

2.L(a) - Handling of Bulk Products

Short description

Under category *2.L(a) - Handling of Bulk Products* dust emissions from bulk material handling (loading and unloading) including agricultural bulk materials offsite the fields are reported. Emissions from quarrying and mining of minerals and from point source emissions are excluded.

Methodology

For 1990 to 1996, only simplified estimates without a differentiation of handled materials and products exist. For all following years, emissions are calculated using a tier1 method taking into account detailed data on handled materials and products.

Activity data

Official statistics are of limited use in determining handling of bulk products. There are only transport statistics available providing the amounts of several transported materials.

During a research project carried out by (Müller-BBM) ¹⁾, activity data was derived from primary statistical data from the Federal Statistical Office for Germany (Statistisches Bundesamt, Destatis) and the Federal Motor Transport Authority (Kraftfahrt-Bundesamt, KBA). Here, data on goods transported by railways and ships is gathered by Destatis whereas data for road transport is collected by the KBA.

Here, for all years until 2009, the collection of data for transported goods followed the official **NST/R (1968) nomenclature and regulation** (Eurostat, 2014a) ²⁾.

As of 2010, statistical data following the newly implemented **NST-2007** ^{3), 4)} **nomenclature and regulation** from Destatis and KBA is applied instead.

Table 1: Overview of primary activity data sources over time

= 1990-1996	simplified estimates without differentiation of handled materials
= 1997-2009	statistical data following NST/R nomenclature
= as of 2010	statistical data following NST-2007 nomenclature

Here, NST/R allowed the distribution of a broad variety of goods and materials (e.g. barley, corn, oats, rice, rye, and wheat), whereas NST-2007 provides only a very condensed list of classes of goods (e.g. 'crops').

Due to these methodological breaks, activity data and emissions show inconsistencies (especially on the level of specific goods and materials) that cannot be eliminated at the moment. Nonetheless, on an aggregate level, these breaks are balanced out more or less automatically as the total amount of transported dry materials does not change too much with changing statistical approaches.

For estimating the amount of moved bulk materials as well as emissions from the loading and unloading of bulk materials, these primary activity data (PAD, including the amounts of imported and exported goods as well as goods transported within Germany) have to be calculated from the amounts of transported goods:



$$PAD_{\text{material } i} = PAD_{\text{import}} + PAD_{\text{export}} + 2 * PAD_{\text{domestic handling}}$$

with

1. $PAD_{\text{import}} =$ amount of imported good or material, $PAD_{\text{export}} =$ amount of exported good or material and $PAD_{\text{domestic handling}} =$ amount of good or material transported only within Germany. As the basic statistics provide only total amounts of imported, exported and domestically transported dry goods without any distinction into bulk and packed goods, the shares of bulk goods had to be estimated via expert judgement during the workshop mentioned above. During this workshop, experts, for comparable kinds of dry bulk material, discussed specific shares displaying which part of the total amount of dry material i loaded and/or unloaded within Germany might be transported as bulk material thus causing PM emissions. So the activity data finally used for estimating specific particulate matter emissions for every bulk material is calculated as a specific share s of the amount of this material i loaded and/or unloaded within Germany:



$$AD_{\text{bulk material } i} = PAD_{\text{bulk material } i} * s_{\text{bulk share}}$$

Table 2: Amounts of dry, dusty bulk goods handled in Germany 2010-2018, in tonnes ||=

