

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 IASA 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 (IASA, 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 IASA (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

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

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

TREMODO, 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 2002⁶⁾, 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.

Table 1: Resulting adjustment proposal 2020

for year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
proposed adjustment	-296.1	-300.7	-300.4	-305.2	-294.9	-274.9	-250.9	-221.1	-179.6	-144.8

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]	adjustment in [kg]	difference in [%]
1.A.3.b.i	gasoline		755.957	755.957	0%	97.55	84.99	-13%	77.644.842	67.959.906	9.684.935	-13%
1.A.3.b.i	diesel oil		629.380	629.380	0%	429.45	180.51	-63%	227.341.056	84.370.461	142.970.635	-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%	623.00	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	154.056.160	99.092.083	-39%
1.A.3.b.iv	gasoline		19.712	19.712	0%	113.68	188.43	48%	2.240.745	3.320.034	-1.079.289	48%
1.A.3.b TOTAL		2010	2.079.688	2.079.688	0%			0%	645.965.162	349.851.206	296.113.956	-46%
1.A.3.b.i	gasoline		794.688	794.688	0%	92.09	81.61	-11%	73.185.551	64.851.951	8.333.590	-11%
1.A.3.b.i	diesel oil		553.564	553.564	0%	434.12	159.22	-63%	248.313.791	88.138.959	160.174.832	-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	14.718.142	41.126.376	-74%
1.A.3.b.iii	gasoline		47.365	47.365	0%	592.65	448.99	-24%	28.071.221	21.286.323	6.884.898	-24%
1.A.3.b.iii	diesel oil		563.891	563.891	0%	419.38	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%	2.137.602	3.289.162	-1.151.560	54%
1.A.3.b TOTAL		2011	2.100.883	2.100.883	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	-9%	64.379.984	58.577.229	5.802.765	-9%
1.A.3.b.i	diesel oil		656.245	656.245	0%	435.96	158.66	-64%	242.062.902	88.096.699	153.966.203	-64%
1.A.3.b.ii	gasoline		5.657	5.657	0%	218.93	193.15	-12%	1.238.620	1.092.662	145.958	-12%
1.A.3.b.ii	diesel oil		114.368	114.368	0%	481.91	128.17	-75%	55.106.382	13.741.354	41.365.028	-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		588.585	588.585	0%	381.33	224.00	-41%	224.829.180	132.064.753	92.764.428	-41%
1.A.3.b.iv	gasoline		18.268	18.268	0%	107.43	173.28	61%	1.962.545	3.165.439	-1.202.893	61%
1.A.3.b TOTAL		2012	2.084.964	2.084.964	0%			0%	616.721.438	316.391.343	300.428.094	-49%
1.A.3.b.i	gasoline		749.114	749.114	0%	93.35	74.85	-7%	68.190.007	56.071.797	12.118.210	-7%
1.A.3.b.i	diesel oil		589.131	589.131	0%	437.14	158.71	-64%	257.633.728	93.499.010	164.134.718	-64%
1.A.3.b.ii	gasoline		5.678	5.678	0%	202.80	184.07	-9%	1.131.209	1.026.727	104.482	-9%
1.A.3.b.ii	diesel oil		116.777	116.777	0%	489.60	114.93	-76%	57.083.633	13.699.488	43.433.045	-76%
1.A.3.b.iii	gasoline		81.716	81.716	0%	589.64	388.96	-34%	28.360.969	18.420.843	9.940.126	-34%
1.A.3.b.iii	diesel oil		600.139	600.139	0%	353.06	207.93	-41%	211.807.531	124.788.469	87.019.062	-41%
1.A.3.b.iv	gasoline		18.229	18.229	0%	194.34	175.38	-9%	1.902.668	3.197.038	-1.294.369	9%
1.A.3.b TOTAL		2013	2.132.683	2.132.683	0%			0%	616.079.063	316.854.371	300.224.692	-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	158.12	-63%	272.876.061	99.613.892	173.262.169	-63%
1.A.3.b.ii	gasoline		5.845	5.845	0%	198.34	176.49	-11%	1.112.584	1.031.612	80.972	-7%
1.A.3.b.ii	diesel oil		128.578	128.578	0%	475.56	118.96	-75%	61.146.575	14.267.237	46.879.338	-77%
1.A.3.b.iii	gasoline		45.143	45.143	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%	109.59	175.24	78%	1.878.294	3.346.794	-1.468.499	78%
1.A.3.b TOTAL		2014	2.152.563	2.152.563	0%			0%	597.120.297	302.252.271	294.868.025	-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		645.565	645.565	0%	426.19	159.80	-63%	276.130.233	103.163.501	172.966.732	-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		135.396	135.396	0%	469.35	107.96	-77%	63.505.443	14.607.480	48.897.963	-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	116.520.703	40.668.973	-30%
1.A.3.b.iv	gasoline		18.459	18.459	0%	99.32	188.65	82%	1.833.362	3.334.472	-1.501.090	82%
1.A.3.b TOTAL		2015	2.161.576	2.161.576	0%			0%	575.931.265	301.877.596	274.053.670	-48%
1.A.3.b.i	gasoline		715.272	715.272	0%	79.93	76.65	-4%	59.736.967	56.535.049	3.201.918	-5%
1.A.3.b.i	diesel oil		676.119	676.119	0%	419.36	160.76	-61%	277.041.660	108.535.230	168.506.430	-61%
1.A.3.b.ii	gasoline		5.926	5.926	0%	189.27	171.06	-9%	1.068.292	1.013.678	54.614	-5%
1.A.3.b.ii	diesel oil		144.868	144.868	0%	458.12	105.62	-77%	65.712.732	15.216.007	50.496.726	-77%
1.A.3.b.iii	gasoline		54.157	54.157	0%	424.73	308.24	-27%	23.002.109	16.893.117	6.108.992	-27%
1.A.3.b.iii	diesel oil		594.813	594.813	0%	226.31	188.97	-16%	134.431.899	107.496.262	26.935.637	-20%
1.A.3.b.iv	gasoline		18.785	18.785	0%	96.14	181.66	89%	1.805.897	3.412.476	-1.606.579	89%
1.A.3.b TOTAL		2016	2.207.338	2.207.338	0%			0%	553.199.558	302.991.820	250.897.738	-45%
1.A.3.b.i	gasoline		724.571	724.571	0%	67.66	69.88	7%	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%	272.126.091	112.810.721	159.315.370	-59%
1.A.3.b.ii	gasoline		6.186	6.186	0%	171.15	167.18	-2%	1.058.799	1.034.211	24.588	2%
1.A.3.b.ii	diesel oil		153.284	153.284	0%	424.66	103.89	-76%	66.093.930	15.925.216	50.168.714	-76%
1.A.3.b.iii	gasoline		53.382	53.382	0%	378.80	286.71	-23%	19.793.501	15.304.828	4.488.673	-23%
1.A.3.b.iii	diesel oil		598.263	598.263	0%	195.02	175.92	-10%	116.671.141	105.286.508	11.384.633	-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	304.489.906	221.079.424	-42%
1.A.3.b.i	gasoline		699.827	699.827	0%	64.42	68.36	6%	45.032.996	47.786.817	-2.753.820	6%
1.A.3.b.i	diesel oil		666.874	666.874	0%	371.66	163.30	-56%	247.595.063	108.768.604	138.826.459	-56%
1.A.3.b.ii	gasoline		6.315	6.315	0%	158.22	168.11	1%	999.199	1.011.138	-11.939	1%
1.A.3.b.ii	diesel oil		154.259	154.259	0%	384.71	182.69	-53%	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	-31%	15.993.526	13.607.106	2.386.420	-16%
1.A.3.b.iii	diesel oil		585.186	585.186	0%	171.18	172.10	1%	199.173.337	166.710.869	32.462.468	16%
1.A.3.b.iv	gasoline		18.497	18.497	0%	89.66	184.61	106%	1.658.588	3.414.767	-1.756.179	106%
1.A.3.b TOTAL		2018	2.186.993	2.186.993	0%			0%	478.758.206	291.139.612	179.618.593	-38%
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		603.841	603.841	0%	341.81	161.07	-53%	229.586.688	109.582.982	119.983.706	-52%
1.A.3.b.ii	gasoline		6.683	6.683	0%	146.08	153.25	5%	976.219	1.024.160	-47.931	5%
1.A.3.b.ii	diesel oil		159.183	159.183	0%	347.42	181.90	-47%	55.303.336	16.221.445	39.081.890	-71%
1.A.3.b.iii	gasoline		52.939	52.939	0%	274.41	247.81	-10%	14.527.012	13.118.578	1.408.434	-10%
1.A.3.b.iii	diesel oil		595.913	595.913	0%	153.35	169.17	10%	91.390.700	109.939.376	-18.548.676	10%
1.A.3.b.iv	gasoline		18.750	18.750	0%	86.05	186.83	117%	1.613.450	3.502.941	-1.889.491	117%
1.A.3.b TOTAL		2019	2.202.000	2.202.000	0%			0%	437.268.744	292.497.497	144.771.248	-33%

