1.A.5.b i - Military Ground Vehicles and Vehicles

Short description

In sub-category *1.A.5.b i - Other, Mobile (including Military)* emissions from military ground-vehicles and mobile machinery are reported.

Method	AD	EF	Key Category Analysis
T1, T2	NS	CS, D	see superordinate chapter

Methodology

Activity data

Basically, all fuel consumption in military vehicles is included in the primary acitivity data provided by the National Energy Balances (NEB) (AGEB, 2020) [1].

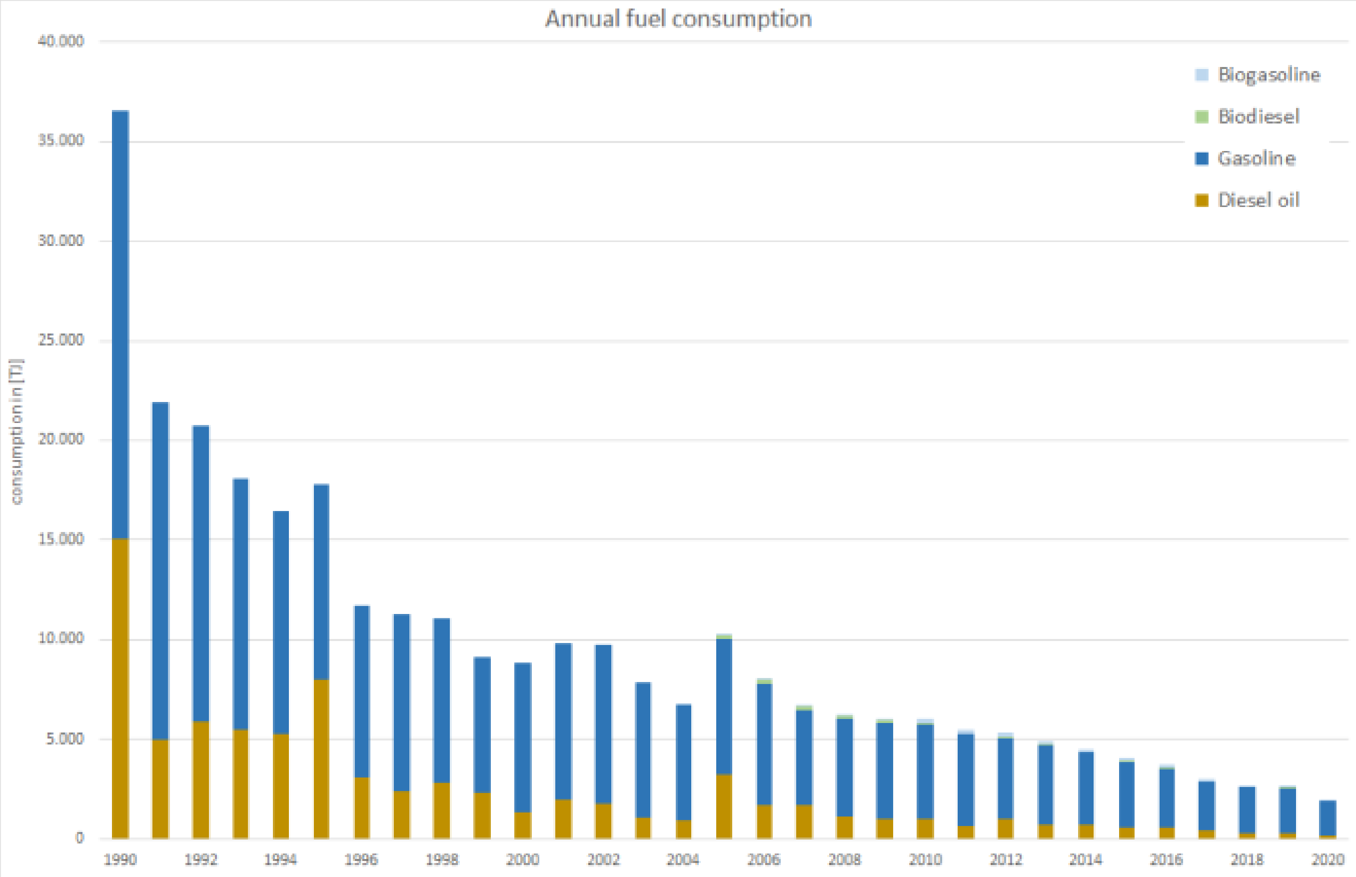
As the NEB does not provide specific data for military use, the following additional sources are used:

For the years as of 1995, the official mineral-oil data of the Federal Republic of Germany (Amtliche Mineralöldaten der Bundesrepublik Deutschland), prepared by the Federal Office of Economics and Export Control (BAFA), are used (BAFA, 2020) [2]. Provided in units of [1,000 t], these amounts have to be converted into [TJ] on the basis of the relevant net calorific values given by [3].

