

# Adjustment DE-A regarding NO<sub>x</sub> 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<sub>x</sub>, (IIASA, 1999) <sup>1)</sup>. The over-all 2010 national emission ceiling (NEC) for NO<sub>x</sub>, was set to 1,081 kt. When negotiating the EU NEC Directive two years later, Germany agreed to reduce its NO<sub>x</sub>, emissions further, resulting in a NEC of 1,051 kt.

In its 2016 NEC emissions reporting, Germany provided a national total for NO<sub>x</sub>, 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) <sup>2), 3)</sup> was agreed. This procedure is applicable also for existing NECs (EB, 2012b) <sup>4)</sup>.

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<sub>x</sub>, 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) <sup>5)</sup>. 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<sub>x</sub>, emissions for four selected countries (Germany, France, Netherlands and Belgium) and found higher NO<sub>x</sub>, 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<sub>x</sub>, 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<sub>x</sub>. However, as changes in AD are no valid adjustment reason, the latter value is for information only.

This was mainly due to: \* NO<sub>x</sub>, 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<sub>x</sub>, 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<sub>x</sub>, 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 EM<sup>1</sup>**

<sup>1</sup> "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<sub>adjustment</sub>**, = amount of emissions to be subtracted from National Totals \* **AD<sub>current</sub>**, = AD from latest TREMOD version as used for current submission \* **EF<sub>current</sub>**, = EF from latest TREMOD version as used for current submission \* **EF<sub>original</sub>**, = EF from TREMOD version used at the time NEC ceilings were set (here: TREMOD 3.1) \* **EM<sub>current</sub>**, = EM estimated from AD and EF from latest TREMOD version = EM reported for NFR 1.A.3.b with latest submission \* **EM<sub>current-artificial</sub>**, = 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<sub>x</sub>, 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 2002<sup>6)</sup>, including the following set of NO<sub>x</sub>, 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<sub>x</sub>, 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<sub>x</sub>, 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)<sup>7)</sup>.

### 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<sub>x</sub>, 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
<b>proposed adjustment</b>	<b>-297.8</b>	<b>-302.3</b>	<b>-301.3</b>	<b>-306.1</b>	<b>-294.5</b>	<b>-269.0</b>	<b>-244.3</b>	<b>-214.9</b>	<b>-174.6</b>	

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<sub>x</sub>, 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

