

Adjustment DE-A regarding NO_x from Road Vehicles

PREFACE

When deriving proposals for national emission ceilings for negotiations of the 1999 Gothenburg Protocol, sector-specific emission estimates for the year 2010 were calculated at IIASA using a set of scenarios which assumed various technological abatement measures, policy incentives, and legislation available / in place or planned at that time. As a result, the 2010 emission by road transport in Germany was estimated at NO_x (IIASA, 1999)¹⁾. The over-all 2010 national emission ceiling (NEC) for NO_x was set to 1,081 kt. When negotiating the EU NEC Directive two years later, Germany agreed to reduce its NO_x emissions further, resulting in a NEC of 1,051 kt.

In its 2016 NEC emissions reporting, Germany provided a national total for NO_x emissions of 1,337 kt for 2010. However, this total includes emissions from agricultural soils and other source categories not accounted for when setting the NEC. In addition, some assumptions made in 1999, including on emission factors from road traffic, turned out to be wrong in reality. Like in many other European countries, non-compliance with the 2010 NEC as set in 1999 was partly not caused by failed national mitigation policies, but by changes beyond the control of, and unforeseen by, the individual Party or Member State.

In order to differentiate such changes from policy failures in the responsibility of the individual Parties to the Gothenburg Protocol, a procedure (Inventory Adjustment) allowing the adjustment of emissions resulting from new emission categories, changes in estimation methodologies, emission factors etc. provided within the EMEP/EEA Guidebook, or other effects beyond national control with respect to complying to emission reduction obligations (EB, 2012a & c)^{2), 3)} was agreed. This procedure is applicable also for existing NECs (EB, 2012b)⁴⁾.

With respect to road transport, such an unforeseeable effect was the partial failure of several so-called "Euro norms" set on the EU level to reduce emissions from road vehicles. In this report, Germany presents an estimate of the NO_x emissions resulting from the partial failure of the mitigation policy reflected by the Euro norms, and lays out the calculations leading to these estimates.

REASONS FOR MISSING THE GOTHENBURG CEILINGS

The TREMOD methodology applied for estimating emissions from road transportation in Germany has changed over time. These changes include updates of emission factors (EF) for various pollutants and other changes such as an extension of vehicle classification (and thus inclusion of emission factors associated with these new vehicle sub-categories) to improve the estimation's accuracy.

The main changes occurred for the emission factors and for the Heavy Duty Vehicles (HDV) fleet structure. This last point led to changes in emissions because of the reallocation of activities (consumption/traffic) between the sub-categories of vehicles.

For the formalism of the adjustments, it is difficult to flag whether the modifications for road transport are due to "methodological changes" or due to "changes of emission factor". Therefore, only the term "change of methodology" will be used (even if at the NFR reporting level this may seem like a simple change in EFs).

So far as road transport is concerned, the inability to attain the emission ceiling is most likely to have been affected by a combination of technological changes within the fleet (which of course made their way into the several versions of TREMOD) combined with greater than originally expected dieselisation of the fleet.

ANALYSING THE PROBLEM: THE EUROPEAN PERSPECTIVE BASED ON COPERT

Already in 2011, these effects were demonstrated by Ntziachristos and Papageorgiou (2011)⁵⁾. Here, the impacts of changing model versions and activity data in the context of meeting the EU NEC Directive ceiling commitments were examined for four European countries including Germany. Unfortunately, this comparison study was carried out within a COPERT environment. Therefore, the results gained cannot be transferred to the German TREMOD environment on a one-to-one level but nonetheless allow a highly illustrative insight in the reasons for not meeting the set ceiling. The study modeled fuel consumption and NO_x emissions for four selected countries (Germany, France, Netherlands and Belgium) and found higher NO_x emissions were estimated for the road transport sector than originally modelled by the RAINS model of IIASA (which underpinned the setting of 2010 ceilings). For Germany, this study shows that with the same activity data set (LIFE+

EC4MACS data from Amann et al. (2010)), NO_x, emissions estimated with COPERT II vs. COPERT 4 (v8.0) increase from 410 kt to 518 kt due to methodological changes, a difference of 282 kt. An additional consideration of changes in AD would lead to 620 kt of NO_x. However, as changes in AD are no valid adjustment reason, the latter value is for information only.

This was mainly due to: * NO_x, emission factors updated in COPERT 4 that did not follow the reductions as set by the emission standards for diesel passenger cars; * important part of diesel fuel consumption in the total fuel consumption of the road traffic.

The results of this study showed that it is the combination of different parameters which might affect the ability (to different extents) of a Party to attain the emission ceilings. In other words, the exceeding of NO_x, ceilings for road transport is due to:

Changes in methodology and emission factors

As these technologically driven changes (as reflected in the __evolution of the different so-called Euro norms__) lie outside the country's responsibility, current methodology and EFs have to be adjusted in a way to allow the comparison of the actual inventory and the Gothenburg ceilings.

Changes in the activity data

As the development of mileage driven and fuels used within a country (__Germany: stronger dieselisation__ then originally expected) is of the country's responsibility, this effect has to be excluded from any adjustment estimation.

IN-COUNTRY ANALYSIS: THE TREMOD PERSPECTIVE

INITIAL ASSUMPTION

In order to estimate the effect of NO_x, emissions resulting from the failure of the so-called Euro norms, the following procedure has been agreed by expert review teams in the last two years:

proposed amount of adjustable emissions = current AD x current EF - current AD x original EF = current AD x (current EF - original EF) = current EM - "artificial" current EM¹
¹ "artificial" current emissions = virtual current emissions assuming no changes in emission factors

$EM_{\text{adjustment}} = AD_{\text{current}} * EF_{\text{current}} - AD_{\text{current}} * EF_{\text{original}} = AD_{\text{current}} * (EF_{\text{current}} - EF_{\text{original}}) = EM_{\text{current}} - EM_{\text{current-“artificial”}}$ **math**

with * **EM „adjustment,** = amount of emissions to be subtracted from National Totals * **AD „current,** = AD from latest TREMOD version as used for current submission * **EF „current,** = EF from latest TREMOD version as used for current submission * **EF „original,** = EF from TREMOD version used at the time NEC ceilings were set (here: TREMOD 3.1) * **EM „current,** = EM estimated from AD and EF from latest TREMOD version = EM reported for NFR 1.A.3.b with latest submission * **EM „current-“artificial”,** = EM estimated from AD from latest TREMOD version and EF from TREMOD version used at the time NEC ceilings were set (here: TREMOD 3.1)

APPLYING THE ORIGINAL METHODOLOGY

FRAMEWORK INFORMATION

The methodology used for estimating Germany's exhaust emissions from road transport when determining emissions ceilings of the Gothenburg Protocol (1999), was the second version of the EMEP/CORINAIR guidebook corresponding to COPERT II software. This method proposed NO_x, emission factors for

- passenger cars (PC): up to Euro 1
- light commercial vehicles (LCV2): up to Euro 1
- heavy duty vehicles (HDV): pre-EURO I only (conventional)

Back then, without better knowledge, the emission factors for the most recent standards were derived by directly applying

the expected reductions in emission standards.

However, as Germany does not use COPERT for compiling its road transport emissions inventory but a national model called TREMOD, the following comparison has to be carried out between the oldest version of TREMOD still available and the version as applied for the current inventory submission (2020).

Unfortunately, the oldest TREMOD version available for such comparison is TREMOD 3.1 from 2002 ⁶⁾, including the following set of NO_x emission factors:

- passenger cars (PC): up to Euro 4
- light commercial vehicles (LCV): up to Euro 4
- heavy duty vehicles (HDV) only up to EURO V

However, as this version includes the technological development since 1999 (when the ceilings were set based on COPERT II), the results from this analysis and the adjustment proposal based upon these results are likely to slightly underestimate the effect of technological changes since 1999 and must therefore be considered conservative.

THE COMPARISON

Application of the original NO_x methodology to the current road transport background activity data

The *basic activity data* (such as over-all fuel sold and traffic mileages by vehicle type, by fuel or by Euro regulation) implemented in TREMOD 3.1 differ significantly from those of the current TREMOD version especially for the more recent years as of 2005. In addition, *specific activity data* (such as fuel consumptions per vehicle type, per fuel or per Euro regulation) strongly depend on the TREMOD version.

Within this report, Germany re-estimates the NO_x emission within the TREMOD 3.1 model. To isolate the requested information, the original TREMOD 3.1 activity data was combined with emission factors from both TREMOD 3.1 and the currently used TREMOD 6.02 (Knörr et al., 2019a) ⁷⁾.

Description of the updated methodology used

The updated methodology, used in 2019 (for NFR submission 2021) and implemented in version 6.12 of the TREMOD software, considers emission factors of

- passenger cars (PC) up to Euro 6d
- light commercial vehicles (LCV) up to Euro 6d
- heavy duty vehicles (HDV) up to EURO VI

and

- motorized two-wheelers (M2W) up to Euro 4

Comparison of emission estimates made using the original and updated methodologies

The values of NO_x emissions presented in the table below are estimated with:

- TREMOD 3.1 model equations as initial methodology

and ,

- TREMOD 6.12 equations as methodology applied for NEC submission 2021.