Adjustment details for 2023

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions				
		current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference	
		in [t]	in [t]	in [%]	in [g/t]	in [g/t]	in [%]	in [kg]	in [kg]	in [kg]	in [%]	
1.A.3.a.i - Passenger Cars	Gasoline	pre-Cars	11,561	11,561	0%	607.72	635.38	-9%	7,035,041	6,189,785	-836,256	-12%
		Car 1	47,487	47,487	0%	349.56	341.60	-23%	16,571,746	11,426,129	-5,145,617	-31%
		Car 2	72,781	72,781	0%	164.27	137.82	-16%	13,487,749	10,035,380	-3,452,369	-26%
		Car 3	189,443	189,443	0%	63.99	72.62	14%	6,927,963	7,875,172	947,209	14%
		Car 4	488,541	488,541	0%	45.29	45.13	-1%	18,541,881	18,436,736	-105,145	-1%
		Car 5	181,961	181,961	0%	18.61	45.13	143%	1,897,355	4,681,311	2,783,956	143%
	Car 6	282	282	0%	25.06	45.13	78%	7,339	42,736	35,397	74%	
	Gasoline total	190,957	190,957	0%	65.73	78.88	20%	64,379,943	58,577,229	-5,802,715	-9%	
	pre-Cars	1,487	1,487	0%	311.98	284.56	-9%	463,963	383,872	-80,091	-17%	
	Car 1	4,660	4,660	0%	257.79	266.44	-11%	1,980,364	1,717,787	-262,577	-13%	
	Car 2	33,967	33,967	0%	408.82	279.27	-32%	13,987,432	7,445,646	-6,541,787	-46%	
	Car 3	183,539	183,539	0%	564.82	176.63	-69%	58,389,037	10,434,837	-47,954,200	-82%	
	Car 4	234,943	234,943	0%	398.41	146.46	-63%	91,724,188	34,488,997	-57,235,191	-62%	
	Car 5	173,112	173,112	0%	434.89	146.46	-66%	75,284,364	25,353,375	-49,930,989	-66%	
	Car 6	1,557	1,557	0%	259.84	146.46	-44%	484,664	220,086	-264,578	-54%	
Diesel Oil total	555,245	555,245	0%	415.96	158.66	-62%	242,962,982	88,096,699	-154,866,283	-64%		
PKs Total	1,386,262	1,386,262	0%	234.61	152.29	-35%	386,442,896	146,671,927	-239,770,969	-62%		
pre-Cars	962	962	0%	832.39	646.95	-22%	487,779	621,166	133,387	27%		
Car 1	232	232	0%	863.24	983.22	14%	189,985	70,295	-119,690	-63%		
Car 2	989	989	0%	271.36	195.74	-28%	268,154	183,588	-84,566	-31%		
Car 3	835	835	0%	89.38	98.33	11%	74,623	82,082	7,459	10%		
Car 4	2,030	2,030	0%	38.49	47.58	24%	78,155	96,611	18,456	24%		
Car 5	610	610	0%	16.36	47.58	192%	3,941	29,011	19,070	192%		
Car 6	0	0	0%	15.37	47.58	210%	2	6	4	210%		
Gasoline total	5,657	5,657	0%	218.93	193.15	-9%	1,238,520	1,092,667	-145,853	-12%		
pre-Cars	3,281	3,281	0%	424.46	386.79	-9%	1,368,754	982,093	-376,661	-28%		
Car 1	3,666	3,666	0%	399.34	276.24	-30%	1,445,963	787,034	-658,929	-46%		
Car 2	8,479	8,479	0%	336.46	193.39	-42%	2,852,325	1,629,772	-1,222,553	-43%		
Car 3	23,785	23,785	0%	558.53	150.44	-73%	13,050,281	3,585,082	-9,465,199	-73%		
Car 4	59,485	59,485	0%	454.22	89.85	-80%	29,369,078	5,337,395	-24,031,683	-82%		
Car 5	15,964	15,964	0%	442.70	89.85	-80%	7,040,461	1,420,906	-5,619,555	-80%		
Car 6	1	1	0%	151.94	89.85	-41%	122	72	-50	-41%		
Diesel Oil total	114,350	114,350	0%	485.91	126.17	-74%	55,186,382	13,741,354	-41,445,028	-75%		
LNAs Total	129,088	129,088	0%	469.51	125.65	-74%	56,344,963	14,834,696	-41,510,267	-74%		
pre-Cars	1,326	1,326	0%	1091.46	1919.46	74%	1,410,640	1,352,283	-58,357	-4%		
Car 1	1,248	1,248	0%	727.34	751.15	3%	287,476	337,184	49,708	17%		
Car 2	7,780	7,780	0%	763.46	643.34	-16%	6,085,091	4,997,478	-1,087,613	-18%		
Car 3	14,483	14,483	0%	629.94	437.61	-31%	9,073,197	6,089,744	-2,983,453	-33%		
Car 4	5,331	5,331	0%	468.90	361.86	-23%	2,442,179	1,875,777	-566,402	-23%		
Car 5	30,752	30,752	0%	347.84	182.99	-47%	7,219,663	2,787,467	-4,432,196	-61%		
Car 6	73	73	0%	64.52	182.99	284%	3,961	13,296	9,334	236%		
Diesel Total	30,962	30,962	0%	533.28	384.33	-28%	27,141,913	19,945,288	-7,196,625	-27%		
pre-Cars	6,922	6,922	0%	1036.95	758.82	-27%	7,107,543	5,252,345	-1,855,198	-26%		
Car 1	3,630	3,630	0%	749.70	570.57	-24%	2,721,326	2,071,111	-650,215	-24%		
Car 2	23,577	23,577	0%	811.27	516.43	-36%	19,822,253	12,175,855	-7,646,398	-38%		
Car 3	86,726	86,726	0%	634.65	370.21	-42%	61,287,137	35,848,665	-25,438,472	-42%		
Car 4	50,650	50,650	0%	356.50	288.44	-19%	19,982,680	14,880,877	-5,101,803	-26%		
Car 5	485,981	485,981	0%	261.24	152.32	-42%	116,149,955	61,626,577	-54,523,378	-47%		
Car 6	2,380	2,380	0%	189.487	360.323	189%	189,487	360,323	170,836	223%		
Diesel Total	589,585	589,585	0%	385.33	224.69	-41%	224,829,180	132,064,753	-92,764,427	-41%		
pre-Cars	6,780	6,780	0%	122.76	151.03	23%	822,530	1,011,520	188,990	23%		
Car 1	4,366	4,366	0%	134.61	171.39	26%	536,615	738,050	201,435	38%		
Car 2	3,267	3,267	0%	136.22	184.95	43%	445,087	636,833	191,746	43%		
Car 3	3,994	3,994	0%	39.66	184.95	382%	158,286	778,616	620,330	392%		
Car 4	0	0	0%	0	0	0%	0	0	0	0%		
Car 5	0	0	0%	0	0	0%	0	0	0	0%		
Motor Total	18,268	18,268	0%	167.41	175.28	11%	1,982,548	3,163,439	1,180,891	61%		
1.A.3.b - Road Transport Total		2,084,964	2,084,964	0%	295.79	151.71	-49%	616,721,438	296,381,343	-320,340,094	-48%	

