

## 2.A.5.b - Construction and Demolition

### Short description

| Category Code   | Method                               | AD | EF |
|---|--------------------------------------|----|----|
| 2.A.5.b   | T1/T2                                | NS | CS |
| <b>Method(s) applied</b>  |                                      |    |    |
| <b>D</b>  | Default                              |    |    |
| <b>T1</b>   | Tier 1 / Simple Methodology *        |    |    |
| <b>T2</b>   | Tier 2*                              |    |    |
| <b>T3</b>   | Tier 3 / Detailed Methodology *      |    |    |
| <b>C</b>  | CORINAIR                             |    |    |
| <b>CS</b>   | Country Specific                     |    |    |
| <b>M</b>  | Model                                |    |    |
| * as described in the EMEP/EEA Emission Inventory Guidebook - 2019, in category chapters. |                                      |    |    |
| <b>(source for) Activity Data</b>   |                                      |    |    |
| <b>NS</b>   | National Statistics                  |    |    |
| <b>RS</b>   | Regional Statistics                  |    |    |
| <b>IS</b>   | International Statistics             |    |    |
| <b>PS</b>   | Plant Specific                       |    |    |
| <b>As</b>   | Associations, business organisations |    |    |
| <b>Q</b>  | specific Questionnaires (or surveys) |    |    |
| <b>M</b>  | Model / Modelled                     |    |    |
| <b>C</b>  | Confidential                         |    |    |
| <b>(source for) Emission Factors</b>  |                                      |    |    |
| <b>D</b>  | Default (EMEP Guidebook)             |    |    |
| <b>CS</b>   | Country Specific                     |    |    |
| <b>PS</b>   | Plant Specific                       |    |    |
| <b>M</b>  | Model / Modelled                     |    |    |
| <b>C</b>  | Confidential                         |    |    |

| NO <sub>x</sub>   | NM VOC | SO <sub>2</sub> | NH <sub>3</sub> | PM <sub>2.5</sub> | PM <sub>10</sub> | TSP | BC | CO | Heavy Metals | POPs |
|---|--------|-----------------|-----------------|-------------------|------------------|-----|----|----|--------------|------|
| NA  | NA     | NA              | NA              | -/-               | L/-              | L/- | NA | NA | NA           | NA   |
| <b>L/-</b> key source by <b>Level</b> only  |        |                 |                 |                   |                  |     |    |    |              |      |
| <b>-/T</b> key source by <b>Trend</b> only  |        |                 |                 |                   |                  |     |    |    |              |      |
| <b>L/T</b> key source by both <b>Level</b> and <b>Trend</b>                                   |        |                 |                 |                   |                  |     |    |    |              |      |
| <b>-/-</b> no key source for this pollutant   |        |                 |                 |                   |                  |     |    |    |              |      |
| <b>IE</b> emission of specific pollutant <b>Included Elsewhere</b> (i.e. in another category) |        |                 |                 |                   |                  |     |    |    |              |      |
| <b>NE</b> emission of specific pollutant <b>Not Estimated</b> (yet)                           |        |                 |                 |                   |                  |     |    |    |              |      |
| <b>NA</b> specific pollutant not emitted from this source or activity = <b>Not Applicable</b> |        |                 |                 |                   |                  |     |    |    |              |      |
| * no analysis done  |        |                 |                 |                   |                  |     |    |    |              |      |

With respect to particle emissions, construction is the second main emissions source in the Mineral industries.

### Methodology

Since the last update of the EMEP/EEA air pollutant emission inventory guidebook, a tier1 method is applied to estimate particulate matter emissions. However, this tier1 method is applied with various adaptations to national conditions improving it to a rather higher tier, perhaps T1/T2.

The approach for uncontrolled fugitive emissions from 2.A.5.b was adapted for national circumstances within a research project by Kampffmeyer & Visschedijk (2016) <sup>1)</sup>, partly considering existing emission-control technologies. As a result, statistical information is combined with modified default emission factors for TSP and PM.

## Activity data

Activity data are determined taking into account figures for various construction activities and based on national production statistics.

According to the method applied, figures of area of land affected by construction activities per building were concluded from statistical data and multiplied with emission factors, as explained below. The common uncertainty of 3% for national statistics could be increased as a result of this calculation, but the effect has not yet been quantified.

## Emission factors

The emission factors used are results of the adaptation of EMEP/EEA Guidebook defaults (EMEP/EEA, 2023)<sup>2)</sup>.

