

# 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> “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., 2021a) <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       | adjusted  | difference | current                 | adjusted | difference | current                   | adjusted    | adjustment  | difference |
|               |            |      | in [TJ]       | in [TJ]   | in [%]     | in [kg/TJ]              | in [%]   | in [%]     | in [kg]                   | in [kg]     | in [%]      | in [%]     |
| 1.A.3.b.i     | gasoline   |      | 795.957       | 795.957   | 0%         | 97.55                   | 84.99    | -13%       | 77.64.842                 | 67.690.906  | 9.993.935   | -13%       |
| 1.A.3.b.i     | diesel oil |      | 629.380       | 629.380   | 0%         | 429.45                  | 160.51   | -63%       | 227.341.096               | 84.970.461  | 142.376.635 | -63%       |
| 1.A.3.b.ii    | gasoline   |      | 6.325         | 6.325     | 0%         | 255.87                  | 214.75   | -16%       | 1.618.432                 | 1.358.328   | 266.104     | -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 |      | 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               | 154.056.160 | 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                | 64.851.951  | 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   | diesel oil |      | 47.355        | 47.355    | 0%         | 592.65                  | 448.99   | -24%       | 28.071.221                | 21.268.323  | 6.804.898   | -24%       |
| 1.A.3.b.iii   | diesel oil |      | 563.891       | 563.891   | 0%         | 410.38                  | 244.97   | -40%       | 231.410.271               | 138.135.342 | 93.273.929  | -40%       |
| 1.A.3.b.iv    | gasoline   |      | 19.289        | 19.289    | 0%         | 110.79                  | 171.60   | 54%        | 2.137.002                 | 3.299.162   | -1.162.160  | 54%        |
| 1.A.3.b TOTAL | 2011       |      | 2.106.883     | 2.106.883 | 0%         |                         |          | 0%         | 632.365.736               | 331.625.655 | 300.740.081 | -48%       |
| 1.A.3.b.i     | gasoline   |      | 750.957       | 750.957   | 0%         | 85.73                   | 78.00    | -9%        | 64.379.994                | 58.677.229  | 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%       | 55.106.362                | 13.741.354  | 41.365.008  | -75%       |
| 1.A.3.b.iii   | diesel oil |      | 50.902        | 50.902    | 0%         | 533.22                  | 384.33   | -28%       | 27.141.913                | 19.563.200  | 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%        |
| 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%         | 89.35                   | 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%       | 257.633.728               | 93.499.010  | 164.134.718 | -64%       |
| 1.A.3.b.ii    | gasoline   |      | 5.578         | 5.578     | 0%         | 202.80                  | 184.07   | -9%        | 1.131.209                 | 1.026.727   | 104.482     | -9%        |
| 1.A.3.b.ii    | diesel oil |      | 118.777       | 118.777   | 0%         | 480.60                  | 114.93   | -76%       | 57.083.533                | 13.690.488  | 43.433.045  | -76%       |
| 1.A.3.b.iii   | diesel oil |      | 51.716        | 51.716    | 0%         | 509.64                  | 260.06   | -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   | -41%       | 211.887.531               | 124.788.469 | 87.099.062  | -41%       |
| 1.A.3.b.iv    | gasoline   |      | 18.229        | 18.229    | 0%         | 104.34                  | 175.38   | 68%        | 1.902.068                 | 3.197.038   | -1.294.951  | 68%        |
| 1.A.3.b TOTAL | 2013       |      | 2.132.683     | 2.132.683 | 0%         |                         |          | 0%         | 616.079.063               | 316.854.371 | 300.224.692 | -50%       |
| 1.A.3.b.i     | gasoline   |      | 752.526       | 752.526   | 0%         | 76.03                   | 73.09    | -4%        | 57.215.533                | 54.988.921  | 2.216.612   | -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%        | 1.112.584                 | 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 |      | 49.143        | 49.143    | 0%         | 468.37                  | 339.99   | -27%       | 23.017.115                | 16.708.234  | 6.308.881   | -27%       |
| 1.A.3.b.iii   | diesel oil |      | 572.754       | 572.754   | 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 |      | 135.386       | 135.386   | 0%         | 489.35                  | 187.96   | -77%       | 63.605.443                | 14.607.490  | 48.997.953  | -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%       | 157.189.675               | 110.620.703 | 46.568.973  | -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       |      | 2.161.976     | 2.161.976 | 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%        | 50.736.367                | 50.535.049  | 201.318     | 0%         |
| 1.A.3.b.i     | diesel oil |      | 675.119       | 675.119   | 0%         | 410.36                  | 160.76   | -61%       | 277.041.660               | 108.535.230 | 168.506.430 | -61%       |
| 1.A.3.b.ii    | gasoline   |      | 5.926         | 5.926     | 0%         | 180.27                  | 171.05   | -5%        | 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  | 50.496.725  | -77%       |
| 1.A.3.b.iii   | diesel oil |      | 54.157        | 54.157    | 0%         | 424.73                  | 388.24   | -27%       | 23.002.109                | 16.683.117  | 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%         | 553.799.558               | 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  | -1.607.640  | 3%         |
| 1.A.3.b.i     | diesel oil |      | 696.592       | 696.592   | 0%         | 390.65                  | 161.95   | -59%       | 272.126.091               | 112.810.721 | 159.315.370 | -59%       |
| 1.A.3.b.ii    | gasoline   |      | 6.186         | 6.186     | 0%         | 171.15                  | 167.18   | -2%        | 1.058.799                 | 1.034.211   | 24.588      | -2%        |
| 1.A.3.b.ii    | diesel oil |      | 153.284       | 153.284   | 0%         | 424.66                  | 183.89   | -76%       | 65.093.930                | 15.925.216  | 49.168.714  | -76%       |
| 1.A.3.b.iii   | diesel oil |      | 53.382        | 53.382    | 0%         | 370.80                  | 286.71   | -23%       | 19.793.901                | 15.304.828  | 4.489.073   | -23%       |
| 1.A.3.b.iii   | diesel oil |      | 596.263       | 596.263   | 0%         | 195.02                  | 175.92   | -10%       | 116.671.141               | 106.246.508 | 11.424.633  | -10%       |
| 1.A.3.b.iv    | gasoline   |      | 19.160        | 19.160    | 0%         | 92.83                   | 183.39   | 98%        | 1.778.674                 | 3.513.787   | -1.735.114  | 98%        |
| 1.A.3.b TOTAL | 2017       |      | 2.251.437     | 2.251.437 | 0%         |                         |          | 0%         | 525.549.410               | 304.469.986 | 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%       | 247.556.063               | 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   | diesel oil |      | 51.634        | 51.634    | 0%         | 309.75                  | 263.53   | -15%       | 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%         | 180.173.337               | 180.710.869 | -537.532    | 1%         |
| 1.A.3.b.iv    | gasoline   |      | 18.497        | 18.497    | 0%         | 89.66                   | 184.61   | 106%       | 1.658.568                 | 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 |      | 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%         | 146.08                  | 153.25   | 5%         | 976.219                   | 1.034.150   | -57.931     | 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   | -10%       | 14.527.012                | 13.118.578  | 1.408.434   | -10%       |
| 1.A.3.b.iii   | diesel oil |      | 595.913       | 595.913   | 0%         | 153.35                  | 169.17   | 10%        | 91.380.760                | 106.809.376 | -15.428.616 | 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       |      | 2.202.888     | 2.202.888 | 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 [t]       |              |      |
| 1.A.3.a.i. Passenger Cars                  | Gasoline                | pre-Cars       | 13.686    | 13.686     | 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   | -3.569.995   | -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          | 795.957        | 795.957   | 0%         | 592.55                  | 514.25   | -13%       | 77.644.842                | 67.650.986  | -9.993.855   | -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%                      | 296.62   | 246.17     | -17%                      | 3.066.428   | 2.741.387    | -325.041     | -11%         |      |
|  |                         | Car 2          | 50.088    | 50.088     | 0%                      | 406.90   | 279.19     | -31%                      | 29.372.795  | 19.974.210   | -9.398.584   | -32%         |      |
|  |                         | Car 3          | 134.025   | 134.025    | 0%                      | 542.94   | 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 | -83%         |      |
|  |                         | 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%         |              |      |
|  | Flx 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     | -31%         |      |
|  |                         | Car 3          | 856       | 856        | 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                 | 1,358.328   | -120.504     | -8%          |              |      |