Adjustment details for 2023

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions				
		current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference	
		in [t]	in [t]	in [%]	in [g/t]	in [g/t]	in [%]	in [kg]	in [kg]	in [kg]	in [%]	
1.A.3.a.i - Passenger Cars	Gasoline	pre-Cars	11,680	11,680	0%	618.27	619.35	0%	7,011,641	5,967,452	-1,044,189	-15%
		Car 1	37,743	37,743	0%	353.78	341.68	-32%	13,362,986	9,129,495	-4,233,491	-32%
		Car 2	62,680	62,680	0%	189.93	139.33	-27%	11,889,922	8,722,244	-3,167,678	-27%
		Car 3	97,792	97,792	0%	68.38	73.19	9%	6,491,618	7,156,920	665,303	10%
		Car 4	387,911	387,911	0%	47.22	46.52	-1%	18,790,345	18,589,937	-200,407	-1%
		Car 5	138,063	138,063	0%	18.68	46.52	150%	2,583,150	6,439,691	3,856,541	150%
	Car 6	2,714	2,714	0%	25.99	46.52	79%	70,626	126,237	55,611	79%	
	Gasoline total	149,116	149,116	0%	88.35	74.85	-16%	69,190,887	56,671,797	-12,519,090	-18%	
	pre-Cars	987	987	0%	112.26	284.56	254%	433,081	348,138	-84,943	-19%	
	Car 1	6,625	6,625	0%	298.42	266.79	-11%	1,678,472	1,640,688	-37,784	-2%	
	Car 2	28,437	28,437	0%	408.84	279.91	-32%	11,983,522	6,253,531	-5,729,991	-48%	
	Car 3	92,795	92,795	0%	574.33	176.67	-69%	53,284,956	10,979,373	-42,305,583	-79%	
	Car 4	222,583	222,583	0%	393.55	149.27	-62%	87,598,471	33,225,586	-54,372,885	-62%	
	Car 5	233,766	233,766	0%	435.42	149.27	-66%	101,787,275	34,884,788	-66,902,487	-66%	
	Car 6	4,536	4,536	0%	259.53	149.27	-42%	5,177,151	677,045	-4,500,106	-87%	
Diesel Oil total	589,131	589,131	0%	437.54	158.75	-64%	257,533,128	83,899,698	-173,633,430	-64%		
PKs Total	1,338,245	1,338,245	0%	217.42	111.37	-49%	317,723,735	146,576,886	-171,146,849	-54%		
pre-Cars	184	184	0%	831.81	646.95	-22%	968,320	779,233	-189,087	-19%		
Car 1	836	836	0%	274.42	291.18	7%	229,520	188,285	-41,235	-18%		
Car 2	784	784	0%	52.66	191.79	36%	72,691	79,780	7,089	10%		
Car 3	1,089	1,089	0%	43.70	48.89	11%	77,284	82,833	5,549	7%		
Car 4	966	966	0%	16.67	48.89	192%	15,187	47,268	31,081	192%		
Car 5	1	1	0%	17.68	48.89	176%	26	72	46	176%		
Gasoline total	5,578	5,578	0%	262.86	184.67	-30%	1,131,299	1,026,727	-104,572	-9%		
pre-Cars	2,754	2,754	0%	424.37	286.79	-33%	1,988,757	944,928	-1,043,829	-53%		
Car 1	2,948	2,948	0%	399.75	276.25	-30%	1,166,782	634,586	-532,196	-46%		
Car 2	6,982	6,982	0%	336.92	193.39	-42%	2,246,147	1,260,074	-986,073	-44%		
Car 3	20,421	20,421	0%	569.12	150.38	-73%	11,437,995	3,070,913	-8,367,082	-73%		
Car 4	55,887	55,887	0%	497.72	90.45	-82%	27,775,440	5,048,416	-22,727,024	-82%		
Car 5	29,024	29,024	0%	441.97	90.45	-80%	13,181,305	2,687,964	-10,493,341	-80%		
Car 6	41	41	0%	151.26	90.45	-40%	6,160	3,688	-2,472	-40%		
Diesel Oil total	118,777	118,777	0%	488.66	154.93	-68%	57,083,513	13,656,488	-43,427,025	-76%		
LNAs Total	124,354	124,354	0%	468.54	158.03	-67%	58,214,142					

Adjustment details for 2024

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions				
		current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference	
		kg [t]	kg [t]	%	in [g/t]	in [g/t]	in [%]	in [kg]	in [kg]	in [kg]	in [kg]	
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	11,647	11,647	0%	812.37	848.11	-11%	7,132,680	6,337,484	-796,844	-11%
		Car 1	30,667	30,667	0%	358.77	343.93	-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	7,584,432	-2,918,844	-29%
		Car 3	87,374	87,374	0%	69.31	73.93	7%	8,955,589	6,459,737	-404,218	-7%
		Car 4	387,159	387,159	0%	49.16	47.80	-3%	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%	78.33	73.89	-8%	57,215,533	54,998,501	-2,216,812	-8%	
