

1.A.3.a ii (ii) - Domestic Civil Aviation: Cruise

Short description

Method	AD	EF	Key Category for
T1, T2, T3	NS, M	CS, D, M	not included in key category analysis

In NFR category 1.A.3.a ii (ii) - Domestic Civil Aviation: Cruise emissions from domestic flights between German airports during cruise stage (above 3,000 feet of altitude) are reported.

In the following, information on sub-category specific activity data, (implied) emission factors and emission estimates are provided.

Methodology

Activity Data

Specific jet kerosene consumption during LTO-stage is calculated within TREMOD AV as described in the [superordinate chapter](#).

Table 1: annual jet kerosene consumption during cruise-stage, in terajoules

1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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source: Knörr et al. (2019c) ¹⁾ & Gores (2019) ²⁾

gallery size="medium" : 1A3aii(ii)_AD.png [gallery](#)

Emission factors

All country specific emission factors used for emission reporting were basically ascertained within UBA project FKZ 360 16 029 ³⁾ and have since then been compiled, revised and maintained in TREMOD AV ⁴⁾.

For more information, please see the [superordinate chapter](#) on civil aviation.

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

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NH ₃																		
NM VOC																		
NO _x																		
SO _x																		
PM ¹																		
BC ²																		
CO																		

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.

< 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: <https://www.umweltbundesamt.de/publikationen/entwicklung-eines-modells-zur-berechnung>; Berlin & Heidelberg, 2012. : 2 : Knörr et al. (2019c): Knörr, W., Schacht, A., & Gores, S.: TREMOD Aviation (TREMOT AV) 2019 - Revision des Modells zur

Berechnung des Flugverkehrs (TREMODO-AV). Heidelberg, Berlin: Ifeu Institut für Energie- und Umweltforschung Heidelberg GmbH & Öko-Institut e.V., Berlin & Heidelberg, 2019. : 3 : Gores (2018): Inventartool zum deutschen Flugverkehrsinventar 1990-2018, im Rahmen der Aktualisierung des Moduls TREMOD-AV im Transportemissionsmodell TREMOD, Berlin, 2019. : 4 : EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook 2019, <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-a-aviation/view>; Copenhagen, 2019. : 5 : Eurocontrol (2019): Advanced emission model (AEM); <https://www.eurocontrol.int/model/advanced-emission-model>; 2019 [bibliography](#)

¹⁾ (bibcite 2)

²⁾ (bibcite 3)

³⁾ (bibcite 1)

⁴⁾ (bibcite 2)

⁵⁾ (bibcite 4)

⁶⁾ (bibcite 4)

⁷⁾ (bibcite 5)

⁸⁾ (bibcite 4)

⁹⁾ (bibcite 5)