

### 1.A.4.c iii - Agriculture/Forestry/Fishing: National Fishing

## Short description

In NFR sub-category 1.A.4.c *iii* fuel consumption and emissions of Germany's maritime fishing fleet are reported.

| Method | AD    | EF               | Key Category Analysis  |
|--------|-------|------------------|------------------------|
| T1, T2 | NS, M | D, M, CS, T1, T2 | <i>no key category</i> |

## Methodology

## Activity Data

Primary fuel delivery data for national fishing is included in NEB lines 6 ('International Deep-Sea Bunkers') and 64 ('Coastal and Inland Navigation') for IMO-registered and unregistered ships respectively.

The actual annual amounts used are therefore calculated within (Deichnik (2020)), where ship movement data (AIS signal) allows for a bottom-up approach providing the needed differentiation.<sup>1)</sup>

Table 1: Annual fuel consumption, in terajoules

|                       | 1990       | 1995       | 2000       | 2005       | 2010       | 2011       | 2012       | 2013       | 2014       | 2015       | 2016       | 2017       | 2018       | 2019       | 2020       | 2021 |
|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|
| <b>Diesel oil</b>     | 305        | 240        | 238        | 226        | 227        | 213        | 209        | 214        | 227        | 284        | 298        | 293        | 356        | 322        | 359        |      |
| <b>Heavy fuel oil</b> | 33,3       | 26,0       | 26,0       | 24,4       | 24,5       | 23,0       | 22,6       | 16,8       | 13,8       | NO         | NO         | NO         | NO         | NO         | NO         |      |
| <b>Σ 1.A.4.c iii</b>  | <b>338</b> | <b>266</b> | <b>264</b> | <b>250</b> | <b>251</b> | <b>236</b> | <b>232</b> | <b>231</b> | <b>241</b> | <b>284</b> | <b>298</b> | <b>293</b> | <b>356</b> | <b>322</b> | <b>359</b> |      |

The strong increase after 2015 cannot be conclusively explained at the moment. However, even if the over-all fuel quantities delivered to the navigation sector would be somehow misallocated between the specific nautical activities, there would be no over- or under-estimation of over-all emissions.

## Emission factors

The emission factors applied here, are derived from different sources and therefore are of very different quality.

For the main pollutants, country-specific implied values are used, that are based on tier3 EF included in the BSH model <sup>2)</sup> which mainly relate on values from the EMEP/EEA guidebook 2019 <sup>3)</sup>. These modelled IEFs take into account the ship specific information derived from AIS data as well as the mix of fuel-qualities applied depending on the type of ship and the current state of activity.

Table 2: Annual country-specific emission factors, in kg/TJ

[illegible]

|                         | 1990 | 1995 | 2000 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>NMVO</b>             | 33,2 | 33,2 | 33,2 | 33,2 | 33,2 | 33,2 | 33,2 | 33,2 | 33,2 | 33,2 | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>NO<sub>x</sub></b>   | 1187 | 1187 | 1187 | 1187 | 1187 | 1187 | 1187 | 1187 | 1187 | 1187 | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>SO<sub>x</sub></b>   | 1319 | 1332 | 1323 | 1336 | 744  | 742  | 742  | 744  | 496  | 496  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>BC<sup>2</sup></b>   | 56,3 | 56,8 | 56,5 | 57,0 | 31,7 | 31,7 | 31,7 | 31,7 | 21,2 | 21,2 | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>PM<sub>2.5</sub></b> | 469  | 474  | 471  | 475  | 264  | 264  | 264  | 264  | 176  | 176  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>PM<sub>10</sub></b>  | 516  | 521  | 518  | 523  | 291  | 290  | 290  | 291  | 194  | 194  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>TSP</b>              | 516  | 521  | 518  | 523  | 291  | 290  | 290  | 291  | 194  | 194  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |
| <b>CO</b>               | 182  | 182  | 182  | 182  | 182  | 182  | 182  | 182  | 182  | 182  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |      |

<sup>1</sup> ratios PM<sub>2.5</sub> : PM<sub>10</sub> : TSP derived from the tier1 default EF as provided in <sup>4)</sup>

<sup>2</sup> estimated from f-BCs as provided in <sup>5)</sup>: f-BC (HFO) = 0.12, f-BC (MDO/MGO) = 0.31, chapter: 1.A.3.d.i, 1.A.3.d.ii, 1.A.4.c.iii Navigation, Table 3-2 and Table A1 - BC fractions of PM emissions from relevant studies

**NOTE:** For the country-specific emission factors applied for particulate matter, no clear indication is available, whether or not condensables are included.

For information on the **emission factors for heavy-metal and POP exhaust emissions**, please refer to Appendix 2.3 - Heavy Metal (HM) exhaust emissions from mobile sources and Appendix 2.4 - Persistent Organic Pollutant (POP) exhaust emissions from mobile sources.

