

# 1.A.4 - Small Combustion: Mobile Sources (OVERVIEW)

## Short description

| NFR-Code                                        | Source category                                                                     |
|-------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>1.A.4</b>                                    | <b>Small Combustion</b>                                                             |
| <i>including mobile sources sub-categories:</i> |                                                                                     |
| 1.A.4.a ii                                      | <a href="#">Commercial / Institutional: Mobile</a>                                  |
| 1.A.4.b ii                                      | <a href="#">Residential: Household and Gardening: Mobile</a>                        |
| 1.A.4.c ii                                      | <a href="#">Agriculture/Forestry/Fishing: Off-road Vehicles and Other Machinery</a> |
| 1.A.4.c iii                                     | <a href="#">Agriculture/Forestry/Fishing: National Fishing</a>                      |

Mobile sources reported under *NFR 1.A.4 - Small combustion* comprise of such versatile mobile equipment as forklifters (1.A.a ii), gasoline-driven lawn mowers used for gardening (1.A.4.b ii) over tractors in agriculture and harvesters and chain saws in forestry (1.A.4.c ii) to the German deep sea fishing fleet (1.A.4.c iii).



For further information on sub-sector specific consumption data, emission factors and emissions as well as further information on emission trends, recalculations and planned improvements, please follow the links above.

## Method

### Activity data

**Primary activity data** are available from National Energy Balances (NEBs) (AGEB, 2020) <sup>1)</sup>.

Here, aggregated data for NFRs *1.A.a ii*, *1.A.4.c ii* and *1.A.2.g vii* are included in line 67: 'Commercial, trade, services and other consumers'. In contrast, AD for is available directly from line 66: 'Households'. Furthermore, AD for is included partly in NEB lines 6: 'Maritime Bunkers' and 64: 'Coastal and inland navigation'.

Table 1 below tries to demonstrate the breaking-down of primary data in NEB line 67 onto NFRs *1.A.2.g vii*, *1.A.4a ii* and *1.A.4.c ii*. For further information on the resulting specific shares as well as the fuel consumption in NFRs *1.A.4.b ii* and *1.A.4.c iii* please refer to the respective sub-chapters.

Table 1: Primary AD from NEB line 67: 'Commercial, trade, services and other consumers', in terajoules

|                   | 1990    | 1995    | 2000   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015    | 2016    | 2017    | 2018    | 2019    |
|-------------------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|
| <b>diesel oil</b> | 126.920 | 105.800 | 96.425 | 85.293 | 84.674 | 84.918 | 85.850 | 90.599 | 89.516 | 91.362 | 90.044 | 93.377 | 97.410 | 101.911 | 105.895 | 108.752 | 101.519 | 102.654 |
| <b>biodiesel</b>  | 0       | 0       | 0      | 5.460  | 9.376  | 10.468 | 8.163  | 7.239  | 6.863  | 6.375  | 6.355  | 5.538  | 5.986  | 5.575   | 5.614   | 5.806   | 5.901   | 5.845   |

|                    | 1990   | 1995   | 2000   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   |
|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>gasoline</b>    | 26.036 | 17.264 | 14.881 | 14.151 | 13.487 | 12.161 | 12.224 | 9.354  | 9.204  | 8.637  | 5.358  | 5.257  | 4.941  | 8.329  | 7.991  | 7.484  | 7.204  | 7.000  |
| <b>biogasoline</b> | 0      | 0      | 0      | 97     | 194    | 164    | 234    | 267    | 356    | 354    | 237    | 225    | 215    | 361    | 347    | 316    | 324    | 302    |
| <b>LPG</b>         | 0      | 7.963  | 9.238  | 28.246 | 21.209 | 21.752 | 20.860 | 21.222 | 24.605 | 19.193 | 19.582 | 19.559 | 17.945 | 19.916 | 23.260 | 16.971 | 19.426 | 20.844 |

In a first step, annual fuel deliveries to the military as provided in (BAFA, 2020) <sup>2)</sup> ...