|  | Diesel Oil              | pre-Cars       | 4,876     | 4,876      | 0%                      | 425.99   | 386.79     | -9%                       | 2,077.142   | 1,436.983    | -640.159     | -31%         |      |
|  |                         | Car 1          | 9,989     | 9,989      | 0%                      | 399.59   | 276.24     | -30%                      | 2,389.089   | 1,289.630    | -1,099.459   | -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  | 5,085.780    | -12,570.103  | -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    | 417%       | 7                         | 4           | -3           | -43%         |              |      |
|  | Diesel oil total        | 113,450        | 113,450   | 0%         | 476.34                  | 134.96   | -72%       | 54,043.533                | 15,351.584  | -38,691.949  | -72%         |              |      |
|  | LDVs Total              | 179,775        | 179,775   | 0%         | 464.70                  | 139.18   | -70%       | 55,658.966                | 16,689.913  | -38,969.053  | -70%         |              |      |
| 1.A.3.b.ii. Heavy Duty Vehicles (HDVs)     | Gasoline                | pre-Cars       | 3,382     | 3,382      | 0%                      | 1,096.25 | 1,028.78   | -6%                       | 3,674.087   | 3,432.644    | -241.443     | -7%          |      |
|  |                         | 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%                      | 13,065.776  | 7,289.299    | -5,776.477   | -44%         |      |
|  |                         | 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%                      | 0        | 0          | 0%                        | 0           | 0            | 0            | 0%           |      |
|  |                         | Gasoline total | 45,044    | 45,044     | 0%                      | 623.80   | 482.55     | -23%                      | 29,931.286  | 23,185.732   | -6,745.554   | -23%         |      |
|  | Diesel Oil              | pre-Cars       | 10,185    | 10,185     | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -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   | 374.48     | -41%                      | 161,136.182 | 99,617.271   | -61,518.911  | -38%         |      |
|  |                         | Car 4          | 69,636    | 69,636     | 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%                      | 79,543.643  | 43,115.897   | -36,427.746  | -46%         |      |
|  |                         | Car 6          | 0         | 0          | 0%                      | 0        | 0          | 0%                        | 0           | 0            | 0            | 0%           |      |
|  |                         | Trucks Total   | 566,741   | 566,741    | 0%                      | 446.67   | 271.83     | -39%                      | 293,148,243 | 154,696,160  | -138,452,083 | -39%         |      |
|  | LDVs Total              | 7,973          | 7,973     | 0%         | 1,040.16                | 787.37   | -24%       | 10,510.623                | 7,754.138   | -2,756.485   | -26%         |              |      |
| 1.A.3.b.iii. Motorized Two-Wheelers (MTWs) | Gasoline                | pre-Cars       | 5,231     | 5,231      | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  |                         | Car 1          | 5,231     | 5,231      | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  |                         | Car 2          | 5,231     | 5,231      | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  |                         | Car 3          | 5,231     | 5,231      | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  |                         | Car 4          | 5,231     | 5,231      | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  |                         | Car 5          | 5,231     | 5,231      | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  | Car 6                   | 5,231          | 5,231     | 0%         | 1,040.16                | 787.37   | -24%       | 10,510.623                | 7,754.138   | -2,756.485   | -26%         |              |      |
|  | Gasoline total          | 31,712         | 31,712    | 0%         | 1,040.16                | 787.37   | -24%       | 2,240,749                 | 1,326,034   | -914,715     | -41%         |              |      |
|  | LDVs Total              | 7,973          | 7,973     | 0%         | 1,040.16                | 787.37   | -24%       | 10,510.623                | 7,754.138   | -2,756.485   | -26%         |              |      |
|  |                         | MTWs Total     | 39,685    | 39,685     | 0%                      | 1,040.16 | 787.37     | -24%                      | 10,510.623  | 7,754.138    | -2,756.485   | -26%         |      |
|  | 1.A.3.b. Road Transport | Gasoline       | pre-Cars  | 2,879,688  | 2,879,688               | 0%       | 219.62     | 168.23                    | -23%        | 645,965,162  | 349,851,296  | -296,113,866 | -46% |
|  |                         |                | Car 1     | 2,879,688  | 2,879,688               | 0%       | 219.62     | 168.23                    | -23%        | 645,965,162  | 349,851,296  | -296,113,866 | -46% |
|  |                         |                | Car 2     | 2,879,688  | 2,879,688               | 0%       | 219.62     | 168.23                    | -23%        | 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     | -5%                       | 7,035,041   | 6,189,785   | -836,256     | -12% |
|                                       |            | Euro 1                  | 47,487    | 47,487     | 0%                      | 348.56   | 341.62     | -2%                       | 16,571,746  | 11,426,129  | -5,145,617   | -31% |
|                                       |            | Euro 2                  | 72,781    | 72,781     | 0%                      | 194.27   | 137.82     | -29%                      | 13,487,749  | 10,035,380  | -3,372,369   | -25% |
|                                       |            | 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%                      | 1,887,355   | 4,681,311   | 2,793,956    | 142% |
|                                       |            | Euro 6                  | 282       | 282        | 0%                      | 25.06    | 45.13      | 74%                       | 7,339       | 12,736      | 5,399        | 74%  |
|                                       |            | Gasoline total          | 794,267   | 794,267    | 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      | -17% |
|                                       |            | 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               | 1,349,512 | 1,349,512  | 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     | -52%                      | 189,985     | 70,295      | -119,690     | -60% |
|                                       |            | Euro 2                  | 989       | 989        | 0%                      | 271.16   | 195.74     | -28%                      | 268,134     | 133,538     | -134,596     | -50% |
|                                       |            | 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%                      | 15.37    | 47.58      | 210%                      | 2           | 6           | 4            | 210% |
|                                       |            | Gasoline total          | 5,657     | 5,657      | 0%                      | 218.93   | 183.15     | -16%                      | 1,238,520   | 1,692,662   | 454,142      | 37%  |
|                                       | Diesel Oil | pre-Euro                | 3,281     | 3,281      | 0%                      | 424.46   | 386.79     | -9%                       | 1,368,754   | 982,093     | -386,661     | -28% |
|                                       |            | Euro 1                  | 3,666     | 3,666      | 0%                      | 398.34   | 276.24     | -30%                      | 1,445,980   | 787,634     | -658,346     | -46% |
|                                       |            | Euro 2                  | 8,479     | 8,479      | 0%                      | 336.40   | 133.39     | -40%                      | 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%                      | 15.14    | 89.85      | -81%                      | 122         | 72          | -50          | -41% |
|                                       |            | Diesel oil total        | 114,550   | 114,550    | 0%                      | 485.91   | 126.17     | -74%                      | 55,186,382  | 13,741,354  | -41,445,028  | -74% |
|                                       |            | FCs Total               | 129,088   | 129,088    | 0%                      | 489.51   | 123.61     | -74%                      | 56,344,963  | 14,824,656  | -41,520,307  | -74% |
| 1.A.3.b.ii. Heavy Duty Vehicles Buses | Gasoline   | pre-Euro                | 1,326     | 1,326      | 0%                      | 1091.46  | 1918.46    | 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         | -0%  |
|                                       |            | Euro 2                  | 7,789     | 7,789      | 0%                      | 703.46   | 643.34     | -9%                       | 5,085,091   | 4,597,478   | -487,613     | -10% |
|                                       |            | Euro 3                  | 14,483    | 14,483     | 0%                      | 629.94   | 457.61     | -27%                      | 9,073,137   | 6,689,744   | -2,383,393   | -27% |
|                                       |            | 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   | -62% |
|                                       |            | Euro 6                  | 73        | 73         | 0%                      | 64.52    | 182.99     | 284%                      | 3,961       | 13,296      | 9,334        | 236% |