The activity data applied to initial (here: oldest available) and most recent methodology, are those of the latest inventory provided with NEC submission 2021.

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cf. Also related columns in the Excel table "Annex_VII_Adjustments_summary_template_extended2_V2_Aprill15.xlsx" for road transport).

Table: Aggregated impact of adjustments on NO_x emissions from NFR 1.A.3.b

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Table 1: Resulting adjustment proposal 2020

||> for year ||= **2010** ||= **2011** ||= **2012** ||= **2013** ||= **2014** ||= **2015** ||= **2016** ||= **2017** ||= **2018** ||=
 ||~ proposed adjustment ||~ ##red| -297.8## ||~ ##red| -302.3## ||~ ##red| -301.3## ||~ ##red| -306.1## ||~
 ##red| -294.5## ||~ ##red| -269.0## ||~ ##red| -244.3## ||~ ##red| -214.9## ||~ ##red| -174.6## ||>

The following screenshots show the TREMOD 3.1 / TREMOD 6.12 implementation comparisons per vehicle type/fuel/Euro regulation.

Activity Data

- * **current**: from TREMOD 6.12, as reported with the latest inventory submission
- * **adjusted**: has to be similar to **current** AD!
- * **difference**: as only recent AD are to be used for adjustment estimations, this value must be zero!

Implied Emission Factor

- * **current**: representing the ratio of current emissions and current AD
- * **adjusted**: representing the ratio of adjusted emissions and current AD
- * **difference**: shows percentual difference

NO_x Emissions

- * **current**: from TREMOD 6.12, as reported with the latest inventory submission
- * **adjusted**: estimated based on TREMOD 3.1 methodology and TREMOD 6.12 AD
- * **adjustment**: adjusted emissions minus current emissions
- * **difference**: percentual difference between current and adjusted emissions

Adjustment overview for years 2010 to 2019

NFR Code	Fuel	Year	Activity Data			Implied Emission Factor			NO _x Emissions			
			current in [TJ]	adjusted in [TJ]	difference in [%]	current in [kg/TJ]	adjusted in [kg/TJ]	difference in [%]	current in [kg]	adjusted in [kg]	difference in [%]	
1.A.3.b.i	gasoline		795.957	795.957	0%	97.55	84.99	-13%	77.644.842	67.690.906	9.953.936	-13%
1.A.3.b.i	diesel oil		629.380	629.380	0%	429.45	180.61	-63%	227.341.696	84.970.461	142.371.235	-63%
1.A.3.b.ii	gasoline		6.325	6.325	0%	255.87	214.75	-16%	1.618.432	1.358.328	260.104	-16%
1.A.3.b.ii	diesel oil		113.450	113.450	0%	476.34	134.96	-72%	54.040.533	15.311.584	38.728.949	-72%
1.A.3.b.iii	gasoline		48.844	48.844	0%	823.00	482.55	-23%	29.931.266	23.183.732	6.747.534	-23%
1.A.3.b.iii	diesel oil		566.741	566.741	0%	446.67	271.83	-39%	253.148.243	154.956.160	98.192.083	-39%
1.A.3.b.iv	gasoline		19.712	19.712	0%	113.68	188.43	48%	2.240.749	3.320.034	-1.079.285	48%
1.A.3.b TOTAL	2010		2.079.608	2.079.608	0%			0%	645.965.162	348.851.206	296.113.956	-46%
1.A.3.b.i	gasoline		794.688	794.688	0%	92.09	81.61	-11%	73.185.851	64.851.951	8.333.900	-11%
1.A.3.b.i	diesel oil		553.564	553.564	0%	434.12	159.22	-63%	240.313.791	88.138.959	152.174.832	-63%
1.A.3.b.ii	gasoline		6.118	6.118	0%	229.35	198.57	-13%	1.403.081	1.214.776	188.305	-13%
1.A.3.b.ii	diesel oil		115.967	115.967	0%	481.55	126.92	-74%	55.844.518	14.719.142	41.125.376	-74%
1.A.3.b.iii	gasoline		47.365	47.365	0%	592.65	448.99	-24%	28.071.221	21.266.323	6.804.898	-24%
1.A.3.b.iii	diesel oil		563.891	563.891	0%	410.38	244.97	-40%	231.410.271	138.136.342	93.273.929	-40%
1.A.3.b.iv	gasoline		19.289	19.289	0%	119.79	171.60	54%	2.137.002	3.299.162	-1.162.160	54%
1.A.3.b TOTAL	2011		2.106.883	2.106.883	0%			0%	632.365.736	331.625.655	300.740.081	-48%
1.A.3.b.i	gasoline		750.957	750.957	0%	85.73	78.00	-8%	64.379.994	58.577.229	5.802.765	-9%
1.A.3.b.i	diesel oil		555.245	555.245	0%	435.96	158.66	-64%	242.082.902	88.096.699	153.986.203	-64%
1.A.3.b.ii	gasoline		5.657	5.657	0%	218.93	193.15	-12%	1.238.520	1.092.662	145.859	-12%
1.A.3.b.ii	diesel oil		114.360	114.360	0%	481.91	128.17	-75%	55.106.362	13.741.354	41.365.008	-75%
1.A.3.b.iii	gasoline		50.902	50.902	0%	533.22	384.33	-28%	27.141.913	19.563.208	7.578.704	-28%
1.A.3.b.iii	diesel oil		589.585	589.585	0%	381.33	224.00	-41%	234.829.180	132.064.753	102.764.428	-41%
1.A.3.b.iv	gasoline		18.268	18.268	0%	107.43	173.28	61%	1.962.546	3.165.439	-1.202.893	61%
1.A.3.b TOTAL	2012		2.084.964	2.084.964	0%			0%	616.721.638	316.391.343	300.420.094	-49%
1.A.3.b.i	gasoline		749.114	749.114	0%	80.35	74.05	-7%	60.190.007	56.071.797	4.118.211	-7%
1.A.3.b.i	diesel oil		585.131	585.131	0%	437.14	158.71	-64%	257.633.728	93.499.010	164.134.718	-64%
1.A.3.b.ii	gasoline		5.578	5.578	0%	202.80	184.07	-9%	1.131.209	1.026.727	104.482	-9%
1.A.3.b.ii	diesel oil		118.777	118.777	0%	489.60	114.93	-76%	57.003.633	13.690.488	43.313.145	-76%
1.A.3.b.iii	gasoline		51.716	51.716	0%	509.64	368.06	-29%	26.350.969	18.620.843	7.730.126	-29%
1.A.3.b.iii	diesel oil		600.139	600.139	0%	353.06	287.93	-18%	211.807.531	124.798.459	87.009.072	-41%
1.A.3.b.iv	gasoline		18.229	18.229	0%	104.34	175.30	68%	1.902.688	3.197.038	-1.294.351	68%
1.A.3.b TOTAL	2013		2.132.683	2.132.683	0%			0%	616.079.663	318.854.371	296.224.692	-50%
1.A.3.b.i	gasoline		752.526	752.526	0%	76.03	73.09	-4%	57.215.533	54.988.921	2.226.612	-4%
1.A.3.b.i	diesel oil		626.845	626.845	0%	435.87	159.12	-63%	272.876.061	99.613.892	173.262.169	-63%
1.A.3.b.ii	gasoline		5.845	5.845	0%	190.34	176.49	-7%	1.112.584	1.031.612	80.972	-7%
1.A.3.b.ii	diesel oil		126.578	126.578	0%	475.56	118.96	-77%	61.546.575	14.267.237	47.279.338	-77%
1.A.3.b.iii	gasoline		49.143	49.143	0%	468.37	339.99	-27%	23.017.116	16.708.234	6.308.881	-27%
1.A.3.b.iii	diesel oil		672.754	672.754	0%	314.05	196.05	-38%	179.874.133	112.285.582	67.588.551	-38%
1.A.3.b.iv	gasoline		18.673	18.673	0%	100.59	179.24	78%	1.870.294	3.346.794	-1.466.499	78%
1.A.3.b TOTAL	2014		2.153.563	2.153.563	0%			0%	597.120.207	362.252.271	234.868.025	-49%
1.A.3.b.i	gasoline		715.156	715.156	0%	74.38	71.73	-4%	53.190.787	51.300.983	1.889.805	-4%
1.A.3.b.i	diesel oil		645.555	645.555	0%	426.19	159.80	-63%	275.130.233	103.163.501	171.966.732	-63%
1.A.3.b.ii	gasoline		5.793	5.793	0%	187.12	172.80	-8%	1.083.927	1.000.999	82.928	-8%
1.A.3.b.ii	diesel oil		135.386	135.386	0%	469.35	107.96	-77%	63.605.443	14.607.490	48.997.953	-77%
1.A.3.b.iii	gasoline		52.287	52.287	0%	458.96	327.99	-29%	23.997.617	17.149.448	6.848.170	-29%
1.A.3.b.iii	diesel oil		589.411	589.411	0%	266.69	187.51	-30%	157.189.675	110.620.703	46.568.973	-30%
1.A.3.b.iv	gasoline		18.459	18.459	0%	93.32	189.69	82%	1.833.362	3.334.472	-1.501.090	82%
1.A.3.b TOTAL	2015		2.161.976	2.161.976	0%			0%	575.931.265	361.077.596	214.853.670	-48%
1.A.3.b.i	gasoline		715.272	715.272	0%	79.93	76.65	-4%	50.736.367	50.535.049	201.318	0%
1.A.3.b.i	diesel oil		675.119	675.119	0%	410.36	160.76	-61%	277.041.660	108.535.230	168.506.430	-61%
1.A.3.b.ii	gasoline		5.925	5.925	0%	189.27	171.05	-9%	1.068.292	1.013.678	54.614	-6%
1.A.3.b.ii	diesel oil		144.868	144.868	0%	456.12	105.62	-77%	65.712.732	15.216.007	50.496.725	-77%
1.A.3.b.iii	gasoline		54.157	54.157	0%	424.73	308.24	-27%	23.002.109	16.833.117	6.168.992	-27%
1.A.3.b.iii	diesel oil		594.013	594.013	0%	226.31	180.97	-20%	134.431.899	107.496.262	26.935.637	-20%
1.A.3.b.iv	gasoline		18.785	18.785	0%	95.14	181.66	89%	1.805.897	3.412.476	-1.606.579	89%
1.A.3.b TOTAL	2016		2.207.339	2.207.339	0%			0%	553.199.558	362.991.820	190.197.738	-45%
1.A.3.b.i	gasoline		724.571	724.571	0%	67.66	69.88	3%	49.026.074	50.634.714	-1.608.640	3%
1.A.3.b.i	diesel oil		696.592	696.592	0%	399.65	161.95	-59%	272.126.691	112.810.721	159.315.970	-59%
1.A.3.b.ii	gasoline		6.186	6.186	0%	171.15	167.18	-2%	1.058.799	1.034.211	24.589	-2%
1.A.3.b.ii	diesel oil		153.284	153.284	0%	424.66	103.89	-76%	65.093.930	15.925.216	49.168.714	-76%
1.A.3.b.iii	gasoline		53.382	53.382	0%	370.80	288.71	-23%	19.793.961	15.394.828	4.399.133	-23%
1.A.3.b.iii	diesel oil		598.263	598.263	0%	195.02	175.92	-9%	116.671.141	106.246.508	11.424.633	-10%
1.A.3.b.iv	gasoline		19.160	19.160	0%	92.83	183.39	98%	1.778.674	3.513.787	-1.735.114	98%
1.A.3.b TOTAL	2017		2.251.437	2.251.437	0%			0%	525.549.410	364.489.986	161.059.424	-42%
1.A.3.b.i	gasoline		699.027	699.027	0%	64.42	68.36	6%	45.032.596	47.786.817	-2.754.221	6%
1.A.3.b.i	diesel oil		666.074	666.074	0%	371.66	163.30	-56%	247.556.063	108.758.604	138.797.459	-56%
1.A.3.b.ii	gasoline		6.315	6.315	0%	158.22	160.11	1%	999.199	1.011.138	-11.939	1%
1.A.3.b.ii	diesel oil		154.259	154.259	0%	384.71	102.69	-73%	59.344.525	15.840.310	43.504.215	-73%
1.A.3.b.iii	gasoline		51.634	51.634	0%	389.75	263.53	-15%	15.983.526	13.607.106	2.376.420	-15%
1.A.3.b.iii	diesel oil		585.186	585.186	0%	171.18	172.10	1%	180.173.337	180.710.869	-537.532	1%
1.A.3.b.iv	gasoline		18.497	18.497	0%	89.66	184.61	106%	1.658.588	3.414.767	-1.756.209	106%
1.A.3.b TOTAL	2018		2.180.993	2.180.993	0%			0%	478.758.206	291.139.612	187.618.593	-39%
1.A.3.b.i	gasoline		704.691	704.691	0%	62.30	68.45	10%	43.901.941	48.238.025	-4.336.084	10%
1.A.3.b.i	diesel oil		663.841	663.841	0%	345.81	165.07	-52%	229.566.088	109.582.982	119.983.106	-52%
1.A.3.b.ii	gasoline		6.683	6.683	0%	148.08	153.25	5%	976.219	1.024.150	-47.931	5%
1.A.3.b.ii	diesel oil		159.183	159.183	0%	347.42	101.90	-71%	55.303.535	16.221.445	39.082.090	-71%
1.A.3.b.iii	gasoline		52.939	52.939	0%	274.41	247.81	-9%	14.627.012	13.118.678	1.498.334	-9%
1.A.3.b.iii	diesel oil		595.913	595.913	0%	153.35	169.17	10%	81.380.760	100.809.376	-19.428.616	10%
1.A.3.b.iv	gasoline		18.758	18.758	0%	86.05	186.83	117%	1.613.450	3.582.941	-1.969.491	117%
1.A.3.b TOTAL	2019		2.262.898	2.262.898	0%			0%	437.268.744	292.497.697	144.771.248	-33%

