

1 Discussion paper – Review of consistency for Manufacturing Industries 2 (1A2)

3 The chapter on combustion in manufacturing industries and construction provides tier 1 emission factors
4 (EFs) for the main four fuel groups (solid, gaseous, liquid and biomass). The chapter also includes a large
5 number of tier 2 EF tables for a variety of processes. In the previous GB update it was decided that only
6 emissions of NO_x, SO₂ and CO should be attributed to fuel combustion (1A2) while the remaining pollutants
7 should be considered under industrial processes (2A-G). This choice will not be revisited in the current
8 review of the GB. Therefore, only limited work has been done for the tier 2 EFs since they with the
9 exception of cement production do not include EFs of PM, HM and POPs.

10 Tier 1

11 As mentioned the tier 1 EFs consists of four EF tables for the four major fuel groups. The allocation of
12 different fuels to fuel groups is presented in table 3-1. This allocation should be reconsidered considering
13 the typical fuel properties. E.g. considering refinery gas as a liquid fuel could lead to significant
14 overestimation of emissions in particular for PM and HM. The same is the case for LPG and natural gas
15 liquids, which presumably has more in common with gaseous fuels than with the other liquid fuels. Biogas
16 has been added in fuel category gaseous fuels.

17 Existing fuel correspondence table (table 3-1)

Fuel group	Fuel
Solid	Hard coal, coking coal, other bituminous coal, sub-bituminous coal, coke, brown coal, lignite, oil shale, manufactured 'patent' fuel, peat
Gaseous	Natural gas, gas works gas, coke oven gas, blast furnace gas
Liquid	Residual fuel oil, refinery feedstock, petroleum coke, gas oil, kerosene, naphtha, natural gas liquids, liquefied petroleum gas, orimulsion, bitumen, shale oil, refinery gas
Biomass	Wood, charcoal, vegetable (agricultural) waste

18 Suggestion for new fuel correspondence table

Fuel group	Fuel
Solid	Hard coal, coking coal, other bituminous coal, sub-bituminous coal, coke, brown coal, lignite, oil shale, manufactured 'patent' fuel, peat
Gaseous	Natural gas, gas works gas, coke oven gas, blast furnace gas, natural gas liquids, liquefied petroleum gas, biogas, refinery gas
Liquid	Residual fuel oil, refinery feedstock, petroleum coke, gas oil, kerosene, naphtha, orimulsion, bitumen, shale oil
Biomass	Wood, charcoal, vegetable (agricultural) waste

1 The text basically states that EFs from either chapter 1A1 or 1A4 should be used, wherefore it perhaps is
2 unnecessary to have the fuel related tier 1 EFs in chapter 1A2. The vast majority of the EFs refer to the
3 previous version of the GB (chapter B216). The following inconsistencies have been identified:

- 4 • Wrong reference in table 3-2. Should refer to B216.
- 5 • PM EFs in table 3-3 are wrongfully referenced to B216. It has not been possible to find the origin of
6 the PM EFs.
- 7 • In table 3-5 the EF for selenium is referenced to B216, which is incorrect. It has not been possible to
8 find the origin of the selenium EF.

9 Tier 2

10 A final BREF document for iron and steel has been published in 2012 (EIPPCB, 2012a). The EFs referenced to
11 the 2008 draft version has been checked.

12 For blast furnaces (GB table 3-7) the upper limit for CO in the final BREF document is reported as 36 g per
13 tonnes. It is proposed to correct this in table 3-7 and calculate the EF as the geometric mean of the upper
14 and lower limit.

15 For pelletizing plants the lower and upper limits for NO_x are reported as 150 and 550 g per tonnes in the
16 final BREF document. It is proposed to correct this in table 3-9 and calculate the EF as the geometric mean
17 of the upper and lower limit.

18 For grey iron foundries the EFs refer to a previous version of the GB. It is proposed to change the EFS to
19 refer to the BREF document on smitheries and foundries (EIPPCB, 2005). EF values could be taken from
20 table 3.1 of the BREF document for NO_x, SO₂ and CO. Using the lower and higher values provided and then
21 calculating the EF as the geometric mean.