|                                       |            | Buses Total             | 50,962    | 50,962     | 0%                      | 533.22   | 384.33     | -28%                      | 27,141,913  | 19,965,288  | -7,176,625   | -27% |
|                                       | Diesel Oil | pre-Euro                | 6,922     | 6,922      | 0%                      | 1036.95  | 158.82     | -87%                      | 7,107,543   | 5,252,345   | -1,855,198   | -26% |
|                                       |            | Euro 1                  | 3,630     | 3,630      | 0%                      | 743.70   | 570.57     | -23%                      | 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   | 370.21     | -42%                      | 61,387,137  | 35,888,665  | -25,498,472  | -42% |
|                                       |            | Euro 4                  | 69,550    | 69,550     | 0%                      | 366.50   | 288.44     | -21%                      | 19,982,680  | 14,680,877  | -5,301,723   | -27% |
|                                       |            | Euro 5                  | 485,981   | 485,981    | 0%                      | 261.24   | 152.32     | -42%                      | 116,149,955 | 61,626,577  | -54,523,378  | -47% |
|                                       |            | Euro 6                  | 2,380     | 2,380      | 0%                      | 188.487  | 360.323    | 191%                      | 188,487     | 360,323     | 171,836      | 91%  |
|                                       |            | Buses Total             | 589,585   | 589,585    | 0%                      | 385.33   | 224.69     | -41%                      | 224,829,180 | 132,064,153 | -92,765,027  | -41% |
|                                       | Gasoline   | pre-Euro                | 6,180     | 6,180      | 0%                      | 122.76   | 151.03     | 23%                       | 822,530     | 1,011,520   | 188,990      | 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%   |
|                                       |            | FCs Total               | 18,268    | 18,268     | 0%                      | 107.43   | 175.28     | 61%                       | 1,982,548   | 3,165,438   | 1,182,890    | 60%  |
|                                       |            | 1.A.3.b. Road Transport | 2,084,964 | 2,084,964  | 0%                      | 295.79   | 151.71     | -49%                      | 616,721,438 | 396,381,343 | -220,340,094 | -40% |

| 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%                       | 7,011,541    | 6,967,452    | -4,444,808  | -63% |
|   |                  | Euro 1        | 37,743    | 37,743     | 0%                      | 353.78   | 341.68      | -3%                       | 13,362,986   | 9,129,436    | -4,233,550  | -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        | 97,782    | 97,782     | 0%                      | 66.38    | 73.19       | 10%                       | 6,481,618    | 7,156,920    | 675,302     | 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   | 784,114       | 784,114   | 0%         | 88.35                   | 74.85    | -16%        | 68,090,687                | 56,671,737   | -11,418,950  | -17%        |      |
|   | Diesel Oil       | pre-Euro      | 1,389     | 1,389      | 0%                      | 312.32   | 284.56      | -9%                       | 433,081      | 368,136      | -64,945     | -15% |
|   |                  | Euro 1        | 5,626     | 5,626      | 0%                      | 268.42   | 246.79      | -11%                      | 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%                      | 87,588,471   | 33,225,566   | -54,362,905 | -62% |
|   |                  | Euro 5        | 233,786   | 233,786    | 0%                      | 435.42   | 149.27      | -66%                      | 101,787,275  | 34,884,788   | -66,902,487 | -66% |
|   | Euro 6           | 4,536         | 4,536     | 0%         | 259.53                  | 149.27   | -42%        | 1,177,151                 | 677,045      | -500,106     | -42%        |      |
| Diesel oil total                                  | 589,131          | 589,131       | 0%        | 437.14     | 158.71                  | -64%     | 257,533,128 | 83,899,619                | -173,633,509 | -64%         |             |      |
| FCs Total   | 1,373,245        | 1,373,245     | 0%        | 237.49     | 111.77                  | -53%     | 317,723,735 | 146,576,886               | -171,146,849 | -53%         |             |      |
| Gasoline  | pre-Euro         | 981           | 981       | 0%         | 618.81                  | 645.95   | 2%          | 1,048,320                 | 1,075,293    | 26,973       | 3%          |      |
|   | Euro 1           | 184           | 184       | 0%         | 803.50                  | 383.22   | -52%        | 187,281                   | 59,328       | -127,953     | -60%        |      |
|   | Euro 2           | 836           | 836       | 0%         | 274.42                  | 291.18   | 11%         | 229,520                   | 188,285      | -41,235      | -18%        |      |
|   | Euro 3           | 784           | 784       | 0%         | 52.66                   | 191.79   | 10%         | 72,691                    | 79,780       | 7,089        | 10%         |      |
|   | Euro 4           | 1,089         | 1,089     | 0%         | 43.70                   | 48.89    | 10%         | 77,284                    | 82,833       | 5,549        | 7%          |      |
|   | Euro 5           | 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%        | 1,131,299                 | 1,696,727    | 565,428      | 50%         |      |
| Diesel Oil  | pre-Euro         | 2,744         | 2,744     | 0%         | 424.37                  | 386.79   | -9%         | 1,168,757                 | 944,928      | -223,829     | -19%        |      |
|   | Euro 1           | 2,945         | 2,945     | 0%         | 398.34                  | 276.24   | -30%        | 1,166,782                 | 634,566      | -532,216     | -46%        |      |
|   | Euro 2           | 6,982         | 6,982     | 0%         | 336.92                  | 133.39   | -40%        | 2,340,147                 | 1,350,614    | -989,533     | -42%        |      |
|   | Euro 3           | 20,421        | 20,421    | 0%         | 568.12                  | 150.38   | -73%        | 11,437,988                | 3,670,823    | -7,767,165   | -73%        |      |
|   | Euro 4           | 55,087        | 55,087    | 0%         | 407.72                  | 90.45    | -42%        | 27,776,440                | 5,040,146    | -22,736,294  | -42%        |      |
|   | Euro 5           | 29,024        | 29,024    | 0%         | 441.97                  | 90.45    | -40%        | 13,181,325                | 2,687,964    | -10,493,361  | -40%        |      |
|   | Euro 6           | 41            | 41        | 0%         | 161.20                  | 90.45    | -40%        | 6,160                     | 3,688        | -2,472       | -40%        |      |
|   | Diesel oil total | 118,777       | 118,777   | 0%         | 488.60                  | 154.83   | -76%        | 57,083,513                | 13,656,480   | -43,427,033  | -76%        |      |
| LDWs Total  | 124,354          | 124,354       | 0%        | 488.74     | 156.03                  | -69%     | 58,214,142  | 14,677,215                | -43,537,927  | -69%         |             |      |
| 1.A.3.a.ii. Heavy Duty Vehicles (LDVs)            | pre-Euro         | 1,172         | 1,172     | 0%         | 1098.69                 | 1019.23  | -7%         | 1,249,028                 | 1,134,143    | -114,885     | -9%         |      |
|   | Euro I           | 1,054         | 1,054     | 0%         | 727.68                  | 750.39   | 3%          | 780,620                   | 791,181      | 10,561       | 1%          |      |
|   | Euro II          | 6,684         | 6,684     | 0%         | 764.87                  | 643.48   | -16%        | 3,324,968                 | 4,379,371    | 1,054,403    | 32%         |      |
|   | Euro III         | 13,187        | 13,187    | 0%         | 638.43                  | 473.65   | -27%        | 6,262,880                 | 5,998,226    | -2,654,575   | -27%        |      |
|   | Euro IV          | 4,946         | 4,946     | 0%         | 460.55                  | 351.71   | -24%        | 2,278,051                 | 1,739,736    | -548,354     | -24%        |      |
|   | Euro V           | 36,096        | 36,096    | 0%         | 368.98                  | 183.48   | -40%        | 8,435,583                 | 4,240,743    | -4,194,761   | -40%        |      |
|   | Euro VI          | 537           | 537       | 0%         | 44.76                   | 183.48   | 310%        | 34,047                    | 86,672       | 74,625       | 310%        |      |
|   | Buses Total      | 51,776        | 51,776    | 0%         | 508.54                  | 340.06   | -29%        | 25,390,969                | 16,620,843   | -7,738,126   | -29%        |      |
| 1.A.3.a.iii. Heavy Duty Vehicle: Trucks & Lorries | pre-Euro         | 5,983         | 5,983     | 0%         | 1030.72                 | 737.35   | -29%        | 6,072,170                 | 4,322,888    | -1,749,303   | -29%        |      |
|   | Euro I           | 2,945         | 2,945     | 0%         | 748.27                  | 583.27   | -24%        | 2,176,946                 | 1,650,960    | -526,987     | -24%        |      |
|   | Euro II          | 16,888        | 16,888    | 0%         | 818.17                  | 510.45   | -37%        | 10,080,881                | 6,949,975    | -3,130,906   | -31%        |      |
|   | Euro III         | 45,574        | 45,574    | 0%         | 633.52                  | 387.73   | -39%        | 47,587,448                | 27,081,147   | -19,506,300  | -39%        |      |
|   | Euro IV          | 42,781        | 42,781    | 0%         | 356.90                  | 287.27   | -27%        | 16,936,867                | 12,289,770   | -4,647,097   | -27%        |      |
