2.H.2 - Food & Beverages Industry

Category Code	Method					AD					EF				
2.H.2	T1					NS					CS				
	NO_x	NMVOC	SO_2	NH_3	$PM_{2.5}$	PM_{10}	TSP	BC	CO	Pb	Cd	Hg	Diox	PAH	HCB
Key Category:	-	-/-	-	-	-/-	-/-	-/-	-	-	-	-	-	-	-	-

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

Methods	
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 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 (or surveys)
M	Model / Modelled
C	Confidential

EF - Emission Factors	
D	Default (EMEP Guidebook)
C	Confidential
CS	Country Specific
PS	Plant Specific data
M	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 (PM2.5, PM10 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 [1)]/ [2)]/ [3)]

Activity data

The activity data for feedstuffs were obtained from the Federal Ministry of Food, Agriculture and Consumer Protection [4)]. 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 [5)]. 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
Animal Fat	kg/t	1	Expert judgement
Animal Feed	kg/t	0,1	Expert judgement
Beer	kg/hl	0,002	Expert judgement
Bread (artisanry)	kg/t	3	Guidebook 2019 (Bouscaren, 1992)
Bread (industry)	kg/t	0,3	Expert judgement
Cakes & Cookies	kg/t	0,1	Expert judgement
Coffee	kg/t	0,06885	Expert judgement
Meat	kg/t	0,03	Guidebook 2019 (Bouscaren, 1992)
Other Wine/ sparkling Wine	kg/hl	0,058	Expert judgement
Red Wine	kg/hl	0,08	IPCC GB 1996
Smoked Meat & Fish	kg/t	0,0023	Expert judgement
Spirits	kg/hl	2,93	Expert judgement
Sugar	kg/t	0,898368	Expert judgement
White Wine	kg/hl	0,035	IPCC GB 1996

In the following table the EF of TSP, PM_{10} and $PM_{2.5}$ are presented.

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

	Value	Source
Sugar (TSP)	0,19	Expert judgement

	Value	Source
Sugar (PM_{10})	0,10526	Expert judgement
Sugar ($PM_{2.5}$)	0,0589	Expert judgement
Coffee (TSP)	0,00905	Expert judgement
Coffee (PM_{10})	0,00318	Expert judgement
Coffee ($PM_{2.5}$)	0,0009055	Expert judgement
Dried fodder (TSP)	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:

Table 3: Trends of NMVOC emissions

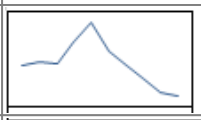
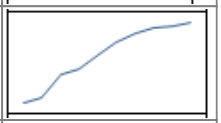
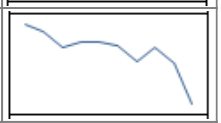
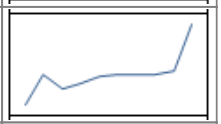
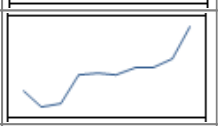
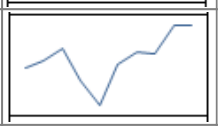
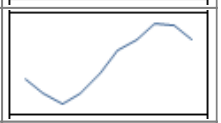
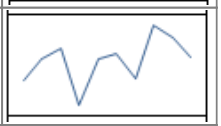
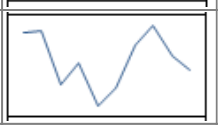
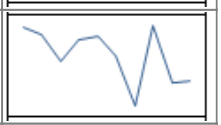
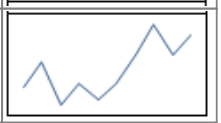
Product	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	trend-indicator
Animal fat	t	344.96	351.93	348.92	388.32	428.77	374.11	345.61	320.39	295.23	287.21	
Animal food	t	2104.45	2141.73	2293.94	2338.86	2433.07	2511.94	2570.23	2607.38	2616.44	2651.66	
Beer	t	178.89	177.01	173.01	174.46	174.43	173.55	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	
Spirituous 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	

Table 3: Trends of particulate matter emissions

	Product	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
$PM_{2.5}$	Coffee	t	0.49	0.49	0.50	0.48	0.46	0.49	0.50	0.50	0.51	0.5140341
	Sugar	t	260.09	262.04	217.71	235.60	199.60	213.81	249.64	266.49	240.64	229.52
	SUM	t	260.57	262.53	218.21	236.08	200.06	214.30	250.14	266.98	241.15	230.03
PM_{10}	Coffee	t	1.73	1.74	1.78	1.70	1.64	1.73	1.76	1.76	1.83	1.83
	Sugar	t	464.80	468.30	389.06	421.04	356.70	382.09	446.13	476.24	430.04	410.17
	SUM	t	466.53	470.04	390.84	422.74	358.34	383.83	447.89	478.00	431.87	411.99
TSP	Coffee	t	4.9	5.0	5.0	4.8	4.7	4.9	5.0	5.0	5.2	5.20
	Dried fodder	t	205.7	210.0	191.3	168.3	146.2	146.2	198.9	207.4	180.2	180.20
	Sugar	t	839.0	845.3	702.3	760.0	643.9	689.7	805.3	859.6	776.3	740.37
	SUM	t	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 2020**, please see the pollutant specific recalculation tables following chapter 8.1 - Recalculations.

Planned improvements

For purposes of updating the EF, a project has started in 2020, but results are delayed to use for the 2022 submission [6], but are expected for the next annual submission.

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[1] 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

[2] 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

[3] Statistisches Bundesamt (FS 3, R 3.2.2): Land- und Forstwirtschaft, Fischerei, Wirtschaftsdünger tierischer Herkunft inlandwirtschaftlichen Betrieben - Erhebung zur Wirtschaftsdüngerausbringung (div. Jgg.)

[4] 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

[5] J. Theloke, S. Wagner, D. Jepsen, U. Hackmack, 2008: “Emissionen aus der Nahrungsmittelindustrie”, FKZ 206 42 101/01

[6] ReFoPlan FKZ – 3720533040: „Aktualisierung der Datengrundlagen zu Emissionen aus der Nahrungsmittelindustrie“