NER Code	Fuel	Year	Activity Data			Implied Emission Factor			NO <sub>x</sub> Emissions			
			current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference
			in [TJ]		in [%]	in [kg/TJ]		in [%]	in [kg]			in [%]
1.A.3.b.i	gasoline		795.957	795.957	0%	97.55	94.99	-13%	77.644.842	67.959.906	9.683.935	-13%
1.A.3.b.i	diesel oil		529.390	529.390	0%	429.45	160.51	-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	diesel oil		46.844	46.844	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	168.43	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	349.851.206	296.113.956	-46%
1.A.3.b.i	gasoline		794.688	794.688	0%	92.09	81.61	-11%	73.185.851	64.351.951	8.833.900	-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	diesel oil		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%	2.137.662	3.299.162	-1.162.160	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%	64.379.994	58.577.229	5.802.765	-9%
1.A.3.b.i	diesel oil		555.245	555.245	0%	435.96	158.66	-64%	242.062.902	88.096.699	153.966.203	-64%
1.A.3.b.ii	gasoline		5.657	5.657	0%	218.93	193.15	-12%	1.238.520	1.092.662	145.859	-12%
1.A.3.b.ii	diesel oil		114.350	114.350	0%	481.91	128.17	-75%	55.106.382	13.741.354	41.365.028	-75%
1.A.3.b.iii	diesel oil		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%	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%	1.962.546	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	300.420.094	-49%
1.A.3.b.i	gasoline		749.114	749.114	0%	80.35	74.85	-7%	60.190.007	56.071.797	4.118.211	-7%
1.A.3.b.i	diesel oil		589.131	589.131	0%	437.14	158.71	-64%	257.533.728	93.499.010	164.034.718	-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		116.777	116.777	0%	489.60	114.93	-76%	57.003.533	13.690.488	43.333.045	-76%
1.A.3.b.iii	diesel oil		81.716	81.716	0%	509.54	369.96	-29%	26.350.969	18.420.843	7.930.126	-29%
1.A.3.b.iii	diesel oil		600.139	600.139	0%	353.06	287.93	-19%	211.887.531	124.788.459	87.099.072	-41%
1.A.3.b.iv	gasoline		18.229	18.229	0%	194.34	175.38	8%	1.902.668	3.197.038	-1.294.361	8%
1.A.3.b TOTAL		2013	2.132.683	2.132.683	0%			0%	616.078.663	316.854.371	300.224.292	-50%
1.A.3.b.i	gasoline		752.526	752.526	0%	75.03	73.09	-3%	57.215.533	54.988.921	2.216.612	-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		128.578	128.578	0%	475.56	110.96	-77%	61.146.575	14.267.237	46.879.338	-77%
1.A.3.b.iii	diesel oil		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%	100.59	179.24	78%	1.878.294	3.346.794	-1.468.499	78%
1.A.3.b TOTAL		2014	2.153.563	2.153.563	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		645.555	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		135.396	135.396	0%	469.35	187.96	-77%	63.505.443	14.607.490	48.897.953	-77%
1.A.3.b.iii	diesel oil		52.287	52.287	0%	458.96	327.99	-29%	23.997.817	17.149.448	6.848.370	-29%
1.A.3.b.iii	diesel oil		589.411	589.411	0%	266.69	187.51	-30%	157.189.676	116.529.703	40.659.973	-30%
1.A.3.b.iv	gasoline		18.459	18.459	0%	99.32	180.65	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%	50.736.967	50.535.049	201.918	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		5.926	5.926	0%	189.27	171.06	-9%	1.068.292	1.013.678	54.614	-5%
1.A.3.b.ii	diesel oil		144.068	144.068	0%	456.12	185.62	-77%	65.712.732	15.216.007	50.496.726	-77%
1.A.3.b.iii	diesel oil		54.157	54.157	0%	424.73	388.24	-7%	23.002.109	16.893.117	6.308.992	-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%	553.799.556	302.901.820	250.897.738	-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%	272.126.091	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		153.294	153.294	0%	424.66	183.89	-76%	66.093.930	15.925.216	50.168.714	-76%
1.A.3.b.iii	diesel oil		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		596.263	596.263	0%	195.02	175.92	-9%	116.671.141	105.248.508	11.422.633	-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	304.469.906	221.079.424	-42%
1.A.3.b.i	gasoline		699.027	699.027	0%	64.42	68.36	6%	45.032.996	47.786.817	-2.753.820	6%
1.A.3.b.i	diesel oil		666.074	666.074	0%	371.66	163.30	-56%	247.695.063	108.768.604	138.926.459	-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	-73%	69.344.525	15.840.310	53.504.215	-73%
1.A.3.b.iii	diesel oil		51.634	51.634	0%	399.75	263.53	-35%	15.993.526	13.607.106	2.386.420	-15%
1.A.3.b.iii	diesel oil		585.186	585.186	0%	171.18	172.10	1%	188.173.337	188.710.869	-537.532	1%
1.A.3.b.iv	gasoline		18.497	18.497	0%	89.66	184.61	106%	1.658.568	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	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		683.841	683.841	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%	146.08	153.25	5%	976.219	1.024.160	-47.941	5%
1.A.3.b.ii	diesel oil		159.183	159.183	0%	347.42	181.90	-71%	55.303.535	16.221.445	39.082.090	-71%
