

# 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, 2012 a & 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> "artificial" current emissions = virtual current emissions assuming no changes in emission factors 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



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

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<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 TREMOD, the following comparison has to be carried out between the oldest version of TREMOD still available and the version as applied for the current inventory submission (2021).

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 6.12 (Knörr et al., 2020a)<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>-296.1</b>	<b>-300.7</b>	<b>-300.4</b>	<b>-305.2</b>	<b>-294.9</b>	<b>-274.9</b>	<b>-250.9</b>	<b>-221.1</b>	<b>-179.6</b>	<b>-144.8</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

NFR Code	Fuel	Year	Activity Data			Implied Emission Factor			NO <sub>x</sub> Emissions			
			current in [TJ]	adjusted in [TJ]	difference in [%]	current in [kg/TJ]	adjusted in [kg/TJ]	difference in [%]	current in [kg]	adjusted in [kg]	difference in [%]	
1.A.3.b.i	gasoline		795.957	795.957	0%	97.55	84.99	-13%	77.644.842	67.590.906	9.993.935	-13%
1.A.3.b.i	diesel oil		629.380	629.380	0%	429.45	160.61	-63%	227.341.096	84.970.461	142.370.635	-63%
1.A.3.b.ii	gasoline		6.325	6.325	0%	255.87	214.75	-16%	1.618.432	1.358.328	268.104	-16%
1.A.3.b.ii	diesel oil		113.450	113.450	0%	476.34	134.96	-72%	54.040.533	15.311.584	38.728.949	-72%
1.A.3.b.iii	gasoline		48.844	48.844	0%	823.00	482.55	-23%	29.931.266	23.183.732	6.747.534	-23%
1.A.3.b.iii	diesel oil		566.741	566.741	0%	446.67	271.83	-39%	253.148.243	154.956.160	99.892.083	-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%
<b>1.A.3.b TOTAL</b>		<b>2010</b>	<b>2.079.688</b>	<b>2.079.688</b>	<b>0%</b>			<b>0%</b>	<b>645.965.162</b>	<b>348.851.206</b>	<b>296.113.956</b>	<b>-46%</b>
1.A.3.b.i	gasoline		794.688	794.688	0%	92.09	81.61	-11%	73.185.851	64.851.951	8.333.900	-11%
1.A.3.b.i	diesel oil		553.564	553.564	0%	434.12	159.22	-63%	240.313.791	88.138.959	152.174.832	-63%
1.A.3.b.ii	gasoline		6.118	6.118	0%	229.35	198.57	-13%	1.403.081	1.214.776	188.305	-13%
1.A.3.b.ii	diesel oil		115.967	115.967	0%	481.55	126.92	-74%	55.844.518	14.718.142	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%	410.38	244.97	-40%	231.410.271	138.136.342	93.273.929	-40%
1.A.3.b.iv	gasoline		19.289	19.289	0%	119.79	171.60	54%	2.137.002	3.299.162	-1.162.160	54%
<b>1.A.3.b TOTAL</b>		<b>2011</b>	<b>2.106.883</b>	<b>2.106.883</b>	<b>0%</b>			<b>0%</b>	<b>632.365.736</b>	<b>331.625.655</b>	<b>300.740.081</b>	<b>-48%</b>
1.A.3.b.i	gasoline		750.957	750.957	0%	85.73	78.00	-9%	64.379.994	58.877.229	5.802.765	-9%
1.A.3.b.i	diesel oil		555.245	555.245	0%	435.96	158.66	-64%	242.062.902	88.896.699	153.866.203	-64%
1.A.3.b.ii	gasoline		5.657	5.657	0%	218.93	183.15	-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%	55.106.362	13.741.354	41.365.008	-75%
1.A.3.b.iii	gasoline		50.902	50.902	0%	533.22	384.33	-28%	27.141.913	19.563.208	7.578.704	-28%
1.A.3.b.iii	diesel oil		589.585	589.585	0%	381.33	224.00	-41%	234.829.180	132.064.753	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%
<b>1.A.3.b TOTAL</b>		<b>2012</b>	<b>2.084.964</b>	<b>2.084.964</b>	<b>0%</b>			<b>0%</b>	<b>616.721.438</b>	<b>316.301.343</b>	<b>300.420.094</b>	<b>-49%</b>
1.A.3.b.i	gasoline		749.114	749.114	0%	80.35	74.05	-7%	60.190.007	56.071.797	4.118.211	-7%
1.A.3.b.i	diesel oil		585.131	585.131	0%	437.14	158.71	-64%	257.633.728	93.499.010	164.834.718	-64%
1.A.3.b.ii	gasoline		5.578	5.578	0%	202.80	184.07	-9%	1.131.209	1.026.727	104.482	-9%
1.A.3.b.ii	diesel oil		118.777	118.777	0%	480.60	114.93	-76%	57.003.533	13.690.488	43.433.045	-76%
1.A.3.b.iii	gasoline		51.716	51.716	0%	509.64	360.06	-29%	26.350.969	18.620.843	7.730.126	-29%
1.A.3.b.iii	diesel oil		600.139	600.139	0%	353.06	287.93	-11%	211.807.531	124.798.459	87.099.062	-41%
1.A.3.b.iv	gasoline		18.229	18.229	0%	104.34	175.30	68%	1.902.688	3.197.038	-1.294.351	68%
<b>1.A.3.b TOTAL</b>		<b>2013</b>	<b>2.132.683</b>	<b>2.132.683</b>	<b>0%</b>			<b>0%</b>	<b>616.079.663</b>	<b>316.854.371</b>	<b>305.224.692</b>	<b>-50%</b>
1.A.3.b.i	gasoline		752.526	752.526	0%	76.03	73.09	-4%	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	95.613.892	173.262.169	-63%
1.A.3.b.ii	gasoline		5.845	5.845	0%	190.34	176.49	-7%	1.112.184	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	gasoline		49.143	49.143	0%	468.37	339.99	-27%	23.017.116	16.708.234	6.308.881	-27%
1.A.3.b.iii	diesel oil		672.754	672.754	0%	314.05	196.05	-38%	179.874.133	112.285.582	67.588.551	-38%
1.A.3.b.iv	gasoline		18.673	18.673	0%	100.59	179.24	78%	1.070.294	3.346.794	-1.468.499	78%
<b>1.A.3.b TOTAL</b>		<b>2014</b>	<b>2.153.563</b>	<b>2.153.563</b>	<b>0%</b>			<b>0%</b>	<b>597.120.297</b>	<b>302.252.271</b>	<b>294.868.025</b>	<b>-49%</b>
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%	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%	1.083.527	1.000.999	82.528	-8%
1.A.3.b.ii	diesel oil		135.386	135.386	0%	469.35	187.96	-77%	63.605.443	14.607.490	48.997.953	-77%
1.A.3.b.iii	gasoline		52.287	52.287	0%	458.96	327.99	-29%	23.997.617	17.149.448	6.848.170	-29%
1.A.3.b.iii	diesel oil		589.411	589.411	0%	266.69	187.51	-30%	157.189.675	110.620.703	46.888.973	-30%
1.A.3.b.iv	gasoline		18.459	18.459	0%	93.32	180.69	82%	1.833.362	3.334.472	-1.501.090	82%
<b>1.A.3.b TOTAL</b>		<b>2015</b>	<b>2.161.976</b>	<b>2.161.976</b>	<b>0%</b>			<b>0%</b>	<b>575.931.265</b>	<b>301.077.596</b>	<b>274.853.670</b>	<b>-48%</b>
1.A.3.b.i	gasoline		715.272	715.272	0%	79.93	76.65	-4%	50.736.367	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		5.925	5.925	0%	193.27	171.05	-11%	1.068.292	1.013.678	54.614	-5%
1.A.3.b.ii	diesel oil		144.868	144.868	0%	456.12	185.62	-77%	65.712.732	15.216.007	50.496.725	-77%
1.A.3.b.iii	gasoline		54.157	54.157	0%	424.73	308.24	-27%	23.002.109	16.683.117	6.388.992	-27%
1.A.3.b.iii	diesel oil		594.013	594.013	0%	226.31	180.97	-20%	134.431.699	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%
<b>1.A.3.b TOTAL</b>		<b>2016</b>	<b>2.207.339</b>	<b>2.207.339</b>	<b>0%</b>			<b>0%</b>	<b>553.199.558</b>	<b>302.901.820</b>	<b>250.897.738</b>	<b>-45%</b>
1.A.3.b.i	gasoline		724.571	724.571	0%	67.66	69.88	3%	49.026.074	50.634.714	-1.607.640	3%
1.A.3.b.i	diesel oil		696.592	696.592	0%	390.65	161.95	-59%	272.126.691	112.810.721	159.315.970	-59%
1.A.3.b.ii	gasoline		6.186	6.186	0%	171.15	167.18	-2%	1.058.799	1.034.211	24.588	-2%
1.A.3.b.ii	diesel oil		153.284	153.284	0%	424.66	183.89	-76%	65.093.930	15.925.216	49.168.714	-76%
1.A.3.b.iii	gasoline		53.382	53.382	0%	370.80	288.71	-23%	19.793.901	15.304.828	4.489.073	-23%
1.A.3.b.iii	diesel oil		598.263	598.263	0%	195.02	175.92	-10%	116.671.141	106.246.508	11.424.633	-10%
1.A.3.b.iv	gasoline		19.180	19.180	0%	92.83	183.39	98%	1.778.674	3.513.787	-1.735.114	98%
<b>1.A.3.b TOTAL</b>		<b>2017</b>	<b>2.251.437</b>	<b>2.251.437</b>	<b>0%</b>			<b>0%</b>	<b>525.549.410</b>	<b>304.469.986</b>	<b>221.079.424</b>	<b>-42%</b>
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%	247.556.063	108.768.604	138.787.459	-56%
1.A.3.b.ii	gasoline		6.315	6.315	0%	158.22	160.11	1%	999.199	1.011.138	-11.939	1%
1.A.3.b.ii	diesel oil		154.259	154.259	0%	384.71	182.69	-73%	59.344.525	15.840.310	43.504.215	-73%
1.A.3.b.iii	gasoline		51.634	51.634	0%	389.75	263.53	-15%	15.983.526	13.607.106	2.386.420	-15%
1.A.3.b.iii	diesel oil		585.186	585.186	0%	171.18	172.10	1%	180.173.337	180.710.869	-537.532	1%
1.A.3.b.iv	gasoline		18.497	18.497	0%	89.66	184.61	106%	1.608.588	3.414.767	-1.756.209	106%
<b>1.A.3.b TOTAL</b>		<b>2018</b>	<b>2.180.993</b>	<b>2.180.993</b>	<b>0%</b>			<b>0%</b>	<b>478.758.206</b>	<b>291.139.612</b>	<b>179.618.593</b>	<b>-38%</b>
1.A.3.b.i	gasoline		704.691	704.691	0%	62.30	68.45	10%	43.901.941	48.238.026	-4.336.084	10%
1.A.3.b.i	diesel oil		663.841	663.841	0%	345.81	165.07	-52%	229.566.088	109.582.982	119.983.106	-52%
1.A.3.b.ii	gasoline		6.683	6.683	0%	148.08	153.25	5%	976.219	1.024.150	-47.931	5%
1.A.3.b.ii	diesel oil		169.183	169.183	0%	347.42	181.90	-71%	55.303.535	16.221.445	39.081.890	-71%
1.A.3.b.iii	gasoline		52.939	52.939	0%	274.41	247.81	-10%	14.627.012	13.118.678	1.488.434	-10%
1.A.3.b.iii	diesel oil		595.913	595.913	0%	153.35	169.					