22 The second draft version of the BREF document for non-ferrous metals (EIPPCB, 2009) contains revised SO₂
23 values for primary and secondary copper production.

24 The second draft version of the BREF document for non-ferrous metals (EIPPCB, 2009) contains EFs for
25 secondary aluminium production that could replace the current EFs referenced to a previous version of the
26 GB.

27 For lime production a final version of the BREF document has been published (EIPPCB, 2010). There are
28 slight revision to the lower limit for NO_x and SO₂. This should be implemented in table 3-23 of the GB.

29 For cement production all pollutants except PM are included in the 1A2 chapter. Most EFs refer to the draft
30 BREF document. The final BREF document was published in 2010 (EIPPCB, 2010). The lower and upper
31 limits for most gaseous pollutants are slightly changed. For HM the EFs presented in the GB seem to be
32 recalculated from the values in the BREF document assuming a flue gas flow of 2000 Nm³ per tonnes. It is
33 not possible to find a reference for this assumption and it should be checked in the future. The BREF
34 document contains values for the EF of PCDD/F of 0.0276-627 ng per tonnes. The current EF range is 30-500
35 ng per tonnes referenced to UNEP. It is recommended to change the reference to the BREF document.

36 The EFs of PAHs refer to AP42 (US EPA, 1995). It has not been possible to find a better reference for the EFs
37 of PAHs.

1 The EFs for HCB and PCBs refer to Kakareka et al. (2004) and a previous version of the GB. It has not been
2 possible to get a copy of Kakareka et al. (2004) wherefore the review has been complicated. According to
3 SINTEF (2006) measurements of HCB from cement production plants have shown an emission level of
4 between 1 and 4 ng per Nm³. With an assumed flue gas flow of 2300 Nm³ per tonnes clinker this would
5 equate to an EF range of 2.3-9.2 µg per tonnes clinker. This is slightly lower than the current range of 6-17
6 µg per tonnes clinker. Using the geometric mean the revised HCB EF would be 4.6 µg per tonnes rather
7 than the current value of 11 µg per tonnes.

8 The PCB EF is referenced to a previous version of the GB. The current value is 1 µg per tonnes and the range
9 is 0.5-10 µg per tonnes. According to VDZ (2011) the PCB emission were measured at 12 kilns. In 8
10 measurements PCBs were not detected. The remaining 27 measurements are all below 0.1 µg per m³. Most
11 values are significantly below. According to the report by VDZ the measuring method does not provide
12 reliable results for concentrations below 0.02 µg per m³. Based on the data from VDZ the range can be
13 assumed to be 0.02-0.1 µg per m³. With an assumed flue gas flow of 2300 Nm³ per tonnes clinker this
14 would equate to an EF range of 46-230 µg per tonnes clinker. Using the geometric mean the revised PCB EF
15 would be 103 µg per tonnes rather than the current value of 1 µg per tonnes.

16 For glass production there is currently only one set of EFs available (table 3-26). However, the BREF
17 document (EIPPCB, 2012b) contains EFs (NO_x and SO₂) for container glass, flat glass, glass fibres, domestic
18 glass and special glass. It would also make the chapter consistent with the level of disaggregation in chapter
19 2A7d. However, CO EFs are not included in the final BREF document, so it is not possible to review the
20 current EFs. It has not been prioritised to search for alternative references for CO EFs.

21 For mineral wool the BREF data allows for the disaggregation between glass wool and stone wool. This split
22 should be made for both the fuel related EFs in chapter 1A2 and the process related emissions in chapter
23 2A7d.

24 For bricks and tiles the EFs refer to AP 42 (US EPA, 1997). However, EFs are available from the BREF
25 document on ceramics (EIPPCB, 2007). It is suggested to change the reference for the EFs from bricks and
26 tiles production from US EPA to BREF since the latter is presumed to better reflect European conditions.

27 For enamel production (table 3-30), it is not possible to reproduce the EFs for NO_x and SO₂ attributed to a
28 draft version of the BREF document on glass production. EFs should be updated to reflect the final BREF
29 document published in 2012.

30 **References**

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11 Cement Manufacturing.
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