|  |  |  |
| --- | --- | --- |
| **Category** | | **Title** |
| **NFR:** | 5.E | Other waste |
| **SNAP:** | Not applicable | Car and building fires |
| **ISIC:** |  |  |
| **Version** | Guidebook 2023 |  |

**Coordinator (including to earlier versions of this chapter)**

Carlo Trozzi, Céline Guéguen

**Contributing authors (including to earlier versions of this chapter)**

Katja Hjelgaard, Marc Deslauriers, David R. Niemi and Mike Woodfield, Adriana Gomez Sanabria

Contents

[1 Overview 3](#_Toc128487627)

[2 Description of sources 3](#_Toc128487628)

[2.1 Process description 3](#_Toc128487629)

[2.2 Techniques 3](#_Toc128487630)

[2.3 Emissions 3](#_Toc128487631)

[2.4 Controls 3](#_Toc128487632)

[3 Methods 4](#_Toc128487633)

[3.1 Choice of method 4](#_Toc128487634)

[3.2 Tier 1 default approach 5](#_Toc128487635)

[3.3 Tier 2 technology-specific approach 5](#_Toc128487636)

[3.4 Tier 3 emission modelling and use of facility data 9](#_Toc128487637)

[4 Data quality 9](#_Toc128487638)

[5 References 9](#_Toc128487639)

[6 Point of enquiry 10](#_Toc128487640)

# Overview

This chapter covers the emissions from other waste. The following activities are included in this category:

* car fires;
* building fires.

Note: Sludge spreading has been moved to agricultural chapter (in terms of methodological description and allocation).

# Description of sources

## Process description

**Car and building fires**

This activity includes mostly unwanted fires in cars and various types of buildings.

## Techniques

Not relevant.

## Emissions

**Car and building fires**

Emissions from fires include emissions of particulates, possibly heavy metals and main pollutants like NOx, SO2, CO, non-methane volatile organic compounds (NMVOC), dioxins and other HAP, depending on the type of material burned. This chapter is proposing a methodology to estimate particulate (TSP, PM10, PM2.5) and PCDD/F emissions.

## Controls

No specific information available for this source category.

# Methods

## Choice of method

Figure 3‑1 presents the procedure to select the methods for estimating emissions from this source category. The basic idea is:

* if detailed information is available; use it;
* if the source category is a key category, a Tier 2 or better method must be applied and detailed input data must be collected. The decision tree directs the user in such cases to the Tier 2 method, since it is expected that it is easier to obtain the necessary input data for this approach than to collect ‘facility level’ data needed for a Tier 3 estimate;
* the alternative of applying a Tier 3 method, using detailed process modelling, is not explicitly included in this decision tree. However, detailed modelling will always be done at facility level and results of such modelling could be seen as ‘facility data’ in the decision tree.

Figure 3‑1 Decision tree for source category 5.E Other waste



## Tier 1 default approach

**Car and building fires**

Napproachcar and building fires

## Tier 2 technology-specific approach

### Algorithm

**Car and building fires**

Emissions from cars and building fires are estimated following Eq. 1:

where:

= Number of fires of category i

i = Fire category (Car fire; Detached house fire; Undetached house fire; Apartment building fire; Industrial building fire)

= Emission Factor for fire category i and pollutant *p*

### Technology-specific emission factors

This section presents Tier 2 technology-specific emission factors for car and building fires.



Table 3‑1 Tier 2 emission factors for source category 5.E Other waste, car fire

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Tier 2 emission factors | | | | | |
|  | Code | Name | | | |
| NFR source category | 5.E | Other waste | | | |
| Fuel | NA | | | | |
| SNAP (if applicable) |  |  | | | |
| Technologies/Practices | Car fire | | | | |
| Region or regional conditions |  | | | | |
| Abatement technologies |  | | | | |
| Not applicable | HCH | | | | |
| Not estimated | SO2, NOx, NMVOC, CO, NH3, BC, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, HCB, Benzo(a)pyrene, Benzo(b)fluoranthene, benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, PCBs | | | | |
| Pollutant | Value | Unit | 95 % confidence interval | | Reference |
| Lower | Upper |
| TSP | 2.3 | kg/fire | 1 | 5 | Aasestad (2007) |
| PM10 | 2.3 | kg/fire | 1 | 5 | Aasestad (2007) |
| PM2.5 | 2.3 | kg/fire | 1 | 5 | Aasestad (2007) |
| PCDD/F | 0.048 | mg/fire | 0.02 | 0.1 | Hansen (2000) |

Table 3‑2 Tier 2 emission factors for source category 5.E Other waste, detached house fire