As the official mineral-oil data does not distinguish into fossil and biofuels but does provide amounts for inland deliveries of total diesel and gasoline fuels, no data on the consumption of biodiesel and bioethanol is available directly at the moment. Therefore, activity data for biofuels used in military vehicles are calculated by applying Germany's official annual biofuel shares to the named total deliveries (see also: info on EF).

Table 1: Annual fuel deliveries to the military for ground-vehicles and machinery, in terajoules

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Diesel Oil	15,037	8,001	1,364	3,206	1,701	1,664	1,139	990	977	620	966	680	683	580	577	415	279	281	133
Biodiesel	21,508	9,800	7,477	6,838	6,095	4,764	4,919	4,854	4,792	4,624	4,106	4,027	3,635	3,287	2,959	2,463	2,300	2,269	1,770
Gasoline				214	205	223	114	80.0	74.9	43.2	68.2	40.3	41.9	31.7	30.6	22.1	16.2	16.0	11.1
Biogasoline				47.0	87.9	64.3	94.0	139	185	190	182	173	158	143	129	104	103	97.9	80.8
Σ 1.A.5.b i	**36,545**	**17,801**	**8,841**	**10,306**	**8,089**	**6,716**	**6,266**	**6,063**	**6,029**	**5,476**	**5,323**	**4,920**	**4,517**	**4,041**	**3,696**	**3,004**	**2,699**	**2,663**	**1,995**



Emission factors

Table 2: Annual country-specific emission factors[1], in kg/TJ

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DIESEL FUELS																			
NH_3	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
NMVOC	316	274	274	274	274	274	274	274	274	274	274	274	274	274	274	274	274	274	274
NO_x	1,195	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360
SO_x	125	60.5	14.0	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
PM[2]	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0
BC[3]	134	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CO	515	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
GASOLINE FUELS																			
NH_3	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
NMVOC	594	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373
NO_x	682	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725	725
SO_x	11.8	8.30	3.20	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
PM[2]	3.63	3.55	3.13	2.66	2.66	2.51	2.39	2.27	2.14	2.09	2.03	1.97	1.91	1.91	1.91	1.91	1.91	1.91	1.91
BC[3]	0.44	0.43	0.38	0.32	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23
CO	4,199	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,010
TSP[4]	2.46	0.82																	
Pb[4]	1.54	0.52																	

[1] Due to lack of better information: similar EF are applied for fossil fuels and biofuels.
[2] EF($PM_{2.5}$) also applied for PM_{10} and TSP (assumption: > 99% of TSP from diesel oil combustion consists of $PM_{2.5}$)
[3] EF(BC) estimated from tier1 default f-BC values provided in [4)], chapter 1.A.3.b, table 3-11 for gasoline passenger cars (f-BC: 0.12) and diesel heavy duty vehicles (f-BC: 0.53)
[4] from leaded gasoline (until 1997), based upon country-specific emission factors from TREMOD [5)]