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	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	13,685	13,685	0%	584.75	514.25	-8%	7,965,060	6,986,917	-858,143	-10%
		Car 1	36,541	36,541	0%	338.50	297.71	-9%	25,915,925	10,189,262	-7,716,663	-30%
		Car 2	96,425	96,425	0%	172.95	135.03	-22%	16,580,020	13,020,026	-3,559,994	-22%
		Car 3	133,139	133,139	0%	58.51	70.19	20%	7,790,384	9,343,433	1,553,049	20%
		Car 4	444,991	444,991	0%	42.27	42.19	0%	18,911,389	18,173,529	-737,859	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	2	0	0%	
	Gasoline total	795,957	795,957	0%	97.55	84.39	-13%	37,644,842	47,456,968	9,812,126	26%	
	pre-Cars	1,113	1,113	0%	311.13	244.56	-18%	183,760	147,256	-36,504	-20%	
	Car 1	10,338	10,338	0%	294.62	295.17	0%	3,044,428	2,741,587	-302,841	-10%	
	Car 2	50,088	50,088	0%	406.90	279.19	-31%	20,372,795	10,974,210	-9,398,584	-46%	
	Car 3	134,025	134,025	0%	542.94	170.54	-69%	72,648,173	23,929,276	-48,718,897	-67%	
	Car 4	279,154	279,154	0%	354.37	140.58	-60%	107,299,160	39,243,811	-68,055,349	-63%	
	Car 5	53,547	53,547	0%	434.70	140.58	-68%	23,276,735	7,527,796	-15,748,939	-68%	
	Car 6	334	334	0%	257.62	140.58	-45%	85,044	46,953	-38,091	-45%	
Diesel oil total	529,380	529,380	0%	429.45	140.58	-67%	227,341,096	84,920,481	-142,420,615	-63%		
PKs Total	1,325,337	1,325,337	0%	234.32	155.14	-34%	364,985,938	152,421,367	-212,564,570	-58%		
pre-Cars	1,249	1,249	0%	627.29	640.56	1%	783,320	898,871	115,551	15%		
Car 1	367	367	0%	861.95	297.39	-65%	368,969	186,020	-182,949	-50%		
Car 2	5,293	5,293	0%	264.75	184.41	-30%	368,940	256,917	-112,023	-30%		
Car 3	856	856	0%	82.47	90.63	10%	70,631	77,625	6,994	10%		
Car 4	2,420	2,420	0%	36.32	44.90	24%	87,967	188,679	100,712	24%		
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%			
Gasoline total	6,325	6,325	0%	255.87	254.75	-5%	1,478,832	1,358,328	-120,504	-8%		
pre-Cars	4,876	4,876	0%	425.99	386.79	-9%	2,017,142	1,436,983	-580,159	-29%		
Car 1	5,989	5,989	0%	395.19	276.24	-30%	2,269,095	1,289,036	-980,059	-43%		
Car 2	13,126	13,126	0%	336.76	193.10	-42%	4,420,380	2,534,731	-1,885,649	-43%		
Car 3	33,249	33,249	0%	531.01	150.58	-72%	17,655,883	5,085,760	-12,570,123	-72%		
Car 4	54,581	54,581	0%	491.42	80.69	-84%	26,021,036	4,840,722	-21,180,314	-82%		
Car 5	1,629	1,629	0%	427.50	80.69	-81%	696,296	144,434	-551,862	-79%		
Car 6	0	0	0%	151.73	80.69	-47%	7	4	-3	-43%		
Diesel oil total	113,450	113,450	0%	476.34	134.94	-72%	54,040,533	15,311,584	-38,728,949	-72%		
LNAs Total	119,175	119,175	0%	464.70	139.18	-70%	55,658,966	16,689,933	-38,969,033	-70%		
pre-Cars	3,382	3,382	0%	1036.25	1029.78	-0%	3,674,067	3,452,644	-221,423	-6%		
Car 1	2,626	2,626	0%	749.41	732.14	-2%	2,117,871	2,125,995	7,124	0%		
Car 2	10,162	10,162	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	-30%	13,066,176	7,289,299	-5,776,877	-44%		
Car 4	5,461	5,461	0%	448.63	351.65	-21%	2,450,016	1,921,527	-528,489	-22%		
Car 5	10,326	10,326	0%	327.28	182.33	-44%	3,482,417	1,882,644	-1,599,773	-46%		
Car 6	0	0	0%	0%	0%	0	0	0	0%			
Bees Total	48,044	48,044	0%	623.80	482.55	-23%	29,931,266	23,183,732	-6,747,534	-23%		
pre-Cars	10,185	10,185	0%	1040.16	787.37	-24%	10,510,623	7,754,130	-2,756,493	-26%		
Car 1	5,677	5,677	0%	759.59	575.55	-24%	4,261,383	3,287,681	-973,702	-23%		
Car 2	38,565	38,565	0%	817.62	524.79	-36%	31,525,526	20,224,079	-11,301,447	-36%		
Car 3	168,223	168,223	0%	626.28	274.48	-41%	84,126,182	50,617,271	-33,508,911	-41%		
Car 4	69,635	69,635	0%	358.94	280.62	-21%	27,183,867	20,166,636	-7,017,231	-26%		
Car 5	283,934	283,934	0%	278.62	151.65	-45%	78,040,643	43,116,987	-34,923,656	-45%		
Car 6	0	0	0%	0%	0%	0	0	0	0%			
Trucks Total	566,141	566,141	0%	446.67	271.83	-39%	293,148,243	134,096,160	-159,052,083	-54%		
pre-Cars	7,973	7,973	0%	122.90	149.16	22%	372,721	1,189,353	216,632	58%		
Car 1	5,231	5,231	0%	123.77	165.74	34%	647,479	887,039	239,560	34%		
Car 2	3,587	3,587	0%	141.16	184.21	30%	585,362	686,681	101,319	17%		
Car 3	2,920	2,920	0%	38.11	184.21	381%	116,190	617,032	490,842	381%		
Car 4	0	0	0%	0%	0%	0	0	0	0%			
Car 5	0	0	0%	0%	0%	0	0	0	0%			
MOVs Total	19,112	19,112	0%	113.68	188.43	68%	2,249,149	3,320,034	1,070,885	48%		
1.A.3.b. Road Transport	Total	2,079,688	2,079,688	0%	218.62	168.23	-23%	645,965,162	349,851,296	-296,113,866	-46%	