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Tier 2 emission factors** | | | | | | |
|  | | Code | Name | | | |
| **NFR Source Category** | | 5.E | Other waste | | | |
| **Fuel** | | NA | | | | |
| **SNAP (if applicable)** | |  |  | | | |
| **Technologies/Practices** | | Detached house fire | | | | |
| **Region or regional conditions** | |  | | | | |
| **Abatement technologies** | |  | | | | |
| **Not applicable** | | NH3, HCH | | | | |
| **Not estimated** | | NOx, CO, NMVOC, SO2, BC, Ni, Se, Zn, PCBs, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB | | | | |
| **Pollutant** | | **Value** | **Unit** | **95% confidence interval** | | **Reference** |
| **Lower** | **Upper** |
| TSP | | 143.82 | kg/fire | 71.9 | 287.6 | Aasestad (2007)\* |
| PM10 | | 143.82 | kg/fire | 71.9 | 287.6 | Aasestad (2007)\* |
| PM2.5 | | 143.82 | kg/fire | 71.9 | 287.6 | Aasestad (2007)\* |
| Pb | | 0.42 | g/fire | 0.2 | 0.8 | Aasestad (2007)\* |
| Cd | | 0.85 | g/fire | 0.4 | 1.7 | Aasestad (2007)\* |
| Hg | | 0.85 | g/fire | 0.4 | 1.7 | Aasestad (2007)\* |
| As | | 1.35 | g/fire | 0.7 | 2.7 | Aasestad (2007)\* |
| Cr | | 1.29 | g/fire | 0.6 | 2.6 | Aasestad (2007)\* |
| Cu | | 2.99 | g/fire | 1.5 | 6.0 | Aasestad (2007)\* |
| PCDD/F | | 1.44 | mg/fire | 0.7 | 2.9 | Aasestad (2007)\* |
| \*Personal contact with Kristin Aasestad has provided a correction of the units which are inaccurate in the text of Aasestad (2007) | | | | | |

Table 3‑3 Tier 2 emission factors for source category 5.E Other waste, undetached house fire

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tier 2 emission factors** | | | | | |
|  | Code | Name | | | |
| **NFR Source Category** | 5.E | Other waste | | | |
| **Fuel** | NA | | | | |
| **SNAP (if applicable)** |  |  | | | |
| **Technologies/Practices** | Undetached house fire | | | | |
| **Region or regional conditions** |  | | | | |
| **Abatement technologies** |  | | | | |
| **Not applicable** | NH3, HCH | | | | |
| **Not estimated** | NOx, CO, NMVOC, SO2, BC, Ni, Se, Zn, PCBs, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB | | | | |
| **Pollutant** | **Value** | **Unit** | **95% confidence interval** | | **Reference** |
| **Lower** | **Upper** |
| TSP | 61.62 | kg/fire | 30.8 | 123.2 | Aasestad (2007)\* |
| PM10 | 61.62 | kg/fire | 30.8 | 123.2 | Aasestad (2007)\* |
| PM2.5 | 61.62 | kg/fire | 30.8 | 123.2 | Aasestad (2007)\* |
| Pb | 0.18 | g/fire | 0.1 | 0.4 | Aasestad (2007)\* |
| Cd | 0.36 | g/fire | 0.2 | 0.7 | Aasestad (2007)\* |
| Hg | 0.36 | g/fire | 0.2 | 0.7 | Aasestad (2007)\* |
| As | 0.58 | g/fire | 0.3 | 1.2 | Aasestad (2007)\* |
| Cr | 0.55 | g/fire | 0.3 | 1.1 | Aasestad (2007)\* |
| Cu | 1.28 | g/fire | 0.6 | 2.6 | Aasestad (2007)\* |
| PCDD/F | 0.62 | mg/fire | 0.3 | 1.2 | Aasestad (2007)\* |

\*Personal contact with Kristin Aasestad has provided a correction of the units which are inaccurate in the text of Aasestad (2007)

Table 3‑4 Tier 2 emission factors for source category 5.E Other waste, apartment building fire

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Tier 2 emission factors** | | | | | | | |
|  | | Code | Name | | | | |
| **NFR Source Category** | | 5.E | Other waste | | | | |
| **Fuel** | | NA | | | | | |
| **SNAP (if applicable)** | |  |  | | | | |
| **Technologies/Practices** | | Apartment building fire | | | | | |
| **Region or regional conditions** | |  | | | | | |
| **Abatement technologies** | |  | | | | | |
| **Not applicable** | | NH3, HCH | | | | | |
| **Not estimated** | | NOx, CO, NMVOC, SO2, BC, Ni, Se, Zn, PCBs, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB | | | | | |
| **Pollutant** | | **Value** | **Unit** | **95% confidence interval** | | **Reference** | |
| **Lower** | **Upper** |
| TSP | | 43.78 | kg/fire | 21.9 | 87.6 | Aasestad (2007)\* | |
| PM10 | | 43.78 | kg/fire | 21.9 | 87.6 | Aasestad (2007)\* | |
| PM2.5 | | 43.78 | kg/fire | 21.9 | 87.6 | Aasestad (2007)\* | |
| Pb | | 0.13 | g/fire | 0.1 | 0.3 | Aasestad (2007)\* | |
| Cd | | 0.26 | g/fire | 0.1 | 0.5 | Aasestad (2007)\* | |
| Hg | | 0.26 | g/fire | 0.1 | 0.5 | Aasestad (2007)\* | |
| As | | 0.41 | g/fire | 0.2 | 0.8 | Aasestad (2007)\* | |
| Cr | | 0.39 | g/fire | 0.2 | 0.8 | Aasestad (2007)\* | |
| Cu | | 0.91 | g/fire | 0.5 | 1.8 | Aasestad (2007)\* | |
| PCDD/F | | 0.44 | mg/fire | 0.2 | 0.9 | Aasestad (2007)\* | |
| \*Personal contact with Kristin Aasestad has provided a correction of the units which are inaccurate in the text of Aasestad (2007) | | | | | |

