

1.A.3.d - Navigation

Short description

Category 1.A.3.d - Navigation includes emissions from national and international inland and maritime navigation.

NFR-Code	Name of Category	Method	AD	EF	Key Category
1.A.3.d	Navigation	see sub-category details			
consisting of / including source categories					
1.A.3.d i (ii)	International Inland Waterways	Germany does not report emissions from this sub-category			
1.A.3.d ii	National Navigation (Shipping)	see sub-category details			
1.A.3.d i (i)	International Maritime Navigation	see sub-category details			

Methodology

Activity Data

Primary fuel deliveries data for the entire navigation sector (maritime and inland waterways) is included in lines 6 ('International Maritime Bunkers') and 64 ('Coastal and Inland Navigation') of the National Energy Balance (NEB) (AGEB, 2019) ¹⁾. (For comparison, official mineral-oil data of the Federal Office of Economics and Export Control (BAFA, 2019) ²⁾ and sales data of the German Petroleum Industry Association (MWV, 2019) ³⁾ are used, too.)

Data on the consumption of *biodiesel* is provided in NEB line 64 from 2004 onward. However, as this data appears to be rather inconsistent, the consumption of biofuels is calculated within TREMOD via the official annual blending rates.

Table 1: Primary fuel deliveries as listed in the National Energy Balance, in terajoules

	= 1990	= 1995	= 2000	= 2004	= 2005	= 2006	= 2007	= 2008	= 2009	= 2010	= 2011	= 2012	= 2013	= 2014	= 2015	= 2016	= 2017	= 2018
< NEB line 6 - Maritime Bunkers ('Hochseebunkerungen')																		
~ Diesel / Light heating oil	> 23,336	> 20,426	> 21,542	> 18,971	> 18,636	> 22,376	> 24,441	> 20,300	> 20,748	> 22,483	> 21,046	> 18,617	> 18,333	> 20,898	> 43,376	> 42,606	> 36,872	> 31,406
~ Heavy fuel oil	> 80,230	> 64,382	> 69,578	> 92,020	> 85,370	> 85,277	> 104,066	> 103,830	> 92,614	> 93,063	> 92,649	> 87,595	> 77,754	> 73,729	> 57,900	> 74,844	> 58,788	> 39,570
< NEB line 64 - Coastal and Inland Navigation ('Küsten- und Binnenschifffahrt')																		
~ Diesel oil	> 27,710	> 23,562	> 11,864	> 11,625	> 12,831	> 11,188	> 6,826	> 5,426	> 11,091	> 11,182	> 12,050	> 11,322	> 11,635	> 12,112	> 13,321	> 11,131	> 10,150	> 9,383
~ Biodiesel	> 0	> 0	> 0	> 100	> 281	> 326	> 499	> 503	> 765	> 725	> 790	> 739	> 674	> 734	> 720	> 481	> 538	> 542
<																		
< TOTAL Navigation	~ 131,276	~ 108,370	~ 102,984	~ 122,716	~ 117,118	~ 119,167	~ 135,832	~ 130,059	~ 125,218	~ 127,453	~ 126,535	~ 118,273	~ 108,396	~ 107,473	~ 115,317	~ 129,062	~ 106,348	~ 80,901

source: National Energy Balances

As the statistical allocation of fuels delivered to the navigation (shipping) sector follows tax aspects, NEB line 6 ('International Maritime Bunkers') includes all fuel deliveries to IMO-registered ship involved in both national and international maritime activities. On the other hand, NEB line 64 ('Coastal and Inland Navigation') includes all fuel deliveries to ship involved in inland and non-IMO maritime navigation.

Table 2: Allocation of for subsector-specific fuel deliveries data in the NEB

= NEB line	= including fuel deliveries to navigation sub-sectors...
< 6 - 'International Maritime Bunkers'	< ...international maritime navigation / national maritime navigation (IMO) / national fishing (IMO) / military navigation (IMO)
< 64 - 'Coastal and Inland Navigation'	< ...national inland navigation / national maritime navigation (non-IMO) / national fishing (non-IMO) / military navigation (non-IMO)

Therefore, the amounts of fuels listed in NEB lines 6 and 64 have to be broken down on several sub-sectors. Regarding all national maritime activities, taking place in [National Maritime Navigation](#)], [1.A.4.c iii - National fishing](#)], and [1.A.5.b iii -](#)

[Military navigation](#)]), a newly implemented approach allows for estimating tier3 fuel consumption data based on ship movement information (AIS signal) for IMO- and non-IMO ships. In contrast to this bottom-up approach, fuel consumption in both *international maritime navigation* and *national inland navigation* are calculated as simple tier1 estimates. The following equations and charts try to illustrate the way of deducing these tier1 activity data:

Estimating the tier1 activity data for International maritime navigation:

$AD_{\text{1.A.3.d i}} = PAD_{\text{NEB line 6}} - AD_{\text{1.A.3.d ii (a) - IMO}} - AD_{\text{1.A.4.c iii - IMO}} - AD_{\text{1.A.5.b iii - IMO}}$

with AD „1.A.3.d i,, - tier1 activity data for International maritime navigation PAD „NEB line 6,, - primary over-all fuel deliveries data from NEB line 6 - 'International Maritime Bunkers' AD „1.A.3.d ii (a), IMO,, - tier3 activity data for IMO-registered ships involved in national maritime navigation AD „1.A.4.c iii, IMO,, - tier3 activity data for IMO-registered ships involved in national fishing AD „1.A.5.b iii, IMO,, - tier3 activity data for IMO-registered ships involved in military navigation

