

## 2.H.2 - Food & Beverages Industry

| Category Code | Method                |               |                       |                       |                         | AD                     |            |           |           |           | EF        |           |             |            |            |
|---------------|-----------------------|---------------|-----------------------|-----------------------|-------------------------|------------------------|------------|-----------|-----------|-----------|-----------|-----------|-------------|------------|------------|
| 2.H.2         | T1                    |               |                       |                       |                         | NS                     |            |           |           |           | CS        |           |             |            |            |
|               | <b>NO<sub>x</sub></b> | <b>NM VOC</b> | <b>SO<sub>2</sub></b> | <b>NH<sub>3</sub></b> | <b>PM<sub>2.5</sub></b> | <b>PM<sub>10</sub></b> | <b>TSP</b> | <b>BC</b> | <b>CO</b> | <b>Pb</b> | <b>Cd</b> | <b>Hg</b> | <b>Diox</b> | <b>PAH</b> | <b>HCb</b> |
| Key Category: | -                     | -/-           | -                     | -                     | -/-                     | -/-                    | -/-        | -         | -         | -         | -         | -         | -           | -          | -          |

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

| Methods   |                                 |
|-----------|---------------------------------|
| <b>D</b>  | Default                         |
| <b>T1</b> | Tier 1 / Simple Methodology *   |
| <b>T2</b> | Tier 2*                         |
| <b>T3</b> | Tier 3 / Detailed Methodology * |
| <b>C</b>  | CORINAIR                        |
| <b>CS</b> | Country Specific                |
| <b>M</b>  | Model                           |

\* as described in the EMEP/EEA Emission Inventory Guidebook - 2019, in the group specific chapters.

| AD - Data Source for Activity Data |                                      |
|------------------------------------|--------------------------------------|
| <b>NS</b>                          | National Statistics                  |
| <b>RS</b>                          | Regional Statistics                  |
| <b>IS</b>                          | International Statistics             |
| <b>PS</b>                          | Plant Specific data                  |
| <b>As</b>                          | Associations, business organisations |
| <b>Q</b>                           | specific Questionnaires (or surveys) |
| <b>M</b>                           | Model / Modelled                     |
| <b>C</b>                           | Confidential                         |
| EF - Emission Factors              |                                      |
| <b>D</b>                           | Default (EMEP Guidebook)             |
| <b>C</b>                           | Confidential                         |
| <b>CS</b>                          | Country Specific                     |
| <b>PS</b>                          | Plant Specific data                  |
| <b>M</b>                           | Model / Modelled                     |

Emissions occurring in this sector in Germany derive from the following production processes which are analogous to the IPCC category (Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual (Volume 3)):

### Alcoholic beverages

- Wine
- Beer
- Spirits

### Bread and other foods

- Meat, fish and poultry
- Sugar
- Margarine as well as hard and hardened fats
- Cake, cookies and breakfast cereals
- Bread
- Animal feedstuffs
- Coffee roasting

Following pollutants are reported:

- volatile organic compounds (NMVOC),
- particulate matter (PM<sub>2.5</sub>, PM<sub>10</sub> and TSP).

Pursuant to the 1993 Classification of Economic Activities (WZ 93), the food and beverage industry is divided into nine groups and a total of 33 classes. Governmental statistical evaluations are oriented to this classification. The German food industry includes an especially large number of small and medium-sized enterprises (SMEs); nearly 80 percent of its companies have fewer than 100 employees, and only 3 per cent have more than 500 employees (BpB, 2002, p.51).

Energy related emissions from the sugar industry are reported under category 1.A.2.e.

## Methodology

The Inventory Database (CSE) lists activity rates (produced amounts) and emission factors for the relevant sectors. The activity rates for the various products / product groups, with the exception of that for feedstuffs, were obtained from the Federal Statistical Office <sup>1)/ 2)/ 3)</sup>

### Activity data

The activity data for feedstuffs were obtained from the Federal Ministry of Food, Agriculture and Consumer Protection <sup>4)</sup>. The production amounts are serve as activity data for following products: Animal fat [t], Animal food [t], Beer [hl], Bread production (craft) [t], Bread production (industrial) [t], Cake & cookies [t], Coffee [t], Dried fodder [t], Meat [t], Other wine and sparkling [hl], Red Wine [hl], Smoked Products [t], Spirituous beverages [hl] Sugar [t], White wine [hl].

For the purpose of international comparability, the inventory team aggregates all products to the common unit of kilotons. These totals can be find in CRF tables and NFR tables as activity data, but this approximately converted figure is not statistically published. The procedure for the uniform reporting of the activity rate shows a high degree of uncertainty due to the very different products of official statistics.

### Emission factors

For emissions calculations, country-specific emission factors were used where available. EF were evaluated and updated by a national research study <sup>5)</sup>. Otherwise, the emission factors recommended by IPCC and CORINAIR were used.

All NMVOC emission factors except for beer were perpetuated during the complete time series. The emission factor for beer changed in 2000.

