

# 1.A.3.b vi - Road Transport: Automobile Tyre and Brake Wear

## Short description

In sub-categories *1.A.3.b vi - Road transport: Automobile tyre and brake wear* emissions from automobile tyre and brake wear in RT are reported. Therefore, these sub-category is an important source for a) particle emissions and b) emissions of heavy metals, POPs etc. included in these particles.

| Category Code | Method          |                 |                 |      |    | AD    |     |    |     |      | EF  |    |     |                  |                   |
|---------------|-----------------|-----------------|-----------------|------|----|-------|-----|----|-----|------|-----|----|-----|------------------|-------------------|
| 1.A.3.b vi    | T1, T3          |                 |                 |      |    | NS, M |     |    |     |      | CS  |    |     |                  |                   |
| Key Category  | SO <sub>2</sub> | NO <sub>x</sub> | NH <sub>3</sub> | NMVO | CO | BC    | Pb  | Hg | Cd  | Diox | PAH | HC | TSP | PM <sub>10</sub> | PM <sub>2.5</sub> |
| 1.A.3.b vi    | -               | -               | -               | -    | -  | L/-   | L/- | -  | -/- | -    | -/- | -  | L/- | L/T              | L/-               |

## Methodology

### Activity data

Abrasive emissions from tyre and brake wear are estimated based on vehicle-type specific mileage data.

For detailed mileage data, please see [superordinate chapter](#) on abrasive emissions from road vehicles.

### Emission factors

Table 1: Emission factors applied

|                   |         | Tyre Wear |       |       |       |        |             | Brake Wear |      |       |       |        |             |
|-------------------|---------|-----------|-------|-------|-------|--------|-------------|------------|------|-------|-------|--------|-------------|
|                   |         | PCs       | LDVs  | HDVs  | Buses | Mopeds | Motorcycles | PCs        | LDVs | HDVs  | Buses | Mopeds | Motorcycles |
| BC                | [mg/km] | 1,07      | 1,69  | 4,50  | 4,50  | 0,55   | 0,55        | 0,75       | 1,17 | 3,27  | 3,27  | 0,44   | 0,44        |
| PM <sub>2.5</sub> |         | 4,49      | 7,10  | 18,90 | 18,90 | 1,93   | 1,93        | 2,93       | 4,56 | 12,7  | 12,7  | 1,44   | 1,44        |
| PM <sub>10</sub>  |         | 6,40      | 10,10 | 27,00 | 24,30 | 2,80   | 2,80        | 7,35       | 11,5 | 32,0  | 28,8  | 3,63   | 3,63        |
| TSP               |         | 10,70     | 16,90 | 45,00 | 45,00 | 4,60   | 4,60        | 7,50       | 11,7 | 32,7  | 32,7  | 3,70   | 3,7         |
| Pb                | [µg/km] | 1,88      | 2,97  | 4,26  | 3,10  | 0,81   | 0,81        | 45,5       | 71,0 | 199   | 199   | 22,5   | 22,5        |
| Hg                |         | 0         | 0     | 0     | 0     | 0      | 0           | 0          | 0    | 0     | 0     | 0      | 0           |
| Cd                |         | 0,05      | 0,08  | 0,11  | 0,08  | 0,02   | 0,02        | 0,17       | 0,26 | 0,73  | 0,73  | 0,08   | 0,08        |
| As                |         | 0,04      | 0,06  | 0,09  | 0,07  | 0,02   | 0,02        | 0,51       | 0,79 | 2,21  | 2,21  | 0,25   | 0,25        |
| Cr                |         | 0,26      | 0,40  | 0,58  | 0,42  | 0,11   | 0,11        | 17,3       | 27,0 | 75,7  | 75,7  | 8,55   | 8,55        |
| Cu                |         | 1,86      | 2,94  | 4,21  | 3,06  | 0,80   | 0,80        | 383        | 598  | 1674  | 1674  | 189    | 189         |
| Ni                |         | 0,32      | 0,51  | 0,72  | 0,53  | 0,14   | 0,14        | 2,45       | 3,83 | 10,71 | 10,71 | 1,21   | 1,21        |
| Se                |         | 0,21      | 0,34  | 0,48  | 0,35  | 0,09   | 0,09        | 0,15       | 0,23 | 0,66  | 0,66  | 0,07   | 0,07        |
| Zn                |         | 79,5      | 126   | 180   | 131   | 34,2   | 34,2        | 65,1       | 102  | 284   | 284   | 32,1   | 32,1        |
| B[a]P             |         | 0,032     | 0,049 | 0,134 | 0,120 | 0,013  | 0,013       | NA         | NA   | NA    | NA    | NA     | NA          |
| B[b]F             |         | 0,038     | 0,063 | 0,161 | 0,144 | 0,019  | 0,019       | NA         | NA   | NA    | NA    | NA     | NA          |
| B[k]F             |         | 0         | 0     | 0     | 0     | 0      | 0           | NA         | NA   | NA    | NA    | NA     | NA          |
| I[.].P            |         | 0,019     | 0,028 | 0,082 | 0,072 | 0,006  | 0,006       | NA         | NA   | NA    | NA    | NA     | NA          |
| Σ PAHs 1-4        |         | 0,090     | 0,140 | 0,379 | 0,336 | 0,038  | 0,038       | NA         | NA   | NA    | NA    | NA     | NA          |

## Discussion of emission trends

(emissions from wear/abrasion only; no fuel combustion included)

Table: Outcome of Key Category Analysis

|      |           |           |            |                        |                         |
|------|-----------|-----------|------------|------------------------|-------------------------|
| for: | <b>BC</b> | <b>Pb</b> | <b>TSP</b> | <b>PM<sub>10</sub></b> | <b>PM<sub>2.5</sub></b> |
| by:  | L/-       | L/-       | L/-        | L/T                    | L/-                     |

All reported emissions from tyre and brake wear are connected directly to the mileage driven by the road vehicles covered.

### Particulate Matter

### Heavy metals

The emissions of heavy metals are as well linked directly to the trend of mileage.

## Recalculations

**Activity data** (mileage) have been revised due to the regular revision of the TREMOD model. (see [superordinate chapter](#) ).

However, the biggest changes occur in the tier1 **emission factors** that have been revised during a research study. The variety of old and revised emission factors cannot be compared here in a comprehensible way.



For more information on recalculated emission estimates for Base Year and 2018, please see the pollutant-specific recalculation tables following chapter [8.1 - Recalculations](#).

## Planned improvements

Besides a routine revision of the underlying model, no specific improvements are planned.

## FAQs

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**bibliography** : 1 : EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook 2019; <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>; Copenhagen, 2019. **bibliography**