

1.A.3.b vi-vii - Road Transport: Automobile Tyre and Brake Wear and Road Abrasion

This overview chapter provides information on emissions from automobile tyre and brake wear & road abrasion are reported reported in NFR sub-categories 1.A.3.b vi and 1.A.3.b vii. These sub-categories are important sources for a) particle emissions and b) emissions of heavy metals, POPs etc. included in these particles.

NFR-Code	Name of Category
1.A.3.b vi	Automobile Tyre and Brake Wear
1.A.3.b vii	Automobile Road Abrasion

Methodology

Activity data

Specific mileage data for all different types of road vehicles are generated within TREMOD (Knörr et al., 2020a)¹⁾. The following table provides an overview of annual mileages.

Table 1: Mileage data for road vehicles 1990-2019, in 10⁶ kilometers

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Passenger Cars	492.280	535.524	565.345	580.076	581.645	585.236	582.194	592.591	596.532	606.233	607.519	612.573	623.683	630.995	638.156	643.711	643.198	645.829
Light Duty Vehicles	14.259	23.294	31.541	35.938	36.679	37.830	38.290	38.755	39.226	39.703	40.185	40.673	43.112	45.330	47.457	49.698	51.918	53.659
Heavy Duty Vehicles	40.827	54.279	62.659	60.974	63.492	65.618	65.395	60.917	62.979	64.519	63.810	64.318	64.822	65.823	66.697	67.346	68.059	68.968
thereof: Lorries & Trucks 36.657 50.362 58.621 56.877 59.374 61.483 61.244 56.751 58.799 60.324 59.572 60.064 60.553 61.408 62.138 62.833 63.539 64.396																		
thereof: Buses 4.170 3.916 4.038 4.098 4.119 4.135 4.150 4.166 4.180 4.195 4.238 4.254 4.269 4.415 4.560 4.512 4.520 4.572																		
Two-wheelers	15.734	12.303	15.161	15.621	15.647	15.804	15.616	15.807	15.298	14.866	14.463	14.196	14.200	14.508	14.519	14.523	14.625	14.842
thereof: Mopeds	5.917	3.830	4.047	4.191	4.278	4.548	4.686	5.192	4.990	4.855	4.742	4.755	4.684	4.870	4.831	4.749	4.849	4.922
thereof: Motorcycles	9.817	8.473	11.113	11.429	11.370	11.256	10.931	10.615	10.308	10.011	9.721	9.441	9.516	9.638	9.687	9.773	9.776	9.920
TOTAL MILEAGE	522.272	571.120	612.046	631.634	633.971	638.870	636.100	647.153	651.056	660.801	662.167	667.443	680.994	690.832	700.132	707.932	709.742	714.330

source: TREMOD 6.02²⁾

Discussion of emission trends

Please see sub-category chapters [1.A.3.b vi - Automobile Tyre and Brake Wear](#) and [1.A.3.b vii - Automobile Road Abrasion](#).

Recalculations

Recalculations were carried out due to a fundamental revision of the TREMOD software.

For changes in the **emission factors** applied, please refer to the sub-ordinate chapters on **tyre and brake wear** and **road abrasion**.