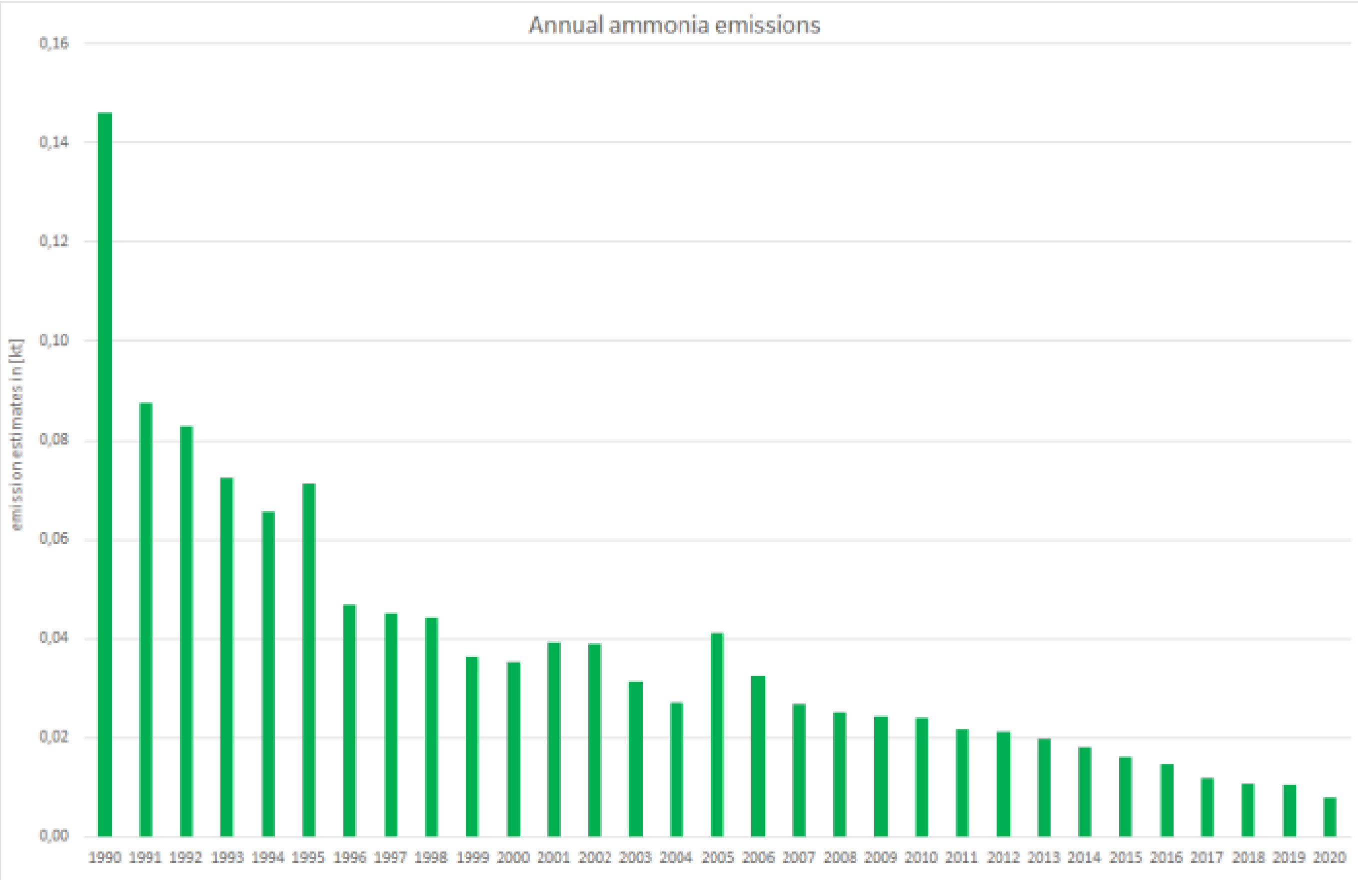
With respect to the emission factors applied for particulate matter, given the circumstances during test-bench measurements, condensables are most likely included at least partly. [1)]

For information on the **emission factors for heavy-metal and POP exhaust emissions**, please refer to Appendix 2.3 - Heavy Metal (HM) exhaust emissions from mobile sources and Appendix 2.4 - Persistent Organic Pollutant (POP) exhaust emissions from mobile sources.