Table 2: Annual fuel deliveries to the military as included in NEB line 67, in terajoules

|                    | 1990   | 1995  | 2000  | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  |
|--------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>diesel oil</b>  | 15.037 | 8.001 | 1.364 | 3.206 | 1.701 | 1.664 | 1.139 | 990   | 977   | 620   | 966   | 680   | 683   | 580   | 577   | 415   | 279   | 281   |
| <b>biodiesel</b>   | 0      | 0     | 0     | 214   | 205   | 223   | 114   | 80    | 75    | 43    | 68    | 40    | 42    | 32    | 31    | 22    | 16    | 16    |
| <b>gasoline</b>    | 21.508 | 9.800 | 7.477 | 6.857 | 6.128 | 4.789 | 4.955 | 4.907 | 4.862 | 4.696 | 4.175 | 4.092 | 3.695 | 3.342 | 3.009 | 2.503 | 2.341 | 2.269 |
| <b>biogasoline</b> | 0      | 0     | 0     | 47    | 88    | 65    | 95    | 140   | 188   | 192   | 185   | 175   | 161   | 145   | 131   | 106   | 105   | 98    |

...are deduced from these primary AD, giving the remaining amounts of gasoline and diesel oil for NFRs 1.A.2.g vii, 1.A.a ii and 1.A.4.c ii:

Table 3: Annual fuel deliveries to the remaining sectors covered by NEB line 67, in terajoules

|                    | 1990    | 1995   | 2000   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015    | 2016    | 2017    | 2018    | 2019    |
|--------------------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|
| <b>diesel oil</b>  | 111.883 | 97.799 | 95.061 | 82.087 | 82.973 | 83.253 | 84.710 | 89.608 | 88.539 | 90.742 | 89.078 | 92.697 | 96.727 | 101.331 | 105.318 | 108.337 | 101.240 | 102.373 |
| <b>biodiesel</b>   | 0       | 0      | 0      | 5.245  | 9.171  | 10.246 | 8.049  | 7.159  | 6.788  | 6.331  | 6.287  | 5.497  | 5.944  | 5.543   | 5.583   | 5.784   | 5.885   | 5.829   |
| <b>gasoline</b>    | 4.528   | 7.464  | 7.404  | 7.294  | 7.359  | 7.372  | 7.269  | 4.447  | 4.342  | 3.941  | 1.183  | 1.165  | 1.246  | 4.987   | 4.982   | 4.981   | 4.863   | 4.731   |
| <b>biogasoline</b> | 0       | 0      | 0      | 50     | 106    | 100    | 139    | 127    | 168    | 162    | 52     | 50     | 54     | 216     | 216     | 210     | 219     | 204     |
| <b>LPG</b>         | 0       | 7.963  | 9.238  | 28.246 | 21.209 | 21.752 | 20.860 | 21.222 | 24.605 | 19.193 | 19.582 | 19.559 | 17.945 | 19.916  | 23.260  | 16.971  | 19.426  | 20.844  |

As the National Energy Balances provide no consumption data for LPG before 1995 and as part of the LPG provided in NEB line 67 is used for stationary combustion (whereas all diesel and gasoline fuels are allocated to mobile combustion), activity data for LPG used in in NRMM are taken directly from TREMOD MM.

In another step, the following sub-sectors specific annual percentual contributions to NEB line 67 as computed within TREMOD-MM <sup>3)</sup> are applied to these primary AD to deduce sub-sectors specific AD.

Table 4: Annual percentual contributions of NFRs 1.A.2.g vii, 1.A.a ii and 1.A.4.c ii