Table 1: Overview of NMVOC emission factors applied

|                                   | Unit  | EF       | Source                           |
|-----------------------------------|-------|----------|----------------------------------|
| <b>Animal Fat</b>                 | kg/t  | 1        | Expert judgement                 |
| <b>Animal Feed</b>                | kg/t  | 0,1      | Expert judgement                 |
| <b>Beer</b>                       | kg/hl | 0,002    | Expert judgement                 |
| <b>Bread (artisanry)</b>          | kg/t  | 3        | Guidebook 2019 (Bouscaren, 1992) |
| <b>Bread (industry)</b>           | kg/t  | 0,3      | Expert judgement                 |
| <b>Cakes &amp; Cookies</b>        | kg/t  | 0,1      | Expert judgement                 |
| <b>Coffee</b>                     | kg/t  | 0,06885  | Expert judgement                 |
| <b>Meat</b>                       | kg/t  | 0,03     | Guidebook 2019 (Bouscaren, 1992) |
| <b>Other Wine/ sparkling Wine</b> | kg/hl | 0,058    | Expert judgement                 |
| <b>Red Wine</b>                   | kg/hl | 0,08     | IPCC GB 1996                     |
| <b>Smoked Meat &amp; Fish</b>     | kg/t  | 0,0023   | Expert judgement                 |
| <b>Spirits</b>                    | kg/hl | 2,93     | Expert judgement                 |
| <b>Sugar</b>                      | kg/t  | 0,898368 | Expert judgement                 |
| <b>White Wine</b>                 | kg/hl | 0,035    | IPCC GB 1996                     |

In the following table the EF of TSP, PM<sub>10</sub> and PM<sub>2.5</sub> are presented.

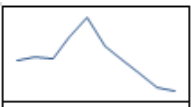
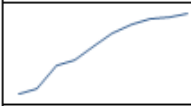
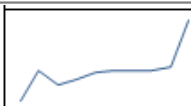
Table 2: Particulate matter emission factors applied, in [kg/t]

|                    | Value | Source           |
|--------------------|-------|------------------|
| <b>Sugar (TSP)</b> | 0,19  | Expert judgement |

|                                  | Value     | Source           |
|----------------------------------|-----------|------------------|
| <b>Sugar (PM<sub>10</sub>)</b>   | 0,10526   | Expert judgement |
| <b>Sugar (PM<sub>2.5</sub>)</b>  | 0,0589    | Expert judgement |
| <b>Coffee (TSP)</b>              | 0,00905   | Expert judgement |
| <b>Coffee (PM<sub>10</sub>)</b>  | 0,00318   | Expert judgement |
| <b>Coffee (PM<sub>2.5</sub>)</b> | 0,0009055 | Expert judgement |
| <b>Dried fodder (TSP)</b>        | 0,85      | Expert judgement |

## Trends in emissions

Emissions of the food and drink industry are reported, in summary form, in the inventory in of the sectoral report for industrial processes. Emissions in detail for the resp. products are presented following tables:

| NMVOC Emissions          | Unit    | 2011     | 2012     | 2013     | 2014     | 2015     | 2016     | 2017     | 2018     | 2019     | 2020     | trend-indicator                                                                       |
|--------------------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------------------------------------------------------------------------------|
| Animal fat               | t       | 344.96   | 351.93   | 348.92   | 388.32   | 428.77   | 374.11   | 345.61   | 320.39   | 295.23   | 287.21   |    |
| Animal food              | t       | 2104.45  | 2141.73  | 2293.94  | 2338.86  | 2433.07  | 2511.94  | 2570.23  | 2607.38  | 2616.44  | 2651.66  |    |
| Beer                     | t       | 178.89   | 177.01   | 173.01   | 174.46   | 174.43   | 173.55   | 169.61   | 173.14   | 169.21   | 158.94   |    |
| Bread production (total) | t       | 3865.46  | 4174.49  | 4037.89  | 4074.56  | 4154.79  | 4172.44  | 4180.89  | 4175.16  | 4214.30  | 4690.60  |   |
| Cake & cookies...        | t       | 158.72   | 152.28   | 153.92   | 164.96   | 165.69   | 164.89   | 167.79   | 167.79   | 171.19   | 184.07   |  |
| Coffee                   | t       | 37.20    | 37.53    | 38.22    | 36.60    | 35.32    | 37.35    | 37.96    | 37.96    | 39.39    | 39.35    |  |
| Meat, fish               | t       | 51.81    | 50.80    | 50.05    | 50.86    | 52.20    | 53.87    | 54.51    | 55.74    | 55.55    | 54.55    |  |
| Spirituos beverages      | t       | 3497.82  | 3535.31  | 3554.21  | 3456.59  | 3536.34  | 3545.82  | 3503.41  | 3595.14  | 3571.66  | 3538.05  |  |
| Sugar                    | t       | 3974.19  | 4004.04  | 3326.58  | 3599.98  | 3049.85  | 3267.01  | 3814.53  | 4071.99  | 3676.98  | 3507.03  |  |
| Wine (total)             | t       | 534.34   | 522.81   | 484.25   | 514.38   | 521.64   | 490.74   | 416.16   | 537.85   | 450.35   | 453.25   |  |
| Total                    | t       | 14747.84 | 15147.94 | 14460.99 | 14799.57 | 14552.10 | 14791.71 | 15260.69 | 15742.54 | 15260.28 | 15564.69 |  |
| Particle Emissions       | Product | Unit     | 2011     | 2012     | 2013     | 2014     | 2015     | 2016     | 2017     | 2018     | 2019     | 2020                                                                                  |
| PM 10                    | Coffee  | t        | 1.73     | 1.74     | 1.78     | 1.70     | 1.64     | 1.73     | 1.76     | 1.76     | 1.83     | 1.83                                                                                  |
| PM 10                    | Sugar   | t        | 464.80   | 468.30   | 389.06   | 421.04   | 356.70   | 382.09   | 446.13   | 476.24   | 430.04   | 410.17                                                                                |
| PM 10 (total)            |         |          | 466.53   | 470.04   | 390.84   | 422.74   | 358.34   | 383.83   | 447.89   | 478.00   | 431.87   | 411.99                                                                                |
| PM 2.5                   | Coffee  | t        | 0.49     | 0.49     | 0.50     | 0.48     | 0.46     | 0.49     | 0.50     | 0.50     | 0.51     | 0.5140341                                                                             |