Adjustment details for 2021

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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	13,063	13,063	0%	592.96	534.68	-9%	7,728,235	6,979,435	-748,801	-10%
		Car 1	61,979	61,979	0%	347.96	340.16	-2%	21,040,430	18,884,961	-2,155,469	-10%
		Car 2	87,083	87,083	0%	179.38	136.68	-24%	15,620,983	11,883,782	-3,737,191	-24%
		Car 3	124,330	124,330	0%	61.94	71.52	16%	7,683,891	8,891,671	1,207,780	16%
		Car 4	442,185	442,185	0%	43.84	43.68	0%	19,384,914	19,376,439	-8,475	0%
		Car 5	66,057	66,057	0%	18.58	43.68	135%	1,227,381	2,085,636	1,658,255	135%
	Car 6	1	1	0%	25.08	43.68	69%	17	20	3	18%	
	Gasoline total	794,688	794,688	0%	92.09	81.65	-11%	33,183,891	44,851,951	11,668,060	35%	
	pre-Cars	1,084	1,084	0%	629.25	640.56	1%	182,214	193,373	11,159	6%	
	Car 1	8,426	8,426	0%	297.32	295.65	-1%	2,165,115	2,239,987	74,872	3%	
	Car 2	42,514	42,514	0%	407.93	279.27	-31%	17,384,549	9,321,916	-8,062,633	-46%	
	Car 3	121,429	121,429	0%	555.36	170.55	-69%	67,437,053	21,681,386	-45,755,667	-68%	
	Car 4	264,943	264,943	0%	308.08	143.46	-53%	102,817,081	38,089,755	-64,727,326	-63%	
	Car 5	113,047	113,047	0%	435.12	143.46	-67%	49,536,960	16,332,974	-33,203,986	-67%	
	Car 6	695	695	0%	259.59	143.46	-45%	180,582	99,754	-80,828	-45%	
Diesel oil total	553,564	553,564	0%	434.52	159.92	-63%	249,713,191	88,138,959	-161,574,232	-65%		
PKs Total	1,348,252	1,348,252	0%	212.52	153.47	-28%	313,899,642	152,990,910	-160,908,732	-51%		
pre-Cars	1,084	1,084	0%	629.25	640.56	1%	182,214	193,373	11,159	6%		
Car 1	283	283	0%	818.74	384.47	-53%	243,289	86,158	-157,131	-64%		
Car 2	1,184	1,184	0%	268.66	191.66	-29%	310,529	223,189	-87,340	-28%		
Car 3	783	783	0%	85.97	95.39	11%	67,320	74,782	7,462	11%		
Car 4	2,582	2,582	0%	37.38	46.51	24%	95,786	119,162	23,376	24%		
Car 5	241	241	0%	16.13	46.51	188%	3,082	11,190	7,308	188%		
Car 6	0	0	0%	15.33	46.51	293%	1	3	2	203%		
Gasoline total	6,118	6,118	0%	229.35	186.52	-18%	1,483,081	1,254,716	-228,365	-15%		
pre-Cars	3,395	3,395	0%	425.99	386.79	-9%	1,989,280	1,225,682	-763,598	-38%		
Car 1	4,787	4,787	0%	395.71	276.24	-30%	1,984,360	1,030,426	-953,934	-48%		
Car 2	10,810	10,810	0%	336.90	193.29	-42%	3,644,582	2,091,863	-1,552,719	-43%		
Car 3	28,076	28,076	0%	541.53	150.54	-72%	15,037,240	4,346,870	-10,690,370	-72%		
Car 4	60,832	60,832	0%	493.82	80.26	-84%	30,039,914	5,429,011	-24,610,904	-82%		
Car 5	6,609	6,609	0%	448.95	80.26	-82%	2,930,190	594,364	-2,335,826	-80%		
Car 6	0	0	0%	154.21	80.26	-48%	16	8	-8	-43%		
Diesel oil total	115,967	115,967	0%	481.55	126.90	-74%	55,844,519	14,718,142	-41,126,376	-74%		
LNAs Total	122,085	122,085	0%	468.52	130.95	-72%	57,247,599	15,932,898	-41,314,691	-72%		
pre-Cars	2,620	2,620	0									