Product / Good / Material	Mode of transport	2010	2011	2012	2013	2014	2015	2016	2017	2018
~ other herbal products	inland vessel	5,523,633	5,711,645	6,541,031	6,529,161	38,829,323	39,189,603	38,498,874	34,508,319	30,305,094
	railways	1,242,916	1,242,916	170,158	807,829	17,868	470,000	547,545	532,253	445,547
	heavy-duty vehicle	20,847,400	30,967,600	29,445,800	28,094,800	34,166,200	34,166,200	22,918,493	24,118,587	35,511,100
	sea-going vessel	4,052,384	6,083,248	5,690,857	6,321,278	6,052,546	6,376,068	7,164,149	6,953,293	6,614,999
~ raw mineral chemicals	inland vessel	6,794,922	11,213,581	11,750,342	12,044,542	2,556,501	2,366,579	2,573,770	2,696,029	11,798,872
	railways	9,827,059	9,827,059	10,158,766	9,139,348	10,472,017	9,273,000	9,627,577	9,885,631	10,634,917
	heavy-duty vehicle	78,928,400	89,219,400	83,315,200	84,937,600	82,363,000	82,363,000	10,043,513	11,351,314	63,713,624
	sea-going vessel	5,550,621	8,904,300	8,692,669	8,768,942	8,741,513	7,905,516	7,888,208	8,131,408	7,386,700
~ raw organic chemicals	inland vessel	6,299,350	6,310,746	6,636,096	6,417,766	171,884	57,126	114,803	175,726	6,667,823
	railways	16,287,803	16,287,803	19,006,897	17,965,252	17,716,320	21,094,000	18,661,643	18,339,593	0
	heavy-duty vehicle	11,345,600	5,875,200	5,293,800	5,192,200	4,570,800	4,570,800	0	828,916	12,601,908
	sea-going vessel	3,638,264	2,630,859	2,502,315	2,690,538	3,182,266	2,478,579	2,341,016	2,413,459	2,463,615
~ iron ore	inland vessel	25,728,177	23,048,502	21,885,592	23,312,725	24,389,450	25,203,179	25,755,504	25,193,580	22,796,286
	railways	38,565,334	38,565,334	37,513,305	37,215,277	39,012,340	37,708,000	37,434,377	37,586,847	38,252,864
	heavy-duty vehicle	203,800	1,502,000	1,166,000	NE	NE	NE	1,764,223	534,846	1,680,885
	sea-going vessel	13,922,885	12,702,983	13,397,347	14,028,077	14,444,514	13,967,430	13,365,447	14,810,135	