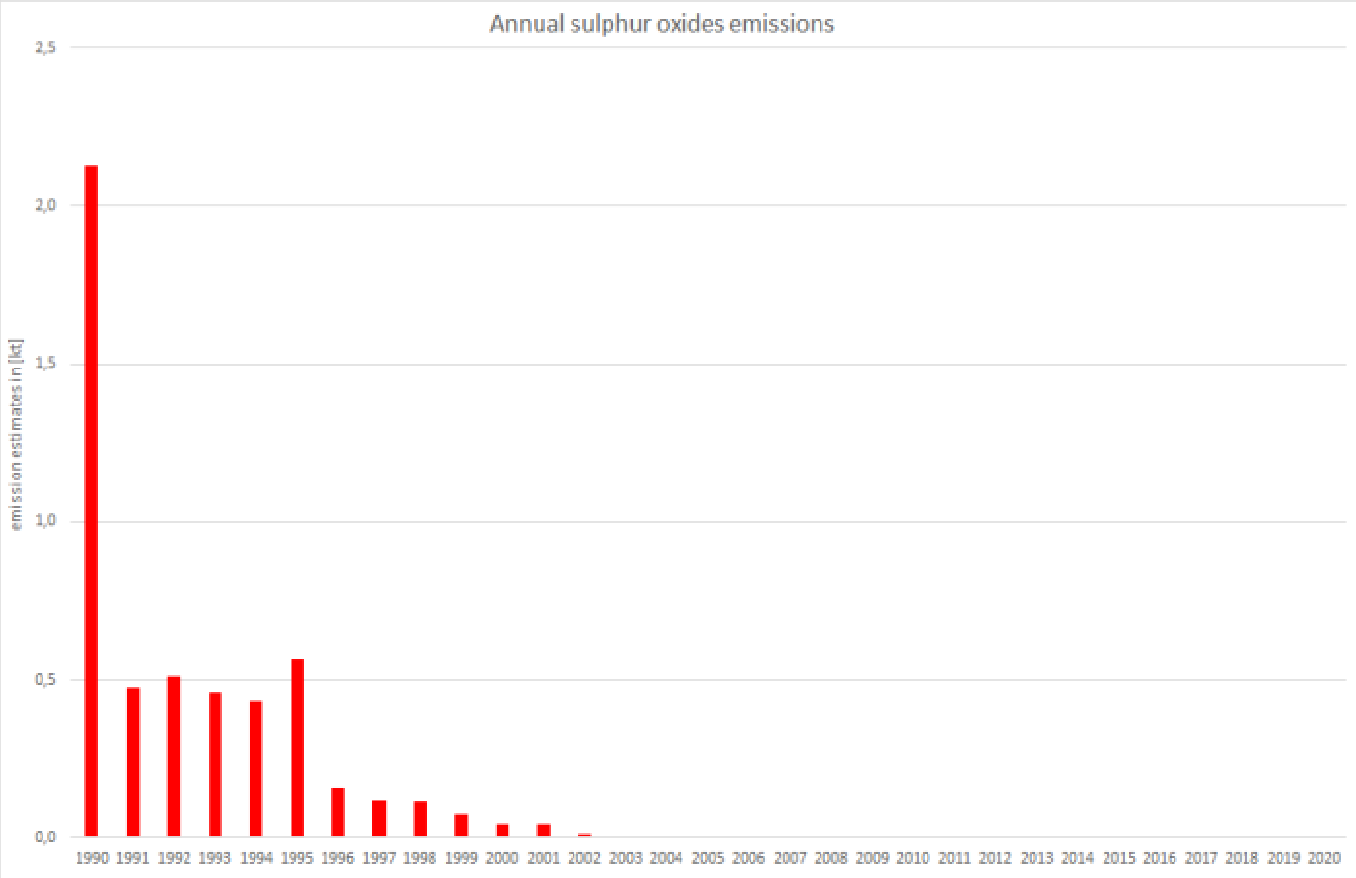
Discussion of emission trends

As only NFR 1.A.5.b as a whole is taken into account within the key category analysis, this country-specific sub-sector is not considered separately.