	pre-Cars	1,341	1,341	0%	311.73	284.66	-9%	417,987	364,246	-42,722	-9%	
	Car 1	4,982	4,982	0%	298.92	287.28	-11%	1,482,284	1,387,643	-155,951	-11%	
	Car 2	23,934	23,934	0%	408.71	320.45	-49%	9,734,484	5,276,490	-4,458,094	-49%	
	Car 3	82,749	82,749	0%	589.53	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%	4,170,580	2,480,686	-1,729,814	-41%	
	Diesel Oil total	626,045	626,045	0%	415.87	159.12	-62%	272,876,061	89,643,892	-173,262,169	-62%	
Flx Total	1,338,571	1,338,571	0%	218.44	152.15	-31%	338,091,584	154,642,853	-175,478,261	-31%		
1.A.3.b.i. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	986	986	0%	838.14	646.96	-23%	563,683	378,724	-184,848	-23%
		Car 1	173	173	0%	868.27	389.96	-54%	160,074	53,576	-106,499	-54%
		Car 2	748	748	0%	284.73	287.11	21%	212,888	154,839	-58,029	-27%
		Car 3	771	771	0%	98.02	185.21	7%	75,982	81,070	5,078	7%
		Car 4	1,087	1,087	0%	43.47	50.15	15%	81,139	83,618	12,479	15%
		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	-2%	1,112,584	1,031,652	-80,972	-7%	
	pre-Cars	2,537	2,537	0%	428.16	386.79	-21%	1,985,879	1,762,259	-223,629	-21%	
	Car 1	2,589	2,589	0%	393.82	276.25	-49%	987,136	639,888	-347,248	-49%	
	Car 2	6,087	6,087	0%	338.81	133.23	-62%	1,985,995	1,180,889	-805,106	-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%	26,184,486	4,703,796	-21,480,690	-82%	
	Car 5	46,749	46,749	0%	438.64	91.69	-79%	20,496,234	4,258,626	-16,237,608	-79%	
	Car 6	187	187	0%	151.18	91.69	-40%	29,829	17,974	-11,855	-40%	
	Diesel Oil total	128,578	128,578	0%	415.56	170.94	-77%	61,146,525	14,267,237	-46,879,288	-77%	
LDV Total	134,423	134,423	0%	463.16	153.85	-75%	62,259,160	15,298,849	-46,960,311	-75%		
1.A.3.b.ii. Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	984	984	0%	1059.48	1819.23	-5%	1,062,384	1,062,921	-48,433	-5%
		Car 1	837	837	0%	728.32	750.99	3%	699,222	628,359	-70,827	-3%
		Car 2	5,588	5,588	0%	784.35	643.67	-18%	4,384,320	3,623,441	-760,879	-18%
		Car 3	11,221	11,221	0%	621.20	458.38	-27%	7,082,740	5,143,528	-1,939,238	-27%
		Car 4	4,278	4,278	0%	461.10	361.79	-21%	1,972,610	1,584,978	-407,632	-21%
		Car 5	32,042	32,042	0%	358.55	183.99	-49%	7,726,911	4,065,532	-3,661,379	-49%
	Car 6	4,182	4,182	0%	42.78	183.99	330%	178,913	789,476	610,563	330%	
	Diesel Total	49,143	49,143	0%	468.37	339.99	-27%	23,017,115	16,788,234	-6,228,881	-27%	
	pre-Cars	4,782	4,782	0%	1034.34	737.35	-29%	4,945,942	3,625,898	-1,320,134	-29%	
	Car 1	2,285	2,285	0%	748.86	581.41	-22%	1,800,088	1,237,759	-562,329	-22%	
	Car 2	13,023	13,023	0%	817.90	510.28	-37%	11,146,862	6,565,738	-4,581,124	-37%	
	Car 3	54,085	54,085	0%	632.52	384.41	-42%	36,589,677	19,927,835	-16,661,841	-42%	
	Car 4	34,037	34,037	0%	396.37	285.34	-30%	13,481,100	9,711,896	-3,779,204	-30%	
	Car 5	389,283	389,283	0%	262.82	153.66	-42%	110,112,782	69,688,043	-40,424,739	-42%	
	Car 6	34,214	34,214	0%	63.95	153.66	189%	3,937,089	11,368,682	7,421,413	189%	
Trucks Total	572,154	572,154	0%	314.89	186.69	-38%	179,874,133	112,285,562	-67,588,571	-38%		
1.A.3.b.iii. Motorised Two-Wheelers (M2W)	pre-Cars	6,185	6,185	0%	122.85	158.04	29%	795,185	974,388	218,152	29%	
	Car 1	3,837	3,837	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	680,379	246,504	52%	
	Car 3	5,385	5,385	0%	38.53	186.25	386%	209,722	1,041,189	831,467	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%	
M2W Total	18,675	18,675	0%	108.99	176.84	78%	1,828,284	3,386,194	1,488,499	78%		
1.A.3.b. Road Transport Total	2,153,563	2,153,563	0%	277.27	140.35	-49%	597,120,297	382,252,271	-214,868,025	-49%		