|   | Euro V           | 436,980       | 436,980   | 0%         | 261.70                  | 152.65   | -40%        | 123,181,324               | 66,796,436   | -56,384,887  | -40%        |      |
|   | Euro VI          | 18,020        | 18,020    | 0%         | 91.87                   | 152.65   | 261%        | 913,082                   | 2,750,630    | 1,837,548    | 261%        |      |
|   | Trucks Total     | 680,139       | 680,139   | 0%         | 353.96                  | 287.33   | -21%        | 218,587,531               | 124,188,469  | -94,399,062  | -43%        |      |
| 1.A.3.b.iv. Motorised Two-Wheelers (MOWs)         | pre-Euro         | 6,352         | 6,352     | 0%         | 123.97                  | 151.79   | 23%         | 781,730                   | 964,170      | 182,443      | 23%         |      |
|   | Euro I           | 4,013         | 4,013     | 0%         | 125.91                  | 173.15   | 39%         | 582,073                   | 634,880      | 152,807      | 39%         |      |
|   | Euro 2           | 3,362         | 3,362     | 0%         | 132.24                  | 158.58   | 40%         | 436,688                   | 648,894      | 209,136      | 40%         |      |
|   | Euro 3           | 4,562         | 4,562     | 0%         | 39.81                   | 158.58   | 261%        | 181,610                   | 882,175      | 716,565      | 261%        |      |
|   | Euro 4           | 0             | 0         | 0%         | 0                       | 0        | 0%          | 0                         | 0            | 0            | 0%          |      |
|   | Euro 5           | 0             | 0         | 0%         | 0                       | 0        | 0%          | 0                         | 0            | 0            | 0%          |      |
|   | Euro 6           | 0             | 0         | 0%         | 0                       | 0        | 0%          | 0                         | 0            | 0            | 0%          |      |
|   | MOWs Total       | 18,229        | 18,229    | 0%         | 104.34                  | 175.38   | 68%         | 1,962,088                 | 3,197,038    | 1,234,951    | 68%         |      |
| 1.A.3.b. Road Transport                           | Total            | 2,132,083     | 2,132,083 | 0%         | 268.88                  | 182.57   | -50%        | 616,073,963               | 310,854,371  | -305,219,592 | -50%        |      |

| 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   |      |
|   |            | 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                  | 11.647    | 11.647     | 0%                      | 812.37   | 844.11     | -11%                      | 7.132.688   | 6.327.484   | -796.844     | -11% |
|   |            | Car 1                     | 30.667    | 30.667     | 0%                      | 368.77   | 343.93     | -32%                      | 11.082.246  | 7.480.641   | -3.621.706   | -32% |
|   |            | Car 2                     | 53.486    | 53.486     | 0%                      | 198.58   | 140.31     | -29%                      | 10.514.477  | 7.584.432   | -3.018.844   | -29% |
|   |            | Car 3                     | 87.374    | 87.374     | 0%                      | 65.31    | 73.93      | 7%                        | 6.955.589   | 6.459.797   | -494.218     | -7%  |
|   |            | Car 4                     | 387.759   | 387.759    | 0%                      | 45.16    | 47.80      | -3%                       | 19.093.585  | 18.536.009  | -523.557     | -3%  |
|   |            | Car 5                     | 171.270   | 171.270    | 0%                      | 18.59    | 47.80      | 151%                      | 3.183.282   | 0.187.581   | -5.004.209   | 151% |
|   |            | Car 6                     | 10.315    | 10.315     | 0%                      | 25.97    | 47.80      | 84%                       | 267.855     | 433.096     | 225.248      | 84%  |
|   |            | Gasoline total            | 752.426   | 752.426    | 0%                      | 76.40    | 73.89      | -3%                       | 57.215.533  | 54.598.521  | -2,616,412   | -3%  |
|   | Diesel Oil | pre-Cars                  | 1.341     | 1.341      | 0%                      | 311.73   | 284.66     | -9%                       | 417.947     | 364.246     | -42,722      | -9%  |
|   |            | Car 1                     | 4.892     | 4.892      | 0%                      | 298.92   | 267.28     | -11%                      | 1.482.284   | 1.387.643   | -156,951     | -11% |
|   |            | Car 2                     | 23.934    | 23.934     | 0%                      | 408.71   | 320.45     | -40%                      | 9.734.484   | 5,276,480   | -4,458,004   | -40% |
|   |            | Car 3                     | 82.749    | 82.749     | 0%                      | 585.53   | 176.81     | -69%                      | 48.481.830  | 14.796.245  | -33,685,585  | -69% |
|   |            | Car 4                     | 211.237   | 211.237    | 0%                      | 297.27   | 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   | 2.440.686   | -1,729,814   | -41% |
|   |            | Diesel oil total          | 626.045   | 626.045    | 0%                      | 415.87   | 159.12     | -62%                      | 272,876,061 | 99,613,892  | -173,262,169 | -62% |
|   |            | Pkcs Total                | 1,338,571 | 1,338,571  | 0%                      | 298.44   | 152.15     | -53%                      | 138,091,584 | 154,652,853 | -175,478,269 | -53% |
|   | Gasoline   | pre-Cars                  | 986       | 986        | 0%                      | 632.44   | 645.95     | 2%                        | 193,683     | 278.724     | 85,844       | 2%   |
|   |            | Car 1                     | 173       | 173        | 0%                      | 968.27   | 989.98     | 64%                       | 150.074     | 53.575      | -96,499      | -64% |
|   |            | Car 2                     | 748       | 748        | 0%                      | 204.73   | 287.11     | -21%                      | 212.888     | 154.839     | -58,029      | -27% |
|   |            | Car 3                     | 771       | 771        | 0%                      | 98.62    | 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      | 2,479        | 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         | 657          | 179% |
|   |            | Gasoline total            | 5.845     | 5.845      | 0%                      | 598.34   | 176.49     | -7%                       | 1,112,584   | 1,031,852   | -88,732      | -7%  |
|   | Diesel Oil | pre-Cars                  | 2.537     | 2.537      | 0%                      | 428.16   | 386.79     | -21%                      | 1,985,879   | 776,259     | -1,209,620   | -21% |
|   |            | Car 1                     | 2.588     | 2.588      | 0%                      | 393.82   | 276.25     | -40%                      | 987.136     | 539,898     | -447,328     | -40% |
|   |            | Car 2                     | 6.087     | 6.087      | 0%                      | 338.91   | 133.25     | -42%                      | 1,385,995   | 1,180,889   | -205,126     | -42% |
|   |            | Car 3                     | 18.220    | 18.220     | 0%                      | 571.75   | 150.58     | -74%                      | 18,417,076  | 2,742,056   | -15,675,020  | -74% |
|   |            | Car 4                     | 52.361    | 52.361     | 0%                      | 498.70   | 91.69      | -82%                      | 26,164,486  | 4,703,746   | -21,460,740  | -82% |
|   |            | Car 5                     | 46.749    | 46.749     | 0%                      | 438.44   | 91.69      | -79%                      | 20,696,234  | 4,258,026   | -16,437,709  | -79% |
|   |            | Car 6                     | 187       | 187        | 0%                      | 151.18   | 91.69      | -60%                      | 29,829      | 17,974      | -11,855      | -60% |
|   |            | Diesel oil total          | 128,528   | 128,528    | 0%                      | 415.56   | 170.94     | -77%                      | 61,146,525  | 14,267,237  | -46,879,318  | -77% |
|   |            | LDNs Total                | 134,423   | 134,423    | 0%                      | 463.56   | 153.81     | -75%                      | 62,259,160  | 15,298,849  | -46,968,311  | -75% |
| 1.A.3.b.ii. - Heavy Duty Vehicles - Buses | Diesel Oil | pre-Cars                  | 984       | 984        | 0%                      | 1099.48  | 1919.23    | -5%                       | 1,062,384   | 1,062,921   | -48,443      | -5%  |
|   |            | Car 1                     | 837       | 837        | 0%                      | 728.12   | 170.99     | -3%                       | 659,232     | 628,359     | -18,127      | -3%  |
|   |            | Car 2                     | 5.586     | 5.586      | 0%                      | 704.95   | 643.67     | -9%                       | 4,384,320   | 3,683,441   | -708,807     | -9%  |
|   |            | Car 3                     | 11.221    | 11.221     | 0%                      | 621.20   | 458.38     | -27%                      | 7,082,740   | 5,143,628   | -1,939,228   | -27% |
|   |            | Car 4                     | 4.270     | 4.270      | 0%                      | 461.10   | 361.79     | -24%                      | 1,972,610   | 1,584,978   | -467,632     | -24% |
|   |            | Car 5                     | 22.042    | 22.042     | 0%                      | 368.55   | 183.99     | -40%                      | 7,726,921   | 4,065,632   | -3,671,389   | -40% |
|   |            | Car 6                     | 4.182     | 4.182      | 0%                      | 42.78    | 183.99     | 330%                      | 178,913     | 789,476     | 610,563      | 330% |