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-Cars	11,561	11,561	0%	607.72	635.38	-52%	7,026,041	6,189,785	-836,256	-52%
		Car 1	47,487	47,487	0%	348.56	241.60	-31%	16,571,746	11,426,129	-5,145,617	-31%
		Car 2	72,781	72,781	0%	164.27	137.82	-25%	13,487,749	10,035,380	-3,452,369	-25%
		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	142%	1,897,355	4,681,311	2,783,956	142%
	Gasoline total	790,957	790,957	0%	85.73	78.88	-9%	64,379,943	58,577,229	-5,802,715	-9%	
	pre-Cars	1,487	1,487	0%	311.88	284.56	-55%	463,963	263,872	-199,091	-55%	
	Car 1	4,660	4,660	0%	257.79	266.44	-11%	1,980,364	1,717,787	-262,577	-11%	
	Car 2	33,967	33,967	0%	408.82	279.27	-40%	13,987,432	7,445,646	-6,541,787	-40%	
Car 3	183,539	183,539	0%	564.82	176.63	-69%	58,389,037	10,434,837	-47,954,200	-69%		
Car 4	234,943	234,943	0%	298.41	146.46	-42%	91,724,188	34,480,997	-57,243,191	-42%		
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	186.46	-44%	484,664	220,086	-264,578	-44%		
Diesel Oil total	555,245	555,245	0%	415.96	158.66	-64%	242,962,982	88,096,699	-154,866,283	-64%		
Flx Total	1,386,202	1,386,202	0%	234.61	152.29	-35%	386,442,896	146,673,927	-239,768,969	-35%		
pre-Cars	962	962	0%	832.39	646.95	-24%	487,779	621,166	133,387	24%		
Car 1	232	232	0%	803.24	383.22	-52%	189,985	70,295	-119,690	-52%		
Car 2	989	989	0%	271.36	195.74	-28%	268,154	183,588	-84,566	-28%		
Car 3	835	835	0%	89.38	98.33	10%	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	182%	9,941	29,011	19,070	182%		
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	-23%	1,238,520	1,092,667	-145,853	-12%		
pre-Cars	3,281	3,281	0%	424.48	286.79	-33%	1,368,754	982,093	-386,661	-28%		
Car 1	3,666	3,666	0%	399.34	276.24	-30%	1,445,963	107,034	-1,338,929	-49%		
Car 2	8,479	8,479	0%	336.46	183.28	-45%	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%	29,359,078	5,337,395	-24,021,683	-80%		
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	-74%		
Flx Total	129,088	129,088	0%	469.51	125.65	-74%	56,344,963	14,834,676	-41,510,287	-74%		
pre-Cars	1,326	1,326	0%	1091.48	1919.45	4%	1,410,640	1,352,283	-58,357	-4%		
Car 1	1,248	1,248	0%	727.34	751.15	3%	987,476	937,184	-50,292	-5%		
Car 2	7,780	7,780	0%	783.46	643.24	-18%	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%	468.50	361.85	-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	3,787,467	-3,432,196	-47%		
Car 6	73	73	0%	64.52	182.99	284%	3,961	13,296	9,334	284%		
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	-27%		
Car 1	3,630	3,630	0%	749.70	570.27	-24%	2,721,326	2,071,111	-650,215	-24%		
Car 2	23,577	23,577	0%	811.27	516.43	-36%	19,322,253	12,175,855	-7,146,398	-37%		
Car 3	86,726	86,726	0%	634.65	370.21	-42%	61,287,137	35,848,685	-25,438,452	-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	-46%		
Car 6	2,380	2,380	0%	189.487	360.323	189%	189,487	360,323	170,836	189%		
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	4,386	4,386	0%	134.61	171.39	28%	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	382%		
Car 4	0	0	0%	0	0	0%	0	0	0	0%		
Car 5	0	0	0%	0	0	0%	0	0	0	0%		
MOWs Total	18,288	18,288	0%	167.41	175.28	11%	1,982,548	3,163,438	1,180,890	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	-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-Cars	11,680	11,680	0%	618.27	619.35	-0%	7,011,641	5,967,452	-1,044,189	-52%
		Car 1	37,743	37,743	0%	353.78	241.68	-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	748,116	748,116	0%	88.35	74.85	-16%	69,190,887	56,671,797	-12,519,090	-18%	
	pre-Cars	987	987	0%	112.28	284.56	-55%	433,081	248,138	-184,943	-55%	
	Car 1	5,625	5,625	0%	298.42	266.79	-11%	1,678,472	1,640,688	-37,784	-11%	
Car 2	28,437	28,437	0%	408.84	279.91	-40%	11,983,522	6,253,531	-5,729,991	-40%		
Car 3	92,795	92,795	0%	574.33	176.67	-69%	53,284,956	10,979,373	-42,305,583	-69%		
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	-42%		
Diesel Oil total	589,131	589,131	0%	437.54	158.75	-64%	257,533,128	83,699,698	-173,833,430	-64%		
Flx Total	1,338,247	1,338,247	0%	217.42	111.77	-51%	317,723,735	148,576,886	-169,146,849	-51%		
pre-Cars	184	184	0%	831.81	646.95	-24%	968,320	779,293	-189,027	-24%		
Car 1	836	836	0%	274.42	291.18	21%	229,520	188,285	-41,235	-21%		
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	183%	15,187	47,268	31,081	183%		
Car 5	1	1	0%	17.68	48.89	170%	26	72	46	170%		
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	634,588	-532,194	-46%		
Car 2	6,982	6,982	0%	336.92	183.38	-45%	2,246,147	1,260,074	-986,073	-43%		
Car 3	20,421	20,421	0%	568.12	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	2,687,664	-10,493,641	-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	-74%		
Flx Total	124,354	124,354	0%	468.54	158.03	-75%	58,214,142	14,677,275	-43,536,867	-75%		
pre-Cars	1,172	1,172	0%	1096.69	1919.23							