Adjustment details for 2025

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO _x Emissions				
		current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference	
		kg [t]	kg [t]	%	in [g/t]	in [g/t]	in [%]	in [kg]	in [kg]	in [kg]	in [kg]	
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	11,380	11,380	0%	833.23	848.11	-1%	7,266,112	6,191,942	-1,074,169	-14%
		Car 1	36,112	36,112	0%	371.34	345.71	-34%	8,963,881	5,924,574	-3,039,288	-34%
		Car 2	42,925	42,925	0%	267.78	142.69	-32%	8,918,785	6,099,659	-2,819,148	-32%
		Car 3	72,871	72,871	0%	73.96	74.74	1%	5,381,361	5,446,237	64,857	1%
		Car 4	353,474	353,474	0%	52.36	49.62	-6%	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	-5,408,575	151%
	Gasoline total	715,156	715,156	0%	26.70	71.73	-6%	53,190,187	51,280,933	-1,889,895	-4%	
	pre-Cars	1,341	1,341	0%	311.73	284.66	-9%	417,987	364,246	-42,722	-9%	
	Car 1	4,279	4,279	0%	298.14	287.84	-9%	1,261,930	1,129,989	-132,821	-10%	
	Car 2	19,689	19,689	0%	407.80	320.98	-49%	8,013,687	4,338,179	-3,674,788	-49%	
	Car 3	71,044	71,044	0%	595.81	179.04	-70%	42,271,648	12,719,962	-29,551,686	-70%	
	Car 4	182,410	182,410	0%	401.42	154.07	-62%	77,237,655	29,644,450	-47,593,206	-62%	
	Car 5	364,346	364,346	0%	434.67	154.07	-65%	132,290,433	46,080,424	-86,409,859	-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	183,163,591	-91,966,732	-62%	
Flx Total	1,360,721	1,360,721	0%	245.28	153.52	-37%	328,321,020	154,444,484	-173,876,536	-37%		
1.A.3.b.i. Light Duty Vehicles (LDV)	Gasoline	pre-Cars	979	979	0%	876.34	737.35	-29%	4,488,571	3,184,428	-1,294,143	-29%
		Car 1	1,853	1,853	0%	748.71	553.48	-26%	1,387,291	1,025,251	-362,040	-26%
		Car 2	11,082	11,082	0%	817.90	510.28	-37%	9,072,943	5,633,460	-3,439,391	-37%
		Car 3	43,481	43,481	0%	621.55	381.64	-42%	27,460,779	15,734,621	-11,726,157	-42%
		Car 4	15,781	15,781	0%	588.35	150.67	-74%	9,112,414	2,385,113	-6,727,301	-74%
		Car 5	47,480	47,480	0%	501.73	91.74	-82%	23,782,396	4,348,298	-19,434,098	-82%
	Car 6	62,116	62,116	0%	436.13	91.74	-79%	27,090,214	5,690,295	-21,392,809	-79%	
	Gasoline total	135,386	135,386	0%	469.35	187.96	-77%	64,585,643	34,687,496	-29,898,153	-77%	
	pre-Cars	979	979	0%	1076.34	1819.23	-5%	1,048,312	986,255	-62,057	-6%	
	Car 1	747	747	0%	738.26	751.91	3%	545,471	581,836	36,365	3%	
	Car 2	5,211	5,211	0%	787.43	644.46	-18%	4,183,087	3,358,604	-824,483	-18%	
	Car 3	11,282	11,282	0%	633.90	458.38	-29%	7,141,732	5,174,959	-1,966,773	-28%	
	Car 4	4,586	4,586	0%	469.70	361.99	-23%	2,154,086	1,614,177	-539,909	-25%	
	Car 5	34,257	34,257	0%	358.77	184.59	-49%	8,727,068	4,477,641	-4,249,427	-49%	
	Car 6	5,224	5,224	0%	63.13	184.59	247%	277,542	964,225	686,684	247%	
Diesel Total	52,887	52,887	0%	458.96	327.99	-29%	23,987,817	11,149,448	-12,838,369	-29%		
1.A.3.b.ii. Motorised Two-Wheelers (M2W)	pre-Cars											

