

¹ EF(TSP) also applied for PM₁₀ and PM_{2.5} (assumption: > 99% of TSP consists of PM_{2.5})

² estimated via a f-BC of 0.48 as provided in ⁵⁾, Chapter: 1.A.3.a, 1.A.5.b Aviation, page 49: "Conclusion".



For the country-specific emission factors applied for particulate matter, no clear indication is available, whether or not condensables are included.

Trend discussion for Key Sources

NFR 1.A.3.a ii (ii) - Domestic Civil Aviation - Cruise is **not included in the national emission totals** and hence **not included in the key category analysis**.

Recalculations

Activity data have been revised for all years within TREMOD AV to keep in line with information available from the 2019 EMEP/EEA Guidebook ⁶⁾ and Eurocontrol's AEM model ⁷⁾.

Table 3: Revised kerosene consumption in 1.A.3.a ii (ii), in terajoules

	= 1990	= 1995	= 2000	= 2005	= 2006	= 2007	= 2008	= 2009	= 2010	= 2011	= 2012	= 2013	= 2014	= 2015	= 2016	= 2017
~ Submission 2020	> 20,024	> 20,875	> 22,967	> 21,565	> 22,122	> 22,904	> 23,145	> 21,771	> 21,579	> 21,776	> 20,673	> 18,717	> 19,614	> 19,730	> 19,746	> 19,074
~ Submission 2019	> 19,455	> 20,404	> 23,321	> 21,678	> 22,233	> 22,907	> 23,190	> 21,977	> 21,753	> 21,967	> 20,754	> 18,869	> 19,090	> 19,803	> 20,388	> 19,586
~ absolute change	> 569	> 471	> -354	> -112	> -112	> -3.15	> -44.9	> -206	> -174	> -191	> -81.7	> -152	> 524.71	> -72.8	> -643	> -512
~ relative change	> 2.92%	> 2.31%	> -1.52%	> -0.52%	> -0.50%	> -0.01%	> -0.19%	> -0.94%	> -0.80%	> -0.87%	> -0.39%	> -0.80%	> 2.75%	> -0.37%	> -3.15%	> -2.61%

In parallel, the majority of **country-specific emission factors** has been revised within TREMOD AV based on information available from the 2019 EMEP/EEA Guidebook ⁸⁾ and Eurocontrol's AEM model ⁹⁾.

Table 4: Revised emission-factor values, in [kg/TJ]

< NMVOC																
~ Submission 2020	> 15.1	> 17.0	> 17.2	> 19.9	> 20.9	> 21.5	> 21.7	> 21.6	> 21.3	> 21.4	> 21.7	> 23.3	> 23.6	> 23.8	> 19.1	> 19.5
~ Submission 2019	> 9.3	> 11.6	> 10.5	> 12.1	> 13.2	> 13.3	> 13.0	> 13.1	> 13.1	> 13.3	> 13.2	> 13.7	> 14.1	> 13.5	> 13.4	> 13.6
~ absolute change	> 5.84	> 5.46	> 6.68	> 7.76	> 7.69	> 8.21	> 8.69	> 8.49	> 8.24	> 8.10	> 8.48	> 9.68	> 9.48	> 10.28	> 5.66	> 5.83
~ relative change	> 63.0%	> 47.2%	> 63.8%	> 64.0%	> 58.1%	> 61.7%	> 66.7%	> 64.8%	> 63.1%	> 61.1%	> 64.0%	> 70.9%	> 67.1%	> 75.9%	> 42.2%	> 42.7%
< Nitrogen oxides - NO _x																
~ Submission 2020	> 330	> 367	> 332	> 319	> 317	> 320	> 333	> 346	> 354	> 356	> 360	> 359	> 366	> 365	> 379	> 380