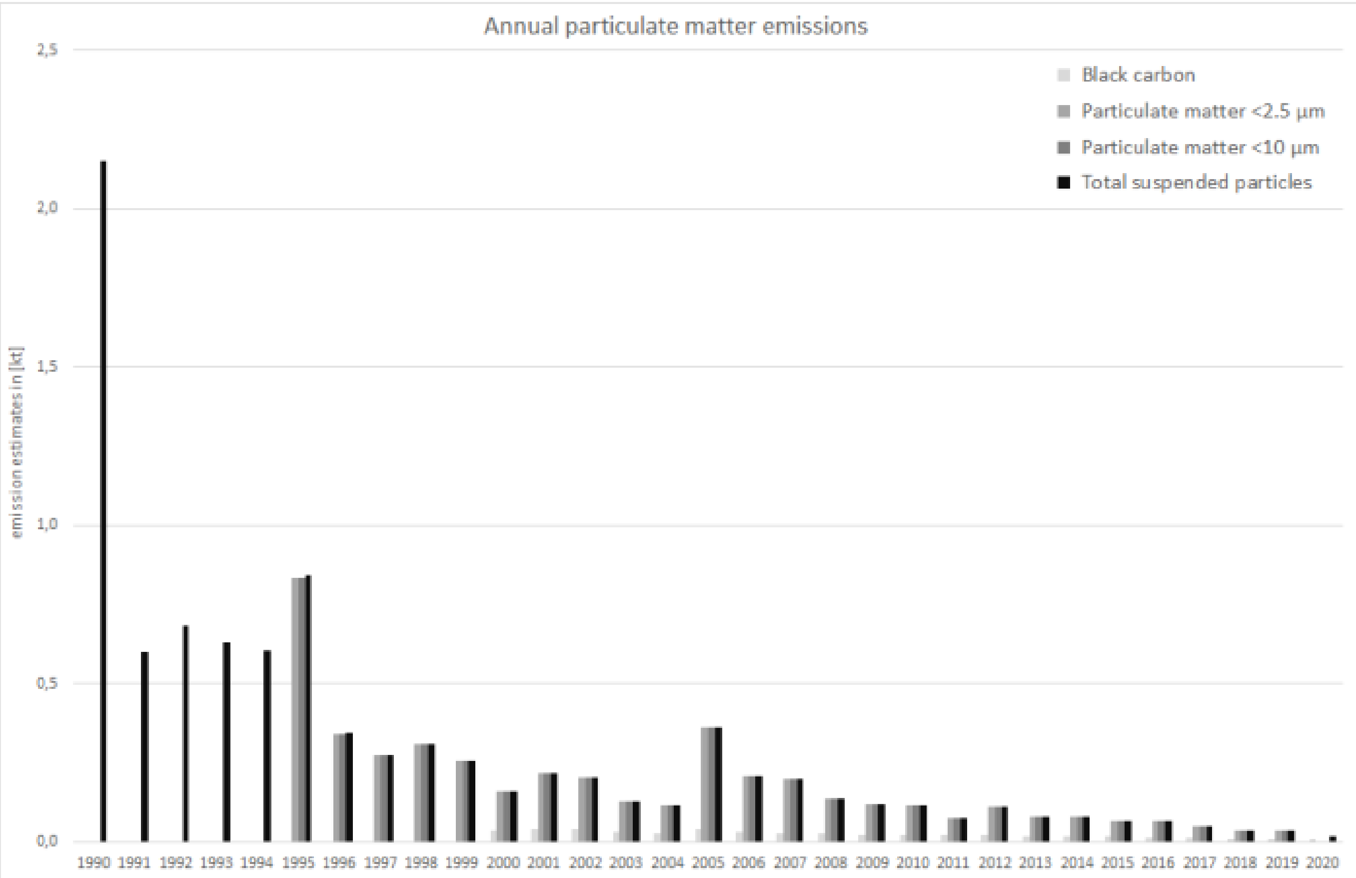
Due to the application of very several tier1 emission factors, most emission trends reported for this sub-category only reflect the trend in fuel deliveries. Therefore, the fuel-consumption dependend trends in emission estimates are only influenced by the annual fuel mix.



Here, for **sulphur dioxide**, this consumption-based falling trend is intensified by the impact of fuel-sulphur legislation.



Over-all **particulate matter** emissions are dominated by emissions from diesel oil combustion with the falling trend basically following the decline in fuel consumption. Here, until 1997, the emission values reported for **total suspended particles (TSP)** are slightly higher than those reported for $PM_{2.5}$ and PM_{10} due to the additional TSP emissions from leaded gasoline that was banned in 1997.



Recalculations

Changes in specific **activity data** result from a correction of the shares of biodiesel and the NCV applied for fossil diesel oil.

The annual amounts reported for fossil gasoline and bio-gasoline remain unaltered.