Adjustment details for 2020

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions			
		current	adjusted	difference	current	adjusted	difference	current	adjusted	difference	
		in [t]	in [t]	in [%]	in [g/Td]	in [g/Td]	in [%]	in [kg]	in [kg]	in [t]	
1.A.3.a.1. Passenger Cars	Gasoline	pre-Cars	13,685	13,685	0%	584.75	514.25	-8%	7,965,060	6,986,917	-858,143
		Car 1	36,541	36,541	0%	338.50	297.71	-8%	25,915,925	19,189,262	-7,726,663
		Car 2	96,425	96,425	0%	172.95	135.03	-22%	16,580,020	13,020,026	-3,559,994
		Car 3	133,139	133,139	0%	58.51	70.18	20%	7,790,384	9,343,433	1,553,049
		Car 4	444,991	444,991	0%	42.27	42.13	0%	18,911,389	18,173,529	-737,859
		Car 5	31,234	31,234	0%	18.61	42.13	127%	581,142	1,317,737	736,595
	Car 6	0	0	0%	25.08	42.13	67%	2	2	0	
	Gasoline total	795,957	795,957	0%	97.55	84.39	-13%	77,444,642	67,456,965	-9,987,676	
	pre-Cars	1,129	1,129	0%	313.13	284.56	-9%	183,760	147,256	-36,504	
	Car 1	10,338	10,338	0%	286.62	285.17	-1%	3,044,428	2,741,987	-302,441	
	Car 2	50,088	50,088	0%	406.90	275.15	-32%	20,372,795	10,974,210	-9,398,584	
Car 3	134,025	134,025	0%	542.94	170.54	-69%	72,648,173	23,929,276	-48,718,897		
Car 4	279,154	279,154	0%	354.37	140.58	-60%	107,299,160	39,243,811	-68,055,349		
Car 5	53,547	53,547	0%	434.70	140.58	-68%	23,276,735	7,527,796	-15,748,939		
Car 6	334	334	0%	257.62	140.58	-45%	85,044	46,563	-38,481		
Diesel oil total	529,380	529,380	0%	429.45	140.55	-67%	227,341,096	84,920,491	-142,420,605		
Pkcs Total	1,325,337	1,325,337	0%	234.32	155.14	-34%	364,985,938	152,421,367	-212,564,571		
1.A.3.b.1. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	1,229	1,229	0%	627.39	642.95	7%	783,320	908,871	125,551
Car 1		367	367	0%	861.35	297.39	-66%	368,969	186,020	-182,948	
Car 2		1,393	1,393	0%	264.75	184.41	-30%	368,940	256,917	-112,023	
Car 3		856	856	0%	82.47	90.63	10%	70,631	77,625	6,994	
Car 4		2,420	2,420	0%	36.32	44.90	24%	87,967	188,679	100,712	
Car 5		49	49	0%	15.34	44.90	193%	750	2,218	1,468	
Car 6		0	0	0%	0%	0%	0	0	0		
Gasoline total		6,325	6,325	0%	255.87	274.75	16%	1,478,832	1,598,126	119,294	
pre-Cars		4,876	4,876	0%	425.99	386.79	-9%	2,017,142	1,436,983	-580,159	
Car 1		5,989	5,989	0%	395.19	276.24	-30%	2,269,995	1,289,036	-980,959	
Car 2		13,126	13,126	0%	336.76	133.10	-60%	4,420,380	2,534,731	-1,885,649	
Car 3	33,249	33,249	0%	531.01	150.58	-72%	17,655,883	5,085,760	-12,570,123		
Car 4	54,581	54,581	0%	491.42	80.69	-84%	26,021,036	4,840,722	-21,180,314		
Car 5	1,629	1,629	0%	427.50	80.69	-81%	696,296	144,434	-551,862		
Car 6	0	0	0%	-15.73	80.69	-123%	7	4	-3		
Diesel oil total	113,450	113,450	0%	416.34	134.94	-68%	54,040,513	15,311,584	-38,728,929		
LDVs Total	119,775	119,775	0%	464.70	139.18	-70%	55,468,986	16,649,913	-38,819,073		
1.A.3.b.2. Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	3,382	3,382	0%	1036.25	1029.78	-1%	3,674,067	3,452,644	-221,423
Car 1		2,026	2,026	0%	743.41	732.14	-2%	2,117,871	2,125,995	7,123	
Car 2		10,162	10,162	0%	801.96	643.47	-20%	8,140,119	6,532,213	-1,607,906	
Car 3		15,890	15,890	0%	633.22	437.25	-30%	13,066,776	7,269,299	-5,797,477	
Car 4		5,461	5,461	0%	448.63	361.85	-20%	2,450,016	1,921,627	-528,389	
Car 5		10,326	10,326	0%	327.28	182.33	-44%	3,882,417	1,882,644	-1,999,773	
Car 6		0	0	0%	0%	0%	0	0	0		
Diesel Total		48,044	48,044	0%	623.80	482.55	-23%	29,911,296	23,183,732	-6,727,564	
pre-Cars		10,185	10,185	0%	1040.16	787.37	-25%	10,510,623	7,754,130	-2,756,493	
Car 1		5,677	5,677	0%	759.59	576.55	-24%	4,261,383	3,267,681	-993,702	
Car 2		38,565	38,565	0%	817.62	524.79	-36%	31,525,526	20,234,079	-11,291,447	
Car 3	168,233	168,233	0%	626.28	274.48	-56%	141,136,182	60,617,271	-80,518,911		
Car 4	69,635	69,635	0%	358.94	290.02	-19%	27,183,867	20,166,636	-7,017,231		
Car 5	283,934	283,934	0%	276.42	151.85	-45%	78,040,643	43,116,897	-34,923,746		
Car 6	0	0	0%	0%	0%	0	0	0			
Trucks Total	566,741	566,741	0%	446.67	271.83	-39%	293,148,243	134,096,160	-159,052,083		
1.A.3.b.3. Motorised Two-Wheelers (M2W)	Gasoline	pre-Cars	7,973	7,973	0%	122.90	149.16	22%	972,721	1,189,353	216,632
Car 1		5,231	5,231	0%	123.77	185.74	51%	647,479	887,039	239,560	
Car 2		3,587	3,587	0%	141.16	194.21	38%	585,362	696,681	111,319	
Car 3		2,900	2,900	0%	38.11	184.21	381%	116,190	647,032	530,842	
Car 4		0	0	0%	0%	0%	0	0	0		
Car 5		0	0	0%	0%	0%	0	0	0		
M2Ws Total	19,712	19,712	0%	113.68	148.43	30%	2,483,149	3,326,034	842,885		
1.A.3.b. Road Transport Total	Total	2,079,680	2,079,680	0%	218.62	148.23	-32%	645,965,162	349,851,296	-296,113,866	