~ Submission 2019	> 342	> 381	> 351	> 338	> 339	> 346	> 358	> 366	> 372	> 375	> 380	> 385	> 384	> 388	> 396	> 402		
~ absolute change	> -12.51	> -14.42	> -18.74	> -19.36	> -21.48	> -26.16	> -25.15	> -20.71	> -18.06	> -19.21	> -20.09	> -26.37	> -17.21	> -22.82	> -17.11	> -21.59		
~ relative change	> -3.65%	> -3.79%	> -5.34%	> -5.72%	> -6.34%	> -7.55%	> -7.02%	> -5.65%	> -4.86%	> -5.13%	> -5.29%	> -6.85%	> -4.48%	> -5.88%	> -4.33%	> -5.38%		
< Sulphur oxides - SO _x																		
~ Submission 2020	> 19.7	> 19.5	> 19.5	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6	> 19.6		
~ Submission 2019	> 25.1	> 15.2	> 8.5	> 6.3	> 5.9	> 5.5	> 5.1	> 4.7	> 4.7	> 4.7	> 4.7	> 4.7	> 4.7	> 4.7	> 4.7	> 4.7		
~ absolute change	> -5.45	> 4.30	> 11.08	> 13.28	> 13.71	> 14.13	> 14.55	> 14.98	> 14.98	> 14.98	> 14.98	> 14.98	> 14.98	> 14.98	> 14.98	> 14.98		
~ relative change	> -21.7%	> 28.2%	> 131%	> 209%	> 232%	> 257%	> 287%	> 322%	> 322%	> 322%	> 322%	> 322%	> 322%	> 322%	> 322%	> 322%		
< Black carbon - BC																		
~ Submission 2020	> 2.02	> 2.49	> 2.44	> 2.53	> 2.56	> 2.47	> 2.20	> 2.22	> 2.28	> 2.25	> 2.26	> 2.27	> 2.38	> 2.40	> 2.24	> 2.21		
~ Submission 2019	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23	> 2.23		
~ absolute change	> -0.21	> 0.26	> 0.21	> 0.30	> 0.32	> 0.24	> -0.03	> -0.01	> 0.05	> 0.02	> 0.03	> 0.03	> 0.15	> 0.17	> 0.01	> -0.02		
~ relative change	> -9.52%	> 11.61%	> 9.50%	> 13.39%	> 14.49%	> 10.85%	> -1.42%	> -0.49%	> 2.32%	> 0.82%	> 1.34%	> 1.55%	> 6.53%	> 7.57%	> 0.29%	> -0.95%		
< Particulate matter - PM																		
~ Submission 2020	> 4.21	> 5.19	> 5.09	> 5.27	> 5.33	> 5.16	> 4.58	> 4.63	> 4.76	> 4.69	> 4.71	> 4.72	> 4.95	> 5.00	> 4.66	> 4.61		
~ Submission 2019	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65	> 4.65		
~ absolute change	> -0.44	> 0.54	> 0.44	> 0.62	> 0.67	> 0.50	> -0.07	> -0.02	> 0.11	> 0.04	> 0.06	> 0.07	> 0.30	> 0.35	> 0.01	> -0.04		
~ relative change	> -9.52%	> 11.6%	> 9.50%	> 13.4%	> 14.5%	> 10.8%	> -1.42%	> -0.49%	> 2.32%	> 0.82%	> 1.34%	> 1.55%	> 6.53%	> 7.57%	> 0.29%	> -0.95%		
< Carbon monoxide - CO																		
~ Submission 2020	> 144.5	> 145.2	> 179.0	> 195.3	> 194.5	> 193.3	> 195.1	> 194.2	> 190.2	> 190.0	> 194.1	> 205.0	> 206.2	> 208.5	> 149.0	> 145.3		
~ Submission 2019	> 85.5	> 88.2	> 111.7	> 111.0	> 111.0	> 105.2	> 102.4	> 104.8	> 105.8	> 105.2	> 102.1	> 98.7	> 100.4	> 104.3	> 98.2	> 91.7		
~ absolute change	> 58.93	> 56.97	> 67.33	> 84.30	> 83.50	> 88.08	> 92.71	> 89.41	> 84.38	> 84.77	> 91.96	> 106.30	> 105.85	> 104.16	> 50.81	> 53.62		
~ relative change	> 68.9%	> 64.6%	> 60.3%	> 75.9%	> 75.2%	> 83.7%	> 90.5%	> 85.3%	> 79.7%	> 80.6%	> 90.1%	> 108%	> 105.4%	> 99.9%	> 51.7%	> 58.5%		



For more information on recalculated emission estimates for Base Year and 2018, please see the pollutant specific recalculation tables following chapter [8.1 - Recalculations](#)].

Uncertainties

For uncertainties information, please see [main chapter](#) on civil aviation.

Planned improvements

For information on planned improvements, please see [main chapter](#) on civil aviation.

FAQs

[bibliography](#) : 1 : Knörr, W., Schacht, A., & Gores, S. (2010): Entwicklung eines eigenständigen Modells zur Berechnung des Flugverkehrs (TREMOT-AV) : Endbericht. Endbericht zum F+E-Vorhaben 360 16 029, URL:

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¹⁾ (bible 2)

²⁾ (bible 3)

³⁾ (bible 1)

⁴⁾ (bible 2)

⁵⁾ (bible 4)

⁶⁾ (bible 4)

⁷⁾ (bible 5)

⁸⁾ (bible 4)

⁹⁾ (bible 5)