1.A.3.b.iii	diesel oil		52.939	52.939	0%	274.41	247.81	-9%	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%	91.380.700	100.809.376	-9.428.676	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 2020												
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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 [kg]	
1.A.3.a.i. Passenger Cars	Gasoline	pre-Cars	13.685	13.685	0%	584.75	514.25	-12%	7.955.060	6.986.917	-958.143	-12%
		Car 1	36.541	36.541	0%	338.50	297.71	-12%	25.915.925	19.189.262	-7.716.663	-30%
		Car 2	96.425	96.425	0%	172.95	135.63	-22%	16.580.020	13.020.026	-3.568.995	-22%
		Car 3	133.139	133.139	0%	58.51	70.18	20%	7.790.384	9.343.433	1.553.129	20%
		Car 4	444.991	444.991	0%	42.27	42.19	0%	18.911.389	18.773.529	-137.859	0%
		Car 5	31.234	31.234	0%	18.61	42.19	127%	581.142	1.317.737	736.595	127%
	Car 6	0	0	0%	25.08	42.19	67%	2	3	1	67%	
	Gasoline total	795.057	795.057	0%	592.55	514.25	-13%	77.644.042	67.650.586	-9.993.455	-13%	
	Diesel Oil	pre-Cars	1.915	1.915	0%	318.13	264.95	-17%	583.760	527.256	-56.505	-10%
		Car 1	10.338	10.338	0%	294.42	245.17	-17%	3.046.428	2.741.387	-302.121	-10%
		Car 2	50.088	50.088	0%	406.90	278.19	-31%	29.372.795	19.974.230	-9.398.564	-32%
		Car 3	134.025	134.025	0%	542.54	170.54	-69%	72.645.173	23.929.276	-48.715.897	-67%
Car 4		279.154	279.154	0%	304.37	140.58	-53%	187.299.180	39.243.811	-148.055.369	-81%	
Car 5		53.547	53.547	0%	434.70	140.58	-68%	23.275.735	7.527.796	-15.747.939	-68%	
Car 6	334	334	0%	257.62	140.58	-45%	85.044	46.553	-38.491	-45%		
Diesel oil total	529.380	529.380	0%	429.45	140.58	-67%	227.347.096	84.970.461	-142.376.635	-67%		
Pkx Total	1.325.337	1.325.337	0%	238.12	155.14	-35%	364.985.938	152.621.367	-212.364.570	-58%		
1.A.3.b.i. Light Duty Vehicles (LDVs)	Gasoline	pre-Cars	1.249	1.249	0%	627.99	545.95	-13%	783.320	686.871	-96.449	-12%
		Car 1	367	367	0%	361.95	297.39	-18%	368.969	186.620	-182.349	-50%
		Car 2	1.393	1.393	0%	264.75	184.41	-30%	368.840	256.917	-111.923	-30%
		Car 3	855	855	0%	82.47	30.83	-63%	70.631	77.625	6.994	10%
		Car 4	2.420	2.420	0%	36.32	44.90	24%	87.987	188.679	100.692	114%
		Car 5	49	49	0%	15.34	44.90	193%	750	2.218	1.468	193%
	Car 6	0	0	0%	0	0	0%	0	0	0	0%	
	Gasoline total	6.345	6.345	0%	255.87	254.75	-0%	1.478.832	1.358.126	-120.706	-8%	
	Diesel Oil	pre-Cars	4.876	4.876	0%	425.99	385.79	-9%	2.077.142	1.436.983	-640.159	-31%
		Car 1	9.989	9.989	0%	398.59	276.24	-31%	2.389.080	1.289.630	-1.099.449	-46%
		Car 2	13.126	13.126	0%	336.76	153.18	-54%	4.420.380	2.534.731	-1.885.649	-43%
		Car 3	33.249	33.249	0%	531.91	150.58	-72%	17.655.883	5.085.760	-12.570.123	-71%
Car 4		54.581	54.581	0%	491.42	80.69	-84%	26.021.036	4.940.722	-21.080.314	-81%	
Car 5		1.629	1.629	0%	427.50	80.69	-79%	696.296	144.434	-551.862	-80%	
Car 6	0	0	0%	15.73	80.69	-81%	7	4	-3	-43%		
Diesel oil total	113.450	113.450	0%	416.34	134.96	-74%	54.043.533	15.351.584	-38.691.949	-74%		
LDVs Total	119.175	119.175	0%	464.70	139.18	-70%	55.658.966	36.685.913	-18.973.053	-34%		
1.A.3.b.ii. Heavy Duty Vehicles (HDVs)	Diesel Oil	pre-Cars	3.382	3.382	0%	1096.25	1029.78	-6%	3.674.087	3.452.644	-221.443	-6%
		Car 1	2.826	2.826	0%	749.41	732.14	-2%	2.117.871	2.125.595	7.723	0%
		Car 2	10.152	10.152	0%	801.96	643.47	-20%	8.140.119	6.532.213	-1.607.906	-20%
		Car 3	15.890	15.890	0%	633.22	437.25	-31%	10.865.776	7.289.299	-3.576.477	-33%
		Car 4	5.461	5.461	0%	448.63	351.65	-21%	2.650.016	1.921.527	-728.489	-28%
		Car 5	10.326	10.326	0%	337.28	182.33	-46%	3.882.417	1.882.544	-1.999.873	-51%
		Car 6	0	0	0%	15.73	80.69	-81%	7	4	-3	-43%
		Diesel total	48.044	48.044	0%	623.80	482.55	-23%	29.931.266	23.183.732	-6.747.534	-23%
1.A.3.b.iii. Heavy Duty Trucks & Lorries	Diesel Oil	pre-Cars	10.185	10.185	0%	1040.16	787.37	-25%	10.510.623	7.754.136	-2.756.487	-26%
		Car 1	5.677	5.677	0%	758.59	575.55	-24%	4.261.383	3.287.681	-973.702	-23%
		Car 2	38.558	38.558	0%	817.62	524.79	-35%	31.525.526	20.234.619	-11.290.907	-36%
		Car 3	169.023	169.023	0%	636.28	274.48	-57%	161.136.182	59.617.271	-101.519.911	-63%
		Car 4	69.635	69.635	0%	368.34	280.62	-24%	27.183.867	20.146.636	-7.037.231	-26%
		Car 5	283.934	283.934	0%	276.42	151.65	-45%	78.643.643	43.115.897	-35.527.746	-45%
		Car 6	0	0	0%	0	0	0%	0	0	0	0%
		Trucks Total	565.141	565.141	0%	446.67	271.83	-39%	293.148.243	154.696.160	-138.452.083	-39%
1.A.3.b.iv. Motorized Two-Wheelers (M2Ws)	Gasoline	pre-Cars	7.973	7.973	0%	122.80	149.18	22%	372.721	1.189.393	216.502	58%
		Car 1	5.231	5.231	0%	123.77	185.74	51%	647.479	887.039	239.560	37%
		Car 2	3.587	3.587	0%	141.16	184.21	31%	585.362	686.681	101.319	17%
		Car 3	2.950	2.950	0%	38.11	184.21	381%	116.180	657.032	540.852	465%
		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	19.112	19.112	0%	113.68	148.43	48%	2.243.149	3.326.034	1.082.885	48%
1.A.3.b. Road Transport	Total	2.879.688	2.879.688	0%	219.62	148.23	-46%	645.965.162	349.851.296	-296.113.866	-46%	



