Category		Title
NFR:	**5.E**	**Other waste**
SNAP:	**091003** **091006** **091008**	**Sludge spreading** **Biogas production** **Other production of fuel (refuse derived fuel, etc.)**
ISIC:		
Version	**Guidebook 2013**	

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Contents

1 Overview

This chapter covers the emissions from other waste. Because these are not considered to be significant on a national level for any pollutant, there will only be a brief description and a set of emission factors presented in this chapter. The activities that will be discussed are:

- sludge spreading;
- car fires;
- house fires.

2 Description of sources

2.1 Process description

Sludge spreading

The sludge produced in a wastewater treatment plant is either burned, mechanically dried or dried by spreading in the open air. In the Netherlands some information on the composition of communal sludge is available. Some of the pollutants, especially halogenated hydrocarbons and polycyclic aromatic hydrocarbons (PAHs), might also become airborne on spreading.

Car and house fires

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

2.2 Techniques

Not relevant.

2.3 Emissions

Emissions to air from this source category include odours. Also, small amounts of ammonia are produced. These are considered in this chapter.

Emissions from fires obviously also include emissions of particulates, possibly heavy metals and main pollutants like NO_x, SO_2, CO and non-methane volatile organic compounds (NMVOC).

2.4 Controls

No specific information available for this source category.

3 Methods

3.1 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 more easy 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.

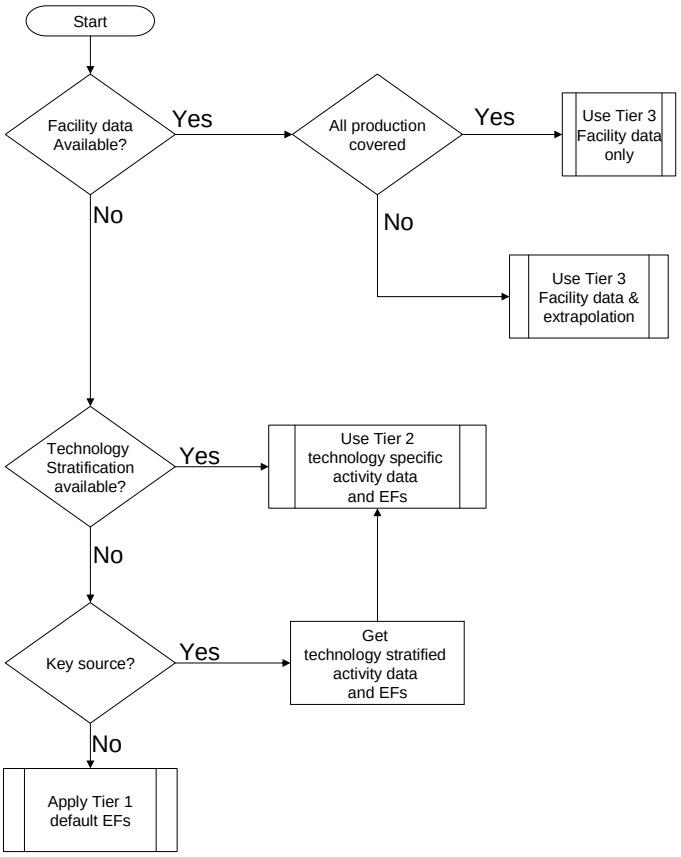

Figure 3-1 Decision tree for source category 5.E Other waste

3.2 Tier 1 default approach

Because the processes considered in this source category are not comparable, no Tier 1 emission factors could be provided for this source category. For each of the specific processes considered in this section, emission factors have been defined at a Tier 2 level. If the decision tree directs the user to a Tier 1 approach, it is recommended to use the Tier 2 approach provided in the next section. It is good practice to use Tier 2 when activity data is available.

3.3 Tier 2 technology-specific approach

3.3.1 Algorithm

To apply the Tier 2 approach, both the activity data and the emission factors need to be stratified according to the different process types that may occur in the country.

The approach followed to apply a Tier 2 approach is as follows.

Stratify the processes in 'other waste' in the country to model the different process types occurring in the national industry into the inventory by:

- defining the production using each of the separate process types (together called 'technologies' in the formulae below) separately; and
- applying technology-specific emission factors for each process type:

$$E_{pollutant} = \sum_{technologies} AR_{production,technology} \times EF_{technology,pollutant} \quad (1)$$

where:

$AR_{production,technology}$ = the production rate within the source category, using this specific technology,

$EF_{technology,pollutant}$ = the emission factor for this technology and this pollutant.

A country where only one technology is implemented will result in a penetration factor of 100 % and the algorithm reduces to:

$$E_{pollutant} = AR_{production} \times EF_{technology,pollutant} \quad (2)$$

where:

$E_{pollutant}$ = the emission of the specified pollutant,

$AR_{production}$ = the activity rate for this specific technology,

$EF_{pollutant}$ = the emission factor for this pollutant.

3.3.2 Technology-specific emission factors

This section presents Tier 2 technology-specific emission factors for sludge spreading, car fires and various types of house fires.

Table 3-1 Tier 2 emission factors for source category 5.E Other waste, sludge spreading

Tier 2 emission factors					
	Code	Name			
NFR Source Category	5.E	Other waste			
Fuel	NA				
SNAP (if applicable)	091003	Sludge spreading			
Technologies/Practices	Sludge spreading				
Region or regional conditions					
Abatement technologies					
Not applicable	HCH				
Not estimated	NO_x, CO, NMVOC, SO_2, TSP, PM_{10}, $PM_{2.5}$, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCBs, PCDD/F, 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**	
NH_3	50	g/kg NH_3 in the sludge	10	150	Guidebook (2006)

Table 3-2 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	SO_2, NO_x, NMVOC, CO, NH_3, 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)
PM_{10}	2.3	kg/fire	1	5	Aasestad (2007)
$PM_{2.5}$	2.3	kg/fire	1	5	Aasestad (2007)
PCDD/F	0.048	mg/fire	0.02	0.1	Hansen (2000)

Table 3-3 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	NH_3, HCH				
Not estimated	NO_x, CO, NMVOC, SO_2, 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)*
PM_{10}	143.82	kg/fire	71.9	287.6	Aasestad (2007)*
$PM_{2.5}$	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 3-4 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	NH_3, HCH				
Not estimated	NO_x, CO, NMVOC, SO_2, 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)*
PM_{10}	61.62	kg/fire	30.8	123.2	Aasestad (2007)*
$PM_{2.5}$	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 3-5 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	NH_3, HCH				
Not estimated	NO_x, CO, NMVOC, SO_2, 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)*
PM_{10}	43.78	kg/fire	21.9	87.6	Aasestad (2007)*
$PM_{2.5}$	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 3-6 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	NH_3, HCH				
Not estimated	NO_x, CO, NMVOC, SO_2, 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)*
PM_{10}	27.23	kg/fire	13.6	54.5	Aasestad (2007)*
$PM_{2.5}$	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)

3.3.3 Abatement

A number of add-on technologies exist that are aimed at reducing the emissions of specific pollutants. The resulting emission can be calculated by replacing the technology-specific emission factor with an abated emission factor as given in the formula:

$$EF_{technology,abated} = (1 - \eta_{abatement}) \times EF_{technology,unabated} \quad (3)$$

No default abatement efficiency information is available.

3.3.4 Activity data

For sludge spreading, the relevant activity statistics are the standard statistics on sludge production and the fraction that is dried by spreading.

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

3.4 Tier 3 emission modelling and use of facility data

Not available for this source.

4 Data quality

No source specific issues are applicable to this source category.

5 References

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6 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/) for the contact details of the current expert panel leaders.