Table: Revised activity data, in terajoules

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Diesel oil																		
Submission 2022	15.037	8.001	1.364	3.206	1.701	1.664	1.139	990	977	620	966	680	683	580	577	415	279	281
Submission 2021	15.037	8.001	1.364	3.206	1.701	1.664	1.139	990	977	620	966	680	683	580	577	415	279	281
absolute change	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,01
relative change	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Biodiesel																		
Submission 2022				214	205	223	114	80,0	74,9	43,2	68,2	40,3	41,9	31,7	30,6	22,1	16,2	16,0
Submission 2021				214	205	223	114	80,0	74,9	43,2	68,2	40,3	41,9	31,7	30,6	22,0	16,2	16,0
absolute change				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,14	0,00	0,01
relative change				0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,62%	0,00%	0,03%
Gasoline																		
Submission 2022	21.508	9.800	7.477	6.838	6.095	4.764	4.919	4.854	4.792	4.624	4.106	4.027	3.635	3.287	2.959	2.463	2.300	2.269
Submission 2021	21.508	9.800	7.477	6.857	6.128	4.789	4.955	4.907	4.862	4.696	4.175	4.092	3.695	3.342	3.009	2.503	2.341	2.269
absolute change	0,00	0,00	0,00	-18,1	-33,8	-24,7	-36,0	-52,9	-70,1	-71,7	-68,7	-65,2	-59,7	-55,4	-50,0	-40,4	-40,2	0,00
relative change	0,00%	0,00%	0,00%	-0,26%	-0,55%	-0,52%	-0,73%	-1,08%	-1,44%	-1,53%	-1,65%	-1,59%	-1,62%	-1,66%	-1,66%	-1,61%	-1,72%	0,00%
Biogasoline																		
Submission 2022				47,0	87,9	64,3	94,0	139	185	190	182	173	158	143	129	104	103	97,9
Submission 2021				47,1	88,3	64,7	94,7	140	188	192	185	175	161	145	131	106	105	97,9
absolute change				-0,12	-0,49	-0,33	-0,69	-1,51	-2,71	-2,94	-3,04	-2,80	-2,60	-2,40	-2,17	-1,70	-1,81	0,00
relative change				-0,26%	-0,55%	-0,52%	-0,73%	-1,08%	-1,44%	-1,53%	-1,65%	-1,59%	-1,62%	-1,66%	-1,66%	-1,61%	-1,72%	0,00%
Σ 1.A.5.b i																		
Submission 2022	36.545	17.801	8.841	10.306	8.089	6.716	6.266	6.063	6.029	5.476	5.323	4.920	4.517	4.041	3.696	3.004	2.699	2.663
Submission 2021	36.545	17.801	8.841	10.324	8.123	6.741	6.303	6.117	6.102	5.551	5.394	4.988	4.580	4.099	3.748	3.046	2.741	2.663
absolute change	0,00	0,00	0,00	-18,3	-34,3	-25,1	-36,7	-54,4	-72,8	-74,6	-71,7	-68,0	-62,3	-57,8	-52,1	-42,0	-42,0	0,00
relative change	0,00%	0,00%	0,00%	-0,18%	-0,42%	-0,37%	-0,58%	-0,89%	-1,19%	-1,34%	-1,33%	-1,36%	-1,36%	-1,41%	-1,39%	-1,38%	-1,53%	0,00%

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

Given the limited quality of the emission factors applied, the inventory compiler will check a possible revision at least for the main pollutants.

FAQs

[1], [3] AGEB, 2020: Working Group on Energy Balances (Arbeitsgemeinschaft Energiebilanzen (Hrsg.), AGEB): Energiebilanz für die Bundesrepublik Deutschland; URL: http://www.ag-energiebilanzen.de/7-0-Bilanzen-1990-2018.html, (Aufruf: 29.11.2020), Köln & Berlin, 2020.
[2] BAFA, 2020: Federal Office of Economics and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA): Amtliche Mineralöldaten für die Bundesrepublik Deutschland; URL: https://www.bafa.de/SharedDocs/Downloads/DE/Energie/Mineraloel/moel_amtliche_daten_2018_dezember.html, Eschborn, 2020.
[4] EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook – 2019, Copenhagen, 2019.
[5] Knörr et al. (2020b): Knörr, W., Heidt, C., Gores, S., & Bergk, F.: ifeu Institute for Energy and Environmental Research (Institut für Energie- und Umweltforschung Heidelberg gGmbH, ifeu): Aktualisierung des Modells TREMOD-Mobile Machinery (TREMOD MM) 2020, Heidelberg, 2020.
[1]

During test-bench measurements, temperatures are likely to be significantly higher than under real-world conditions, thus reducing condensation. On the contrary, smaller dillution (higher number of primary particles acting as condensation germs) together with higher pressures increase the likeliness of condensation. So over-all condensables are very likely to occur but different to real-world conditions.