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	
		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%	65.31	73.93	7%	8,955,585	6,459,757	-404,218	-7%
		Car 4	387,159	387,159	0%	45.16	47.80	-5%	19,093,585	16,536,009	-2,523,557	-5%
		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%	76.33	73.89	-3%	57,215,533	54,996,501	-2,216,812	-3%	
	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	5,276,480	-4,458,004	-49%	
	Car 3	82,749	82,749	0%	585.53	176.81	-69%	48,481,830	14,796,249	-33,685,589	-69%	
	Car 4	211,237	211,237	0%	397.27	151.77	-62%	83,917,680	32,059,973	-51,857,706	-62%	
	Car 5	285,011	285,011	0%	436.38	151.77	-65%	124,721,396	43,370,300	-81,343,896	-65%	
	Car 6	16,081	16,081	0%	259.34	151.77	-41%	4,170,580	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%	
PKs Total	1,338,571	1,338,571	0%	218.44	152.15	-31%	338,091,584	154,632,853	-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	-1%	212,888	154,839	-58,029	-27%
		Car 3	771	771	0%	58.02	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	183%
	Car 6	17	17	0%	18.06	50.15	179%	212	670	457	179%	
	Gasoline total	5,845	5,845	0%	198.34	176.49	-7%	1,112,584	1,031,652	-80,972	-7%	
	pre-Cars	2,537	2,537	0%	428.16	386.79	-12%	1,985,879	1,762,259	-223,629	-12%	
	Car 1	2,589	2,589	0%	393.82	276.25	-29%	987,136	639,888	-347,328	-29%	
	Car 2	6,087	6,087	0%	338.81	133.25	-62%	1,985,995	1,180,889	-805,126	-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	-21,494,748	-82%	
	Car 5	46,749	46,749	0%	438.64	91.69	-79%	20,496,234	4,258,626	-16,237,708	-79%	
	Car 6	187	187	0%	151.18	91.69	-40%	29,829	17,974	-11,855	-40%	
Diesel oil total	128,578	128,578	0%	415.56	170.94	-77%	61,146,525	14,267,237	-46,879,318	-77%		
LDVs Total	134,423	134,423	0%	463.56	153.85	-75%	62,259,160	15,298,849	-46,968,311	-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	1,062,321	-63	-5%
		Car 1	837	837	0%	728.32	750.99	2%	699,222	628,359	-70,863	-9%
		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	-1,939,228	-27%
		Car 4	4,278	4,278	0%	461.90	361.79	-21%	1,972,610	1,584,978	-387,632	-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	-1,320,144	-29%	
	Car 1	2,285	2,285	0%	748.66	581.41	-22%	1,600,088	1,237,759	-362,329	-22%	
	Car 2	13,023	13,023	0%	817.90	510.28	-37%	11,146,862	6,655,738	-4,491,124	-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	-28%	13,481,100	9,711,896	-3,779,204	-28%	
	Car 5	389,263	389,263	0%	262.92	153.66	-42%	110,112,782	69,688,043	-40,424,749	-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%	314.85	186.65	-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	26%	795,185	974,388	218,152	26%	
	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	5,365	5,365	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%	
M2Ws Total	18,627	18,627	0%	108.59	176.24	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 <sub>x</sub> 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	-3,039,298	-34%
		Car 2	42,925	42,925	0%	267.78	142.69	-32%	8,918,785	6,089,659	-2,818,648	-32%
		Car 3	72,871	72,871	0%	73.96	74.74	1%	5,381,361	5,446,237	64,876	1%
		Car 4	353,474	353,474	0%	52.36	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%
	Car 6	29,612	29,612	0%	25.70	49.62	84%	790,791	1,451,483	660,752	84%	
	Gasoline total	715,156	715,156	0%	74.38	71.73	-3%	53,190,187	51,280,933	-1,889,895	-3%	
	pre-Cars	1,382	1,382	0%	311.32	284.66	-9%	387,913	339,733	-48,180	-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	-86,408,809	-65%	
	Car 6	52,576	52,576	0%	259.76	154.07	-41%	13,657,082	0,180,384	-5,556,778	-41%	
Diesel oil total	645,565	645,565	0%	426.19	159.89	-62%	275,130,223	183,163,591	-91,966,732	-62%		
PKs 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%	1076.34	1819.23	-5%	1,048,312	986,255	-62,057	-6%
		Car 1	747	747	0%	738.26	751.91	2%	545,471	581,636	36,165	3%
		Car 2	5,211	5,211	0%	787.43	644.46	-16%	4,183,087	3,358,694	-824,393	-16%
		Car 3	11,282	11,282	0%	633.90	458.67	-28%	7,141,732	5,174,989	-1,966,822	-28%
		Car 4	4,586	4,586	0%	469.70	361.99	-23%	2,154,086	1,614,177	-539,929	-25%
		Car 5	34,267	34,267	0%	358.77	184.69	-49%	8,727,068	4,477,641	-4,249,427	-49%
	Car 6	5,224	5,224	0%	63.13	184.69	241%	277,542	964,225	686,684	241%	
	Diesel Total	52,887	52,887	0%	458.96	327.99	-29%	23,987,817	11,149,448	-12,838,379	-29%	
	pre-Cars	4,319	4,319	0%	1034.89	737.35	-29%	4,488,571	3,184,428	-1,304,143	-29%	
	Car 1	1,853	1,853	0%	748.71	583.48	-22%	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	-38%	
	Car 3	43,481	43,481	0%	621.55	384.41	-42%	27,460,779	15,734,631	-11,726,147	-43%	
	Car 4	39,233	39,233	0%	396.88	283.72	-28%	11,572,660	8,284,180	-3,278,768	-28%	
	Car 5	308,726	308,726	0%	264.17	153.49	-42%	63,413,973	40,446,486	-22,967,477	-42%	
	Car 6	159,787	159,787	0%	67.48	153.49						



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	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	4,986,688	2,558,795
		Car 2	36,062	36,062	0%	212.73	143.11	-33%	7,671,581	5,160,897	2,510,684
		Car 3	83,039	83,039	0%	78.17	75.50	-3%	4,861,482	4,739,259	122,223
		Car 4	334,413	334,413	0%	53.74	50.17	-7%	17,363,964	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
	Car 6	66,332	66,332	0%	26.67	50.17	86%	1,768,917	3,327,856	1,558,939	
	Gasoline total	715,272	715,272	0%	79.33	70.65	-10%	58,736,967	50,535,649	8,201,318	
	pre-Cars	1,280	1,280	0%	368.78	254.66	-31%	386,263	339,172	47,091	
	Car 1	3,749	3,749	0%	298.38	269.66	-9%	1,122,449	1,011,626	110,823	
	Car 2	16,584	16,584	0%	407.19	221.43	-45%	6,720,132	3,663,964	3,056,168	
	Car 3	61,398	61,398	0%	602.50	179.24	-70%	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	116,684	116,684	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	188,535,236	89,406,424		
PKs Total	1,390,391	1,390,391	0%	215.75	154.41	-29%	527,738,627	394,070,885	133,667,742		
1.A.3.a.ii. - Light Duty Vehicles (LDV)	Gasoline	pre-Cars	910	910	0%	602.79	640.96	-6%	593,769	547,643	46,126
		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
	Car 6	363	363	0%	19.65	52.36	181%	6,764	19,992	-13,228	
	Gasoline total	5,906	5,906	0%	188.27	171.66	-8%	1,068,292	1,031,679	36,613	
	pre-Cars	2,189	2,189	0%	414.87	386.79	-7%	999,649	986,433	13,216	
	Car 1	1,790	1,790	0%	391.89	276.25	-29%	780,169	386,371	393,798	
	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%	153.69	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	35,276,087	30,436,645		
LDVs Total	149,994	149,994	0%	445.21	188.28	-57%	66,781,025	36,302,866	30,478,181		
1.A.3.a.iii. - Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	891	891	0%	1076.81	1319.23	-18%	964,197	988,234	-24,037
		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	382.28	-20%	2,117,218	1,686,081	431,137
		Car 5	34,380	34,380	0%	364.38	185.22	-49%	9,935,974	4,617,617	5,318,357
	Car 6	9,126	9,126	0%	62.78	185.22	198%	673,066	1,680,481	-1,007,415	
	Diesel Total	54,157	54,157	0%	404.73	388.24	-7%	23,082,189	16,685,117	6,397,072	
	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	-21%	1,163,482	789,813	373,669	
	Car 2	8,075	8,075	0%	817.75	585.52	-28%	7,255,040	4,486,628	2,768,412	
	Car 3	34,167	34,167	0%	638.31	568.64	-10%	21,553,288	12,251,155	9,302,133	
	Car 4	34,287	34,287	0%	394.94	281.66	-29%	9,640,364	6,685,621	2,954,743	
	Car 5	269,735	269,735	0%	267.22	153.80	-43%	74,680,233	39,676,610	35,003,623	
	Car 6	261,480	261,480	0%	61.77	153.80	149%	16,149,288	40,244,036	-24,094,748	
Trucks Total	964,013	964,013	0%	295.31	180.97	-39%	134,431,899	101,496,262	32,935,637		
pre-Cars	5,543	5,543	0%	125.59	155.78	24%	696,072	883,289	-187,217		
Car 1	3,360	3,360	0%	107.11	177.29	39%	407,113	585,796	-178,683		
Car 2	3,375	3,375	0%	125.94	187.68	50%	421,961	687,078	-265,117		
Car 3	6,443	6,443	0%	48.36	187.68	381%	209,627	1,273,071	-1,063,444		
Car 4	66	66	0%	17.47	187.68	1031%	1,134	12,822	-11,688		
Car 5	0	0	0%	0.00	187.68						