Estimating the tier1 activity data for National inland navigation:

$AD_{\text{1.A.3.d ii (b)}} = PAD_{\text{NEB line 64}} - AD_{\text{1.A.3.d ii (a) - non-IMO}} - AD_{\text{1.A.4.c iii - non-IMO}} - AD_{\text{1.A.5.b iii - non-IMO}}$

with AD „1.A.3.d ii (b),, - tier1 activity data for National inland navigation PAD „NEB line 64,, - primary over-all fuel deliveries data from NEB line 64 - 'Coastal and Inland Navigation' AD „1.A.3.d ii (a), non-IMO,, - tier3 activity data for non-IMO ships involved in national maritime navigation AD „1.A.4.c iii, non-IMO,, - tier3 activity data for non-IMO ships involved in national fishing AD „1.A.5.b iii, non-IMO,, - tier3 activity data for non-IMO ships involved in military navigation

Table 3: Resulting breakdown of primary fuel deliveries onto the different navigation sub-sectors, in terajoules

	= 1990	= 1995	= 2000	= 2004	= 2005	= 2006	= 2007	= 2008	= 2009	= 2010	= 2011	= 2012	= 2013	= 2014	= 2015	= 2016	= 2017	= 2018
= Navigation TOTAL	~131,276	~108,370	~102,984	~122,716	~117,138	~119,172	~140,173	~134,800	~125,238	~127,453	~126,549	~118,274	~108,396	~107,473	~115,317	~129,062	~106,348	~80,901
<																		
< 1.A.3.d i - International maritime navigation																		
~ Diesel oil / Light heating oil	> 12,748	> 12,919	> 13,664	> 11,513	> 11,993	> 15,817	> 17,524	> 13,105	> 14,412	> 16,662	> 15,370	> 12,594	> 12,414	> 13,674	> 33,088	> 28,093	> 22,924	> 15,419
~ Heavy fuel oil	> 68,484	> 56,323	> 60,984	> 83,935	> 78,182	> 78,257	> 96,625	> 96,017	> 85,865	> 86,934	> 86,687	> 81,171	> 71,364	> 67,670	> 57,850	> 74,837	> 58,781	> 39,287
~ Biodiesel	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO
< 1.A.3.d ii (a) - National maritime navigation																		
~ Diesel oil / Light heating oil	> 15,940	> 11,258	> 11,860	> 11,231	> 9,962	> 9,845	> 10,395	> 10,834	> 9,486	> 8,685	> 8,489	> 9,046	> 9,047	> 9,965	> 13,359	> 16,295	> 15,221	> 15,856
~ Heavy fuel oil	> 11,723	> 8,041	> 8,577	> 8,069	> 7,172	> 7,004	> 7,425	> 7,797	> 6,733	> 6,114	> 5,961	> 6,410	> 6,376	> 6,046	> 50	> 7	> 7	> 283
~ Biodiesel	= NO	= NO	= NO	> 35	> 79	> 104	> 169	> 195	> 238	> 205	> 202	> 215	> 192	> 210	> 167	> 146	> 134	> 135
< 1.A.3.d ii (b) - National inland navigation																		
~ Diesel oil	> 20,664	> 18,597	> 6,788	> 6,921	> 8,634	> 7,050	> 6,836	> 5,683	> 7,129	> 7,497	> 8,466	> 7,556	> 7,777	> 8,567	> 9,422	> 7,873	> 7,179	> 6,636
~ Heavy fuel oil	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO	= NO
~ Biodiesel	= NO	= NO	= NO	> 60	> 189	> 205	> 305	> 281	> 491	> 486	> 555	> 493	> 454	> 495	> 530	> 315	> 385	> 388
< 1.A.4.c iii - Fishing																		
~ Diesel oil / Light heating oil	> 711	> 549	> 531	> 500	> 488	> 474	> 486	> 484	> 482	> 473	> 442	> 431	> 429	> 472	> 555	> 1,117	> 1,208	> 2,455
~ Heavy fuel oil	> 24	> 18	> 18	> 17	> 16	> 16	> 16	> 16	> 16	> 16	> 15	> 14	> 14	> 13	> 0	> 0	> 0	> 0
~ Biodiesel	= NO	= NO	= NO	= 2	= 4	= 5	= 8	= 9	= 13	= 12	= 11	= 11	= 10	= 10	= 10	= 8	= 8	= 8
< 1.A.5.b iii - Military navigation																		
~ Diesel oil / Light heating oil	> 983	> 665	> 563	> 431	> 410	> 383	> 366	> 360	> 349	> 347	> 330	> 313	> 302	> 332	> 273	> 359	> 489	> 423

- ²⁾ (bibcite 2)
- ³⁾ (bibcite 3)
- ⁴⁾ (bibcite 4)
- ⁵⁾ (bibcite 5)
- ⁶⁾ (bibcite 6)
- ⁷⁾ (bibcite 5)
- ⁸⁾ (bibcite 6)