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%	634.75	644.11	-14%	7,470,914	6,410,967	1,059,947
		Car 1	20,270	20,270	0%	372.25	341.68	-35%	7,545,483	4,986,686	2,558,797
		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%	17,363,964	16,777,445	586,519
		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%	79.03	70.65	-11%	58,736,967	50,535,649	8,201,318	
	pre-Cars	1,280	1,280	0%	368.78	254.66	-31%	386,263	239,172	147,091	
	Car 1	3,749	3,749	0%	298.30	269.66	-9%	1,122,449	1,011,626	110,823	
	Car 2	16,584	16,584	0%	407.19	221.43	-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	11,085,409	25,906,590	
	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	116,034	116,034	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	
PKs Total	1,380,391	1,380,391	0%	215.75	154.41	-29%	127,738,627	159,070,289	-31,331,662		
1.A.3.a.ii - Light Duty Vehicles (LDV)	Gasoline	pre-Cars	910	910	0%	602.79	640.96	-6%	593,769	581,643	12,126
		Car 1	136	136	0%	908.31	512.78	-43%	122,126	42,425	79,701
		Car 2	540	540	0%	308.39	217.84	-29%	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	5,506	5,506	0%	188.27	171.66	-6%	1,068,292	1,033,679	34,613	
	pre-Cars	2,189	2,189	0%	414.81	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%	6,084,323	2,049,233	4,035,090	
	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%	153.49	92.40	-40%	755,285	454,676	300,609	
	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	188.29	-58%	66,781,025	16,298,864	50,482,161		
1.A.3.a.iii - Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	891	891	0%	1076.81	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%	2,117,219	1,686,081	431,138
		Car 5	34,380	34,380	0%	364.38	185.22	-49%	9,935,974	4,617,617	5,318,357
	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	587.92	-22%	1,163,482	789,813	373,669	
	Car 2	8,075	8,075	0%	817.75	585.52	-29%	7,255,040	4,486,620	2,768,420	
	Car 3	34,167	34,167	0%	638.11	568.64	-10%	21,563,288	12,251,155	9,312,133	
	Car 4	34,287	34,287	0%	394.94	281.66	-29%	9,640,364	6,885,621	2,754,743	
	Car 5	269,735	269,735	0%	267.22	153.80	-43%	74,680,233	39,976,610	34,703,623	
	Trucks Total	261,480	261,480	0%	671.77	153.80	-77%	16,149,288	40,244,036	-24,094,748	
	Trucks Total	564,013	564,013	0%	226.31	180.97	-20%	134,431,899	181,496,262	-47,064,363	
1.A.3.b.i - Motorised Two-Wheelers (M2W)	Gasoline	pre-Cars	5,543	5,543	0%	125.59	155.78	-19%	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	-33%	421,961	687,078	-265,117
		Car 3	6,443	6,443	0%	48.36	187.68	281%	209,627	1,273,071	-1,063,444
		Car 4	66	66	0%	17.47	187.68	1071%	1,134	12,822	-11,688
		Car 5	0	0	0%	0.00	187.68	0	0	0	
	M2Ws Total	18,185	18,185	0%	96.14	181.68	-47%	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%	353,789,558	382,961,820	-29,172,262	

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	12,282	12,282	0%	636.73	644.11	-14%	7,814,267	6,648,187	1,166,080
		Car 1	17,449	17,449	0%	372.99	341.68	-35%	6,588,911	4,217,044	2,371,867
		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	724,371	724,371	0%	67.66	60.88	-11%	59,066,874	50,534,714	8,532,160	
	pre-Cars	960	960	0%	364.39	254.66	-30%	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	222.43	-45%	5,914,130	3,066,983	2,847,147	
	Car 3	52,128	52,128	0%	808.85	179.65	-78%	31,696,478	9,384,788	22,311,690	
	Car 4	167,947	167,947	0%	418.10	156.34	-63%	64,733,485	24,993,323	39,740,162	
	Car 5	283,480	283,480	0%	423.99	156.34	-63%	120,157,656	44,073,190	76,084,466	
	Car 6	184,760	184,760	0%	262.61	156.34	-40%	48,521,183	20,255,985	28,265,198	
	Diesel Oil total	686,582	686,582	0%	394.65	161.95	-59%	272,126,091	152,890,721	119,235,370	
PKs Total	1,421,142	1,421,142	0%	245.98	155.83	-36%	121,152,965	163,425,435	-42,272,470		
1.A.3.a.ii - Light Duty Vehicles (LDV)	Gasoline	pre-Cars	960	960	0%	616.81	640.96	-6%	612,242	598,978	13,264
		Car 1	134	134	0%	908.23	512.78	-43%	112,083	38,682	73,401
		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	-2%	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	149%	35,240	89,034	-53,794
	Gasoline total	6,186	6,186	0%	171.55	167.18	-2%	1,058,799	1,034,211	24,588	
	pre-Cars	2,087	2,087	0%	411.41	386.79	-7%	960,499	931,183	29,316	
	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	456,500	
	Car 3	11,684	11,684	0%	556.08	150.79	-73%	6,940,879	1,758,147	5,182,732	
	Car 4	39,050	39,050	0%	506.70	93.69	-81%	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.a.iii - 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	389,662	-8,978
		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%	474.87	382.48	-20%	1,512,380	1,167,620	344,760
		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						

