethylene Oxide | Formaldehyde (Methanal) | Methanol | Phthalic Anhydride | Propene | Styrene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **from 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 producing polymers, in kg/t

| products | Polyethylene (PE) | Polypropylen (PP) | Polystyrene (PS) | Polyvinyl Chloride (PVC) | Styrene Copolymeres |
|---|---|---|---|---|---|

| products | Polyethylene (PE) | | Polypropylen (PP) | Polystyrene (PS) | Polyvinyl Chloride (PVC) | Styrene Copolymeres |
|---|---|---|---|---|---|---|
| | Low density (LD) | High density (HD) | | | | |
| **from 1990 to 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 [2)]; the figures 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 [3)]).
From 2005 onwards, Germany uses activity data calculated from the CO2 emissions of the Emission Trading System (ETS), delivered from 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 result, that the statistical data is most probably overestimated.

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

| Pollutant | CO | SO2 | TSP | PM10 | PM2.5 |
|---|---|---|---|---|---|
| **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 | | |
| **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 |

| Pollutant | CO | SO2 | TSP | PM10 | PM2.5 |
|---|---|---|---|---|---|
| **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 |

### Fertilizers

The Activity data are from the statistical office of Germany. For Fertilizers Number 2415 30 of statistical data. And for nitrogenous fertilizers the numbers 2413 30, 2415 40 and 2415 80 of statistical data.

The emission factors are country specific (Jörß et al. 2006)[1)] and are presented in the following table.

Table 5: Emission factors of fertilizers in Germany, in kg/t

| Product | | | Fertilizers | | Nitrogenous Fertilizers |
|---|---|---|---|---|---|
| **Pollutant** | PM10 | PM2.5 | TSP | NH3 | TSP |
| **from 1990 to 1994** | | | 2 | 5 | 1 |
| **1995** | 0.12 | 0.08 | 0.17 | 5 | 1 |
| **1996** | 0.12 | 0.08 | 0.17 | 5 | 1 |
| **1997** | 0.12 | 0.08 | 0.17 | 5 | 1 |
| **1998** | 0.12 | 0.08 | 0.17 | 5 | 1 |
| **1999** | 0.12 | 0.08 | 0.17 | 5 | 1 |
| **from 2000** | 0.12 | 0.08 | 0.17 | 5 | 1 |

### Sulphuric acid

The activity data for sulphuric acid production are from the statistical office of Germany.

For the $SO_x$ EF from sulphuric acid production there was made a survey in the year 2019. The producers were directly asked by the association. Based on the data from the producers new EFs for the years 2017 and 2018 were developed. All emissions were measured by the producers or respectively are limit values specified in the permit decision for the installation. The EF is weighted by the amount of $H_2SO_4$ produced. Big producers have more influence on the EF than small producers. The EF is smaller than the Default-EF. The reason for this is due to significant process optimizations and technology improvements since 1990.

### Chlor-alkali industry

For the mercury losses from the Chlor-alkali industry Germany uses the yearly published data from OSPAR on the plant specific production capacity for the AD and the plant specific emissions from the chlor-alkali industry. Because of the BAT conclusion for the Chlor-alkali industry the production has stopped in 2017. But the emissions of Hg are still continuing, because two plants are producing alcoholates and dithionite and are not regulated by the BAT conclusions for Chlor-alkali production. At both places also Chlor-alkali was produced. The Hg-emissions from the production of dithionite and alcoholates were so far reported together with the Hg-emissions from Chlor-alkali production. The OSPAR convention does not request to report the Hg-emissions from dithionite- and alcoholate-production, so CEFIC does not anymore report these emissions to OSPAR. Germany plans to get a

treaty with the two plants to get the Hg-emissions in future directly from these plants. And Germany plans to report these emissions in a new subcategory.

## Recalculations

For $SO_2$ emissions from titan dioxide production and sulphuric acid production and for Hg emissions from chlor-alkali industry the emissions of the two last years are always actualized. Because the emissions of the last year are always a prediction as these emissions are still not published.

For specific **information on recalculated emission estimates for Base Year and 2018**, please see the pollutant specific recalculation tables following chapter 8.1 - Recalculations.

## Planned improvements

No category-specific improvements are planned.

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[1)] Umweltbundesamt, W: Jörß, V. Handke, Emissionen und Maßnahmenanalyse Feinstaub 2000-2020, 31.12.2006, Annex A, chapter A.2.4.8

[1)] , [3)]

DESTATIS, Fachserie 4, Reihe 3.1, Produzierendes Gewerbe, Produktion im Produzierenden Gewerbe (“manufacturing industry; production in the manufacturing industry”

[2)]

TODO: David bitte vervollständigen DESTATIS, 1992: p. 234