Adjustment details for 2023												
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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-Euro	11,581	11,581	0%	607.72	635.38	-52%	7,035,041	6,189,785	-836,256	-52%
		Euro 1	47,487	47,487	0%	348.56	341.62	-31%	16,571,746	11,426,129	-5,145,617	-31%
		Euro 2	72,781	72,781	0%	194.27	137.92	-29%	13,487,749	10,035,380	-3,372,369	-26%
		Euro 3	189,443	189,443	0%	63.89	72.62	14%	6,927,963	7,875,172	947,209	14%
		Euro 4	489,541	489,541	0%	45.39	45.13	-1%	18,541,881	18,436,736	-105,145	-1%
		Euro 5	181,961	181,961	0%	18.61	45.13	142%	1,897,355	4,681,311	2,783,956	142%
		Euro 6	282	282	0%	25.06	45.13	74%	7,339	12,736	5,399	74%
		Gasoline total	790,267	790,267	0%	85.73	78.88	-8%	64,379,964	58,577,229	-5,802,735	-9%
	Diesel Oil	pre-Euro	1,487	1,487	0%	311.98	284.56	-9%	463,963	383,872	-80,091	-9%
		Euro 1	6,660	6,660	0%	267.79	246.44	-11%	1,980,364	1,771,787	-208,577	-11%
		Euro 2	33,967	33,967	0%	406.82	279.27	-40%	13,987,432	7,445,646	-6,541,787	-40%
		Euro 3	183,539	183,539	0%	564.82	176.63	-69%	58,389,037	18,434,837	-39,954,200	-69%
		Euro 4	234,943	234,943	0%	398.41	146.46	-62%	91,724,190	34,488,997	-57,235,193	-62%
		Euro 5	173,112	173,112	0%	434.89	146.46	-66%	75,284,364	25,353,375	-49,930,989	-66%
		Euro 6	1,557	1,557	0%	259.84	146.46	-44%	484,664	220,086	-264,578	-44%
		Diesel oil total	555,245	555,245	0%	415.96	158.66	-64%	242,962,982	88,096,639	-154,866,343	-64%
		FCs Total	1,345,512	1,345,512	0%	234.61	115.29	-50%	386,442,896	146,673,867	-239,769,029	-50%
	Gasoline	pre-Euro	962	962	0%	632.36	645.95	2%	607,179	621,160	13,981	2%
		Euro 1	232	232	0%	803.24	383.22	-56%	199,985	70,295	-129,691	-61%
		Euro 2	989	989	0%	271.16	195.74	-28%	269,134	133,598	-135,536	-29%
		Euro 3	835	835	0%	89.38	98.33	10%	34,623	82,092	47,469	10%
		Euro 4	2,030	2,030	0%	38.49	47.58	24%	78,155	96,691	18,536	24%
		Euro 5	610	610	0%	16.36	47.58	182%	9,941	29,011	19,069	182%
		Euro 6	0	0	0%	16.37	47.58	210%	2	6	4	210%
		Gasoline total	5,657	5,657	0%	218.93	193.15	-12%	1,238,520	1,692,662	454,142	12%
1.A.3.b.i. Heavy Duty Vehicles (LON)	Gasoline	pre-Euro	3,281	3,281	0%	424.46	386.79	-9%	1,368,754	1,262,093	-106,661	-9%
		Euro 1	3,666	3,666	0%	398.34	276.24	-30%	1,445,960	1,071,634	-374,326	-26%
		Euro 2	8,479	8,479	0%	336.40	133.39	-49%	2,852,325	1,639,772	-1,212,553	-43%
		Euro 3	23,785	23,785	0%	558.53	150.44	-73%	13,050,281	3,546,082	-9,504,199	-73%
		Euro 4	59,485	59,485	0%	494.22	89.85	-82%	29,369,070	5,337,395	-24,031,675	-82%
		Euro 5	15,964	15,964	0%	442.70	89.85	-80%	7,040,461	1,420,906	-5,619,555	-80%
		Euro 6	1	1	0%	151.94	89.85	-41%	122	72	-50	-41%
		Diesel oil total	114,350	114,350	0%	485.91	120.17	-75%	55,186,382	13,741,354	-41,445,028	-75%
		LONs Total	120,008	120,008	0%	489.51	123.61	-74%	56,344,963	14,834,656	-41,510,307	-74%
	Diesel Oil	pre-Euro	1,326	1,326	0%	1091.46	1919.46	4%	1,410,640	1,352,283	-58,357	-4%
		Euro 1	1,245	1,245	0%	727.34	731.15	1%	1,017,476	1,017,184	-292	-1%
		Euro 2	7,780	7,780	0%	703.46	643.34	-9%	5,085,091	4,597,478	-487,613	-9%
		Euro 3	14,483	14,483	0%	629.94	437.61	-31%	9,073,197	6,089,744	-2,983,453	-33%
		Euro 4	5,331	5,331	0%	468.10	361.86	-23%	2,642,179	1,675,777	-966,402	-37%
		Euro 5	20,752	20,752	0%	347.84	182.99	-47%	7,219,563	2,787,467	-4,432,096	-47%
		Euro 6	73	73	0%	64.52	182.99	236%	3,961	13,296	9,334	236%
		Diesel Total	50,962	50,962	0%	533.22	384.33	-28%	27,141,913	19,965,288	-7,176,625	-28%
	Gasoline	pre-Euro	6,922	6,922	0%	1036.95	158.82	-21%	7,107,543	5,252,345	-1,855,198	-21%
		Euro 1	3,630	3,630	0%	743.70	570.57	-24%	2,721,326	2,071,111	-650,215	-24%
		Euro 2	23,577	23,577	0%	818.27	516.43	-37%	19,262,253	12,175,855	-7,086,398	-37%
		Euro 3	96,736	96,736	0%	634.65	270.21	-42%	61,387,137	35,848,665	-25,538,472	-42%
		Euro 4	60,550	60,550	0%	356.50	288.44	-19%	19,962,680	16,880,877	-3,081,723	-27%
		Euro 5	485,981	485,981	0%	261.24	152.32	-42%	116,149,665	61,626,577	-54,523,088	-47%
		Euro 6	2,380	2,380	0%	188.487	360.323	191%	188,487	360,323	171,836	191%
		Trucks Total	589,585	589,585	0%	385.33	224.69	-41%	224,829,180	132,064,153	-92,765,027	-41%
1.A.3.b.ii. Motorised Two-Wheelers (MOW)	Gasoline	pre-Euro	6,780	6,780	0%	122.76	151.03	23%	822,530	1,011,920	189,391	23%
		Euro 1	4,386	4,386	0%	134.61	171.39	28%	536,615	738,050	201,435	38%
		Euro 2	3,267	3,267	0%	136.22	184.56	35%	445,087	636,853	191,766	43%
		Euro 3	3,984	3,984	0%	38.66	184.56	382%	18,386	778,616	760,230	382%
		Euro 4	0	0	0%	0	0	0%	0	0	0	0%
		Euro 5	0	0	0%	0	0	0%	0	0	0	0%
		MOWs Total	18,268	18,268	0%	107.43	175.28	61%	1,982,548	3,165,439	1,182,891	61%
		1.A.3.b. Road Transport Total	2,084,964	2,084,964	0%	295.79	151.71	-49%	616,721,438	396,381,343	-220,340,094	-49%

