

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 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
MILEAGE: COMBUSTION ENGINES																		
Passenger Cars	488,574	530,900	560,300	574,776	580,455	584,060	581,068	591,437	595,363	605,066	606,320	611,348	621,905	629,261	636,322	641,629	641,266	
Light Duty Vehicles	17,964	27,917	36,585	41,203	37,802	38,927	39,282	39,748	40,218	40,694	41,165	41,650	42,033	45,609	47,709	49,838	52,157	
Heavy Duty Vehicles	40,827	54,310	62,624	60,953	63,401	65,505	65,166	60,752	62,836	64,303	63,610	64,240	64,714	65,613	66,596	67,476	68,457	
<i>thereof: Lorries & Trucks</i>	36,657	50,362	58,621	56,877	59,374	61,483	61,244	56,751	58,799	60,312	59,635	60,191	60,539	61,394	62,339	63,296	64,263	
<i>thereof: Buses</i>	4,170	3,948	4,003	4,076	4,028	4,022	3,922	4,002	4,037	3,991	3,975	4,048	4,175	4,219	4,258	4,180	4,195	
Two-wheelers	15,734	11,851	14,816	15,399	15,294	15,622	15,458	15,664	15,192	14,793	14,402	14,157	14,184	14,487	14,492	14,489	14,624	
Σ from fuel combustion	563,099	624,978	674,326	692,331	696,952	704,114	700,974	707,602	713,608	724,856	725,498	731,394	742,836	754,969	765,119	773,432	776,504	
MILEAGE: ELECTRIC ENGINES																		
Passenger Cars	0	0	0	0	0	0	0	0	0	0	53	92	162	255	379	625	996	
Light Duty Vehicles	0	0	0	0	0	0	0	0	0	0	13	19	23	30	43	74	119	
Heavy Duty Vehicles	0	0	0	0	0	0	0	0	0	0	19	19	21	22	23	26	32	
<i>thereof: Lorries & Trucks</i>	0	0	0	0	0	0	0	0	0	0	13	13	14	14	14	16	21	
<i>thereof: Buses</i>	0	0	0	0	0	0	0	0	0	0	6	6	7	8	9	10	11	
Two-wheelers	0	0	0	0	0	0	0	0	0	0	19	26	32	38	44	50	55	
Σ from electric energy	0	0	0	0	0	0	0	0	0	0	104	156	238	345	489	775	1,203	
TOTAL MILEAGE: COMBUSTION + ELECTRIC ENGINES																		
Passenger Cars	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	
Light Duty Vehicles	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	
Heavy Duty Vehicles	40,827	54,310	62,624	60,953	63,401	65,505	65,166	60,752	62,836	64,303	63,629	64,259	64,735	65,635	66,620	67,502	68,490	
<i>thereof: Lorries & Trucks</i>	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	
<i>thereof: Buses</i>	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	
Two-wheelers	15,734	11,851	14,816	15,399	15,294	15,622	15,458	15,664	15,192	14,793	14,422	14,183	14,216	14,525	14,536	14,539	14,679	
Σ over-all	563,099	624,978	674,326	692,331	696,952	704,114	700,974	707,602	713,608	724,856	725,602	731,550	743,074	755,314	765,608	774,207	777,707	

source: TREMOD 6.02 ²⁾

++ Images: Overview annual mileage for considered vehicle types [gallery size="medium"](#) : AD_Mileage.png : AD_Mileage_el.png [gallery](#)

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.