|   |            | Buses Total               | 49,143    | 49,143     | 0%                      | 468.37   | 339.99     | -27%                      | 23,017,115  | 16,788,234  | -6,308,881   | -27% |
|   | Gasoline   | pre-Cars                  | 4.782     | 4.782      | 0%                      | 1034.34  | 737.35     | -29%                      | 4,945,942   | 3,525,898   | -1,428,134   | -29% |
|   |            | Car 1                     | 2.285     | 2.285      | 0%                      | 748.66   | 581.41     | -22%                      | 1,800,089   | 1,237,759   | -562,348     | -22% |
|   |            | Car 2                     | 13.623    | 13.623     | 0%                      | 817.90   | 510.38     | -30%                      | 11,446,862  | 6,565,738   | -4,891,123   | -30% |
|   |            | Car 3                     | 54.685    | 54.685     | 0%                      | 632.52   | 384.41     | -42%                      | 36,589,677  | 19,927,835  | -16,661,841  | -42% |
|   |            | Car 4                     | 34.037    | 34.037     | 0%                      | 396.37   | 285.34     | -30%                      | 13,481,158  | 9,711,896   | -3,779,262   | -30% |
|   |            | Car 5                     | 389,283   | 389,283    | 0%                      | 282.92   | 153.65     | -46%                      | 110,112,782 | 59,688,643  | -50,424,148  | -46% |
|   |            | Car 6                     | 34.214    | 34.214     | 0%                      | 63.96    | 153.65     | 189%                      | 3,937,089   | 11,368,682  | 7,421,413    | 189% |
|   |            | Trucks Total              | 572,754   | 572,754    | 0%                      | 314.85   | 196.65     | -38%                      | 179,874,133 | 112,285,582 | -67,588,551  | -38% |
|   | Gasoline   | pre-Cars                  | 6.185     | 6.185      | 0%                      | 122.85   | 158.64     | 29%                       | 795.185     | 974.388     | 218.182      | 29%  |
|   |            | Car 1                     | 3.037     | 3.037      | 0%                      | 134.71   | 174.84     | 40%                       | 478,514     | 670,859     | 192,346      | 40%  |
|   |            | Car 2                     | 3.365     | 3.365      | 0%                      | 128.94   | 186.25     | 52%                       | 433,874     | 680,378     | 246,504      | 52%  |
|   |            | Car 3                     | 5.385     | 5.385      | 0%                      | 38.53    | 186.25     | 386%                      | 29,722      | 1,041,189   | 1,011,467    | 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%   |
|   |            | LDNs Total                | 18,673    | 18,673     | 0%                      | 108.59   | 179.24     | 78%                       | 1,878,294   | 3,386,794   | 1,488,499    | 78%  |
|   |            | 1.A.3.b. - Road Transport | 2,153,563 | 2,153,563  | 0%                      | 277.27   | 140.35     | -49%                      | 597,120,287 | 362,252,271 | -234,868,025 | -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  |      |
|   |                | 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      | 11.380    | 11.380     | 0%                      | 833.23   | 844.11      | -1%                       | 7.266.152   | 6.191.942    | -1.014.168  | -14% |
|   |                | Car 1         | 34.112    | 34.112     | 0%                      | 371.34   | 345.71      | -34%                      | 8.963.681   | 5.924.574    | -3.029.228  | -34% |
|   |                | Car 2         | 42.925    | 42.925     | 0%                      | 297.78   | 142.69      | -32%                      | 8.918.785   | 6.099.659    | -2.818.648  | -32% |
|   |                | Car 3         | 72.871    | 72.871     | 0%                      | 73.86    | 74.74       | 1%                        | 5.381.361   | 5.448.237    | 64.897      | 1%   |
|   |                | Car 4         | 363.474   | 363.474    | 0%                      | 52.36    | 49.62       | -5%                       | 18.485.637  | 17.326.221   | -1.159.416  | -6%  |
|   |                | Car 5         | 180.783   | 180.783    | 0%                      | 19.11    | 49.62       | 157%                      | 3.454.481   | 0.881.456    | -5.406.375  | 157% |
|   | Car 6          | 29.612        | 29.612    | 0%         | 26.70                   | 49.62    | 84%         | 790.781                   | 1.451.433   | 652.752      | 84%         |      |
|   | Gasoline total | 715.156       | 715.156   | 0%         | 76.38                   | 71.73    | -6%         | 53,196,187                | 51,380,983  | -1,889,895   | -4%         |      |
|   | Diesel Oil     | pre-Cars      | 1.282     | 1.282      | 0%                      | 313.32   | 284.66      | -9%                       | 267.917     | 239.733      | -28.184     | -9%  |
|   |                | Car 1         | 4.279     | 4.279      | 0%                      | 298.14   | 267.84      | -10%                      | 1,261.930   | 1,129.989    | -132.821    | -10% |
|   |                | Car 2         | 19.689    | 19.689     | 0%                      | 407.80   | 220.36      | -46%                      | 8.913.687   | 4.338.719    | -3.674.968  | -46% |
|   |                | Car 3         | 71.044    | 71.044     | 0%                      | 595.91   | 179.64      | -70%                      | 42,271.648  | 12,719.982   | -29,551.685 | -70% |
|   |                | Car 4         | 182.410   | 182.410    | 0%                      | 401.42   | 154.67      | -62%                      | 77,237.655  | 29,644.450   | -47,593.206 | -62% |
|   |                | Car 5         | 364.346   | 364.346    | 0%                      | 434.67   | 154.67      | -65%                      | 132,290.433 | 46,090.424   | -86,409.959 | -65% |
|   | Car 6          | 62.576        | 62.576    | 0%         | 259.76                  | 154.67   | -41%        | 13,657.082                | 0.180.384   | -5,556.778   | -41%        |      |
| Diesel oil total                          | 645.565        | 645.565       | 0%        | 426.19     | 159.88                  | -63%     | 275,138,233 | 183,163,591               | -91,964,732 | -63%         |             |      |
| Pkcs Total                                | 1,360,721      | 1,360,721     | 0%        | 245.26     | 153.52                  | -53%     | 168,331,080 | 154,644,484               | -13,686,536 | -53%         |             |      |
| 1.A.3.a.ii. - Light Duty Vehicles (LDVs)  | Gasoline       | pre-Cars      | 979       | 979        | 0%                      | 664.37   | 645.95      | -1%                       | 575.360     | 581.977      | 3.624       | 1%   |
|   |                | Car 1         | 150       | 150        | 0%                      | 895.63   | 911.93      | 46%                       | 134.523     | 46.851       | -87.672     | -46% |
|   |                | Car 2         | 629       | 629        | 0%                      | 298.27   | 212.94      | -29%                      | 187.533     | 133.879      | -53.654     | -29% |
|   |                | Car 3         | 781       | 781        | 0%                      | 105.50   | 186.62      | 3%                        | 73.969      | 76.155       | 2.186       | 3%   |
|   |                | Car 4         | 1.720     | 1.720      | 0%                      | 47.06    | 51.30       | 9%                        | 80.950      | 80.240       | -710        | -1%  |
|   |                | Car 5         | 1.620     | 1.620      | 0%                      | 18.41    | 51.30       | 179%                      | 29.812      | 83.086       | 53.274      | 179% |
|   | Car 6          | 94            | 94        | 0%         | 18.71                   | 51.30    | 174%        | 1.752                     | 4.884       | 3.162        | 174%        |      |
|   | Gasoline total | 5.793         | 5.793     | 0%         | 597.52                  | 172.88   | -8%         | 1,083,507                 | 1,080,999   | -2,508       | -0%         |      |
|   | Diesel Oil     | pre-Cars      | 2.323     | 2.323      | 0%                      | 418.91   | 386.79      | -26%                      | 986.185     | 712.531      | -253.654    | -26% |
|   |                | Car 1         | 2.186     | 2.186      | 0%                      | 391.47   | 276.25      | -40%                      | 924.270     | 453.227      | -471.043    | -40% |
|   |                | Car 2         | 5.025     | 5.025      | 0%                      | 324.91   | 133.25      | -40%                      | 1,632.296   | 971.296      | -660.928    | -40% |
|   |                | Car 3         | 15.781    | 15.781     | 0%                      | 304.82   | 150.67      | -50%                      | 5.112.414   | 2,365.703    | -2,746.711  | -50% |
|   |                | Car 4         | 47.480    | 47.480     | 0%                      | 501.73   | 91.76       | -42%                      | 23,762.396  | 3,540.298    | -19,434.098 | -42% |
|   |                | Car 5         | 62.146    | 62.146     | 0%                      | 436.13   | 91.76       | -79%                      | 27,090.214  | 5,630.295    | -21,342.009 | -79% |
|   | Car 6          | 635           | 635       | 0%         | 154.91                  | 91.76    | -40%        | 87.768                    | 62.236      | -25.528      | -40%        |      |
| LDVs total                                | 135.366        | 135.366       | 0%        | 589.35     | 187.96                  | -77%     | 63,565,843  | 54,681.406                | -8,884,357  | -77%         |             |      |
| LDVs total                                | 141.098        | 141.098       | 0%        | 416.76     | 170.62                  | -16%     | 64,968,530  | 55,688.498                | -9,280,031  | -14%         |             |      |
| 1.A.3.a.iii. - Heavy Duty Vehicles (HDVs) | Diesel Oil     | pre-Cars      | 979       | 979        | 0%                      | 1070.34  | 1019.23     | -5%                       | 1.048.372   | 995.256      | -53.856     | -5%  |