14,761,129 || = || ~ crops || < inland vessel || > 9,816,233 || > 9,348,956 || > 9,693,828 || >
 11,180,006 || > 11,452,177 || > 11,243,918 || > 10,046,500 || > 9,546,963 || > 7,715,977 || = || <
 || < railways || > 2,982,548 || > 2,982,548 || > 2,446,615 || > 1,994,499 || > 2,688,008 || >
 4,583,000 || > 3,545,040 || > 3,759,205 || > 2,985,786 || = || < || < heavy-duty vehicle || >
 65,464,800 || > 65,723,600 || > 63,027,200 || > 63,948,600 || > 70,614,200 || > 70,614,200 || >
 58,304,413 || > 61,639,154 || > 58,957,570 || = || < || < sea-going vessel || > 9,319,143 || >
 7,155,770 || > 7,103,932 || > 10,159,483 || > 10,599,072 || > 12,142,981 || > 10,735,948 || >
 8,851,781 || > 7,672,262 || = || ~ potatoes || < inland vessel || > 1,383 || > 1,620 || > 30 || > 1,034
 || > NE || > 0 || > 0 || > 1,056 || > 0 || = || < || < railways || > 17,135 || > 17,135 || > 38,819 || >
 38,425 || > 9,898 || > 0 || > 0 || > 4,581,528 || > 4,896,748 || = || < || < heavy-duty vehicle || >
 10,627,000 || > 10,136,400 || > 10,056,600 || > 11,717,000 || > 9,956,800 || > 9,956,800 || >
 4,683,480 || > 5,039,904 || > 9,621,800 || = || < || < sea-going vessel || > 29,296,456 || >
 26,293,129 || > 29,732,990 || > 23,583,567 || > 23,943,784 || > 21,170,067 || > 20,406,870 || >
 22,490,149 || > 20,701,636 || = || ~ coal products || < inland vessel || > 2,409,311 || > 1,961,483
 || > 1,315,205 || > 1,665,936 || > 1,871,597 || > 1,361,655 || > 2,003,004 || > 2,129,778 || >
 1,560,991 || = || < || < railways || > 22,499,503 || > 22,499,503 || > 8,513,061 || > 9,144,558 || >
 7,120,072 || > 6,721,000 || > 6,610,955 || > 6,456,917 || > 8,421,754 || = || < || < heavy-duty
 vehicle || > 11,801,600 || > 12,236,800 || > 10,278,800 || > 10,415,800 || > 15,401,600 || >
 15,401,600 || > 7,065,314 || > 8,549,595 || > 13,182,782 || = || < || < sea-going vessel || > 802,164
 || > 398,570 || > 59,335 || > 53,695 || > 72,473 || > 48,778 || > 43,760 || > 135,197 || > 25,450 || =
 || ~ proiducts from grinding and shelling mills || < inland vessel || > 1,782,712 || > 2,567,049 || >
 3,086,180 || > 2,871,889 || > 3,200,833 || > 4,133,053 || > 5,180,094 || > 5,368,877 || > 5,275,005
 || = || < || < railways || > 2,852 || > 2,852 || > 328,857 || > 350,368 || > 362,180 || > 0 || > 465,039
 || > 381,098 || > 349,419 || = || < || < heavy-duty vehicle || > 97,539,400 || > 106,391,800 || >
 104,354,000 || > 101,813,400 || > 99,568,200 || > 99,568,200 || > 75,685,582 || > 69,634,714 || >
 99,763,916 || = || < || < sea-going vessel || > 3,104,125 || > 3,995,488 || > 3,971,495 || >
 3,638,766 || > 3,903,447 || > 3,525,359 || > 3,586,612 || > 3,747,650 || > 3,788,108 || = || ~
 mineral fertilisers || < inland vessel || > 760,174 || > 390,276 || > 304,450 || > 279,444 || >
 271,253 || > 305,202 || > 281,603 || > 255,398 || > 197,705 || = || < || < railways || > 4,122,535 || >
 4,122,535 || > 3,890,715 || > 3,684,926 || > 3,578,700 || > 3,424,000 || > 3,619,997 || > 3,581,858
 || > 3,224,654 || = || < || < heavy-duty vehicle || > 7,923,200 || > 6,028,800 || > 2,236,000 || >
 2,532,400 || > 4,322,000 || > 4,322,000 || > 1,338,908 || > 1,006,750 || > 1,814,964 || = || < || <
 sea-going vessel || > 117,224 || > 563,030 || > 348,447 || > 395,809 || > 507,459 || > 409,515 || >
 256,924 || > 323,622 || > 311,822 || = || ~ natural sands, gravel and stones || < inland vessel || >
 40,518,020 || > 40,340,856 || > 38,487,658 || > 35,673,470 || > 34,713,430 || > 31,927,501 || >
 33,178,046 || > 36,072,381 || > 35,475,139 || = || < || < railways || > 56,517,180 || > 56,517,180
 || > 48,907,929 || > 46,590,830 || > 45,317,601 || > 43,958,000 || > 43,837,499 || > 39,960,787
 || > 41,345,431 || = || < || < heavy-duty vehicle || > 1,655,747,400 || > 1,875,461,200 || >
 1,780,682,400 || > 1,810,580,800 || > 1,853,177,400 || > 1,853,177,400 || > 1,669,958,849 || >
 1,672,131,248 || > 1,838,142,737 || = || < || < sea-going vessel || > 8,739,096 || > 11,121,374 || >
 11,421,774 || > 9,822,506 || > 9,947,768 || > 9,739,769 || > 10,353,589 || > 13,515,063 || >
 12,463,686 || = || ~ non-iron ores || < inland vessel || > 1,512,246 || > 2,991,850 || > 3,399,513
 || > 2,909,452 || > 3,186,877 || > 2,964,925 || > 2,827,648 || > 3,199,797 || > 3,043,062 || = || <
 || < railways || > 29,742 || > 29,742 || > 15,232 || > 6,651 || > 7,972 || > 8,000 || > 6,642 || >
 16,877 || > 61,486 || = || < || < heavy-duty vehicle || > 705,600 || > 788,600 || > 2,480,600 || >
 1,321,000 || > NE || > NE || > 0 || > 827,676 || > 512,051 || = || < || < sea-going vessel || >
 2,687,815 || > 3,186,505 || > 3,474,240 || > 3,065,484 || > 3,204,390 || > 2,850,350 || > 3,870,273
 || > 4,368,429 || > 4,621,799 || = || ~ raw coals || < inland vessel || > 36,652,759 || > 36,960,623
 || > 37,127,495 || > 39,825,584 || > 39,049 || > 0 || > 0 || > 0 || > 19,571 || = || < || < railways || >
 58,433,815 || > 58,433,815 || > 69,687,308 || > 73,653,317 || > 69,222,607 || > 67,749,000 || >
 61,034,978 || > 51,142,196 || > 48,277,288 || = || < || < heavy-duty vehicle || > 10,561,400 || >