Adjustment details for 2021

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions			
		current	adjusted	difference	current	adjusted	difference	current	adjusted	difference	
		in [t]	in [t]	in [%]	in [g/Td]	in [g/Td]	in [%]	in [kg]	in [kg]	in [t]	
1.A.3.a.1. Passenger Cars	Gasoline	pre-Cars	13,063	13,063	0%	592.96	514.68	-13%	7,728,235	6,876,435	-851,800
		Car 1	61,979	61,979	0%	347.86	340.16	-2%	21,040,430	18,884,961	-2,155,469
		Car 2	87,083	87,083	0%	178.38	136.68	-23%	15,620,983	11,883,782	-3,737,191
		Car 3	124,330	124,330	0%	61.94	71.52	16%	7,663,891	8,891,671	1,227,780
		Car 4	442,185	442,185	0%	43.84	43.68	0%	19,384,914	19,376,439	-8,475
		Car 5	66,057	66,057	0%	18.58	43.68	135%	1,227,381	2,085,636	1,658,255
	Car 6	1	1	0%	25.08	43.68	69%	17	20	3	
	Gasoline total	794,688	794,688	0%	92.09	81.65	-11%	73,185,851	64,851,951	-8,333,899	
	pre-Cars	1,044	1,044	0%	313.80	284.56	-9%	183,760	147,256	-36,504	
	Car 1	8,426	8,426	0%	297.32	285.85	-4%	2,485,115	2,239,987	-245,128	
	Car 2	42,514	42,514	0%	407.83	275.27	-32%	17,384,549	9,321,976	-8,062,573	
Car 3	121,429	121,429	0%	555.36	170.55	-69%	67,437,053	21,681,386	-45,755,667		
Car 4	264,943	264,943	0%	308.08	143.46	-53%	102,917,081	38,089,755	-64,827,326		
Car 5	113,047	113,047	0%	435.12	143.46	-67%	49,536,960	16,332,974	-33,203,986		
Car 6	695	695	0%	203.59	143.46	-29%	180,582	39,754	-140,828		
Diesel oil total	553,564	553,564	0%	434.52	159.92	-63%	248,713,791	88,138,959	-160,574,832		
Pkcs Total	1,348,252	1,348,252	0%	212.52	115.47	-46%	311,899,642	152,990,910	-158,908,732		
1.A.3.b.1. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	1,044	1,044	0%	626.25	642.95	7%	982,214	1,103,373	121,159
Car 1		283	283	0%	818.74	284.47	-65%	243,289	86,158	-157,131	
Car 2		1,184	1,184	0%	268.66	191.66	-29%	310,429	223,189	-87,240	
Car 3		783	783	0%	85.97	95.39	11%	67,520	74,782	7,262	
Car 4		2,582	2,582	0%	37.38	46.51	24%	95,786	119,162	23,376	
Car 5		241	241	0%	16.13	46.51	188%	3,082	11,190	7,308	
Car 6		0	0	0%	15.33	46.51	293%	1	3	2	
Gasoline total		6,138	6,138	0%	229.35	186.52	-19%	1,483,081	1,274,776	-208,305	
pre-Cars		3,395	3,395	0%	425.99	386.79	-9%	1,689,280	1,225,682	-463,598	
Car 1		4,787	4,787	0%	395.71	276.24	-30%	1,954,360	1,030,426	-923,934	
Car 2		10,810	10,810	0%	336.90	133.10	-60%	3,644,582	2,091,083	-1,553,500	
Car 3	28,076	28,076	0%	541.53	150.54	-72%	15,037,249	4,346,870	-10,690,379		
Car 4	60,832	60,832	0%	493.82	80.26	-84%	30,039,914	5,429,011	-24,610,904		
Car 5	6,609	6,609	0%	448.86	80.26	-82%	2,930,180	584,364	-2,345,816		
Car 6	0	0	0%	-16.21	80.26	-124%	16	0	-16		
Diesel oil total	113,967	113,967	0%	481.55	126.90	-74%	55,844,519	14,718,142	-41,126,376		
LDVs Total	122,085	122,085	0%	468.92	130.95	-72%	57,247,599	15,932,898	-41,314,691		
1.A.3.b.2. Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	2,620	2,620	0%	1092.69	1019.78	-7%	2,936,189	2,671,331	-264,858
Car 1		2,259	2,259	0%	752.41	732.14	-3%	1,059,787	1,086,287	26,499	
Car 2		9,074	9,074	0%	804.17	643.36	-20%	7,287,125	5,837,959	-1,449,166	
Car 3		14,887	14,887	0%	633.16	437.38	-31%	9,425,090	6,089,064	-3,336,026	
Car 4		5,131	5,131	0%	448.88	361.85	-20%	2,383,338	1,885,274	-498,064	

Adjustment details for 2023

Table with 11 columns: NFR Code, Fuel, Activity Data (current, adjusted, difference), Implied Emission Factor (current, adjusted, difference), NOx Emissions (current, adjusted, difference). Rows include Gasoline, Diesel Oil, Light Duty Vehicles (LDV), Heavy Duty Vehicles (HDV), Motorized Two-Wheelers (MW), and Road Transport Total.

Adjustment details for 2023

Table with 11 columns: NFR Code, Fuel, Activity Data (current, adjusted, difference), Implied Emission Factor (current, adjusted, difference), NOx Emissions (current, adjusted, difference). Rows include Gasoline, Diesel Oil, Light Duty Vehicles (LDV), Heavy Duty Vehicles (HDV), Motorized Two-Wheelers (MW), and Road Transport Total.