|   |                | Car 1         | 747       | 747        | 0%                      | 738.76   | 715.91      | 3%                        | 542.471     | 581.636      | 18.955      | 3%   |
|   |                | Car 2         | 5.211     | 5.211      | 0%                      | 707.43   | 644.46      | -10%                      | 4.103.087   | 3,359.644    | -743.453    | -18% |
|   |                | Car 3         | 15.282    | 15.282     | 0%                      | 633.86   | 488.67      | -24%                      | 7.541.732   | 5.174.989    | -1,966.822  | -26% |
|   |                | Car 4         | 4.686     | 4.686      | 0%                      | 689.70   | 351.99      | -30%                      | 2.154.086   | 1.154.177    | -939.828    | -20% |
|   |                | Car 5         | 36.267    | 36.267     | 0%                      | 368.77   | 184.59      | -49%                      | 8.737.608   | 4.477.641    | -4,269.427  | -49% |
|   | Car 6          | 5.224         | 5.224     | 0%         | 63.13                   | 184.59   | 247%        | 277.542                   | 964.226     | 686.684      | 247%        |      |
|   | HDVs total     | 52.887        | 52.887    | 0%         | 438.96                  | 327.99   | -29%        | 23,937,817                | 17,149.448  | -6,888,319   | -29%        |      |
|   | pre-Cars       | 4.379         | 4.379     | 0%         | 1034.69                 | 973.35   | -29%        | 4.488.571                 | 3.184.420   | -1.294.143   | -29%        |      |
|   | Car 1          | 1.983         | 1.983     | 0%         | 748.71                  | 553.48   | -26%        | 1.387.291                 | 1.025.551   | -361.744     | -26%        |      |
|   | Car 2          | 11.082        | 11.082    | 0%         | 817.38                  | 587.99   | -30%        | 8,072.940                 | 5,632.450   | -2,440.391   | -30%        |      |
|   | Car 3          | 41.282        | 41.282    | 0%         | 629.55                  | 381.66   | -39%        | 27.463.779                | 17.724.673  | -9,739.106   | -35%        |      |
|   | Car 4          | 39.233        | 39.233    | 0%         | 356.86                  | 287.72   | -20%        | 11,572.860                | 9,294.190   | -2,278.769   | -20%        |      |
|   | Car 5          | 309.736       | 309.736   | 0%         | 264.17                  | 153.49   | -40%        | 80,413.973                | 60,565.436  | -19,847.577  | -40%        |      |
|   | Car 6          | 179.787       | 179.787   | 0%         | 67.49                   | 153.49   | 167%        | 9,813.364                 | 26,282.637  | 16,469.684   | 167%        |      |
| Trucks Total                              | 589.431        | 589.431       | 0%        | 268.69     | 189.33                  | -30%     | 157,189,675 | 119,520.933               | -36,668,741 | -23%         |             |      |
| pre-Cars                                  | 5.544          | 5.544         | 0%        | 125.41     | 157.28                  | 25%      | 720.441     | 983.470                   | 183.828     | 25%          |             |      |
| Car 1                                     | 1.517          | 1.517         | 0%        | 127.40     | 176.22                  | 39%      | 448.086     | 670.819                   | 171.733     | 39%          |             |      |
| Car 2                                     | 3.382          | 3.382         | 0%        | 127.35     | 196.53                  | 55%      | 430.680     | 666.565                   | 236.206     | 55%          |             |      |
| Car 3                                     | 5.91           | 5.911         | 0%        | 48.29      | 196.53                  | 399%     | 236.136     | 1.144.416                 | 1.168.280   | 399%         |             |      |
| Car 4                                     | 4              | 0             | 0%        | 16.96      |                         | 180%     | 89          | 884                       | 736         | 561%         |             |      |
| Car 5                                     | 0              | 0             | 0%        |            |                         | 0%       | 0           | 0                         | 0           | 0%           |             |      |
| MWVs total                                | 18.499         | 18.499        | 0%        | 99.52      | 180.65                  | 80%      | 1,833.382   | 5,334.472                 | 1,501.898   | 80%          |             |      |
| 1.A.3.b. - Road Transport                 | Total          | 2.161.592     | 2.161.592 | 0%         | 263.86                  | 139.26   | -48%        | 575,975.295               | 381,697.596 | -194,853.578 | -48%        |      |



| 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%                      | 634.75   | 644.11      | -14%                      | 7 470 914    | 6 410 967  | -1 059 947  | -14%       |      |
|   |                          | Car 1         | 20 270   | 20 270     | 0%                      | 372.25   | 341.68      | -8%                       | 7 545 483    | 4 986 888  | -2 558 595  | -34%       |      |
|   |                          | Car 2         | 36 062   | 36 062     | 0%                      | 212.73   | 143.11      | -33%                      | 7 671 581    | 5 180 897  | -2 490 684  | -33%       |      |
|   |                          | Car 3         | 83 039   | 83 039     | 0%                      | 76.17    | 75.50       | -1%                       | 4 881 482    | 4 759 259  | -122 223    | -1%        |      |
|   |                          | Car 4         | 334 413  | 334 413    | 0%                      | 53.74    | 50.17       | -7%                       | 17 363 364   | 16 777 445 | -585 919    | -3%        |      |
|   |                          | 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%         | 79.93                   | 70.65    | -9%         | 58 736 267                | 50 535 049   | -8 201 218 | -14%        |            |      |
|   | Diesel Oil               | pre-Cars      | 1 280    | 1 280      | 0%                      | 369.76   | 254.56      | -31%                      | 396 262      | 339 173    | -57 089     | -14%       |      |
|   |                          | Car 1         | 3 749    | 3 749      | 0%                      | 299.36   | 269.66      | -10%                      | 1 122 449    | 1 011 625  | -110 824    | -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%                      | 36 991 999   | 11 085 409 | -25 906 590 | -70%       |      |
|   |                          | Car 4         | 175 040  | 175 040    | 0%                      | 405.76   | 156.24      | -61%                      | 71 362 220   | 27 474 086 | -43 888 134 | -61%       |      |
|   |                          | Car 5         | 299 054  | 299 054    | 0%                      | 433.34   | 156.24      | -64%                      | 130 032 044  | 46 019 229 | -83 912 815 | -64%       |      |
| Car 6                                       | 116 034                  | 116 034       | 0%       | 268.75     | 156.24                  | -41%     | 30 427 555  | 10 232 785                | -20 194 770  | -66%       |             |            |      |
| Diesel oil total                            | 625 119                  | 625 119       | 0%       | 418.36     | 160.76                  | -61%     | 277 941 660 | 188 535 230               | -89 406 430  | -61%       |             |            |      |
| Pkx Total                                   | 1 380 391                | 1 380 391     | 0%       | 235.75     | 154.41                  | -35%     | 627 778 927 | 199 070 280               | -428 708 647 | -68%       |             |            |      |
| 1.A.3.b.i - Light Duty Vehicles (LDVs)      | Gasoline                 | pre-Cars      | 910      | 910        | 0%                      | 602.79   | 645.35      | -1%                       | 593 186      | 547 543    | -45 643     | -8%        |      |
|   |                          | Car 1         | 136      | 136        | 0%                      | 908.31   | 312.78      | -66%                      | 122 126      | 42 425     | -79 701     | -66%       |      |
|   |                          | Car 2         | 540      | 540        | 0%                      | 308.39   | 217.84      | -30%                      | 162 311      | 117 737    | -44 574     | -28%       |      |
|   |                          | 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%                       | 73 714       | 84 003     | 10 289      | 14%        |      |
|   |                          | Car 5         | 1 724    | 1 724      | 0%                      | 19.82    | 52.36       | 164%                      | 34 157       | 80 258     | 46 101      | 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   | -71%        | 1 068 292                 | 1 013 678    | -54 614    | -5%         |            |      |
|   | Diesel Oil               | pre-Cars      | 2 189    | 2 189      | 0%                      | 414.81   | 385.79      | -7%                       | 899 549      | 885 433    | -14 116     | -2%        |      |
|   |                          | Car 1         | 1 780    | 1 780      | 0%                      | 391.89   | 276.25      | -30%                      | 780 189      | 385 371    | -394 818    | -50%       |      |
|   |                          | 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%                      | 558.91   | 150.77      | -74%                      | 8 064 323    | 2 040 233  | -6 024 090  | -74%       |      |
|   |                          | Car 4         | 43 141   | 43 141     | 0%                      | 504.48   | 32.40       | -94%                      | 21 783 989   | 3 986 141  | -17 797 848 | -82%       |      |