Adjustment details for 2023												
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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-Euro	11,680	11,680	0%	618.27	649.35	-5%	7,011,641	6,967,452	-4,448	-5%
		Euro 1	37,743	37,743	0%	353.78	341.68	-3%	13,362,966	9,129,495	-4,233,471	-32%
		Euro 2	62,680	62,680	0%	188.93	139.33	-27%	11,889,922	8,722,244	-3,167,678	-27%
		Euro 3	97,792	97,792	0%	66.38	73.19	10%	6,481,618	7,156,920	675,303	10%
		Euro 4	397,911	397,911	0%	47.22	46.52	-1%	18,790,345	18,589,937	-200,407	-1%
		Euro 5	138,063	138,063	0%	18.60	46.52	150%	2,583,150	6,439,691	3,856,541	150%
	Euro 6	2,714	2,714	0%	25.99	46.52	79%	70,526	126,237	55,711	79%	
	Gasoline total	748,156	748,156	0%	88.35	74.85	-16%	68,190,687	56,671,737	-11,518,950	-17%	
	Diesel Oil	pre-Euro	1,389	1,389	0%	312.32	284.56	-9%	433,081	388,136	-44,945	-10%
		Euro 1	5,426	5,426	0%	298.42	246.79	-17%	1,678,472	1,640,688	-37,784	-2%
		Euro 2	28,437	28,437	0%	406.84	279.91	-40%	11,563,522	6,253,531	-5,309,991	-46%
		Euro 3	92,795	92,795	0%	574.33	176.67	-69%	53,284,956	16,579,373	-36,705,583	-69%
		Euro 4	222,583	222,583	0%	393.55	149.27	-62%	87,598,471	33,225,566	-54,372,905	-62%
		Euro 5	233,766	233,766	0%	435.42	149.27	-66%	101,787,275	34,894,768	-66,892,507	-66%
	Diesel oil total	6,436	6,436	0%	259.53	149.27	-42%	5,177,151	677,045	-4,500,106	-42%	
	FCs Total	589,131	589,131	0%	437.54	158.71	-64%	257,533,128	83,899,619	-173,633,509	-64%	
Gasoline	pre-Euro	1,338,245	1,338,245	0%	237.40	111.77	-53%	317,723,735	146,571,356	-171,152,379	-53%	
	Euro 1	981	981	0%	633.81	645.95	2%	568,320	575,293	6,973	1%	
	Euro 2	194	194	0%	803.50	383.22	-56%	167,261	59,526	-107,735	-64%	
	Euro 3	836	836	0%	274.42	291.18	7%	229,520	188,265	-41,255	-27%	
	Euro 4	784	784	0%	52.66	191.79	10%	72,691	79,780	7,089	10%	
	Euro 5	1,089	1,089	0%	43.70	48.89	10%	77,284	82,833	5,549	7%	
	Euro 6	965	965	0%	16.37	48.89	183%	15,187	47,268	32,081	183%	
	Euro 6	1	1	0%	17.66	48.89	170%	26	72	46	170%	
Gasoline total	5,578	5,578	0%	262.86	184.67	-30%	1,137,299	1,696,727	559,428	30%		
Diesel Oil	pre-Euro	2,744	2,744	0%	424.37	386.79	-9%	1,168,757	944,928	-223,829	-20%	
	Euro 1	2,945	2,945	0%	398.34	276.24	-30%	1,166,762	834,596	-332,166	-29%	
	Euro 2	6,982	6,982	0%	336.92	133.39	-49%	2,340,147	1,260,674	-1,079,473	-46%	
	Euro 3	20,421	20,421	0%	568.12	150.38	-73%	11,437,995	3,070,914	-8,367,081	-73%	
	Euro 4	55,887	55,887	0%	407.72	90.45	-42%	27,776,440	5,040,456	-22,735,984	-42%	
	Euro 5	29,824	29,824	0%	641.97	90.45	-86%	13,181,325	2,637,964	-10,543,361	-86%	
	Euro 6	41	41	0%	95.20	90.45	-49%	6,168	3,688	-2,479	-40%	
	Diesel oil total	118,177	118,177	0%	488.46	154.93	-76%	57,083,533	13,650,488	-43,433,045	-76%	
FCs Total	124,834	124,834	0%	68.54	118.03	-19%	56,214,142	54,677,475	-1,536,667	-3%		
1.A.3.a.ii. Heavy Duty Vehicles - Buses	Diesel Oil	pre-Euro	1,172	1,172	0%	1098.88	1193.23	-4%	1,249,028	1,134,143	-114,885	-9%
		Euro 1	1,054	1,054	0%	727.88	759.39	4%	766,620	791,181	24,561	3%
		Euro 2	6,884	6,884	0%	764.97	644.49	-16%	3,236,961	4,378,857	1,141,896	37%
		Euro 3	13,187	13,187	0%	638.43	455.65	-27%	8,262,880	5,980,226	-2,284,655	-27%
		Euro 4	45,946	45,946	0%	468.55	351.71	-24%	2,270,081	1,739,794	-530,286	-24%
		Euro 5	34,096	34,096	0%	368.98	183.48	-49%	8,435,582	4,420,743	-4,014,761	-49%
Euro 6	537	537	0%	44.76	183.48	310%	34,047	86,572	52,525	160%		
Buses Total	11,716	11,716	0%	509.54	360.06	-29%	26,390,969	16,820,843	-9,570,126	-29%		
1.A.3.a.iii. Heavy Duty Vehicle- Trucks & Lorries	Diesel Oil	pre-Euro	5,983	5,983	0%	1039.72	731.35	-29%	6,072,170	4,322,888	-1,749,282	-29%
		Euro 1	2,985	2,985	0%	749.27	586.27	-24%	2,176,964	1,650,950	-526,015	-24%
		Euro 2	18,444	18,444	0%	818.17	573.43	-30%	15,880,961	9,482,975	-6,397,986	-40%
		Euro 3	75,130	75,130	0%	633.53	387.33	-39%	47,587,440	27,587,750	-19,999,690	-42%
		Euro 4	42,781	42,781	0%	356.96	267.27	-27%	16,936,887	12,289,770	-4,647,117	-27%
		Euro 5	436,980	436,980	0%	261.70	152.65	-41%	123,181,324	66,796,436	-56,384,887	-46%
Euro 6	19,020	19,020	0%	58.67	152.65	261%	913,082	2,750,630	1,837,548	201%		
Trucks Total	680,139	680,139	0%	353.86	287.83	-21%	218,887,531	124,188,469	-94,699,062	-43%		
1.A.3.b.iv. Motorized Two-Wheelers (MOWs)	Gasoline	pre-Euro	6,352	6,352	0%	92.97	151.79	23%	781,736	964,179	182,443	23%
		Euro 1	4,013	4,013	0%	123.91	175.15	30%	582,073	634,880	52,807	30%
		Euro 2	3,362	3,362	0%	132.24	185.58	40%	434,688	544,228	109,540	25%
		Euro 3	4,562	4,562	0%	39.81	195.53	391%	181,610	882,175	700,565	391%
		Euro 4	0	0	0%	0	0	0%	0	0	0	0%
		Euro 5	0	0	0%	0	0	0%	0	0	0	0%
MOWs Total	18,229	18,229	0%	104.34	175.18	68%	1,982,088	3,197,638	1,214,951	68%		
1.A.3.b. Road Transport	Total	2,132,683	2,132,683	0%	288.88	145.45	-56%	616,078,963	390,654,371	-225,424,592	-58%	