Adjustment details for 2024

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions					
		current	adjusted	difference	current	adjusted	difference	current	adjusted	difference			
		km [T]	kg [T]	%	in [g/T]	in [g/T]	in [%]	in [kg]	in [kg]	in [t]			
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	11,647	11,647	0%	812.37	644.11	-21%	7,132,680	6,327,454	-796,844	-11%	
		Car 1	30,667	30,667	0%	358.77	243.93	-32%	11,082,246	7,480,541	-3,621,706	-32%	
		Car 2	53,486	53,486	0%	196.58	140.31	-29%	10,514,477	7,594,432	-3,818,844	-29%	
		Car 3	87,374	87,374	0%	65.31	73.93	1%	6,955,585	6,455,757	-494,218	-7%	
		Car 4	387,759	387,759	0%	45.16	47.80	-5%	19,093,585	18,536,009	-523,557	-3%	
		Car 5	171,270	171,270	0%	18.59	47.80	151%	3,183,282	0,187,581	-5,044,209	151%	
	Gasoline total	752,526	752,526	0%	25.97	47.80	84%	267,855	433,096	225,248	84%		
	pre-Cars	1,341	1,341	0%	311.73	284.66	-9%	4,117,967	364,246	-42,729	-9%		
	Car 1	4,692	4,692	0%	298.92	287.28	-4%	1,482,264	1,387,643	-156,951	-11%		
	Car 2	23,934	23,934	0%	408.71	220.45	-46%	9,734,484	5,276,490	-4,458,094	-46%		
	Car 3	82,749	82,749	0%	585.53	176.81	-69%	48,481,830	14,796,249	-33,685,589	-69%		
	Car 4	211,237	211,237	0%	397.27	151.77	-62%	83,917,680	32,059,973	-51,857,706	-62%		
	Car 5	285,011	285,011	0%	436.38	151.77	-65%	124,721,396	43,370,300	-81,343,896	-65%		
	Car 6	16,081	16,081	0%	259.34	151.77	-41%	4,130,580	2,480,686	-1,729,814	-41%		
	Diesel oil total	626,045	626,045	0%	415.87	159.12	-62%	272,876,061	89,633,892	-173,262,169	-62%		
	Flt's Total	1,338,571	1,338,571	0%	218.44	152.15	-31%	338,091,584	154,652,853	-176,478,261	-31%		
	1.A.3.b.i. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	386	386	0%	832.14	642.99	-22%	1,663,683	1,278,724	-384,929	-23%
Car 1			173	173	0%	868.27	389.96	-54%	160,074	53,576	-98,498	-54%	
Car 2			748	748	0%	294.73	287.11	-3%	212,985	154,839	-58,129	-27%	
Car 3			771	771	0%	58.02	185.21	1%	75,982	81,070	5,078	7%	
Car 4			1,087	1,087	0%	43.47	50.15	15%	81,139	83,618	2,479	3%	
Car 5			1,374	1,374	0%	17.11	50.15	183%	23,517	68,918	45,401	193%	
Gasoline total		5,845	5,845	0%	198.34	176.49	-7%	1,112,584	1,031,652	-80,972	-7%		
pre-Cars		2,537	2,537	0%	429.16	286.79	-33%	1,985,879	776,259	-1,209,629	-33%		
Car 1		2,589	2,589	0%	393.82	276.25	-30%	987,136	539,898	-447,328	-45%		
Car 2		6,087	6,087	0%	338.91	153.25	-55%	1,985,995	1,160,889	-825,128	-42%		
Car 3		18,220	18,220	0%	571.75	150.58	-74%	10,417,076	2,742,056	-7,675,020	-74%		
Car 4		52,361	52,361	0%	499.70	91.69	-82%	25,184,496	4,703,196	-21,944,748	-82%		
Car 5		46,749	46,749	0%	438.64	91.69	-79%	20,696,234	4,258,026	-16,237,708	-79%		
Car 6		187	187	0%	151.18	91.69	-40%	29,829	17,974	-11,855	-40%		
Diesel oil total		128,538	128,538	0%	415.56	190.94	-54%	61,146,525	34,287,237	-26,879,318	-54%		
LDVs Total		134,423	134,423	0%	463.56	153.85	-67%	62,259,160	35,298,849	-26,960,311	-67%		
1.A.3.b.ii. Heavy Duty Vehicles (HDV)		Diesel Oil	pre-Cars	984	984	0%	1059.49	1919.23	-45%	1,062,384	1,062,921	48	0%
	Car 1		827	827	0%	728.32	750.99	3%	659,232	626,359	-32,873	-5%	
	Car 2		5,599	5,599	0%	794.39	643.67	-19%	4,394,320	3,683,441	-710,879	-16%	
	Car 3		11,221	11,221	0%	621.20	408.38	-35%	7,082,740	5,143,528	-1,939,232	-27%	
	Car 4		4,279	4,279	0%	461.90	351.79	-24%	1,972,610	1,084,976	-887,632	-45%	
	Car 5		32,042	32,042	0%	358.55	183.99	-49%	7,726,911	4,065,632	-3,661,279	-47%	
	Diesel total	48,143	48,143	0%	468.37	339.99	-27%	23,017,115	16,786,234	-6,230,881	-27%		
	pre-Cars	4,782	4,782	0%	1034.34	737.35	-29%	4,945,942	3,525,898	-1,420,124	-29%		
	Car 1	2,295	2,295	0%	749.86	581.41	-22%	1,600,089	1,237,759	-362,340	-23%		
	Car 2	13,029	13,029	0%	817.30	510.28	-37%	11,465,869	6,565,730	-4,901,131	-43%		
	Car 3	54,085	54,085	0%	632.52	384.41	-39%	36,589,677	19,927,835	-16,661,841	-45%		
	Car 4	34,037	34,037	0%	396.37	285.34	-28%	13,681,100	9,711,696	-3,979,402	-29%		
	Car 5	389,263	389,263	0%	262.92	153.66	-42%	110,112,782	59,688,043	-50,544,749	-45%		
	Car 6	34,214	34,214	0%	63.95	153.66	189%	3,937,089	11,368,582	7,421,413	189%		
	Trucks Total	572,154	572,154	0%	314.89	196.69	-38%	179,874,133	112,293,562	-67,580,571	-38%		
	1.A.3.b.iii. Motorised Two-Wheelers (M2W)	Gasoline	pre-Cars	6,185	6,185	0%	122.65	158.64	29%	756,185	974,368	218,182	29%
			Car 1	3,037	3,037	0%	134.71	174.84	40%	478,514	670,859	192,346	40%
Car 2			3,365	3,365	0%	128.94	186.25	52%	433,874	680,770	246,896	52%	
Car 3			5,385	5,385	0%	38.53	186.25	386%	289,722	1,041,189	811,467	386%	
Car 4			0	0	0%	0	0	0%	0	0	0	0%	
Car 5			0	0	0%	0	0	0%	0	0	0	0%	
M2Ws Total		18,827	18,827	0%	108.99	179.84	78%	1,838,284	3,386,134	1,498,499	78%		
1.A.3.b. Road Transport Total		2,153,563	2,153,563	0%	277.27	140.35	-49%	597,120,297	362,252,271	-234,868,625	-49%		

Adjustment details for 2025

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions				
		current	adjusted	difference	current	adjusted	difference	current	adjusted	difference		
		km [T]	kg [T]	%	in [g/T]	in [g/T]	in [%]	in [kg]	in [kg]	in [t]		
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	11,380	11,380	0%	833.23	644.11	-23%	7,206,112	6,191,862	-1,014,258	-14%
		Car 1	34,112	34,112	0%	371.34	245.71	-34%	8,963,081	5,924,574	-3,038,508	-34%
		Car 2	42,925	42,925	0%	267.78	142.69	-47%	8,918,785	6,099,659	-2,819,126	-32%
		Car 3	72,871	72,871	0%	73.96	74.74	1%	5,381,361	5,446,237	64,876	1%
		Car 4	353,474	353,474	0%	52.30	49.62	-5%	18,485,637	17,326,221	-1,159,416	-6%
		Car 5	180,783	180,783	0%	19.11	49.62	151%	3,454,481	0,881,456	-5,408,375	151%
	Gasoline total	715,156	715,156	0%	25.70	49.62	84%	790,791	1,451,483	660,732	84%	
	pre-Cars	1,341	1,341	0%	311.73	284.66	-9%	4,117,967	364,246	-42,729	-9%	
	Car 1	4,279	4,279	0%	298.14	287.84	-3%	1,261,930	1,129,969	-132,021	-10%	
	Car 2	19,689	19,689	0%	407.90	220.98	-46%	8,013,687	4,398,179	-3,615,508	-46%	
	Car 3	71,044	71,044	0%	595.91	179.64	-70%	42,271,648	12,719,962	-29,551,686	-70%	
	Car 4	182,410	182,410	0%	401.42	154.07	-62%	77,237,055	29,644,450	-47,592,605	-62%	
	Car 5	364,346	364,346	0%	434.67	154.07	-65%	132,290,453	46,090,424	-86,408,859	-65%	
	Car 6	52,576	52,576	0%	259.76	154.07	-41%	13,657,082	6,180,384	-7,476,698	-41%	
	Diesel oil total	645,565	645,565	0%	426.19	159.89	-62%	275,130,223	163,163,501	-111,966,732	-62%	
	Flt's Total	1,360,721	1,360,721	0%	245.29	153.52	-37%	328,301,020	154,464,484	-173,836,536	-37%	
	1.A.3.b.i. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	379	379	0%	856.33	642.99	-25%	1,575,369	1,047,877	-527,492
Car 1			150	150	0%	895.63	311.93	-65%	134,523	46,851	-87,672	-65%
Car 2			629	629	0%	298.27	212.94	-29%	187,533	133,879	-53,654	-29%
Car 3			781	781	0%	105.50	186.62	3%	73,969	76,155	2,186	3%
Car 4			1,720	1,720	0%	47.96	51.30	9%	80,968	80,248	-720	-1%
Car 5			1,620	1,620	0%	18.41	51.30	179%	29,912	83,086	53,174	179%
Gasoline total		5,783	5,783	0%	197.52	172.89	-8%	1,083,507	1,080,999	-2,508	-0%	
pre-Cars		2,323	2,323	0%	416.91	286.79	-30%	986,186	712,531	-273,654	-28%	
Car 1		2,186	2,186	0%	391.47	276.25	-29%	824,270	453,227	-371,043	-45%	
Car 2		5,025	5,025	0%	324.91	153.25	-53%	1,632,296	971,296	-660,928	-41%	
Car 3		15,781	15,781	0%	588.35	150.67	-74%	9,112,414	2,385,173	-6,727,241	-74%	
Car 4		47,480	47,480	0%	501.73	91.74	-82%	23,782,396	4,348,298	-19,434,098	-82%	
Car 5		62,116	62,116	0%	436.13	91.74	-79%	27,090,214	6,690,295	-21,392,809	-79%	
Car 6		635	635	0%	154.91	91.74	-40%	87,769	68,230	-19,539	-22%	
Diesel oil total		135,386	135,386	0%	409.35	187.96	-54%	64,585,643	34,687,490	-29,898,153	-54%	
LDVs Total		141,098	141,098	0%	457.76	190.62	-58%	64,989,320	35,688,490	-29,300,831	-58%	
1.A.3.b.ii. Heavy Duty Vehicles (HDV)		Diesel Oil	pre-Cars	979	979	0%	1076.34	1919.23	-43%	1,048,312	986,255	-62,057
	Car 1		747	747	0%	738.26	751.91	3%	545,471	581,836	36,365</	