9,592,600 ||> 10,288,800 ||> 14,056,000 ||> 13,275,800 ||> 13,275,800 ||> 11,858,051 ||>
 16,057,484 ||> 12,593,015 ||> ||< ||< sea-going vessel ||> 13,299,295 ||> 14,640,469 ||>
 13,878,763 ||> 14,194,693 ||> 14,065,658 ||> 16,476,145 ||> 14,401,269 ||> 15,919,606 ||>
 16,187,881 ||> ||~ secondary raw materials ||< inland vessel ||> 15,691,876 ||> 15,455,505 ||>
 15,346,780 ||> 15,565,961 ||> 12,209,667 ||> 11,521,886 ||> 11,212,165 ||> 12,089,358 ||>
 15,101,718 ||> ||< ||< railways ||> 25,614,264 ||> 25,614,264 ||> 24,816,767 ||> 24,034,064
 ||> 23,099,944 ||> 22,113,000 ||> 21,261,312 ||> 22,147,649 ||> 20,565,387 ||> ||< ||< heavy-
 duty vehicle ||> 422,570,000 ||> 465,981,000 ||> 452,569,000 ||> 464,878,800 ||>
 490,299,000 ||> 490,299,000 ||> 161,493,436 ||> 171,462,235 ||> 502,448,809 ||> ||< ||< sea-
 going vessel ||> 5,047,097 ||> 5,440,262 ||> 6,098,151 ||> 5,739,258 ||> 6,094,992 ||>
 5,810,444 ||> 5,057,435 ||> 4,173,386 ||> 3,427,249 ||> ||~ rock & saline salt ||< inland vessel
 ||> 2,769,356 ||> 5,367,045 ||> 4,297,737 ||> 4,588,453 ||> 3,959,354 ||> 3,939,437 ||>
 3,651,498 ||> 4,115,651 ||> 3,977,618 ||> ||< ||< railways ||> 3,067,187 ||> 3,067,187 ||>
 2,413,134 ||> 2,963,318 ||> 2,258,785 ||> 2,575,000 ||> 2,362,886 ||> 2,603,115 ||> 3,017,352
 ||> ||< ||< heavy-duty vehicle ||> 21,579,000 ||> 18,284,800 ||> 11,550,200 ||> 13,746,800 ||>
 7,887,600 ||> 7,887,600 ||> 7,238,776 ||> 10,591,977 ||> 11,820,822 ||> ||< ||< sea-going
 vessel ||> 567,059 ||> 1,340,830 ||> 1,062,136 ||> 912,141 ||> 761,849 ||> 919,251 ||>
 888,593 ||> 812,124 ||> 1,116,411 ||> ||~ noítrogen fertilisers ||< inland vessel ||> 5,737,386
 ||> 5,636,147 ||> 5,616,853 ||> 5,321,196 ||> 5,267,318 ||> 5,104,076 ||> 4,930,755 ||>
 4,742,988 ||> 4,466,442 ||> ||< ||< railways ||> 15,708,472 ||> 15,708,472 ||> 15,592,709 ||>
 15,550,134 ||> 14,971,021 ||> 14,091,000 ||> 13,614,102 ||> 14,066,445 ||> 12,318,493 ||>
 ||< ||< heavy-duty vehicle ||> 37,454,600 ||> 44,977,200 ||> 61,230,200 ||> 64,460,400 ||>
 71,366,600 ||> 71,366,600 ||> 28,434,989 ||> 30,619,530 ||> 68,151,044 ||> ||< ||< sea-going
 vessel ||> 5,309,443 ||> 5,821,309 ||> 5,953,434 ||> 6,489,522 ||> 6,378,323 ||> 6,509,499 ||>
 7,011,855 ||> 7,392,865 ||> 7,239,705 ||> ||~ white cement, lime, cement ||< inland vessel ||>
 3,273,975 ||> 3,324,316 ||> 3,120,120 ||> 3,046,615 ||> 2,408,113 ||> 2,479,720 ||> 2,532,347
 ||> 2,776,593 ||> 2,978,726 ||> ||< ||< railways ||> 17,849,146 ||> 17,849,146 ||> 17,115,456
 ||> 18,418,916 ||> 19,947,465 ||> 21,867,000 ||> 19,270,679 ||> 18,928,775 ||> 18,679,111
 ||> ||< ||< heavy-duty vehicle ||> 69,407,200 ||> 81,743,800 ||> 71,895,800 ||> 76,202,600 ||>
 86,441,400 ||> 86,441,400 ||> 76,251,684 ||> 77,289,169 ||> 99,899,785 ||> ||< ||< sea-going
 vessel ||> 1,544,488 ||> 2,130,253 ||> 2,171,491 ||> 1,954,095 ||> 2,699,787 ||> 2,757,516 ||>
 2,470,814 ||> 2,552,567 ||> 2,172,344 ||> ||~ sugar beet ||< inland vessel ||> 0 ||> 5,003 ||> 0
 ||> 1,035 ||> 6,362,106 ||> 6,366,439 ||> 6,426,328 ||> 6,396,070 ||> 5,912,659 ||> ||< ||<
 railways ||> 123,598 ||> 123,598 ||> 96,747 ||> 29,869 ||> 46,870 ||> 24,000 ||> 64,094 ||>
 37,555 ||> 0 ||> ||< ||< heavy-duty vehicle ||> 26,946,200 ||> 27,903,200 ||> 31,496,200 ||>
 20,903,200 ||> 36,601,000 ||> 36,601,000 ||> 22,159,060 ||> 32,853,554 ||> 31,023,482 ||>
 ||< ||< sea-going vessel ||> 17 ||> 142 ||> 1,843 ||> 1,154 ||> 4,086 ||> 2,872 ||> 3,125 ||>
 9,676 ||> 3,277 ||> ||> sources: annual data deliveries DESTATIS & KBA (for heavy-duty vehicles) to
 the inventory compiler === Emission factors === Emission factors are based on the
 methodology according VDI guidelines 3790. The values used here originate from a research
 project by (Müller-BBM, 2011)⁵⁾ taking into account information of an expert panel of industry
 and administration. For details see the
 [*<https://www.umweltbundesamt.de/publikationen/konsistenzpruefung-verbesserungspotenzial>
 project report] (German version only). Within the study, PM emission factors are estimated for
 each material or good that might be transported as dry and unpacked bulk. These very specific
 EF are then assigned to the classes of materials/goods available from the different different
 statistics (NST/R, NST-2007) to form implied Ef for these class of bulk material. As NST/R
 provided a wide variety of goods and materials, whereas NST-2007 provides only a very
 condensed list of classes of goods, the very specific EF derived during the study and the joint
 expert workshop have been aggregated in order to match the classes of goods following
 NST-2007. Table 2: specific EF for PM emissions from NST/R crop products, in [kg/t], as used for