|   |                          | Car 5         | 74 231   | 74 231     | 0%                      | 434.16   | 32.40       | -93%                      | 32 223 283   | 6 658 730  | -25 564 553 | -79%       |      |
| Car 6                                       | 4 921                    | 4 921         | 0%       | 113.49     | 32.40                   | -72%     | 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                | -50 456 725  | -77%       |             |            |      |
| LN% Total                                   | 149 994                  | 149 994       | 0%       | 445.23     | 188.29                  | -58%     | 66 781 025  | 16 229 684                | -50 551 341  | -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    | 12 561      | 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      | -28%                      | 6 530 364    | 4 741 827  | -1 788 537  | -27%       |      |
|   |                          | Car IV        | 4 449    | 4 449      | 0%                      | 475.90   | 382.29      | -20%                      | 2 117 219    | 1 566 881  | -550 338    | -26%       |      |
|   |                          | Car V         | 34 380   | 34 380     | 0%                      | 366.36   | 185.22      | -49%                      | 8 935 974    | 4 617 617  | -4 318 357  | -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      | -4%                       | 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      | -22%                      | 1 163 482    | 789 813    | -373 669    | -32%       |      |
|   |                          | Car II        | 8 876    | 8 876      | 0%                      | 817.75   | 585.52      | -30%                      | 7 258 047    | 4 486 626  | -2 771 421  | -38%       |      |
|   |                          | Car III       | 34 167   | 34 167     | 0%                      | 638.91   | 458.91      | -28%                      | 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  | -2 754 763  | -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                | 5 884 997    | 149%       |             |            |      |
| Trucks Total                                | 584 013                  | 584 013       | 0%       | 228.31     | 189.07                  | -26%     | 134 617 839 | 187 446 261               | 52 828 422   | 39%        |             |            |      |
| 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    | 187 217     | 24%        |      |
|   |                          | Car 1         | 3 360    | 3 360      | 0%                      | 127.11   | 177.29      | 39%                       | 427 113      | 585 796    | 158 683     | 39%        |      |
|   |                          | Car 2         | 3 375    | 3 375      | 0%                      | 125.94   | 187.68      | 50%                       | 421 961      | 687 078    | 265 117     | 63%        |      |
|   |                          | Car 3         | 6 443    | 6 443      | 0%                      | 48.36    | 187.68      | 381%                      | 209 627      | 1 273 671  | 1 064 044   | 508%       |      |
|   |                          | Car 4         | 66       | 66         | 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      | 5 543    | 5 543      | 0%                      | 125.59   | 155.78      | 24%                       | 696 072      | 883 289    | 187 217     | 24%        |      |
|   |                          | Car 1         | 3 360    | 3 360      | 0%                      | 127.11   | 177.29      | 39%                       | 427 113      | 585 796    | 158 683     | 39%        |      |
|   |                          | Car 2         | 3 375    | 3 375      | 0%                      | 125.94   | 187.68      | 50%                       | 421 961      | 687 078    | 265 117     | 63%        |      |
|   |                          | Car 3         | 6 443    | 6 443      | 0%                      | 48.36    | 187.68      | 381%                      | 209 627      | 1 273 671  | 1 064 044   | 508%       |      |
|   | 1.A.3.b - Road Transport | Gasoline      | pre-Cars | 12 282     | 12 282                  | 0%       | 636.73      | 644.11                    | -1%          | 7 614 267  | 6 480 187   | -1 134 080 | -15% |
|   |                          |               | Car 1    | 17 449     | 17 449                  | 0%       | 372.96      | 341.68                    | -8%          | 6 588 311  | 4 217 644   | -2 370 667 | -36% |
|   |                          |               | Car 2    | 30 435     | 30 435                  | 0%       | 217.43      | 141.75                    | -35%         | 6 617 570  | 4 314 140   | -2 303 430 | -35% |
| Car 3                                       |                          |               | 54 271   | 54 271     | 0%                      | 78.48    | 76.27       | -3%                       | 4 254 938    | 4 139 376  | -115 562    | -3%        |      |

| 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     | -10%                      | 7 780 965   | 6 648 721   | -1 132 234   | -15% |
|   |            | Car 1            | 14 362    | 14 362     | 0%                      | 374.24   | 341.68     | -9%                       | 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            | 159 041   | 159 041    | 0%                      | 6.00     | 52.30      | 788%                      | 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     | 146 173     | -25 503      | -15% |
|   |            | Car 1            | 2 849     | 2 849      | 0%                      | 298.17   | 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   | -45% |
|   |            | 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 | 40 293 731  | -64 292 055  | -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 | 646 074   | 646 074    | 0%                      | 375.66   | 163.38     | -56%                      | 247 596 063 | 188 768 684 | -58 827 379  | -24% |
|   |            | FCs Total        | 1 363 181 | 1 363 181  | 0%                      | 214.34   | 114.68     | -46%                      | 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            | 188       | 188        | 0%                      | 911.58   | 312.78     | -66%                      | 98 528      | 33 895      | -64 633      | -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%                      | 19.09    | 54.36      | 182%                      | 39 550      | 89 326      | 49 776       | 182% |
|   |            | Gasoline total   | 6 315     | 6 315      | 0%                      | 154.22   | 160.11     | 4%                        | 999 199     | 1 091 138   | 91 939       | 9%   |
| 1.A.3.b.i - Light Duty Vehicles (LDVs)      | Gasoline   | pre-Cars         | 1 872     | 1 872      | 0%                      | 411.51   | 386.79     | -6%                       | 771 337     | 674 432     | -96 905      | -13% |
|   |            | Car 1            | 1 285     | 1 285      | 0%                      | 389.94   | 276.25     | -29%                      | 483 129     | 272 286     | -210 843     | -44% |
|   |            | Car 2            | 2 942     | 2 942      | 0%                      | 318.56   | 193.88     | -39%                      | 965 389     | 550 789     | -414 600     | -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      | -82%                      | 16 929 185  | 3 117 457   | -13 811 728  | -80% |
|   |            | Car 5            | 66 283    | 66 283     | 0%                      | 432.92   | 93.81      | -78%                      | 28 684 880  | 6 217 860   | -22 467 020  | -78% |
|   | Diesel Oil | pre-Cars         | 39 482    | 39 482     | 0%                      | 158.79   | 93.81      | -41%                      | 5 941 615   | 3 686 228   | -2 255 387   | -38% |
|   |            | Car 1            | 154 259   | 154 259    | 0%                      | 384.71   | 182.69     | -53%                      | 59 344 525  | 15 880 316  | -43 464 210  | -75% |
|   |            | Car 2            | 180 574   | 180 574    | 0%                      | 375.86   | 184.94     | -51%                      | 69 343 125  | 16 851 449  | -52 491 676  | -76% |
|   |            | Car 3            | 547       | 547        | 0%                      | 1078.15  | 1919.23    | 78%                       | 589 267     | 557 147     | -32 120      | -5%  |
|   |            | Car 4            | 237       | 237        | 0%                      | 732.78   | 732.67     | 0%                        | 173 676     | 178 368     | 4 692        | 3%   |
|   |            | Car 5            | 2 270     | 2 270      | 0%                      | 787.83   | 646.33     | -18%                      | 1 780 686   | 1 487 437   | -293 249     | -16% |
|   | Diesel Oil | pre-Cars         | 6 757     | 6 757      | 0%                      | 638.89   | 459.32     | -29%                      | 4 262 734   | 3 183 482   | -1 079 252   | -25% |
|   |            | Car 1            | 3 043     | 3 043      | 0%                      | 473.16   | 382.73     | -19%                      | 1 439 790   | 1 073 333   | -366 457     | -25% |
|   |            | Car 2            | 18 189    | 18 189     | 0%                      | 362.42   | 186.37     | -49%                      | 6 463 266   | 3 376 016   | -3 087 249   | -48% |
|   |            | Car 3            | 20 670    | 20 670     | 0%                      | 64.89    | 186.37     | 289%                      | 1 176 026   | 3 682 314   | 2 506 288    | 214% |
|   |            | Car 4            | 91 634    | 91 634     | 0%                      | 309.75   | 283.53     | -8%                       | 15 993 546  | 13 687 186  | -2 306 360   | -15% |
|   |            | Car 5            | 3 262     | 3 262      | 0%                      | 1034.82  | 737.35     | -29%                      | 3 375 359   | 2 485 071   | -890 288     | -26% |