Adjustment details for 2026

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions			
		current	adjusted	difference	current	adjusted	difference	current	adjusted	difference	
		in [t]	in [t]	in [%]	in [g/t]	in [g/t]	in [%]	in [kg]	in [kg]	in [t]	
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	11,782	11,782	0%	634.76	644.11	-14%	7,470,914	6,410,967	-1,059,947
		Car 1	20,270	20,270	0%	372.26	241.68	-35%	7,545,483	4,988,688	-2,556,795
		Car 2	36,062	36,062	0%	212.73	143.11	-33%	7,671,581	5,160,897	-2,510,684
		Car 3	83,039	83,039	0%	78.17	75.50	-3%	4,861,482	4,739,259	-122,223
		Car 4	334,413	334,413	0%	53.74	50.17	-7%	17,963,964	16,777,445	-1,186,519
		Car 5	183,374	183,374	0%	19.09	50.17	163%	3,580,746	9,139,634	5,558,888
	Gasoline total	715,272	715,272	0%	79.33	70.65	-10%	58,736,967	50,535,649	-8,201,318	
	pre-Cars	1,280	1,280	0%	368.78	254.56	-31%	386,263	339,172	-47,091	
	Car 1	3,749	3,749	0%	298.30	289.66	-3%	1,122,449	1,011,626	-111,423	
	Car 2	16,684	16,684	0%	407.19	221.48	-46%	6,720,132	3,663,964	-3,056,168	
	Car 3	81,398	81,398	0%	802.50	179.24	-78%	36,991,999	11,085,649	-25,906,350	
	Car 4	175,940	175,940	0%	405.76	156.24	-61%	71,362,220	27,474,086	-43,888,134	
	Car 5	299,654	299,654	0%	433.34	156.24	-64%	130,032,044	46,019,229	-84,012,815	
Car 6	116,084	116,084	0%	268.78	156.24	-42%	30,427,555	10,232,785	-20,194,770		
Diesel oil total	675,119	675,119	0%	418.36	160.76	-61%	277,941,660	188,535,230	-89,406,430		
Pkcs Total	1,390,391	1,390,391	0%	215.75	154.41	-29%	327,738,627	199,070,879	-128,667,748		
1.A.3.b.i. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	910	910	0%	602.79	640.36	-6%	593,789	581,543	-12,246
		Car 1	139	139	0%	908.31	372.78	-59%	122,129	42,425	-79,704
		Car 2	540	540	0%	308.39	217.84	-30%	162,311	117,197	-45,114
		Car 3	650	650	0%	108.43	111.97	3%	70,432	72,731	2,299
		Car 4	1,684	1,684	0%	49.06	52.36	7%	75,714	84,003	8,289
		Car 5	1,724	1,724	0%	19.82	52.36	164%	34,157	80,258	46,101
	Gasoline total	5,906	5,906	0%	198.27	171.66	-13%	1,968,292	1,693,679	-274,613	
	pre-Cars	2,189	2,189	0%	414.87	386.79	-7%	999,649	985,433	-14,216	
	Car 1	1,790	1,790	0%	391.89	276.25	-29%	780,169	385,271	-394,898	
	Car 2	4,223	4,223	0%	323.43	193.71	-40%	1,365,994	676,452	-689,542	
	Car 3	13,582	13,582	0%	588.91	150.77	-74%	8,084,323	2,949,233	-5,135,090	
	Car 4	43,141	43,141	0%	504.48	92.40	-82%	21,783,989	3,986,141	-17,797,848	
	Car 5	74,231	74,231	0%	434.16	92.40	-79%	32,223,283	6,658,790	-25,564,493	
Car 6	4,921	4,921	0%	153.69	92.40	-40%	755,295	454,676	-300,619		
Diesel oil total	148,068	148,068	0%	454.12	185.62	-59%	65,712,732	15,276,087	-50,436,645		
LDVs Total	149,994	149,994	0%	445.21	186.29	-58%	66,781,025	16,229,864	-50,551,161		
1.A.3.b.ii. Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	891	891	0%	1076.87	1319.23	-18%	964,197	980,234	16,037
		Car 1	4,375	4,375	0%	731.87	732.27	0%	433,675	446,226	12,551
		Car 2	4,223	4,223	0%	708.25	645.03	-9%	3,440,614	2,822,621	-617,993
		Car 3	10,333	10,333	0%	632.87	458.91	-28%	6,539,364	4,741,827	-1,797,537
		Car 4	4,449	4,449	0%	475.90	382.29	-20%	2,117,210	1,686,081	-431,129
		Car 5	34,380	34,380	0%	364.38	185.22	-49%	8,935,974	4,617,617	-4,318,357
	Diesel Oil total	54,157	54,157	0%	404.73	388.24	-5%	23,082,189	16,885,117	-6,197,072	
	pre-Cars	3,933	3,933	0%	1034.61	737.35	-29%	4,087,249	2,980,379	-1,106,870	
	Car 1	1,555	1,555	0%	748.16	587.90	-21%	1,163,482	789,813	-373,669	
	Car 2	8,075	8,075	0%	817.75	585.52	-29%	7,255,040	4,486,028	-2,769,012	
	Car 3	34,167	34,167	0%	638.11	568.68	-11%	21,653,288	12,251,155	-9,402,133	
	Car 4	34,287	34,287	0%	396.94	281.86	-29%	9,640,364	6,885,621	-2,754,743	
	Car 5	269,735	269,735	0%	267.22	153.90	-42%	74,680,233	39,976,610	-34,703,623	
Trucks Total	261,480	261,480	0%	671.77	153.90	-77%	16,149,288	40,244,036	24,094,748		
Trucks Total	984,013	984,013	0%	295.31	180.97	-39%	134,431,899	18,496,262	-115,935,637		
1.A.3.b.iv. Motorised Two-Wheelers (M2W)	Gasoline	pre-Cars	5,543	5,543	0%	125.59	155.78	24%	696,072	883,289	187,217
		Car 1	3,360	3,360	0%	107.11	177.29	39%	407,113	585,796	178,683
		Car 2	3,375	3,375	0%	125.94	187.68	50%	421,961	687,078	265,117
		Car 3	6,443	6,443	0%	48.36	187.68	381%	209,627	1,273,071	1,063,444
		Car 4	66	66	0%	17.47	187.68	1031%	1,134	12,822	11,688
M2Ws Total	18,185	18,185	0%	96.14	181.66	88%	1,985,897	3,452,476	1,466,579		
1.A.3.b. Road Transport Total	2,267,339	2,267,339	0%	258.89	137.22	-46%	553,789,558	382,861,820	-170,927,738		