Table 3‑5 Tier 2 emission factors for source category 5.E Other waste, industrial building fire

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tier 2 emission factors** | | | | | |
|  | Code | Name | | | |
| **NFR Source Category** | 5.E | Other waste | | | |
| **Fuel** | NA | | | | |
| **SNAP (if applicable)** |  |  | | | |
| **Technologies/Practices** | Industrial building fire | | | | |
| **Region or regional conditions** |  | | | | |
| **Abatement technologies** |  | | | | |
| **Not applicable** | NH3, HCH | | | | |
| **Not estimated** | NOx, CO, NMVOC, SO2, BC, Ni, Se, Zn, PCBs, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB | | | | |
| **Pollutant** | **Value** | **Unit** | **95% confidence interval** | | **Reference** |
| **Lower** | **Upper** |
| TSP | 27.23 | kg/fire | 13.6 | 54.5 | Aasestad (2007)\* |
| PM10 | 27.23 | kg/fire | 13.6 | 54.5 | Aasestad (2007)\* |
| PM2.5 | 27.23 | kg/fire | 13.6 | 54.5 | Aasestad (2007)\* |
| Pb | 0.08 | g/fire | 0.04 | 0.2 | Aasestad (2007)\* |
| Cd | 0.16 | g/fire | 0.1 | 0.3 | Aasestad (2007)\* |
| Hg | 0.16 | g/fire | 0.1 | 0.3 | Aasestad (2007)\* |
| As | 0.25 | g/fire | 0.1 | 0.5 | Aasestad (2007)\* |
| Cr | 0.24 | g/fire | 0.1 | 0.5 | Aasestad (2007)\* |
| Cu | 0.57 | g/fire | 0.3 | 1.1 | Aasestad (2007)\* |
| PCDD/F | 0.27 | mg/fire | 0.1 | 0.5 | Aasestad (2007)\* |
| \*Personal contact with Kristin Aasestad has provided a correction of the units which are inaccurate in the text of Aasestad (2007) | | | | | |

### Abatement

No default abatement efficiency information is available.

### Activity data

**Car and building fires:**

For accidental fires, activity data can be obtained from national statistics or national emergency management agencies.

## Tier 3 emission modelling and use of facility data

Not available for this source.

# Data quality

No source specific issues are applicable to this source category.

# References

Aasestad K. (eds.) (2007). Norwegian Emission Inventory 2007. Documentation of methodologies for estimating emissions of greenhouse gases and long-range transboundary air pollutants. Report 2007/38, Statistics Norway.

Boldrin, A., Andersen, J.K. & Christensen, T.H.  LCA-report: Environmental assessment of garden waste management in Århus Kommune (Miljøvurdering af haveaffald i Århus kommune), Department of Environmental Engineering, Technical University of Denmark.

Hansen, E., Substance Flow Analysis for dioxins in Denmark, Environmental Project No. 570 2000, Miljøprojekt, the Danish Environmental Protection Agency, (In Danish), (<http://www2.mst.dk/udgiv/publications/2000/87-7944-295-1/pdf/87-7944-297-8.pdf>) accessed 23 July 2019.

Pradel, M., Pacaud, T. & Cariolle, M. (2013). Valorization of Organic Wastes Through Agricultural Fertilization: Coupling Models to Assess the Effects of Spreader Performances on Nitrogenous Emissions and Related Environmental Impacts. *Waste Biomass Valor* **4**, 851–872. <https://doi.org/10.1007/s12649-012-9162-2>

Lu, Q.; He, Z.L.; Stoffella, P.J (2012). Land Application of Biosolids in the USA: A Review. Appl. Environ. Soil. Sci. 2012,, 201462.

# Point of enquiry

Enquiries concerning this chapter should be directed to the relevant leader(s) of the Task Force on Emission Inventories and Projection’s expert panel on combustion and industry. Please refer to the TFEIP website ([www.tfeip-secretariat.org/](http://www.tfeip-secretariat.org/)) for the contact details of the current expert panel leaders.