| Particle Emissions | Product      | Unit | 2011    | 2012    | 2013   | 2014   | 2015   | 2016   | 2017    | 2018    | 2019   | 2020   |
|--------------------|--------------|------|---------|---------|--------|--------|--------|--------|---------|---------|--------|--------|
| PM 2.5             | Sugar        | t    | 260.09  | 262.04  | 217.71 | 235.60 | 199.60 | 213.81 | 249.64  | 266.49  | 240.64 | 229.52 |
| PM 2.5 (total)     |              |      | 260.57  | 262.53  | 218.21 | 236.08 | 200.06 | 214.30 | 250.14  | 266.98  | 241.15 | 230.03 |
| TSP                | Coffee       | t    | 4.9     | 5.0     | 5.0    | 4.8    | 4.7    | 4.9    | 5.0     | 5.0     | 5.2    | 5.20   |
| TSP                | Dried fodder | t    | 205.7   | 210.0   | 191.3  | 168.3  | 146.2  | 146.2  | 198.9   | 207.4   | 180.2  | 180.20 |
| TSP                | Sugar        | t    | 839.0   | 845.3   | 702.3  | 760.0  | 643.9  | 689.7  | 805.3   | 859.6   | 776.3  | 740.37 |
| TSP (Total)        |              |      | 1049.61 | 1060.21 | 898.58 | 933.13 | 794.72 | 840.83 | 1009.20 | 1072.06 | 961.65 | 925.77 |

## Recalculations

No recalculations were necessary compared to last year's Submission.



For **pollutant-specific information on recalculated emission estimates for Base Year and 2019**, please see the pollutant specific recalculation tables following [chapter 8.1 - Recalculations](#).

## Planned improvements

For purposes of updating the EF project has started in 2020, but results are delayed to use for the 2022 submission <sup>6)</sup>, but are expected for next report.

<sup>1)</sup> Statistisches Bundesamt (FS 4, R 3.1): Fachserie 4, Reihe 3.1: Produzierendes Gewerbe, Produktion im Produzierenden Gewerbe ("manufacturing industry; production in the manufacturing industry"; URL: [https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Industrie-Verarbeitendes-Gewerbe/\\_inhalt.html](https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Industrie-Verarbeitendes-Gewerbe/_inhalt.html)

<sup>2)</sup> Statistisches Bundesamt (FS 3, R 3.2.1): Fachserie 3, Reihe 3.2.1: Land- und Forstwirtschaft, Fischerei, Wachstum und Ernte – Feldfrüchte (div. Jgg.). URL: [https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Landwirtschaft-Forstwirtschaft-Fischerei/Flaechennutzung/\\_inhalt.html](https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Landwirtschaft-Forstwirtschaft-Fischerei/Flaechennutzung/_inhalt.html)

<sup>3)</sup> Statistisches Bundesamt (FS 3, R 3.2.2): Land- und Forstwirtschaft, Fischerei, Wirtschaftsdünger tierischer Herkunft in landwirtschaftlichen Betrieben - Erhebung zur Wirtschaftsdüngerausbringung (div. Jgg.)

<sup>4)</sup> BMELV, 2020: Federal Ministry of Food, Agriculture and Consumer Protection (BMELV): Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2019; URL: <https://www.ble-medienservice.de/0227/statistisches-jahrbuch-fuer-ernaehrung-landwirtschaft-und-forsten-2020>

<sup>5)</sup> J. Theloke, S. Wagner, D. Jepsen, U. Hackmack, 2008: "Emissionen aus der Nahrungsmittelindustrie", FKZ 206 42 101/01

<sup>6)</sup> ReFoPlan FKZ – 3720533040: „Aktualisierung der Datengrundlagen zu Emissionen aus der Nahrungsmittelindustrie“