Adjustment details for 2027

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions			
		current	adjusted	difference	current	adjusted	difference	current	adjusted	difference	
		in [t]	in [t]	in [%]	in [g/t]	in [g/t]	in [%]	in [kg]	in [kg]	in [t]	
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	12,262	12,262	0%	636.73	644.11	-14%	7,814,267	6,648,187	-1,166,080
		Car 1	17,449	17,449	0%	372.99	241.68	-35%	6,688,911	4,217,644	-2,471,267
		Car 2	30,435	30,435	0%	217.43	147.75	-32%	6,617,570	4,174,140	-2,443,430
		Car 3	54,271	54,271	0%	78.48	76.27	-3%	4,254,938	4,139,376	-115,562
		Car 4	315,086	315,086	0%	54.96	51.28	-7%	17,315,320	16,151,861	-1,163,459
		Car 5	180,240	180,240	0%	19.17	51.28	163%	3,485,382	9,239,815	5,754,433
	Gasoline total	724,571	724,571	0%	67.66	60.88	-10%	59,026,874	50,534,714	-8,492,160	
	pre-Cars	980	980	0%	364.39	254.56	-31%	680,963	347,620	-333,343	
	Car 1	3,360	3,360	0%	298.17	271.67	-9%	1,082,266	910,182	-172,084	
	Car 2	13,788	13,788	0%	407.17	222.48	-45%	5,914,130	3,086,985	-2,827,145	
	Car 3	52,128	52,128	0%	808.95	179.65	-78%	31,698,478	9,384,788	-22,313,690	
	Car 4	167,947	167,947	0%	418.10	158.34	-61%	64,733,485	24,993,323	-39,740,162	
	Car 5	283,480	283,480	0%	423.99	158.34	-63%	120,157,656	44,073,190	-76,084,466	
Car 6	184,760	184,760	0%	262.61	158.34	-40%	48,521,183	20,255,985	-28,265,198		
Diesel oil total	696,582	696,582	0%	399.65	161.95	-59%	272,126,081	152,890,721	-119,235,360		
Pkcs Total	1,421,153	1,421,153	0%	245.98	155.83	-36%	321,152,955	163,425,435	-157,727,520		
1.A.3.b.i. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	980	980	0%	616.11	640.36	-6%	612,247	598,978	-13,269
		Car 1	134	134	0%	908.23	372.78	-59%	112,083	39,682	-72,401
		Car 2	485	485	0%	302.12	221.62	-27%	140,344	102,950	-37,394
		Car 3	596	596	0%	118.57	116.38	4%	65,955	68,012	2,057
		Car 4	1,476	1,476	0%	58.72	53.38	-9%	74,877	78,816	3,939
		Car 5	1,680	1,680	0%	21.73	53.38	146%	35,240	89,034	53,794
	Gasoline total	6,186	6,186	0%	171.55	167.18	-2%	1,958,799	1,634,211	-324,588	
	pre-Cars	2,087	2,087	0%	411.41	386.79	-6%	960,499	931,163	-29,336	
	Car 1	1,538	1,538	0%	398.47	276.25	-30%	660,716	311,158	-349,558	
	Car 2	3,580	3,580	0%	321.26	193.04	-40%	1,143,793	687,293	-456,501	
	Car 3	11,684	11,684	0%	595.08	150.79	-75%	6,940,879	1,738,147	-5,202,732	
	Car 4	39,050	39,050	0%	506.70	93.69	-82%	19,789,647	3,635,035	-16,154,612	
	Car 5	75,789	75,789	0%	432.66	93.69	-78%	32,790,966	7,054,966	-25,736,000	
Car 6	19,625	19,625	0%	151.71	93.69	-39%	2,977,439	1,626,876	-1,350,563		
Diesel oil total	153,284	153,284	0%	404.66	183.89	-55%	65,083,930	15,925,276	-49,158,654		
LDVs Total	159,470	159,470	0%	414.83	186.35	-55%	66,152,129	16,959,427	-49,192,702		
1.A.3.b.ii. Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	736	736	0%	1077.33	1319.23	-18%	790,259	790,425	166
		Car 1	411	411	0%	731.87	732.27	0%	380,684	389,862	9,178
		Car 2	485	485	0%	707.91	645.03	-9%	2,620,087	2,147,480	-472,607
		Car 3	8,075	8,075	0%	631.33	458.91	-28%	5,478,480	3,984,085	-1,494,395
		Car 4	3,023	3,023	0%	474.07	382.49	-20%	1,912,380	1,387,620	-524,760
		Car 5	21,913	21,913	0%	363.92	185.64	-49%	7,937,976	4,063,686	-3,874,290
	Diesel Oil total	33,382	33,382	0%	318.86	286.71	-10%	15,783,981	15,344,828	-439,153	
	pre-Cars	3,686	3,686	0%	1034.61	737.35	-29%	3,730,272	2,659,676	-1,070,596	

Adjustment details for 2018												
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions			difference in [t]	
		current	adjusted	difference in [%]	current	adjusted	difference in [%]	current	adjusted	adjustment		
1.A.3.a.i. Passenger Cars												
1.A.3.a.i.	Gasoline	pre-Cars	12,219	12,219	0%	637.58	644.11	-9%	7,780,965	6,608,721	-1,172,234	-15%
		Car 1	14,362	14,362	0%	374.34	341.68	-9%	5,371,161	3,488,643	-1,882,518	-35%
		Car 2	24,285	24,285	0%	221.97	111.06	-50%	5,360,977	2,688,163	-2,672,814	-50%
		Car 3	43,642	43,642	0%	89.16	76.96	-14%	3,497,781	3,388,617	-109,164	-4%
		Car 4	279,738	279,738	0%	55.98	52.30	-7%	15,683,498	14,576,755	-1,106,743	-7%
	Car 5	186,830	186,830	0%	19.28	52.30	170%	3,228,282	6,725,688	3,497,406	170%	
	Car 6	159,041	159,041	0%	6.00	52.30	0%	4,190,422	6,716,250	2,525,828	59%	
	Gasoline total	693,027	693,027	0%	64.42	68.36	6%	45,032,296	47,176,837	2,144,541	5%	
	Diesel Oil	pre-Cars	1,543	1,543	0%	303.16	244.96	-19%	396,859	347,173	-49,686	-12%
		Car 1	2,949	2,949	0%	294.17	272.65	-8%	862,432	775,166	-87,267	-10%
Car 2		10,784	10,784	0%	407.20	322.87	-21%	4,981,983	2,483,536	-2,498,447	-50%	
Car 3		40,786	40,786	0%	612.49	180.15	-71%	24,932,029	7,333,241	-17,598,788	-71%	
Car 4		130,534	130,534	0%	414.71	180.49	-56%	54,133,837	20,937,329	-33,196,508	-61%	
Car 5	251,212	251,212	0%	416.25	180.49	-56%	104,585,706	40,293,731	-64,291,975	-61%		
Car 6	228,685	228,685	0%	254.87	180.49	-31%	58,284,140	36,680,446	-21,603,700	-37%		
Diesel oil total	666,074	666,074	0%	379.66	163.39	-56%	247,596,063	188,768,684	-158,827,459	-56%		
Flt% Total	1,365,101	1,365,101	0%	214.34	154.68	-28%	262,588,360	156,555,421	-106,032,939	-40%		
1.A.3.a.ii. Light Duty Vehicles (LDV)												
1.A.3.a.ii.	Gasoline	pre-Cars	911	911	0%	604.53	640.95	-6%	596,859	582,862	-14,000	-2%
		Car 1	189	189	0%	911.58	312.78	-66%	98,529	33,895	-64,634	-66%
		Car 2	377	377	0%	303.64	224.45	-26%	114,682	84,133	-30,549	-26%
		Car 3	511	511	0%	111.92	116.84	5%	57,282	60,739	3,457	6%
		Car 4	1,275	1,275	0%	52.02	54.36	4%	65,290	69,276	3,986	4%
	Car 5	1,483	1,483	0%	23.70	54.36	129%	35,160	80,626	45,466	129%	
	Car 6	1,643	1,643	0%	19.59	54.36	182%	33,650	89,326	55,676	182%	
	Gasoline total	6,315	6,315	0%	154.22	160.11	7%	999,199	1,011,136	11,938	1%	
	Diesel Oil	pre-Cars	1,872	1,872	0%	411.57	386.79	-6%	771,337	574,432	-196,905	-26%
		Car 1	1,285	1,285	0%	389.94	276.25	-29%	483,129	272,286	-210,843	-44%
Car 2		2,942	2,942	0%	318.56	193.80	-39%	965,389	650,789	-314,600	-33%	
Car 3		3,363	3,363	0%	559.10	150.74	-73%	5,609,152	1,411,290	-4,197,862	-75%	
Car 4		33,232	33,232	0%	509.42	93.81	-82%	15,929,185	3,117,457	-12,811,728	-80%	
Car 5	66,283	66,283	0%	432.92	93.81	-78%	28,694,080	6,217,860	-22,476,220	-78%		
Car 6	39,482	39,482	0%	154.79	93.81	-39%	5,941,615	3,696,298	-2,245,317	-38%		
Diesel oil total	154,259	154,259	0%	384.71	182.69	-53%	59,344,525	15,880,316	-43,464,210	-73%		
LDV% Total	180,574	180,574	0%	379.86	184.94	-52%	69,343,725	16,851,449	-52,492,276	-75%		
1.A.3.a.iii. Heavy Duty Vehicles (HDV)												
1.A.3.a.iii.	Diesel Oil	pre-Cars	547	547	0%	1076.16	1919.23	-42%	589,267	587,147	-2,120	-0%
		Car 1	277	277	0%	732.67	176.368	-76%	219,878	4,808	-215,070	-98%
		Car 2	2,270	2,270	0%	707.83	646.33	-9%	1,780,696	1,447,437	-333,259	-19%
		Car 3	6,757	6,757	0%	638.89	459.32	-28%	4,262,734	3,183,492	-1,079,242	-25%
		Car 4	3,043	3,043	0%	473.96	362.73	-24%	4,439,790	1,073,333	-3,366,457	-76%
	Car 5	19,189	19,189	0%	362.42	186.37	-49%	4,663,265	2,375,016	-2,288,249	-49%	
	Car 6	20,670	20,670	0%	64.99	186.37	1,176,026	3,662,314	2,486,288	212%		
	Diesel total	51,634	51,634	0%	309.75	283.33	-10%	19,935,526	13,687,196	-6,248,330	-31%	
	Trucks & Lorries	pre-Cars	3,262	3,262	0%	1034.82	737.35	-29%	3,375,399	2,485,071	-890,328	-26%
		Car 1	1,094	1,094	0%	747.82	480.39	-35%	919,052	512,378	-406,674	-44%
Car 2		5,544	5,544	0%	817.44	581.68	-29%	4,532,190	2,781,510	-1,750,680	-39%	
Car 3		20,583	20,583	0%	629.54	563.68	-10%	12,967,751	7,277,279	-5,690,472	-44%	
Car 4		15,912	15,912	0%	394.00	276.23	-30%	6,334,421	4,386,424	-1,947,997	-31%	
Car 5	154,983	154,983	0%	250.40	154.68	-38%	45,964,153	24,283,399	-21,680,854	-47%		
Car 6	381,799	381,799	0%	68.78	154.68	125%	26,251,482	69,665,888	43,414,406	165%		
Trucks total	585,186	585,186	0%	575.18	172.19	-70%	180,173,337	180,730,869	557,532	0%		
1.A.3.b. Road Transport												
1.A.3.b.	Gasoline	pre-Cars	4,940	4,940	0%	128.95	188.61	46%	622,656	783,451	160,795	26%
		Car 1	2,965	2,965	0%	128.94	177.73	41%	374,114	527,294	153,180	41%
		Car 2	3,221	3,221	0%	129.33	186.64	44%	387,596	639,633	252,037	65%
		Car 3	6,241	6,241	0%	49.24	186.64	381%	251,126	1,239,688	988,562	394%
		Car 4	1,130	1,130	0%	38.41	186.64	487%	23,066	224,627	201,561	874%
	Car 5	0	0	0%	0.00	0.00	0%	0	0	0	0%	
	Gasoline total	16,497	16,497	0%	89.86	184.65	106%	1,698,568	3,424,167	1,725,600	100%	
	Diesel Oil	pre-Cars	2,880	2,880	0%	375.86	184.94	-51%	1,108,512	654,514	-453,998	-41%
		Car 1	1,878	1,878	0%	375.86	184.94	-51%	720,129	454,514	-265,615	-37%
		Car 2	2,942	2,942	0%	318.56	193.80	-39%	965,389	650,789	-314,600	-33%
Car 3		3,363	3,363	0%	559.10	150.74	-73%	5,609,152	1,411,290	-4,197,862	-75%	
Car 4		33,232	33,232	0%	509.42	93.81	-82%	15,929,185	3,117,457	-12,811,728	-80%	
Car 5	66,283	66,283	0%	432.92	93.81	-78%	28,694,080	6,217,860	-22,476,220	-78%		
Car 6	39,482	39,482	0%	154.79	93.81	-39%	5,941,615	3,696,298	-2,245,317	-38%		
Diesel oil total	154,259	154,259	0%	384.71	182.69	-53%	59,344,525	15,880,316	-43,464,210	-73%		
LDV% Total	180,574	180,574	0%	379.86	184.94	-52%	69,343,725	16,851,449	-52,492,276	-75%		