2009 estimates || = **vehicle type** || = **TSP** || = **PM₁₀**, || = **PM_{2.5}**, || = ||||| = **for barley** ||
 || < inland ship || > 0.038 || > 0.019 || > 0.004 || > || < railway || > 0.038 || > 0.019 || > 0.004 || >
 || < maritime ship || > 0.038 || > 0.019 || > 0.0038 || > || < heavy-duty vehicle || > 0.038 || > 0.019
 || > 0.004 || > ||||| = **for oats** || < inland ship || > 0.018 || > 0.009 || > 0.002 || > || < railway || >
 0.018 || > 0.009 || > 0.002 || > || < maritime ship || > 0.018 || > 0.009 || > 0.00179 || > || < heavy-
 duty vehicle || > 0.018 || > 0.009 || > 0.002 || > ||||| = **for corn** || < inland ship || > 0.029 || >
 0.014 || > 0.003 || > || < railway || > 0.029 || > 0.014 || > 0.003 || > || < maritime ship || > 0.029 || >
 0.014 || > 0.00287 || > || < heavy-duty vehicle || > 0.029 || > 0.014 || > 0.003 || > ||||| = **for rice**
 || < inland ship || > 0.015 || > 0.008 || > 0.002 || > || < railway || > 0.015 || > 0.008 || > 0.002 || >
 || < maritime ship || > 0.015 || > 0.008 || > 0.00151 || > || < heavy-duty vehicle || > 0.015 || >
 0.008 || > 0.002 || > ||||| = **for rye** || < inland ship || > 0.038 || > 0.019 || > 0.004 || > || <
 railway || > 0.038 || > 0.019 || > 0.004 || > || < maritime ship || > 0.038 || > 0.019 || > 0.0038 || >
 || < heavy-duty vehicle || > 0.038 || > 0.019 || > 0.004 || > ||||| = **for wheat** || < inland ship || >
 0.038 || > 0.019 || > 0.004 || > || < railway || > 0.038 || > 0.019 || > 0.004 || > || < maritime ship || >
 0.038 || > 0.019 || > 0.0038 || > || < heavy-duty vehicle || > 0.038 || > 0.019 || > 0.004 || > Here, in
 order to match the new NST-2007 classes for goods and materials, the very specific emission
 factors used in former submissions were converted to aggregated implied emission factors.