Table 2: Revised mileage data , in 10⁶ kilometers

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Passenger Cars																	
Submission 2021	492.280	535.524	565.345	580.076	581.645	585.236	582.194	592.591	596.532	606.233	607.519	612.573	623.683	630.995	638.156	643.711	643.198
Submission 2020	488.574	530.900	560.300	574.776	580.455	584.060	581.068	591.437	595.363	605.066	606.373	611.439	622.067	629.516	636.701	642.254	642.262
absolute change	3.706	4.624	5.045	5.300	1.190	1.175	1.126	1.153	1.169	1.167	1.145	1.134	1.616	1.479	1.455	1.457	937
relative change	0,76%	0,87%	0,90%	0,92%	0,21%	0,20%	0,19%	0,20%	0,20%	0,19%	0,19%	0,19%	0,26%	0,23%	0,23%	0,23%	0,15%
Light Duty Vehicles																	
Submission 2021	14.259	23.294	31.541	35.938	36.679	37.830	38.290	38.755	39.226	39.703	40.185	40.673	43.112	45.330	47.457	49.698	51.918
Submission 2020	17.964	27.917	36.585	41.203	37.802	38.927	39.282	39.748	40.218	40.694	41.178	41.669	42.056	45.639	47.752	49.912	52.276
absolute change	-3.706	-4.624	-5.045	-5.265	-1.123	-1.097	-992	-993	-992	-991	-993	-995	1.056	-309	-295	-214	-358
relative change	-20,6%	-16,6%	-13,8%	-12,8%	-2,97%	-2,82%	-2,53%	-2,50%	-2,47%	-2,44%	-2,41%	-2,39%	2,51%	-0,68%	-0,62%	-0,43%	-0,69%
HDVs: Trucks																	
Submission 2021	36.657	50.362	58.621	56.877	59.374	61.483	61.244	56.751	58.799	60.324	59.572	60.064	60.553	61.408	62.138	62.833	63.539
Submission 2020	36.657	50.362	58.621	56.877	59.374	61.483	61.244	56.751	58.799	60.312	59.648	60.204	60.553	61.408	62.353	63.311	64.284
absolute change	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	12,0	-76,2	-140	0,00	0,00	-215	-478	-744
relative change	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,02%	-0,13%	-0,23%	0,00%	0,00%	-0,35%	-0,76%	-1,16%
HDVs: Buses																	
Submission 2021	4.170	3.916	4.038	4.098	4.119	4.135	4.150	4.166	4.180	4.195	4.238	4.254	4.269	4.415	4.560	4.512	4.520
Submission 2020	4.170	3.948	4.003	4.076	4.028	4.022	3.922	4.002	4.037	3.991	3.981	4.055	4.182	4.227	4.267	4.190	4.206
absolute change	0,00	-31,7	34,4	21,6	90,9	113	228	164	143	204	257	199	87,7	188	293	322	314
relative change	0,00%	-0,80%	0,86%	0,53%	2,26%	2,81%	5,82%	4,11%	3,55%	5,11%	6,46%	4,91%	2,10%	4,46%	6,87%	7,69%	7,46%
Mopeds																	
Submission 2021	5.917	3.830	4.047	4.191	4.278	4.548	4.686	5.192	4.990	4.855	4.742	4.755	4.684	4.870	4.831	4.749	4.849
Submission 2020	5.917	3.377	3.703	3.970	4.079	4.366	4.527	5.049	4.884	4.782	4.700	4.743	4.700	4.887	4.848	4.766	4.766
absolute change	0,00	452	344	222	199	183	159	143	106	73,1	41,9	12,6	-16,4	-17,0	-16,9	-16,6	83,1
relative change	0,00%	13,4%	9,30%	5,58%	4,88%	4,18%	3,50%	2,83%	2,18%	1,53%	0,89%	0,27%	-0,35%	-0,35%	-0,35%	-0,35%	1,74%
Motorcycles																	
Submission 2021	9.817	8.473	11.113	11.429	11.370	11.256	10.931	10.615	10.308	10.011	9.721	9.441	9.516	9.638	9.687	9.773	9.776
Submission 2020	9.817	8.473	11.113	11.429	11.215	11.256	10.931	10.615	10.308	10.011	9.721	9.441	9.516	9.638	9.687	9.773	9.913
absolute change	0,00	0,00	0,00	0,00	154,35	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-137
relative change	0,00%	0,00%	0,00%	0,00%	1,38%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	-1,38%
REVISED TOTAL MILEAGE																	
Submission 2021	522.272	571.120	612.046	631.634	633.971	638.870	636.100	647.153	651.056	660.801	662.167	667.443	680.994	690.832	700.132	707.932	709.742
Submission 2020	522.272	570.668	611.702	631.378	633.551	638.609	635.808	646.850	650.773	660.553	661.973	667.291	678.339	689.680	698.989	706.705	709.217
absolute change	0,00	452	344	256	421	261	292	303	283	249	194	151	2.655	1.153	1.143	1.226	525
relative change	0,00%	0,08%	0,06%	0,04%	0,07%	0,04%	0,05%	0,05%	0,04%	0,04%	0,03%	0,02%	0,39%	0,17%	0,16%	0,17%	0,07%

Planned improvements

Besides the **routine revision of the TREMOD model**, no specific improvements are planned.

³⁾ ⁴⁾

¹⁾ ²⁾ ³⁾ Knörr et al. (2020a): Knörr, W., Heidt, C., Gores, S., & Bergk, F.: ifeu Institute for Energy and Environmental Research (Institut für Energie- und Umweltforschung Heidelberg gGmbH, ifeu): Fortschreibung des Daten- und Rechenmodells: Energieverbrauch und Schadstoffemissionen des motorisierten Verkehrs in Deutschland 1960-2035, sowie TREMOD, im Auftrag des Umweltbundesamtes, Heidelberg & Berlin, 2020.

⁴⁾ EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook – 2019