Adjustment details for 2024													
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> Emissions					
		current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference		
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Adjustment details for 2026													
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> Emissions					
		current	adjusted	difference	current	adjusted	difference	current	adjusted	adjustment	difference		
		in [t]	in [t]	in [%]	in [g/t]	in [g/t]	in [%]	in [g]	in [g]	in [g]	in [g]		
1.A.3.a.i - Passenger Cars	Gasoline	pre-Cars	15 782	15 782	0%	636.75	648.11	-16%	7 670 916	6 410 967	-1 657 867	-16%	
		Car 1	20 270	20 270	0%	372.25	268.68	-28%	7 545 483	4 886 888	-2 648 596	-35%	
		Car 2	36 062	36 062	0%	212.73	143.11	-33%	7 671 581	5 180 897	-2 516 693	-33%	
		Car 3	83 039	83 039	0%	76.17	75.50	-1%	4 881 482	4 759 259	-42 233	-1%	
		Car 4	334 413	334 413	0%	53.74	50.17	-7%	17 363 364	16 777 445	-1 192 488	-7%	
		Car 5	183 374	183 374	0%	19.09	50.17	163%	3 580 745	9 189 834	5 609 089	163%	
	Car 6	65 332	65 332	0%	25.67	50.17	89%	1 768 917	3 327 855	1 558 938	89%		
	Gasoline total	715 272	715 272	0%	78.93	70.65	-9%	58 736 267	50 535 049	-8 201 218	-9%		
	Diesel Oil	pre-Cars	1 380	1 380	0%	368.76	264.56	-28%	386 262	239 173	-146 089	-38%	
		Car 1	3 749	3 749	0%	298.36	269.66	-9%	1 122 449	1 011 626	-111 425	-10%	
		Car 2	16 584	16 584	0%	407.19	221.43	-46%	6 720 132	3 663 964	-3 056 168	-46%	
		Car 3	81 398	81 398	0%	802.50	179.24	-78%	36 981 999	11 085 409	-25 896 590	-70%	
		Car 4	175 040	175 040	0%	405.76	156.24	-61%	71 362 220	27 474 086	-43 878 214	-61%	
		Car 5	299 054	299 054	0%	433.34	156.24	-64%	130 032 044	46 019 229	-83 212 815	-64%	
Car 6	116 034	116 034	0%	268.75	156.24	-41%	30 427 555	10 232 785	-19 194 770	-60%			
Diesel oil total	625 119	625 119	0%	418.36	160.76	-61%	277 947 660	188 535 230	-89 406 430	-61%			
Pkx Total	1 386 391	1 386 391	0%	235.75	154.41	-35%	627 778 627	199 070 280	-428 708 347	-59%			
1.A.3.b.i - Light Duty Vehicles (LDVs)	Gasoline	pre-Cars	910	910	0%	602.79	645.35	-11%	593 186	581 543	-11 643	-2%	
		Car 1	136	136	0%	908.31	312.78	-65%	122 126	42 425	-79 708	-65%	
		Car 2	540	540	0%	308.39	217.84	-29%	162 311	117 797	-44 514	-27%	
		Car 3	650	650	0%	108.43	111.57	3%	70 432	72 731	2 299	3%	
		Car 4	1 684	1 684	0%	43.06	52.36	21%	78 714	84 003	5 289	7%	
		Car 5	1 724	1 724	0%	19.82	52.36	164%	34 157	80 258	46 108	164%	
	Car 6	363	363	0%	19.85	52.36	181%	6 764	18 992	12 228	181%		
	Gasoline total	5 506	5 506	0%	588.27	171.66	-70%	1 068 292	1 013 678	-54 614	-5%		
	Diesel Oil	pre-Cars	2 189	2 189	0%	414.81	386.79	-7%	899 549	885 433	-14 116	-2%	
		Car 1	1 780	1 780	0%	391.89	276.25	-29%	780 189	585 371	-194 798	-24%	
		Car 2	4 223	4 223	0%	323.43	153.31	-53%	1 365 594	676 452	-689 142	-50%	
		Car 3	13 582	13 582	0%	588.91	150.77	-74%	8 064 323	2 040 233	-6 024 090	-74%	
		Car 4	43 141	43 141	0%	504.48	32.40	-93%	21 783 989	3 986 141	-17 777 788	-82%	
		Car 5	74 231	74 231	0%	434.16	32.40	-92%	32 223 283	6 658 780	-25 564 503	-79%	
Car 6	4 921	4 921	0%	113.49	32.40	-71%	755 285	454 676	-300 609	-40%			
Diesel oil total	148 068	148 068	0%	456.12	185.62	-59%	65 712 732	15 256 007	-50 456 726	-77%			
LDVs Total	149 994	149 994	0%	445.23	188.29	-57%	66 781 025	16 229 684	-50 551 348	-76%			
1.A.3.b.ii - Heavy Duty Vehicles - Buses	Diesel Oil	pre-Cars	891	891	0%	1076.81	1919.23	-43%	964 197	988 234	24 037	2%	