Adjustment details for 2019												
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions			difference in [t]	
		current	adjusted	difference in [%]	current	adjusted	difference in [%]	current	adjusted	adjustment		
1.A.3.a.i. Passenger Cars												
1.A.3.a.i.	Gasoline	pre-Cars	13,589	13,589	0%	638.58	644.11	-9%	8,664,621	7,382,686	-1,281,935	-15%
		Car 1	12,427	12,427	0%	378.32	341.68	-9%	4,781,480	3,083,383	-1,698,096	-36%
		Car 2	20,086	20,086	0%	225.58	111.06	-50%	4,531,070	1,858,018	-2,672,852	-59%
		Car 3	39,216	39,216	0%	82.22	76.12	-8%	2,977,840	2,829,186	-148,654	-5%
		Car 4	295,220	295,220	0%	57.04	53.29	-7%	14,588,285	13,989,621	-598,664	-4%
	Car 5	180,537	180,537	0%	19.77	53.29	170%	3,173,720	6,584,356	3,410,636	107%	
	Car 6	206,626	206,626	0%	25.63	53.29	180%	5,295,099	11,010,782	5,715,683	108%	
	Gasoline total	764,031	764,031	0%	62.36	68.45	10%	43,961,947	48,238,025	4,276,078	10%	
	Diesel Oil	pre-Cars	1,746	1,746	0%	333.78	276.25	-17%	913,188	724,923	-188,265	-21%
		Car 1	2,545	2,545	0%	294.80	272.65	-8%	764,913	487,786	-277,127	-36%
Car 2		8,891	8,891	0%	407.19	322.87	-21%	3,820,286	2,037,480	-1,782,806	-46%	
Car 3		33,079	33,079	0%	615.11	180.42	-71%	20,370,125	5,967,493	-14,402,632	-71%	
Car 4		111,335	111,335	0%	419.17	182.44	-56%	45,685,685	18,085,228	-27,600,457	-61%	
Car 5	231,784	231,784	0%	419.37	182.44	-56%	95,117,643	37,650,997	-57,466,646	-60%		
Car 6	273,511	273,511	0%	227.30	182.44	-20%	62,189,230	44,429,184	-17,760,046	-29%		
Diesel oil total	663,841	663,841	0%	345.81	165.67	-52%	229,566,088	189,582,987	-139,983,906	-52%		
Flt% Total	1,368,532	1,368,532	0%	399.83	195.32	-50%	273,688,039	157,821,687	-115,866,352	-42%		
1.A.3.a.ii. Light Duty Vehicles (LDV)												
1.A.3.a.ii.	Gasoline	pre-Cars	926	926	0%	641.89	640.95	-0%	601,819	581,962	-19,857	-3%
		Car 1	97	97	0%	915.28	312.78	-66%	88,563	30,396	-58,167	-66%
		Car 2	316	316	0%	304.63	224.45	-26%	96,159	70,848	-25,310	-26%
		Car 3	447	447	0%	112.68	121.47	9%	50,365	54,283	3,918	8%
		Car 4	1,126	1,126	0%	53.06	55.26	4%	59,652	62,199	2,547	4%
	Car 5	1,361	1,361	0%	25.34	55.26	119%	34,240	7			

=	= 2010	= 2011	= 2012	= 2013	= 2014	= 2015	= 2016	= 2017	> 2018											
< Adjustment 2014 (accepted)	> -105.6	> -101.3	> -95.7	> -91.7	~	~	~	~	>											
< Adjustment 2015 (accepted)	> -100.3	> -95.5	> -89.9	> -85.1	~	~	~	~	>											
< Adjustment 2016 (accepted)	> -151.3	> -146.9	> -145.1	> -142.5	> -128.1	~	~	~	>											
< Adjustment 2017 (accepted)	> -151.3	> -146.8	> -145.0	> -142.4	> -127.2	> -100.9	~	~	>											
< Adjustment 2018 (accepted)	> -172.3	> -174.5	> -177.4	> -180.4	> -171.5	> -148.9	> -123.2	~	>											
< Adjustment 2019 (accepted)	> -172.3	> -174.5	> -177.4	> -180.3	> -171.4	> -148.8	> -123.3	> 93.7	>											
>																				
~ Adjustment 2020 (proposal)	~ -297.8	~ -302.3	~ -301.3	~ -306.1	~ -294.5	~ -269.0	~ -244.3	~ -214.9	~ -174.6											
> Change against Adjustment 2019	> -125.5	> -127.8	> -123.9	> -125.8	> -123.1	> -120.2	> -121.0	> -121.2	>											

The noticeable differences between the 2017 and 2018 adjustment proposals resulted from an ad-hoc revision of the *Handbook Emission Factors for Road Transport* (HBEFA, version 3.3) in the aftermath of the so-called "Diesel-gate".⁸⁾

The even bigger changes between adjustment 2019 and adjustment proposal 2020 result from an additional rather fundamental revision of the *Handbook Emission Factors for Road Transport* now available in version 4.1 >⁹⁾ strongly effecting the TREMOD model underlying Germany's emission reporting for road transport and hence any adjustments of NO_x emissions.

With such major model revision between submissions 2019 and 2020, the current adjustment proposal differs significantly from the adjustment applied for and accepted in 2019.

Adjustment description as provided in IIRs 2014 and 2015:

[image Description%20Adjustment%20DE-A%20-%20NOx%20from%201.A.3.b%20Road%20transport%20-%20IIRs%202014%20%26%202015.pdf](#)

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