Table 3: IEFs used for emission estimates as of 2010, in [kg/t] || = **Product / Good / Material**
 ||||| = **Heavy-duty vehicles** ||||| = **Railways** ||||| = **Inland vessels** ||||| = **Sea-going vessels**
 || = || = || = **TSP** || = **PM₁₀**, || = **PM_{2.5}**, || = **TSP** || = **PM₁₀**, || = **PM_{2.5}**, || = **TSP** || = **PM₁₀**,
 || = **PM_{2.5}**, || = **TSP** || = **PM₁₀**, || = **PM_{2.5}**, || = || ~ Other herbal products || > 0.032000 || >
 0.016000 || > 0.003200 || > 0.024000 || > 0.012000 || > 0.002400 || > 0.022000 || > 0.011000 || >
 0.002200 || > 0.028000 || > 0.014000 || > 0.002800 || > || ~ Chemische Grundstoffe. mineralisch
 || > 0.041000 || > 0.020500 || > 0.004100 || > 0.031000 || > 0.015500 || > 0.003100 || > 0.029000
 || > 0.014500 || > 0.002900 || > 0.036000 || > 0.018000 || > 0.003600 || > || ~ Raw organic
 chemicals || > 0.024000 || > 0.012000 || > 0.002400 || > 0.018000 || > 0.009000 || > 0.001800 || >
 0.017000 || > 0.008500 || > 0.001700 || > 0.021000 || > 0.010500 || > 0.002100 || > || ~ Iron ore
 || > 0.057000 || > 0.028500 || > 0.005700 || > 0.042000 || > 0.021000 || > 0.004200 || > 0.040000
 || > 0.020000 || > 0.004000 || > 0.050000 || > 0.025000 || > 0.005000 || > || ~ Crops || > 0.045000
 || > 0.022500 || > 0.004500 || > 0.034000 || > 0.017000 || > 0.003400 || > 0.031000 || > 0.015500
 || > 0.003100 || > 0.039000 || > 0.019500 || > 0.003900 || > || ~ Potatoes || > 0.007000 || >
 0.003500 || > 0.000700 || > 0.005000 || > 0.002500 || > 0.000500 || > 0.005000 || > 0.002500 || >
 0.000500 || > 0.006000 || > 0.003000 || > 0.000600 || > || ~ Coal products || > 0.019000 || >
 0.009500 || > 0.001900 || > 0.014000 || > 0.007000 || > 0.001400 || > 0.013000 || > 0.006500 || >
 0.001300 || > 0.017000 || > 0.008500 || > 0.001700 || > || ~ Products from grinding and shelling
 mills || > 0.003000 || > 0.001500 || > 0.000300 || > 0.003000 || > 0.001500 || > 0.000300 || >
 0.003000 || > 0.001500 || > 0.000300 || > 0.003000 || > 0.001500 || > 0.000300 || > || ~ Mineral
 fertilisers || > 0.024000 || > 0.012000 || > 0.002400 || > 0.018000 || > 0.009000 || > 0.001800 || >
 0.017000 || > 0.008500 || > 0.001700 || > 0.021000 || > 0.010500 || > 0.002100 || > || ~ Natural
 sands. gravel. and stones || > 0.027000 || > 0.013500 || > 0.002700 || > 0.020000 || > 0.010000
 || > 0.002000 || > 0.019000 || > 0.009500 || > 0.001900 || > 0.023000 || > 0.011500 || > 0.002300
 || > || ~ Non-iron ores || > 0.066000 || > 0.033000 || > 0.006600 || > 0.049000 || > 0.024500 || >
 0.004900 || > 0.046000 || > 0.023000 || > 0.004600 || > 0.058000 || > 0.029000 || > 0.005800 || >
 || ~ Raw coals || > 0.016000 || > 0.008000 || > 0.001600 || > 0.016000 || > 0.008000 || > 0.001600
 || > 0.020000 || > 0.010000 || > 0.002000 || > 0.028000 || > 0.014000 || > 0.002800 || > || ~
 Secondary raw materials || > 0.027000 || > 0.013500 || > 0.002700 || > 0.020000 || > 0.010000
 || > 0.002000 || > 0.019000 || > 0.009500 || > 0.001900 || > 0.023000 || > 0.011500 || > 0.002300
 || > || ~ Rock & saline salt || > 0.068000 || > 0.034000 || > 0.006800 || > 0.051000 || > 0.025500
 || > 0.005100 || > 0.047000 || > 0.023500 || > 0.004700 || > 0.059000 || > 0.029500 || > 0.005900
 || > || ~ Nitrogen fertilisers || > 0.024000 || > 0.012000 || > 0.002400 || > 0.018000 || > 0.009000
 || > 0.001800 || > 0.017000 || > 0.008500 || > 0.001700 || > 0.021000 || > 0.010500 || > 0.002100