| 1.A.3.b.ii - Heavy Duty Vehicles (HDVs)     | Gasoline   | pre-Cars         | 1 094     | 1 094      | 0%                      | 747.82   | 488.39     | -35%                      | 818 052     | 512 378     | -305 674     | -37% |
|   |            | Car 1            | 5 544     | 5 544      | 0%                      | 817.44   | 581.68     | -29%                      | 4 532 180   | 2 781 516   | -1 750 664   | -39% |
|   |            | Car 2            | 20 583    | 20 583     | 0%                      | 629.54   | 563.68     | -11%                      | 12 367 751  | 7 277 279   | -5 090 472   | -44% |
|   |            | Car 3            | 15 912    | 15 912     | 0%                      | 358.89   | 276.23     | -23%                      | 6 334 421   | 4 386 424   | -1 947 997   | -31% |
|   |            | Car 4            | 154 983   | 154 983    | 0%                      | 250.40   | 154.68     | -38%                      | 45 964 153  | 24 283 389  | -21 680 764  | -47% |
|   |            | Car 5            | 381 799   | 381 799    | 0%                      | 68.78    | 154.68     | 125%                      | 26 251 482  | 69 665 886  | 43 414 404   | 165% |
|   | Diesel Oil | pre-Cars         | 585 186   | 585 186    | 0%                      | 515.18   | 172.19     | -66%                      | 188 173 537 | 180 760 889 | -7 412 648   | -4%  |
|   |            | Car 1            | 4 940     | 4 940      | 0%                      | 128.95   | 188.61     | 46%                       | 622 656     | 783 451     | 160 795      | 26%  |
|   |            | Car 2            | 2 966     | 2 966      | 0%                      | 128.14   | 177.79     | 41%                       | 374 114     | 527 294     | 153 180      | 41%  |
|   |            | Car 3            | 3 221     | 3 221      | 0%                      | 128.33   | 188.64     | 46%                       | 387 596     | 639 833     | 252 237      | 65%  |
|   |            | Car 4            | 6 241     | 6 241      | 0%                      | 48.24    | 188.64     | 288%                      | 251 126     | 1 239 686   | 988 560      | 394% |
|   |            | Car 5            | 1 130     | 1 130      | 0%                      | 58.41    | 188.64     | 323%                      | 23 066      | 224 682     | 201 616      | 875% |
|   |            | Gasoline total   | 18 487    | 18 487     | 0%                      | 85.86    | 188.61     | 198%                      | 1 658 558   | 3 454 767   | 1 796 209    | 108% |
|   |            | FCs Total        | 2 180 983 | 2 180 983  | 0%                      | 215.85   | 133.49     | -38%                      | 478 758 286 | 291 129 652 | -187 628 634 | -39% |
| 1.A.3.b.iii - Motorised Two-Wheelers (MTWs) | Gasoline   | pre-Cars         | 13 588    | 13 588     | 0%                      | 628.58   | 644.11     | -10%                      | 8 664 621   | 7 382 686   | -1 281 935   | -15% |
|   |            | Car 1            | 12 427    | 12 427     | 0%                      | 378.32   | 341.68     | -9%                       | 4 781 480   | 3 083 383   | -1 698 096   | -36% |
|   |            | Car 2            | 20 086    | 20 086     | 0%                      | 225.58   | 92.58      | -59%                      | 4 531 070   | 1 858 018   | -2 673 052   | -59% |
|   |            | Car 3            | 36 216    | 36 216     | 0%                      | 82.22    | 78.12      | -5%                       | 2 977 840   | 2 829 186   | -148 654     | -5%  |
|   |            | Car 4            | 295 220   | 295 220    | 0%                      | 57.04    | 53.29      | -7%                       | 14 588 285  | 13 589 621  | -998 664     | -7%  |
|   |            | Car 5            | 180 537   | 180 537    | 0%                      | 19.77    | 53.29      | 170%                      | 3 173 728   | 8 054 356   | 4 880 628    | 154% |
|   | Diesel Oil | pre-Cars         | 285 636   | 285 636    | 0%                      | 25.63    | 53.29      | 180%                      | 5 295 099   | 11 010 782  | 5 715 683    | 180% |
|   |            | Car 1            | 174 031   | 174 031    | 0%                      | 62.36    | 68.45      | 10%                       | 43 961 941  | 48 238 025  | 4 276 084    | 10%  |
|   |            | Car 2            | 3 745     | 3 745      | 0%                      | 313.70   | 244.92     | -22%                      | 913 180     | 734 921     | -178 259     | -21% |
|   |            | Car 3            | 2 545     | 2 545      | 0%                      | 298.80   | 272.65     | -9%                       | 764 913     | 687 786     | -77 127      | -10% |
|   |            | Car 4            | 8 891     | 8 891      | 0%                      | 407.19   | 229.16     | -44%                      | 3 420 286   | 2 037 480   | -1 382 806   | -40% |
|   |            | Car 5            | 33 079    | 33 079     | 0%                      | 615.11   | 180.42     | -71%                      | 20 310 125  | 5 967 483   | -14 342 642  | -71% |
|   | Gasoline   | pre-Cars         | 111 335   | 111 335    | 0%                      | 419.17   | 182.44     | -56%                      | 48 688 685  | 10 885 228  | -37 803 457  | -78% |
|   |            | Car 1            | 231 784   | 231 784    | 0%                      | 419.37   | 182.44     | -56%                      | 95 117 643  | 37 650 997  | -57 466 646  | -60% |
|   |            | Car 2            | 273 511   | 273 511    | 0%                      | 227.36   | 182.44     | -20%                      | 62 183 230  | 44 429 184  | -17 754 046  | -29% |
|   |            | Car 3            | 663 841   | 663 841    | 0%                      | 345.81   | 165.67     | -52%                      | 229 566 088 | 189 582 982 | -39 983 106  | -17% |
|   |            | Car 4            | 1 368 532 | 1 368 532  | 0%                      | 699.83   | 155.32     | -78%                      | 273 668 009 | 157 821 687 | -115 846 322 | -42% |
|   |            | Car 5            | 909       | 909        | 0%                      | 644.89   | 645.95     | 1%                        | 687 449     | 581 962     | -105 487     | -15% |
| Gasoline                                    | pre-Cars   | 91               | 91        | 0%         | 915.28                  | 512.78   | -44%       | 88 953                    | 30 396      | -58 557     | -66%         |      |
|   | Car 1      | 316              | 316       | 0%         | 304.63                  | 224.45   | -26%       | 96 158                    | 70 848      | -25 310     | -26%         |      |
| 1.A.3.b.iv - Motorised Two-Wheelers (MTWs)  | Gasoline   | pre-Cars         | 91        | 91         | 0%                      | 915.28   | 512.78     | -44%                      | 88 953      | 30 396      | -58 557      | -66% |
|   |            | Car 1            | 316       | 316        | 0%                      | 304.63   | 224.45     | -26%                      | 96 158      | 70 848      | -25 310      | -26% |
|   |            | Car 2            | 447       | 447        | 0%                      | 112.68   | 121.47     | 8%                        | 59 355      | 54 283      | -5 072       | -8%  |
|   |            | Car 3            | 1 126     | 1 126      | 0%                      | 53.08    | 55.26      | 4%                        | 59 652      | 62 199      | 2 547        | 4%   |
|   |            | Car 4            | 1 361     | 1 361      | 0%                      | 25.34    | 55.26      | 180%                      | 34 240      | 74 680      | 40 440       | 180% |
|   |            | Car 5            | 2 420     | 2 420      | 0%                      | 18.75    | 55.26      | 180%                      | 45 383      | 133 753     | 88 370       | 180% |
|   | Diesel Oil | pre-Cars         | 6 483     | 6 483      | 0%                      | 546.88   | 153.25     | -72%                      | 976 299     | 1 004 150   | 27 851       | 3%   |
|   |            | Car 1            | 1 744     | 1 744      | 0%                      | 418.96   | 386.79     | -7%                       | 725 111     | 541 376     | -183 735     | -25% |
|   |            | Car 2            | 1 079     | 1 079      | 0%                      | 389.52   | 276.25     | -29%                      | 420 285     | 232 256     | -188 029     | -44% |
|   |            | Car 3            | 2 334     | 2 334      | 0%                      | 315.90   | 194.79     | -38%                      | 737 682     | 454 630     | -283 052     | -38% |
|   |            | Car 4            | 7 649     | 7 649      | 0%                      | 601.11   | 150.79     | -75%                      | 4 587 943   | 1 152 711   | -3 435 232   | -75% |
|   |            | Car 5            | 28 711    | 28 711     | 0%                      | 512.20   | 94.57      | -82%                      | 14 700 380  | 2 715 154   | -11 985 226  | -82% |
|   | Gasoline   | pre-Cars         | 58 716    | 58 716     | 0%                      | 434.30   | 94.57      | -78%                      | 25 499 580  | 6 552 428   | -18 947 152  | -76% |
|   |            | Car 1            | 69 931    | 69 931     | 0%                      | 145.18   | 94.5       | -35%                      | 29 540 441  | 10 429 184  | -19 111 257  | -65% |
| Diesel Oil                                  | pre-Cars   | 1 079            | 1 079     | 0%         | 389.52                  | 276.25   | -29%       | 420 285                   | 232 256     | -188 029    | -44%         |      |
|   | Car 1      | 1 079            | 1 079     | 0%         | 389.52                  | 276.25   | -29%       | 420 285                   | 232 256     | -188 029    | -44%         |      |

|                                   | 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> | <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>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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