Adjustment details for 2027

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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%	6,688,911	4,217,044	2,471,867
		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	161%	3,485,382	9,239,815	5,754,433
	Car 6	114,791	114,791	0%	27.66	51.28	82%	3,060,236	5,884,372	2,824,136	
	Gasoline total	724,571	724,571	0%	87.66	80.88	-8%	49,606,874	40,534,714	9,072,160	
	pre-Cars	1,863	1,863	0%	364.39	254.66	-31%	680,963	347,620	333,343	
	Car 1	3,360	3,360	0%	298.17	271.67	-9%	1,082,266	910,182	172,084	
	Car 2	13,788	13,788	0%	407.17	222.43	-45%	5,914,130	3,066,983	2,847,147	
	Car 3	52,128	52,128	0%	608.85	179.65	-70%	31,686,478	9,384,788	22,301,690	
	Car 4	167,947	167,947	0%	418.10	156.34	-61%	64,733,485	24,993,323	39,740,162	
	Car 5	283,480	283,480	0%	423.95	156.34	-63%	120,167,656	44,073,190	76,094,466	
	Car 6	184,760	184,760	0%	262.61	156.34	-40%	48,521,183	20,250,985	28,270,198	
Diesel Oil total	686,582	686,582	0%	394.65	161.95	-59%	272,126,081	152,890,721	119,235,360		
PKs Total	1,421,162	1,421,162	0%	245.98	155.83	-36%	521,732,955	358,425,435	163,307,520		
1.A.3.a.ii. - Light Duty Vehicles (LDV)	Gasoline	pre-Cars	963	963	0%	616.81	640.96	-6%	612,247	566,978	45,269
		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	146%	35,240	89,034	-53,794
	Car 6	910	910	0%	18.58	53.38	181%	17,062	49,080	-31,918	
	Gasoline total	6,186	6,186	0%	171.55	167.18	-3%	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	-29%	660,716	331,158	329,558	
	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%	595.08	150.79	-75%	6,940,879	1,758,147	5,182,732	
	Car 4	39,050	39,050	0%	506.70	93.69	-82%	19,789,647	3,635,035	16,154,612	
	Car 5	75,789	75,789	0%	432.66	93.69	-78%	32,790,966	7,054,966	25,736,000	
	Car 6	19,625	19,625	0%	151.71	93.69	-39%	2,977,439	1,626,876	1,350,563	
Diesel Oil total	153,284	153,284	0%	404.66	183.89	-55%	65,083,930	35,925,276	29,158,654		
LDVs Total	159,470	159,470	0%	414.83	186.35	-55%	66,152,129	36,959,427	29,192,702		
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	3,823	3,823	0%	474.87	382.48	-20%	1,912,380	1,387,620	524,760
		Car 5	21,913	21,913							

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	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	12,219	12,219	0%	637.58	648.11	-15%	7,780,965	6,668,721	-1,112,234
		Car 1	14,362	14,362	0%	374.34	341.68	-30%	5,371,161	3,488,643	-1,882,518
		Car 2	34,285	34,285	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	3,388,617	-509,164
		Car 4	278,738	278,738	0%	55.98	52.30	-7%	15,683,498	14,576,755	-1,106,743
	Car 5	186,830	186,830	0%	19.35	52.30	170%	3,238,282	6,725,668	3,487,386	
	Car 6	159,041	159,041	0%	6.00	52.30	770%	4,190,422	6,718,250	2,527,828	
	Gasoline total	689,027	689,027	0%	64.42	68.45	6%	45,032,995	41,786,893	-3,246,102	
	Diesel Oil	pre-Cars	1,543	1,543	0%	303.16	344.96	-13%	396,486	349,173	-47,313
		Car 1	2,949	2,949	0%	294.17	272.65	-9%	862,432	775,165	-87,267
Car 2		10,784	10,784	0%	407.20	322.87	-21%	4,391,983	2,483,536	-1,908,447	
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	180.49	-56%	54,133,837	20,937,329	-33,196,508	
Car 5	251,212	251,212	0%	416.25	180.49	-56%	104,585,706	40,293,731	-64,291,975		
Car 6	228,685	228,685	0%	254.87	180.49	-31%	58,284,140	35,680,446	-22,603,700		
Diesel oil total	666,074	666,074	0%	375.66	183.38	-52%	247,596,063	188,768,684	-158,827,379		
Flx Total	1,355,101	1,355,101	0%	214.34	154.88	-28%	262,589,060	196,555,427	-136,033,639		
1.A.3.b.i - Light Duty Vehicles (LDV)	Gasoline	pre-Cars	917	917	0%	664.33	640.95	-4%	596,859	582,862	-14,000
		Car 1	189	189	0%	911.58	312.78	-66%	88,529	33,895	-54,634
		Car 2	377	377	0%	303.64	224.45	-26%	114,682	84,133	-30,549
		Car 3	511	511	0%	111.92	116.84	5%	57,282	60,739	3,457
		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%	23.70	54.36	129%	35,160	80,626	45,466	
	Car 6	1,643	1,643	0%	19.59	54.36	182%	33,650	89,326	55,676	
	Gasoline total	6,315	6,315	0%	154.22	160.11	7%	999,199	1,011,136	11,938	
	Diesel Oil	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%	389.94	276.25	-29%	483,129	272,286	-210,843
Car 2		2,942	2,942	0%	318.56	193.80	-39%	965,389	560,789	-394,600	
Car 3		3,363	3,363	0%	559.10	150.74	-73%	5,609,152	1,411,299	-4,197,853	
Car 4		33,232	33,232	0%	509.42	93.81	-82%	15,929,185	3,117,457	-12,811,728	
Car 5	66,283	66,283	0%	432.92	93.81	-78%	28,694,080	6,217,860	-22,476,220		
Car 6	39,482	39,482	0%	158.79	93.81	-41%	5,941,615	3,696,298	-2,245,317		
Diesel oil total	154,259	154,259	0%	384.71	182.69	-53%	59,344,525	15,880,316	-43,464,210		
LDV Total	180,574	180,574	0%	375.86	184.94	-52%	69,343,725	16,851,449	-52,492,276		
1.A.3.b.ii - Heavy Duty Vehicles (HDV)	Diesel Oil	pre-Cars	547	547	0%	1076.16	1919.23	-43%	589,267	557,147	-32,120
		Car 1	277	277	0%	732.67	178.367	-76%	217,678	178,367	-39,311
		Car 2	2,270	2,270	0%	787.83	646.33	-18%	1,780,686	1,447,437	-333,249
		Car 3	6,757	6,757	0%	638.80	459.32	-29%	4,262,734	3,183,482	-1,079,252
		Car 4	3,043	3,043	0%	473.96	362.73	-24%	1,439,790	1,073,333	-366,457
		Car 5	18,189	18,189	0%	362.42	186.37	-49%	6,663,265	3,375,016	-3,288,249
Car 6	20,670	20,670	0%	64.99	186.37	286%	1,176,026	3,662,314	2,486,288		
HDV Total	51,634	51,634	0%	309.75	283.53	-9%	19,935,526	13,687,196	-6,248,330		
1.A.3.b.iii - Heavy Duty Vehicle-Trucks & Lorries	Diesel Oil	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	512,378	-405,674
		Car 2	5,544	5,544	0%	817.44	581.68	-29%	4,532,195	2,781,518	-1,750,677
		Car 3	20,583	20,583	0%	629.54	563.68	-10%	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	154,980	154,980	0%	250.40	154.68	-38%	45,964,153	24,283,389	-21,680,764
Car 6	381,799	381,799	0%	68.76	154.68	125%	26,251,482	69,665,888	43,414,406		
Trucks Total	585,186	585,186	0%	575.18	172.19	-70%	180,173,337	180,730,869	557,532		
1.A.3.b.iv - Motorised Two-Wheelers (M2W)	Gasoline	pre-Cars	4,940	4,940	0%	128.95	188.61	46%	622,656	783,451	160,795
		Car 1	2,965	2,965	0%	128.94	177.73	41%	374,114	527,294	153,180
		Car 2	3,221	3,221	0%	129.33	188.64	46%	387,596	639,633	252,037
		Car 3	6,241	6,241	0%	48.24	188.64	288%	251,126	1,239,688	988,562
		Car 4	1,130	1,130	0%	38.41	188.64	492%	23,066	224,622	201,556
Car 5	0	0	0%	0.00	188.64	0%	0	0	0		
M2W Total	18,497	18,497	0%	89.86	188.61	110%	1,688,568	3,454,167	1,765,599		
1.A.3.b - Road Transport	Total	2,180,983	2,180,983	0%	215.85	133.49	-38%	479,758,286	291,129,652	-178,628,634	