## Trend discussion for Key Sources

**NFR 1.A.4.c iii - National Fishing is no key source.**

## Recalculations

Recalculations occur only due to the revised **activity data**. As, based on expert information, no biodiesel is used in NFR 1.A.4.c iii, these amounts estimated so far based on official blending shares have been removed and replaced by notation key 'NO'.

In contrast, the amounts of diesel oil and heavy fuel oil modelled based on ship movement data remain unaltered.

Table 3: Revised biodiesel consumption estimates, in terajoules

|                          | 1990   | 1995   | 2000   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   |
|--------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>DIESEL OIL</b>        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| <b>Submission 2022</b>   | 305    | 240    | 238    | 226    | 221    | 228    | 229    | 229    | 227    | 213    | 209    | 214    | 227    | 284    | 298    | 293    | 356    | 322    |
| <b>Submission 2021</b>   | 711    | 549    | 531    | 488    | 474    | 486    | 484    | 482    | 473    | 442    | 431    | 429    | 472    | 555    | 1.117  | 1.208  | 2.529  | 512    |
| <b>absolute change</b>   | -407   | -309   | -294   | -262   | -253   | -258   | -255   | -253   | -246   | -229   | -222   | -215   | -245   | -271   | -819   | -915   | -2.174 | -190   |
| <b>relative change</b>   | -57,2% | -56,3% | -55,2% | -53,7% | -53,4% | -53,1% | -52,8% | -52,4% | -52,1% | -51,8% | -51,4% | -50,1% | -51,9% | -48,8% | -73,3% | -75,7% | -85,9% | -37,1% |
| <b>HEAVY FUEL OIL</b>    |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| <b>Submission 2022</b>   | 33,3   | 26,0   | 26,0   | 24,4   | 23,8   | 24,7   | 24,7   | 24,7   | 24,5   | 23,0   | 22,6   | 16,8   | 13,8   | NO     | NO     | NO     | NO     | NO     |
| <b>Submission 2021</b>   | 23,7   | 18,1   | 17,7   | 16,1   | 15,6   | 16,1   | 16,0   | 15,9   | 15,6   | 14,6   | 14,2   | 14,1   | 13,4   | NO     | NO     | NO     | NO     | NO     |
| <b>absolute change</b>   | 9,62   | 7,88   | 8,27   | 8,29   | 8,19   | 8,59   | 8,71   | 8,81   | 8,82   | 8,38   | 8,33   | 2,75   | 0,38   | -      | -      | -      | -      | -      |
| <b>relative change</b>   | 40,6%  | 43,4%  | 46,7%  | 51,4%  | 52,4%  | 53,3%  | 54,4%  | 55,4%  | 56,4%  | 57,4%  | 58,5%  | 19,5%  | 2,8%   | -      | -      | -      | -      | -      |
| <b>TOTAL CONSUMPTION</b> |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| <b>Submission 2022</b>   | 338    | 266    | 264    | 250    | 245    | 253    | 253    | 254    | 251    | 236    | 232    | 231    | 241    | 284    | 298    | 293    | 356    | 322    |
| <b>Submission 2021</b>   | 735    | 567    | 549    | 504    | 489    | 503    | 500    | 498    | 489    | 456    | 445    | 443    | 485    | 555    | 1.117  | 1.208  | 2.529  | 512    |
| <b>absolute change</b>   | -397   | -301   | -285   | -254   | -245   | -250   | -247   | -244   | -238   | -220   | -213   | -212   | -244   | -271   | -819   | -915   | -2.174 | -190   |
| <b>relative change</b>   | -54,0% | -53,1% | -51,9% | -50,4% | -50,0% | -49,7% | -49,3% | -49,0% | -48,6% | -48,3% | -47,9% | -47,9% | -50,3% | -48,8% | -73,3% | -75,7% | -85,9% | -37,1% |

All **emission factors** remain unrevised.



For **pollutant-specific information on recalculated emission estimates for Base Year and 2019**, please see the recalculation tables following [chapter 8.1 - Recalculations](#).

## Uncertainties

Uncertainty estimates for **emission factors** were adopted from NFR 1.A.3.d i as a comparable emission source.

## Planned improvements

Besides a routine revision of the underlying BSH model, further focus will be put on the correct allocation of activity data to the different navigation activities covered in different NFR sub-sectors.

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<sup>1), 2)</sup> Deichnik (2020): Aktualisierung und Revision des Modells zur Berechnung der spezifischen Verbräuche und Emissionen des von Deutschland ausgehenden Seeverkehrs. from Bundesamts für Seeschifffahrt und Hydrographie (BSH); Hamburg, 2020.

<sup>3), 4), 5)</sup> EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook – 2019; Chapter 1.A.3.d.i, 1.A.3.d.ii, 1.A.4.c.iii Navigation; URL:

<https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-d-navigation>