Adjustment details for 2018

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.b.i - Passenger Cars	Gasoline	pre-Cars	12,219	12,219	0%	637.58	648.11	-15%	7,780,965	6,608,721	-1,172,234
		Car 1	14,362	14,362	0%	374.34	341.68	-30%	5,371,161	3,480,643	-1,890,518
		Car 2	24,285	24,285	0%	221.97	111.06	-50%	5,360,977	2,688,163	-2,672,814
		Car 3	43,642	43,642	0%	88.16	76.96	-13%	3,897,781	3,588,617	-309,164
		Car 4	278,738	278,738	0%	55.98	52.30	-7%	15,683,486	14,570,755	-1,112,731
		Car 5	166,830	166,830	0%	19.38	52.30	170%	3,238,282	6,725,688	3,487,406
	Car 6	159,041	159,041	0%	6.00	52.30	770%	4,190,422	6,710,250	2,519,828	
	Gasoline total	689,027	689,027	0%	64.62	68.26	-6%	45,032,296	41,786,837	-3,245,459	
	pre-Cars	3,643	3,643	0%	303.16	344.56	-13%	296,486	346,173	-49,687	
	Car 1	2,949	2,949	0%	294.17	372.66	-22%	962,432	1,76,156	-78,727	
	Car 2	10,784	10,784	0%	407.26	322.87	-21%	4,911,983	2,483,536	-2,428,447	
Car 3	40,786	40,786	0%	612.49	180.15	-71%	24,932,029	7,333,241	-17,598,788		
Car 4	130,534	130,534	0%	414.71	180.40	-56%	54,133,837	20,937,329	-33,196,508		
Car 5	251,212	251,212	0%	416.26	180.40	-56%	104,585,706	40,293,731	-64,291,975		
Car 6	238,685	238,685	0%	254.87	180.40	-31%	58,284,140	36,680,446	-21,603,700		
Diesel oil total	666,074	666,074	0%	375.66	163.38	-56%	247,596,063	188,768,684	-58,827,379		
Px% Total	1,355,101	1,355,101	0%	214.34	134.68	-36%	262,588,260	156,555,421	-106,032,839		
pre-Cars	917	917	0%	668.53	648.56	-1%	596,959	582,862	-14,097		
Car 1	189	189	0%	911.58	372.76	-59%	98,529	33,896	-64,633		
Car 2	377	377	0%	303.64	224.45	-26%	114,682	84,113	-30,569		
Car 3	511	511	0%	111.92	116.64	5%	57,282	60,139	2,857		
Car 4	1,275	1,275	0%	52.02	54.36	4%	65,290	69,278	3,988		
Car 5	1,483	1,483	0%	23.78	54.36	129%	35,160	80,626	45,466		
Car 6	1,643	1,643	0%	19.59	54.36	182%	33,660	89,326	55,666		
Gasoline total	6,315	6,315	0%	154.22	160.11	4%	999,199	1,011,136	11,937		
pre-Cars	1,872	1,872	0%	411.57	386.79	-6%	771,337	674,432	-96,905		
Car 1	1,285	1,285	0%	389.84	276.25	-29%	483,129	372,286	-110,843		
Car 2	2,942	2,942	0%	318.56	153.80	-52%	965,389	650,789	-314,600		
Car 3	3,363	3,363	0%	559.10	150.74	-73%	5,609,152	1,411,290	-4,197,862		
Car 4	33,232	33,232	0%	509.42	93.81	-81%	15,929,185	3,117,457	-12,811,728		
Car 5	66,263	66,263	0%	432.92	93.81	-78%	28,694,080	6,217,860	-22,476,220		
Car 6	39,482	39,482	0%	168.79	93.81	-44%	5,941,616	3,696,208	-2,245,408		
Diesel oil total	154,259	154,259	0%	384.71	182.69	-53%	58,344,525	35,880,316	-22,464,209		
LDA% Total	160,574	160,574	0%	375.86	184.94	-52%	69,343,725	36,851,449	-32,492,276		
pre-Cars	547	547	0%	1078.16	1919.23	-42%	589,267	587,147	-2,120		
Car 1	237	237	0%	732.67	178,389	4,106	732,673	178,389	4,106		
Car 2	2,270	2,270	0%	787.83	646.33	-18%	1,780,696	1,447,437	-333,259		
Car 3	6,757	6,757	0%	638.89	459.32	-29%	4,262,734	3,183,482	-1,079,252		
Car 4	3,043	3,043	0%	473.96	382.73	-20%	1,639,790	1,073,333	-566,457		
Car 5	19,189	19,189	0%	362.42	186.37	-49%	4,663,265	2,376,016	-2,287,249		
Car 6	29,670	29,670	0%	64.89	186.37	286%	1,176,026	3,682,314	2,506,288		
Diesel Total	51,634	51,634	0%	309.75	283.53	-9%	15,935,526	13,687,196	-2,248,330		
pre-Cars	3,262	3,262	0%	1034.82	737.35	-29%	3,375,359	2,485,071	-890,288		
Car 1	1,094	1,094	0%	747.82	488.39	-34%	918,052	612,378	-305,674		
Car 2	5,544	5,544	0%	817.44	581.69	-29%	4,832,190	2,781,510	-2,050,680		
Car 3	20,583	20,583	0%	629.54	583.68	-8%	12,967,751	7,277,279	-5,690,472		
Car 4	15,912	15,912	0%	358.00	276.23	-23%	6,334,421	4,386,424	-1,947,997		
Car 5	164,960	164,960	0%	260.40	154.68	-41%	45,964,153	24,283,390	-21,680,763		
Car 6	381,799	381,799	0%	68.78	154.68	124%	26,251,482	69,665,888	43,414,406		
Trucks Total	583,186	583,186	0%	575.58	172.19	-70%	189,173,337	180,730,869	-8,442,468		
pre-Cars	4,940	4,940	0%	128.95	188.61	46%	622,666	783,451	160,785		
Car 1	2,960	2,960	0%	128.94	177.73	41%	374,114	527,254	153,140		
Car 2	3,221	3,221	0%	129.33	186.64	65%	387,596	639,633	252,037		
Car 3	6,241	6,241	0%	48.24	186.64	284%	251,126	1,239,688	988,562		
Car 4	1,130	1,130	0%	58.41	186.64	0%	23,066	234,627	211,561		
Car 5	0	0	0%	0.00	186.64	0%	0	0	0		
MOWs Total	18,487	18,487	0%	89.86	184.65	106%	1,698,568	3,434,747	1,736,179		
1.A.3.b - Road Transport	Total	2,189,983	2,189,983	0%	215.85	133.49	-38%	479,758,286	291,129,652	-188,628,634	