Table 1: Overview of applied emission factors, in  $[\text{kg}/\text{m}^2 \cdot \text{y}]$ , for roads in  $[\text{tons}/\text{km}^2 \cdot \text{y}]$

| type of building             | pollutant         | EF value | EF trend           |
|------------------------------|-------------------|----------|--------------------|
| single and two-family houses | TSP               | 0.0638   | constant over time |
|                              | PM <sub>10</sub>  | 0.0191   | constant over time |
|                              | PM <sub>2.5</sub> | 0.0019   | constant over time |
| apartment buildings          | TSP               | 0.329    | constant over time |
|                              | PM <sub>10</sub>  | 0.099    | constant over time |
|                              | PM <sub>2.5</sub> | 0.0099   | constant over time |
| non-residential              | TSP               | 0.631    | constant over time |
|                              | PM <sub>10</sub>  | 0.189    | constant over time |
|                              | PM <sub>2.5</sub> | 0.0189   | constant over time |
| roads                        | TSP               | 1,674    | constant over time |
|                              | PM <sub>10</sub>  | 502      | constant over time |
|                              | PM <sub>2.5</sub> | 50.2     | constant over time |

However, further assumptions were necessary to use the formula presented in the 2023 EMEP/EEA Guidebook:

$$EM = EF * B * f * m$$

For example, the emission factors are adapted with correction factors of (i) 0.20 for the moisture level and (ii) 2.22 for the silt content.

The assumption about the duration of the construction activity uses default values from (EMEP/EEA, 2023)<sup>3)</sup>:

Table 2: default duration of different construction activities, in years [y]

| Type of building                               | estimated duration |
|--|--------------------|
| Construction of houses (single and two family) | 0.5 (6 months)     |
| Construction of apartments (all types)         | 0.75 (9 months)    |
| Non-residential construction                   | 0.83 (10 months)   |
| Road construction                              | 1 (12 months)      |

AD is a result of multiplying B the number of houses constructed and f the conversion factor.

## Trends in emissions

All trends in emissions as product of EF and AD correspond to trends of construction activities.

## Trends of Emissions of construction and demolition

Emissions by pollutant / Emissionen nach Schadstoff



\* Base Year for PM = 1995 / Basisjahr für Feinstäube (PM) ist 1995

Quelle: German Environment Agency, National inventory for the German reporting on atmospheric emissions since 1990, (01/2024)

### Emission trends in NFR 2.A.5.b

Note for all: small change for 2023

Notes to PCB emissions of old buildings are given in chapter [2.K - Consumption of POPs and Heavy Metals](#).

## Recalculations

Recalculations were necessary due to improvements for most recently years (2020-2022): a new data gapfilling method for construction of roads.



For **pollutant-specific information on recalculated emission estimates for Base Year and 2022**, please see the recalculation tables following [chapter 8.1 - Recalculations](#).

## Planned improvements



At the moment, no category-specific improvements are planned.

## FAQs

**Where can I find emissions estimation of demolition activities?** - Demolishing without any significant new construction is not covered and there are no other emission factors available for demolition activities only. Nevertheless you can find Information about emissions from [5.E.2 - Other Waste: Building Fires](#).

**Why do German EFs differ from EEA defaults?** - It has to do with the default 50% reduction for non-residential buildings and roads (as a result of wetting unpaved temporary roads) that is assumed in the calculations for Germany. This is also already accounted for in the EPA emission factors. It is a result of a control measure that is nearly always taken but in principle optional. In the Guidebook a 50% reduction is advised.

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<sup>1)</sup> Kampffmeyer, T., Visschedijk, A.: Development of Methods for the Generation of Emission Data for Air Pollutants from Building Activity and Construction Zones, <https://research.ebsco.com/linkprocessor/plink?id=46c9c9e5-c6f9-3229-b7af-6585eb409115>; on order of the Umweltbundesamt, Dessau-Roßlau, 2016

<sup>2), 3)</sup> EMEP/EEA (2023): EMEP/EEA air pollutant emission inventory guidebook 2023; <https://www.eea.europa.eu/en/analysis/publications/emep-eea-guidebook-2023/part-b-sectoral-guidance-chapters/2-industrial-processes-and-product-use/2-a-mineral-products/2-a-5-b-construction/@download/file>; Copenhagen, 2023