||> ||~ White cement. lime. cement ||> 0.005000 ||> 0.002500 ||> 0.000500 ||> 0.004000 ||> 0.002000 ||> 0.000400 ||> 0.003000 ||> 0.001500 ||> 0.000300 ||> 0.004000 ||> 0.002000 ||> 0.000400 ||> ||~ Sugar beet ||> 0.000240 ||> 0.000120 ||> 0.000024 ||> 0.000180 ||> 0.000090 ||> 0.000018 ||> 0.000170 ||> 0.000085 ||> 0.000017 ||> 0.000210 ||> 0.000105 ||> 0.000021 ||> +++ Ratio TSP : PM₁₀ : PM_{2.5} : PM₁₀ : PM_{2.5} : The shares of PM₁₀ and PM_{2.5} of the entire amounts of emitted TSP have been set to fixed values used for the entire time series. Assumptions: * TSP = 100%, * 50% of TSP are ≤ 10 µm. Therefore, the EF(PM₁₀) are assumed as 1/2 of the corresponding EF(TSP), and * 10% of TSP are ≤ 2.5 µm. Therefore, the EF(PM_{2.5}) are assumed as 1/10 of the corresponding EF(TSP). [image PM-ratios.PNG](#) The ratios of TSP, PM₁₀ and PM_{2.5} were also discussed in the research project mentioned above, but without generating any new data. Nonetheless, the ratios might be too low at the moment and will be checked furthermore. ===== Discussion of emission trends ===== > **NFR 2.L(a)** is key category for **PM_{2.5}**, **PM₁₀**, and **TSP**. In general, diffuse particulate matter emissions depend strongly on the amounts of dry bulk goods handled and transported. In addition, due to efforts to prevent such particle emissions, the time series of the emission factors applied for all three fractions of particulate matter show a falling trend. ===== Recalculations ===== With both **activity data** and **emission factors** remaining unrevised, no recalculations have been carried out. ===== Planned improvements ===== Although no specific improvement is planned, additional effort will be necessary to further minimise the inconsistencies in the activity data time series resulting from the different approaches applied. — [bibliography](#) : 1 : Müller-BBM, 2011: Dr. Matthias Bender, Ludger Gronewäller, Detlef Langer: Konsistenzprüfung und Verbesserungspotenzial der Schüttgutemissionsberechnung - Umweltforschungsplan des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit, Förderkennzeichen 3708 49 107 2 - FB 00 1453 UBA; Müller- BBM GmbH, Im Auftrag des Umweltbundesamtes, Planegg/Dessau-Roßlau, Februar 2011 - URL: <https://www.umweltbundesamt.de/publikationen/konsistenzpruefung-verbesserungspotenzial> : 2 : Eurostat, 2015a: Standard Goods Classification for Transport Statistics/Revised (1967) NST/R - URL: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NSTR_1967&StrLanguageCode=EN&IntPcKey=&StrLayoutCode=HIERARCHIC : 3 : Eurostat, 2015b: Standard goods classification for transport statistics, 2007 - URL: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NST_2007&StrLanguageCode=EN&IntPcKey=&StrLayoutCode=HIERARCHIC : 4 : Destatis, 2013: Statistisches Bundesamt, Verkehr, NST-2007: Einheitliches Güterverzeichnis für die Verkehrsstatistik – 2007 - URL: [https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Transport-Verkehr/Gueterverkehr/T](https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Transport-Verkehr/Gueterverkehr/Tabellen/nsz-2007.html)
[abellen/nsz-2007.html](https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Transport-Verkehr/Gueterverkehr/Tabellen/nsz-2007.html) [bibliography](#)

¹⁾ (bibcite 1)

²⁾ (bibcite 2)

³⁾ (bibcite 3)

⁴⁾ (bibcite 4)

⁵⁾ (bibcite 1)