|                        | 1990        | 1995        | 2000        | 2005        | 2006        | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | 2013        | 2014        | 2015        | 2016        | 2017        | 2018        | 2019        |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>1 A 2 g vii</b>     | 43,0%       | 46,4%       | 47,0%       | 43,7%       | 44,9%       | 43,3%       | 44,2%       | 43,8%       | 43,1%       | 43,4%       | 43,7%       | 43,2%       | 43,5%       | 43,1%       | 43,0%       | 42,9%       | 42,6%       | 42,4%       |
| <b>1 A 4 a ii</b>      | 7,01%       | 6,65%       | 6,99%       | 7,18%       | 6,86%       | 6,80%       | 6,59%       | 6,52%       | 6,52%       | 6,36%       | 6,21%       | 5,96%       | 5,82%       | 5,73%       | 5,83%       | 5,78%       | 5,68%       | 5,59%       |
| <b>1 A 4 c ii (i)</b>  | 47,6%       | 45,6%       | 43,9%       | 46,2%       | 45,1%       | 45,9%       | 46,4%       | 47,2%       | 47,5%       | 47,2%       | 47,3%       | 48,0%       | 47,8%       | 48,3%       | 48,5%       | 48,5%       | 48,4%       | 48,4%       |
| <b>1 A 4 c ii (ii)</b> | 2,41%       | 1,36%       | 2,16%       | 2,88%       | 3,12%       | 3,92%       | 2,82%       | 2,50%       | 2,92%       | 2,99%       | 2,77%       | 2,76%       | 2,81%       | 2,89%       | 2,72%       | 2,79%       | 3,35%       | 3,54%       |
| <b>TOTAL NRMM</b>      | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> |
| <b>1 A 2 g vii</b>     | 31,5%       | 59,7%       | 55,1%       | 58,6%       | 58,6%       | 52,9%       | 62,4%       | 66,5%       | 64,5%       | 64,4%       | 66,9%       | 67,1%       | 66,9%       | 66,7%       | 68,4%       | 68,1%       | 64,2%       | 63,2%       |
| <b>1 A 4 c ii (ii)</b> | 68,5%       | 40,3%       | 44,9%       | 41,4%       | 41,4%       | 47,1%       | 37,6%       | 33,5%       | 35,5%       | 35,6%       | 33,1%       | 32,9%       | 33,1%       | 33,3%       | 31,6%       | 31,9%       | 35,8%       | 36,8%       |
| <b>TOTAL NRMM</b>      | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> |

source: own estimates, based on TREMOD MM (Knörr, 2020c) <sup>4)</sup>

The final NFR-specific activity data is provided within the corresponding chapters as linked at the top of this page.

## Recalculations

Table: Revised primary activity data for 2017, in terajoules

| =                 | = Diesel oil | = Biodiesel | = Gasoline | = Biogasoline | = LPG    |
|-------------------|--------------|-------------|------------|---------------|----------|
| ~ Submission 2020 | > 108,752    | > 5,768     | > 7,484    | > 316         | > 16,971 |
| ~ Submission 2019 | > 108,126    | > 5,735     | > 8,372    | > 356         | > 18,789 |
| ~ absolute change | > 626        | > 33        | > -888     | > -40,9       | > -1,818 |
| ~ relative change | > 0.58%      | > 0.57%     | > -10.6%   | > -11.5%      | > -9.68% |

**bibliography** : 1 : AGEb, 2019: Working Group on Energy Balances (Arbeitsgemeinschaft Energiebilanzen (Hrsg.), AGEb): Energiebilanz für die Bundesrepublik Deutschland; URL: <https://www.ag-energiebilanzen.de/7-0-Bilanzen-1990-2017.html>, (Aufruf: 28.11.2018), Köln & Berlin, 2019. : 2 : BAFA, 2019: Federal Office of Economics and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA): Amtliche Mineralöl-daten für die Bundesrepublik Deutschland; URL: [https://www.bafa.de/SharedDocs/Downloads/DE/Energie/Mineraloel/moel\\_amtliche\\_daten\\_2016\\_dezember.xlsx?\\_\\_blob=publicationFile&v=6](https://www.bafa.de/SharedDocs/Downloads/DE/Energie/Mineraloel/moel_amtliche_daten_2016_dezember.xlsx?__blob=publicationFile&v=6), Eschborn, 2019. : 3 : ifeu, 2019b: Helms, H., Lambrecht, U., Knörr, W.; ifeu Institute for Energy and Environmental Research (Institut für Energie- und Umweltforschung Heidelberg gGmbH, ifeu): Aktualisierung des Modells TREMOD-Mobile Machinery, im Auftrag des Umweltbundesamtes, Heidelberg, 2019. **bibliography**

<sup>3)</sup> (bibcite 3)