Adjustment details for 2019

NFR Code	Fuel	Activity Data			Implied Emission Factor			NO <sub>x</sub> 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	13,589	13,589	0%	638.58	648.11	-15%	8,664,621	7,382,686	-1,281,935
		Car 1	12,427	12,427	0%	378.32	341.68	-30%	4,781,480	3,083,383	-1,698,096
		Car 2	29,086	29,086	0%	225.58	111.06	-51%	4,531,070	1,858,018	-2,672,952
		Car 3	39,216	39,216	0%	82.22	76.12	-7%	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	180,537	180,537	0%	19.77	52.29	170%	3,173,720	6,584,356	3,410,636	
	Car 6	206,626	206,626	0%	25.62	52.29	180%	5,295,099	11,010,782	5,715,683	
	Gasoline total	766,031	766,031	0%	62.36	68.45	10%	43,961,947	40,238,025	-3,723,922	
	Diesel Oil	pre-Cars	1,746	1,746	0%	333.78	374.96	-10%	613,188	524,923	-88,265
		Car 1	2,545	2,545	0%	294.80	272.65	-9%	764,913	687,786	-77,127
Car 2		8,891	8,891	0%	407.99	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%	229,566,088	189,582,982	-139,983,106		
Flx Total	1,369,532	1,369,532	0%	399.83	195.32	-50%	273,488,039	191,821,007	-81,667,032		
1.A.3.b.i - Light Duty Vehicles (LDV)	Gasoline	pre-Cars	926	926	0%	641.89	640.95	-0%	601,459	581,962	-19,497
		Car 1	97	97	0%	915.28	312.78	-66%	88,953	30,296	-58,657
		Car 2	316	316	0%	304.63	224.45	-26%	96,150	70,848	-25,302
		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	180%	45,383	133,753	88,370	
	Gasoline total	6,483	6,483	0%	146.88	153.25	5%	976,279	1,004,156	27,877	
	Diesel Oil	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	232,256	-188,029
Car 2		2,334	2,334	0%	316.36	193.79	-39%	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	-82%	14,780,380	2,715,154	-12,065,226	
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%	8,614,586	6,722,892	-1,891,694		
Diesel oil total	159,183	159,183	0%	347.44	181.99	-48%	55,383,535	16,221,445	-39,162,090		
LDV Total	185,866	185,866	0%	379.31	183.97	-52%	66,279,544	11,245,596	-55,033,948		
1.A.3.b.ii - Heavy Duty Vehicle-Trucks & Lorries	Diesel Oil	pre-Cars	489	489	0%	1086.20	1919.23	-43%	589,987	476,258	-113,729
		Car 1	147	147	0%	738.37	488.39	-34%	186,212	110,537	-75,675
		Car 2	1,611	1,611	0%						

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Adjustment 2014 (accepted) <sup>8)</sup> , <sup>9)</sup>	-105.6	-101.3	-95.7	-91.7						
Adjustment 2015 (accepted) <sup>10)</sup> , <sup>11)</sup>	-100.3	-95.5	-89.9	-85.1						
Adjustment 2016 (accepted) <sup>12)</sup> , <sup>13)</sup>	-151.3	-146.9	-145.1	-142.5	-128.1					
Adjustment 2017 (accepted) <sup>14)</sup>	-151.3	-146.8	-145.0	-142.4	-127.2	-100.9				
Adjustment 2018 (accepted) <sup>15)</sup>	-172.3	-174.5	-177.4	-180.4	-171.5	-148.9	-123.2			
Adjustment 2019 (accepted) <sup>16)</sup>	-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>	<b>-296.1</b>	<b>-300.7</b>	<b>-300.4</b>	<b>-305.2</b>	<b>-294.9</b>	<b>-274.9</b>	<b>-250.9</b>	<b>-221.1</b>	<b>-179.6</b>	<b>-144.8</b>
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". <sup>17)</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>18)</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 2020 adjustment proposal differed significantly from the adjustment applied for and accepted in 2019. **In comparison to 2020, the TREMOD model applied for the 2021 submission has been revised only slightly in terms of NO<sub>x</sub> emission factors. Hence, the 2021 adjustment proposal differs only slightly from the (accepted) proposal provided with submission 2020.**

#### **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](#)

<sup>1)</sup> IIASA, 1999: Amann, M.; Bertok, I.; Cofala, J.; Gyarfas, F.; Heyes, Chr.; Klimont, Zb.; Syri, S.; Schöpp, W.: Further analysis of scenario results obtained with the RAINS model - Interim Report to the Ministère de L'Aménagement du Territoire et de l'Environnement Direction de la Prévention des Pollutions et des Risques 20, avenue de Ségur 75302 Paris 07 SP, April 1999 - URL: <https://iiasa.ac.at/web/home/research/researchPrograms/air/policy/france3b.pdf>

<sup>2)</sup> EB, 2012a: CLRTAP EB Decision 2012/3, ECE/EB.AIR/111/Add.1: Adjustments under the Gothenburg Protocol to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them URL: [http://www.unece.org/fileadmin/DAM/env/documents/2013/air/ECE\\_EB.AIR\\_111\\_Add.1\\_ENG\\_DECISION\\_3.pdf](http://www.unece.org/fileadmin/DAM/env/documents/2013/air/ECE_EB.AIR_111_Add.1_ENG_DECISION_3.pdf)