Table 2: Revised mileage data , in 10⁶ kilometers

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Passenger Cars																
Submission 2021	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
Submission 2020	492,280	535,524	565,345	580,075	581,651	585,242	582,199	592,595	596,536	606,237	607,522	612,576	624,573	637,014	650,866	659,589
absolute change	-3,706	-4,624	-5,045	-5,300	-1,197	-1,181	-1,131	-1,158	-1,173	-1,170	-1,148	-1,137	-2,506	-7,498	-14,166	-17,335
relative change	-0,75%	-0,86%	-0,89%	-0,91%	-0,21%	-0,20%	-0,19%	-0,20%	-0,20%	-0,19%	-0,19%	-0,19%	-0,40%	-1,18%	-2,18%	-2,63%
Light Duty Vehicles																
Submission 2021	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
Submission 2020	14,259	21,794	30,941	36,251	36,855	37,847	37,461	37,429	37,583	38,204	38,732	38,966	39,343	40,962	40,938	41,596
absolute change	3,706	6,124	5,645	4,953	947	1,080	1,821	2,319	2,635	2,490	2,446	2,703	2,713	4,677	6,814	8,317
relative change	26,0%	28,1%	18,2%	13,7%	2,57%	2,85%	4,86%	6,20%	7,01%	6,52%	6,31%	6,94%	6,89%	11,4%	16,6%	20,0%
HDVs: Trucks																
Submission 2021	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
Submission 2020	36,657	48,951	55,441	54,213	56,159	57,873	57,819	53,974	56,418	58,171	56,785	57,167	58,482	59,398	60,858	61,489
absolute change	0	1,412	3,180	2,664	3,214	3,610	3,425	2,776	2,380	2,141	2,863	3,038	2,071	2,010	1,495	1,822
relative change	0,00%	2,88%	5,73%	4,91%	5,72%	6,24%	5,92%	5,14%	4,22%	3,68%	5,04%	5,31%	3,54%	3,38%	2,46%	2,96%
HDVs: Buses																
Submission 2021	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
Submission 2020	4,170	4,216	4,138	3,936	3,938	3,826	3,736	3,751	3,751	3,729	3,751	3,729	3,718	3,709	3,735	3,741
absolute change	0	-268	-134	140	90	196	186	250	286	262	230	326	463	517	531	449
relative change	0,00%	-6,36%	-3,25%	3,56%	2,27%	5,13%	4,98%	6,66%	7,61%	7,03%	6,12%	8,74%	12,5%	13,9%	14,2%	12,0%
Motorcycles & Mopeds																
Submission 2021	15,734	11,851	14,816	15,399	15,294	15,622	15,458	15,664	15,192	14,793	14,422	14,183	14,216	14,525	14,536	14,539
Submission 2020	15,734	12,615	15,100	16,800	17,288	14,904	15,322	15,753	15,786	16,208	16,421	16,539	16,801	16,801	16,539	16,539
absolute change	0	-764	-284	-1,401	-1,994	718	136	-89	-594	-1,415	-2,000	-2,355	-2,585	-2,277	-2,003	-1,999
relative change	0,00%	-6,06%	-1,88%	-8,34%	-11,53%	4,81%	0,88%	-0,56%	-3,76%	-8,73%	-12,2%	-14,2%	-15,4%	-13,6%	-12,1%	-12,1%
REVISED TOTAL MILEAGE																
Submission 2021	563,099	624,978	674,326	692,331	696,952	704,114	700,974	707,602	713,608	724,856	725,602	731,550	743,074	755,314	765,608	774,207
Submission 2020	563,099	623,099	670,965	691,275	695,892	699,691	696,537	703,503	710,075	722,549	723,212	728,976	742,918	757,885	772,936	782,954
absolute change	0	1,879	3,361	1,056	1,060	4,422	4,437	4,099	3,534	2,307	2,390	2,575	156	-2,570	-7,328	-8,746
relative change	0,00%	0,30%	0,50%	0,15%	0,15%	0,63%	0,64%	0,58%	0,50%	0,32%	0,33%	0,35%	0,02%	-0,34%	-0,95%	-1,12%

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

Emission estimates



For more information on recalculated emission estimates for Base Year



and 2018, please see the pollutant specific recalculation tables following chapter [8.1 - Recalculations](#).

Planned improvements

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

FAQs

[bibliography](#) : 1 : Knörr et al. (2019a): 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 1960-2030, sowie TREMOD, im Auftrag des Umweltbundesamtes, Heidelberg & Berlin, 2019. : 2 : EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook – 2019 [bibliography](#)

¹⁾ (bibcite 1)

²⁾ (bibcite 1)