Adjustment details for 2019

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.b.i - Passenger Cars	Gasoline	pre-Cars	13,589	13,589	0%	638.58	648.11	-15%	8,664,621	7,382,688	-1,281,933
		Car 1	12,427	12,427	0%	378.32	341.68	-30%	4,781,480	3,083,383	-1,698,096
		Car 2	20,086	20,086	0%	225.58	111.06	-50%	4,531,070	1,858,018	-2,672,952
		Car 3	39,216	39,216	0%	82.22	76.12	-8%	2,977,840	2,829,186	-148,654
		Car 4	295,220	295,220	0%	57.04	52.29	-7%	14,588,285	13,989,621	-598,664
		Car 5	160,537	160,537	0%	19.77	52.29	170%	3,173,729	6,584,356	3,410,627
	Car 6	286,626	286,626	0%	25.63	52.29	180%	5,295,099	11,010,782	5,715,683	
	Gasoline total	768,631	768,631	0%	62.36	68.45	10%	43,961,597	40,236,025	-3,725,572	
	pre-Cars	3,735	3,735	0%	333.78	372.66	-11%	313,188	374,923	-61,735	
	Car 1	2,545	2,545	0%	294.80	372.66	-23%	764,913	887,396	-122,483	
	Car 2	8,891	8,891	0%	407.19	326.16	-20%	3,620,286	2,037,480	-1,582,806	
Car 3	33,079	33,079	0%	615.11	180.42	-71%	20,370,125	5,967,483	-14,402,642		
Car 4	111,335	111,335	0%	419.17	182.44	-56%	45,668,685	18,085,228	-27,583,457		
Car 5	231,784	231,784	0%	418.37	182.44	-56%	95,117,643	37,650,997	-57,466,646		
Car 6	273,511	273,511	0%	227.30	182.44	-20%	62,189,230	44,429,184	-17,760,046		
Diesel oil total	663,841	663,841	0%	345.81	165.67	-52%	229,566,089	189,582,967	-39,983,122		
Px% Total	1,362,512	1,362,512	0%	299.83	165.32	-44%	273,668,029	157,821,687	-115,846,342		
pre-Cars	928	928	0%	641.89	648.56	-1%	681,459	581,962	-99,497		
Car 1	87	87	0%	915.28	372.76	-59%	89,953	30,396	-59,557		
Car 2	316	316	0%	304.63	224.45	-26%	96,159	70,848	-25,310		
Car 3	447	447	0%	112.68	121.47	8%	50,365	54,283	3,918		
Car 4	1,126	1,126	0%	53.06	55.26	4%	59,652	62,199	2,547		
Car 5	1,361	1,361	0%	25.34	55.26	119%	34,240	74,680	40,440		
Car 6	2,420	2,420	0%	18.75	55.26	185%	45,383	133,753	88,370		
Gasoline total	6,483	6,483	0%	146.88	153.25	5%	974,279	1,004,150	29,871		
pre-Cars	1,744	1,744	0%	418.98	386.79	-7%	725,111	641,376	-83,735		
Car 1	1,079	1,079	0%	389.52	276.25	-29%	420,285	332,256	-88,029		
Car 2	2,334	2,334	0%	316.36	154.79	-51%	737,682	454,630	-283,052		
Car 3	7,649	7,649	0%	601.11	150.79	-75%	4,587,943	1,152,711	-3,435,232		
Car 4	28,711	28,711	0%	512.20	94.57	-81%	14,700,380	2,715,154	-11,985,226		
Car 5	58,714	58,714	0%	434.30	94.57	-78%	25,499,580	6,652,428	-18,847,152		
Car 6	58,931	58,931	0%	145.18	94.57	-35%	8,614,086	6,722,892	-1,891,194		
Diesel oil total	159,183	159,183	0%	347.44	181.99	-47%	55,383,535	36,221,446	-19,162,089		
LDA% Total	165,866	165,866	0%	339.31	183.97	-46%	66,279,544	47,245,996	-19,033,548		
pre-Cars	489	489	0%	1086.20	1919.23	-42%	589,267	476,258	-113,009		
Car 1	147	147	0%	738.37	178,389	4,106	738,373	178,389	4,106		
Car 2	1,611	1,611	0%	789.47	646.77	-18%	1,271,445	1,041,621	-229,824		
Car 3	5,789	5,789	0%	631.62	459.55	-27%	3,686,361	2,623,779	-1,062,582		
Car 4	2,747	2,747	0%	473.92	382.8						

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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 (accepted)	-297.8	-302.3	-301.3	-306.1	-294.5	-269.0	-244.3	-214.9	-174.6	
Adjustment 2021 (proposal)	-296.1	-300.7	-300.4	-305.2	-294.9	-274.9	-250.9	-221.1	-179.6	-144.8
Change against Adjustment 2020	1.7	1.6	0.9	0.9	-0.4	-5.9	-6.6	-6.2	-5.0	

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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