

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Passenger Cars	492.280	535.524	565.345	580.076	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	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	62.979	64.519	63.810	64.318	64.822	65.823	66.697	67.346	68.059	68.968	
<i>thereof: Lorries & Trucks</i>	36.657	50.362	58.621	56.877	58.799	60.324	59.572	60.064	60.553	61.408	62.138	62.833	63.539	64.396	
<i>thereof: Buses</i>	4.170	3.916	4.038	4.098	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	15.298	14.866	14.463	14.196	14.200	14.508	14.519	14.523	14.625	14.842	
<i>thereof: Mopeds</i>	5.917	3.830	4.047	4.191	4.990	4.855	4.742	4.755	4.684	4.870	4.831	4.749	4.849	4.922	
<i>thereof: Motorcycles</i>	9.817	8.473	11.113	11.429	10.308	10.011	9.721	9.441	9.516	9.638	9.687	9.773	9.776	9.920	
TOTAL MILEAGE	563.099	625.399	674.705	692.609	714.035	725.321	725.977	731.761	745.817	756.655	766.829	775.277	777.801	783.298	

source: TREMOD 6.02 ²⁾

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	2010	2011	2012	2013	2014	2015	2016	2017	2018
Passenger Cars													
Submission 2021	492.280	535.524	565.345	580.076	596.532	606.233	607.519	612.573	623.683	630.995	638.156	643.711	643.198

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018
Submission 2020	488.574	530.900	560.300	574.776	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	1.169	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%	0,20%	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	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	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	-992	-991	-993	-995	1.056	-309	-295	-214	-358
relative change	-20,6%	-16,6%	-13,8%	-12,8%	-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	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	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	12,0	-76,2	-140	0,00	0,00	-215	-478	-744
relative change	0,00%	0,00%	0,00%	0,00%	0,00%	0,02%	-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	4.180	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	4.037	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	143	204	257	199	87,7	188	293	322	314
relative change	0,00%	-0,80%	0,86%	0,53%	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	4.990	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	4.884	4.782	4.700	4.743	4.700	4.887	4.848	4.766	4.766
absolute change	0,00	452	344	222	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%	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	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	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	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%	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	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	650.773	660.553	661.973	667.291	678.339	689.680	698.989	706.705	709.217

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018
absolute change	0,00	452	344	256	283	249	194	151	2.655	1.153	1.143	1.226	525
relative change	0,00%	0,08%	0,06%	0,04%	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