

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	<i>not included in key category analysis</i>

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.

Method

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
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	19,178	

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 029³⁾ and have since then been compiled, revised and maintained in TREMOD AV⁴⁾.

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

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

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 Guidebook⁵⁾ and Eurocontrol's AEM model⁶⁾.

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 Guidebook⁷⁾ and Eurocontrol's AEM model⁸⁾.

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

< 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	> 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 more information, please see the [superordinate chapter](#).

Planned improvements

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

bibliography : 1 : Knörr, W., Schacht, A., & Gores, S. (2010): Entwicklung eines eigenständigen Modells zur Berechnung des Flugverkehrs (TREMOD-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 (TREMOD AV) 2019 - Revision des Modells zur Berechnung des Flugverkehrs (TREMOD-AV). Heidelberg, Berlin: Ifeu Institut für Energie- und Umweltforschung Heidelberg GmbH & Öko-Institut e.V., Berlin & Heidelberg, 2019. : 3 : Gores (2018): Inventartool zum deutschen Flugverkehrsinventory 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 5)
- ⁷⁾ (bibcite 4)
- ⁸⁾ (bibcite 5)