		Car I	583	583	0%	731.36	732.67	0%	433 675	446 236	12 568	3%	
		Car II	4 375	4 375	0%	708.25	645.03	-9%	3 440 614	2 822 621	-617 993	-18%	
		Car III	10 333	10 333	0%	632.87	458.91	-27%	6 530 364	4 741 827	-1 787 536	-27%	
		Car IV	4 449	4 449	0%	475.90	382.29	-19%	2 117 219	1 586 881	-530 338	-25%	
		Car V	34 380	34 380	0%	366.36	185.22	-49%	8 935 974	4 517 517	-4 418 457	-49%	
		Car VI	9 126	9 126	0%	62.79	185.22	196%	573 066	1 680 431	1 107 365	196%	
		Buses Total	54 157	54 157	0%	404.73	388.24	-2%	23 082 189	16 885 117	-6 197 072	-27%	
	Trucks & Lorries	pre-Cars	3 933	3 933	0%	1034.81	737.35	-29%	4 087 249	2 980 379	-1 106 870	-29%	
		Car I	1 555	1 555	0%	748.16	587.92	-21%	1 163 482	789 813	-373 669	-32%	
		Car II	8 876	8 876	0%	817.75	585.52	-28%	7 258 047	4 486 626	-2 771 421	-38%	
		Car III	34 167	34 167	0%	638.91	458.91	-27%	21 553 280	12 251 155	-9 302 125	-43%	
		Car IV	34 287	34 287	0%	396.94	281.86	-29%	9 640 384	6 885 621	-2 754 803	-29%	
		Car V	269 735	269 735	0%	287.22	153.60	-46%	74 680 233	39 976 610	-34 703 623	-46%	
Car VI	281 480	281 480	0%	61.77	153.92	149%	18 149 289	24 034 286	5 884 794	149%			
Trucks Total	594 013	594 013	0%	226.31	180.97	-20%	134 431 899	101 486 262	-32 945 637	-20%			
1.A.3.b.iii - Motorised Two-Wheelers (MOWs)	Gasoline	pre-Cars	5 543	5 543	0%	125.59	155.78	24%	696 072	883 289	187 218	24%	
		Car 1	3 360	3 360	0%	127.11	177.29	39%	427 113	585 796	158 682	39%	
		Car 2	3 375	3 375	0%	125.94	187.68	50%	421 961	687 078	265 127	50%	
		Car 3	6 443	6 443	0%	48.36	187.68	381%	209 627	1 273 671	1 064 043	508%	
		Car 4	65	65	0%	17.47	187.68	1071%	1 134	12 632	11 498	1071%	
		Car 5	0	0	0%	0	0	0%	0	0	0	0%	
	MOWs Total	16 185	16 185	0%	96.14	181.68	89%	1 885 897	3 452 476	1 566 579	89%		
	Trucks & Lorries	pre-Cars	594 013	594 013	0%	226.31	180.97	-20%	134 431 899	101 486 262	-32 945 637	-20%	
		Car I	1 555	1 555	0%	748.16	587.92	-21%	1 163 482	789 813	-373 669	-32%	
	1.A.3.b.iv - Road Transport	Gasoline	pre-Cars	12 282	12 282	0%	636.75	648.11	-16%	7 670 916	6 410 967	-1 657 867	-16%
			Car 1	17 449	17 449	0%	372.96	268.68	-28%	6 588 211	4 217 644	-2 391 267	-35%
			Car 2	30 435	30 435	0%	212.43	141.75	-33%	6 617 570	4 714 140	-2 303 438	-33%
			Car 3	54 271	54 271	0%	78.48	75.27	-4%	4 254 938	4 139 376	-115 562	-3%
			Car 4	315 086	315 086	0%	54.96	51.25	-7%	17 316 320	16 511 881	-1 194 438	-7%
Car 5			180 240	180 240	0%	19.17	51.25	167%	3 485 382	9 239 815	5 754 433	167%	
Car 6			114 791	114 791	0%	25.65	51.25	102%	3 063 235	5 884 372	2 824 145	102%	
Gasoline total			724 571	724 571	0%	67.66	60.88	-10%	49 046 874	38 634 374	-10 406 888	-10%	
Diesel Oil		pre-Cars	1 780	1 780	0%	368.76	254.56	-31%	386 262	239 173	-146 089	-31%	
		Car 1	3 760	3 760	0%	298.17	271.67	-9%	1 082 288	910 182	-172 106	-16%	
		Car 2	13 788	13 788	0%	407.17	222.43	-45%	5 914 130	3 066 393	-2 847 736	-48%	
		Car 3	52 128	52 128	0%	808.95	179.65	-78%	31 696 478	9 364 788	-22 331 690	-70%	
		Car 4	187 047	187 047	0%	418.16	158.34	-61%	64 733 485	24 983 323	-39 750 162	-61%	
		Car 5	283 480	283 480	0%	423.99	158.34	-63%	120 187 695	44 073 190	-76 114 505	-63%	
Diesel oil total	625 119	625 119	0%	418.36	160.76	-61%	277 947 660	188 535 230	-89 406 430	-61%			
Trucks & Lorries	pre-Cars	19 625	19 625	0%	151.71	33.69	-78%	2 977 439	1 026 876	-1 950 563	-66%		
	Car 1	153 284	153 284	0%	404.66	183.89	-54%	65 034 289	24 983 323	-40 050 966	-63%		