<sup>3)</sup> EB, 2012c: CLRTAP EB Decision 2012/12: Guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them URL: [http://www.unece.org/fileadmin/DAM/env/documents/2012/EB/Decision\\_2012\\_12.pdf](http://www.unece.org/fileadmin/DAM/env/documents/2012/EB/Decision_2012_12.pdf)

<sup>4)</sup> EB, 2012b: CLRTAP EB Decision 2012/4: Provisional Application of Amendment to the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone URL: [http://www.unece.org/fileadmin/DAM/env/documents/2013/air/ECE\\_EB.AIR\\_111\\_Add.1\\_ENG\\_DECISION\\_4.pdf](http://www.unece.org/fileadmin/DAM/env/documents/2013/air/ECE_EB.AIR_111_Add.1_ENG_DECISION_4.pdf)

<sup>5)</sup> (bibcite 4)

<sup>6)</sup> ifeu, 2002: Final report to UFOPLAN study FKZ 201 45 112 (German version only): Aktualisierung des Daten- und Rechenmodells: Energieverbrauch und Schadstoffemissionen des motorisierten Verkehrs in Deutschland 1980-2020; Im Auftrag des Umweltbundesamtes; ifeu Institut für Energie- und Umweltforschung Heidelberg GmbH (Institute for Energy and Environmental Research), Wilckensstraße 3, D-69120 Heidelberg, Germany, phone: +49 (0) 6221 / 47 67 -0, fax: +49 (0) 6221 / 47 67 -19, Heidelberg, 31. Oktober 2002

<sup>7)</sup> Knörr et al. (2020a): Knörr, W., Heidt, C., Gores, S., & Bergk, F.: ifeu Institute for Energy and Environmental Research (Institut für Energie- und Umweltforschung Heidelberg GmbH, ifeu): Fortschreibung des Daten- und Rechenmodells: Energieverbrauch und Schadstoffemissionen des motorisierten Verkehrs in Deutschland 1960-2035, sowie TREMOD, im Auftrag des Umweltbundesamtes, Heidelberg & Berlin, 2020.

<sup>8)</sup> CEIP, 2014a: Centre on Emission Inventories and Projections (CEIP): CEIP/Adjustment RR/2014/GERMANY: Review of the 2014 Adjustment Application by Germany, URL: [https://webdab01.umweltbundesamt.at/download/adjustments2014/Adjustment\\_Review\\_Report\\_GERMANY\\_2014.pdf?cgiproxy\\_skip=1](https://webdab01.umweltbundesamt.at/download/adjustments2014/Adjustment_Review_Report_GERMANY_2014.pdf?cgiproxy_skip=1), 5 August 2014.

<sup>10)</sup> CEIP, 2015a: Centre on Emission Inventories and Projections (CEIP): CEIP/Adjustment RR/2015/Germany: Review of the 2015 Adjustment Application by Germany, URL: [https://webdab01.umweltbundesamt.at/download/adjustments2015/Germany2015-adj.pdf?cgiproxy\\_skip=1](https://webdab01.umweltbundesamt.at/download/adjustments2015/Germany2015-adj.pdf?cgiproxy_skip=1), September 2015.

- <sup>11)</sup> CEIP, 2015b: Centre on Emission Inventories and Projections (CEIP): CE/EB.AIR/GE.1/2015/10-ECE/EB.AIR/WG.1/2015/13: Review of adjustment applications 2015; URL: [http://www.ceip.at/fileadmin/inhalte/emep/Adjustments/ece.eb.air.ge.1.2015.10\\_ece.eb.air.wg.1.2015.13.AV.pdf](http://www.ceip.at/fileadmin/inhalte/emep/Adjustments/ece.eb.air.ge.1.2015.10_ece.eb.air.wg.1.2015.13.AV.pdf), 6 July 2015.
- <sup>12)</sup> CEIP, 2016a: Centre on Emission Inventories and Projections (CEIP): Review of the 2016 Adjustment Application by Germany, URL: [https://webdab01.umweltbundesamt.at/download/adjustments2016/Germany2016-adj.pdf?cgiproxy\\_skip=1](https://webdab01.umweltbundesamt.at/download/adjustments2016/Germany2016-adj.pdf?cgiproxy_skip=1), 2016.
- <sup>13)</sup> CEIP, 2016b: Centre on Emission Inventories and Projections (CEIP): ECE/EB.AIR/GE.1/2016/10-ECE/EB.AIR/WG.1/2016/18: Review of adjustment applications 2016; URL: [http://www.ceip.at/fileadmin/inhalte/emep/pdf/2016/ECE\\_EB.AIR\\_GE.1\\_2016\\_10\\_E.pdf](http://www.ceip.at/fileadmin/inhalte/emep/pdf/2016/ECE_EB.AIR_GE.1_2016_10_E.pdf), 2016.
- <sup>14)</sup> CEIP, 2017a: Centre on Emission Inventories and Projections (CEIP): ECE/EB.AIR/GE.1/2017/10-ECE/EB.AIR/WG.1/2017/20: Review of adjustment applications 2017; URL: [http://www.ceip.at/fileadmin/inhalte/emep/pdf/2017/Advance\\_ece\\_eb\\_air\\_ge\\_1\\_2017\\_10\\_ece\\_eb\\_air\\_wg\\_1\\_2017.pdf](http://www.ceip.at/fileadmin/inhalte/emep/pdf/2017/Advance_ece_eb_air_ge_1_2017_10_ece_eb_air_wg_1_2017.pdf), 2017.
- <sup>15)</sup> CEIP, 2018a: Centre on Emission Inventories and Projections (CEIP): ECE/EB.AIR/GE.1/2018/10-ECE/EB.AIR/WG.1/2018/21: Review of adjustment applications 2018; URL: [https://www.ceip.at/fileadmin/inhalte/emep/pdf/2018/ADJ\\_ece.eb.air.ge.1.2018.10-ece.eb.air.wg.1.2018.21\\_advance.pdf](https://www.ceip.at/fileadmin/inhalte/emep/pdf/2018/ADJ_ece.eb.air.ge.1.2018.10-ece.eb.air.wg.1.2018.21_advance.pdf), 2018.
- <sup>16)</sup> CEIP, 2019a: Centre on Emission Inventories and Projections (CEIP): ECE/EB.AIR/GE.1/2019/10-ECE/EB.AIR/WG.1/2019/22: Review of adjustment applications 2019; URL: [https://www.ceip.at/fileadmin/inhalte/emep/pdf/2019/ECE\\_EB.AIR\\_GE.1\\_2019\\_10-1909789E.pdf](https://www.ceip.at/fileadmin/inhalte/emep/pdf/2019/ECE_EB.AIR_GE.1_2019_10-1909789E.pdf), 2019.
- <sup>17)</sup> (bibcite 18)
- <sup>18)</sup> Notter et al. (2019): Keller, M., Althaus, H.-J., Cox, B., Knörr, W., Heidt, Ch., Biemann, K., Räder, D.: Handbook Emission Factors for Road Transport, version 4.1 (Handbuch Emissionsfaktoren des Straßenverkehrs 4.1), HBEFA 4.1 Development Report; URL: [https://www.hbefa.net/e/documents/HBEFA41\\_Development\\_Report.pdf](https://www.hbefa.net/e/documents/HBEFA41_Development_Report.pdf), Bern, Heidelberg, 21. August 2019.