Adjustment details for 2018												
NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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	12,219	12,219	0%	637.58	644.11	-6%	7,780,965	6,648,721	-1,132,234	-15%
		Car 1	14,362	14,362	0%	374.34	341.68	-8%	5,371,161	3,448,643	-1,922,518	-36%
		Car 2	34,285	34,285	0%	221.97	111.68	-50%	5,360,977	2,688,163	-2,672,814	-50%
		Car 3	43,642	43,642	0%	88.16	76.96	-13%	3,487,781	3,388,617	-99,164	-3%
		Car 4	278,738	278,738	0%	55.98	52.30	-7%	15,683,488	14,576,755	-1,106,733	-7%
		Car 5	186,830	186,830	0%	19.35	52.30	-170%	3,228,282	8,725,688	5,497,406	170%
		Car 6	189,041	189,041	0%	6.00	52.30	-98%	4,190,422	6,718,250	2,527,828	60%
		Gasoline total	689,027	689,027	0%	64.42	68.36	-6%	45,032,296	47,186,817	2,154,521	5%
	Diesel Oil	pre-Cars	1,363	1,363	0%	303.16	264.96	-13%	171,676	346,173	174,497	102%
		Car 1	2,949	2,949	0%	299.17	272.65	-9%	962,432	775,166	-187,266	-20%
		Car 2	10,784	10,784	0%	407.20	222.87	-45%	4,391,383	2,483,536	-1,907,848	-43%
		Car 3	40,786	40,786	0%	812.49	180.15	-78%	24,932,029	7,333,241	-17,598,788	-71%
		Car 4	130,534	130,534	0%	414.71	180.40	-56%	54,133,837	20,937,329	-33,196,508	-61%
		Car 5	251,212	251,212	0%	416.25	180.40	-56%	104,585,786	40,253,731	-64,332,055	-61%
		Car 6	228,685	228,685	0%	254.87	180.40	-30%	58,284,140	35,680,446	-22,603,694	-39%
		Diesel oil total	646,078	646,078	0%	375.66	163.38	-56%	247,596,063	188,748,684	-158,847,359	-56%
		FCs Total	1,365,101	1,365,101	0%	214.34	154.68	-28%	262,588,360	156,555,421	-106,032,939	-40%
	Gasoline	pre-Cars	911	911	0%	944.51	645.95	-32%	596,851	582,662	-14,189	-2%
		Car 1	189	189	0%	911.58	312.78	-66%	99,528	33,895	-65,633	-66%
		Car 2	377	377	0%	303.84	224.45	-26%	114,682	84,713	-29,969	-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	69,278	3,988	6%
		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%	19.18	54.36	182%	39,550	89,326	49,776	182%
		Gasoline total	6,315	6,315	0%	154.22	160.11	4%	999,199	1,011,138	11,939	1%
1.A.3.b.i - Light Duty Vehicles (LDVs)	Gasoline	pre-Cars	1,872	1,872	0%	411.51	386.79	-6%	771,337	574,742	-196,595	-26%
		Car 1	1,285	1,285	0%	389.94	276.25	-29%	483,129	272,296	-210,833	-44%
		Car 2	2,942	2,942	0%	318.56	193.88	-39%	965,389	550,789	-414,599	-43%
		Car 3	9,383	9,383	0%	558.10	150.74	-73%	5,689,152	1,411,299	-4,277,853	-75%
		Car 4	33,232	33,232	0%	508.42	93.81	-81%	16,929,185	3,117,457	-13,811,728	-81%
		Car 5	66,283	66,283	0%	432.92	93.81	-78%	28,684,080	6,217,860	-22,466,220	-78%
		Car 6	39,482	39,482	0%	158.79	93.81	-41%	5,941,615	3,686,228	-2,255,387	-38%
		Diesel oil total	154,259	154,259	0%	384.71	182.69	-53%	59,344,525	15,880,186	-43,464,339	-73%
		LDVs Total	180,574	180,574	0%	375.86	184.94	-52%	69,343,125	16,851,449	-52,491,676	-76%
	Diesel Oil	pre-Cars	547	547	0%	1078.15	1919.23	-45%	589,267	557,147	-32,120	-5%
		Car 1	237	237	0%	732.78	732.57	0%	173,676	178,368	4,692	3%
		Car 2	2,270	2,270	0%	787.83	646.33	-18%	1,780,686	1,487,437	-293,249	-16%
		Car 3	6,757	6,757	0%	638.89	459.32	-28%	4,262,734	3,183,482	-1,079,252	-25%
		Car 4	3,043	3,043	0%	473.16	382.73	-19%	1,439,790	1,073,333	-366,457	-26%
		Car 5	18,189	18,189	0%	362.42	186.37	-49%	6,463,265	3,376,016	-3,087,249	-48%
		Car 6	20,670	20,670	0%	64.89	186.37	289%	1,176,026	3,682,314	2,506,288	214%
		Diesel Total	51,634	51,634	0%	309.75	283.53	-8%	15,993,546	13,687,186	-2,306,360	-15%
1.A.3.b.ii - Heavy Duty Vehicles (HDVs)	Gasoline	pre-Cars	3,262	3,262	0%	1034.82	737.35	-29%	3,375,359	2,485,071	-890,288	-26%
		Car 1	1,094	1,094	0%	747.82	488.39	-35%	918,052	512,378	-405,674	-44%
		Car 2	5,544	5,544	0%	817.44	581.68	-29%	4,532,190	2,781,516	-1,750,674	-39%
		Car 3	20,583	20,583	0%	629.54	563.68	-11%	12,367,751	7,277,279	-5,090,472	-41%
		Car 4	15,912	15,912	0%	358.89	276.23	-23%	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	24,283,389	-21,680,764	-47%
		Car 6	381,799	381,799	0%	68.78	154.68	125%	26,251,482	69,665,886	43,414,404	165%
		Gasoline Total	585,186	585,186	0%	515.18	172.19	-66%	188,173,537	180,710,889	-7,462,648	-4%
	Diesel Oil	pre-Cars	4,940	4,940	0%	128.95	188.61	46%	622,656	783,451	160,795	26%
		Car 1	2,966	2,966	0%	128.14	177.79	41%	374,114	527,294	153,180	41%
		Car 2	3,221	3,221	0%	128.33	188.64	46%	387,596	639,833	252,237	65%
		Car 3	6,241	6,241	0%	48.24	188.64	288%	25,126	1,239,686	1,214,560	484%
		Car 4	1,130	1,130	0%	58.41	188.64	324%	23,966	224,682	200,716	839%
		Car 5	0	0	0%	0.00	188.64	0%	0	0	0	0%
		Diesel Total	18,497	18,497	0%	85.66	188.61	120%	1,658,558	3,454,167	1,795,609	108%
		LDVs Total	2,180,983	2,180,983	0%	215.85	132.89	-38%	478,738,295	291,129,652	-187,608,643	-39%

Adjustment details for 2019													
NFR Code	Fuel	Activity Data				Implied Emission Factor				NO <sub>x</sub> Emissions			
		current	adjusted	difference	in [%]	current	adjusted	difference	in [%]	current	adjusted	adjustment	difference

	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	
<b>Adjustment 2021 (proposal)</b>										
Change against Adjustment 2020										

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".<sup>8)</sup>

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 ><sup>9)</sup> strongly effecting the TREMOD model underlying Germany's emission reporting for road transport and hence any adjustments of NO<sub>x</sub> 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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