Category		Title
NFR:	**2.A.5.b**	**Construction and demolition**
SNAP:	**040624**	**Public works and building sites**
ISIC:	**4510**	**Site preparation**
	4520	**Building of complete constructions or parts thereof; civil engineering**
	4530	**Building installation**
	4540	**Building completion**
Version	**Guidebook 2013**	

Coordinator

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Contents

1   Overview

The present chapter discusses emissions from construction and demolition works. This activity mainly results in emissions of particulates but other pollutants may also be emitted, depending on the materials used in the work.

Although significant at a local level, at a national level emissions are comparatively small and only relevant for the relatively course fractions of particulate matter. This chapter therefore provides only a brief process description and a Tier 1 default emission estimation method for national emission estimates supplemented with a reference to a more detailed Tier 3 methodology that can be used for emission estimation in the case of major local point sources.

2   Description of sources

2.1   Process description

At construction sites, construction materials are used to construct items including buildings and infrastructure. At demolition sites, a building, infrastructure or other constructions are pulled down, resulting in a lot of rubbish.

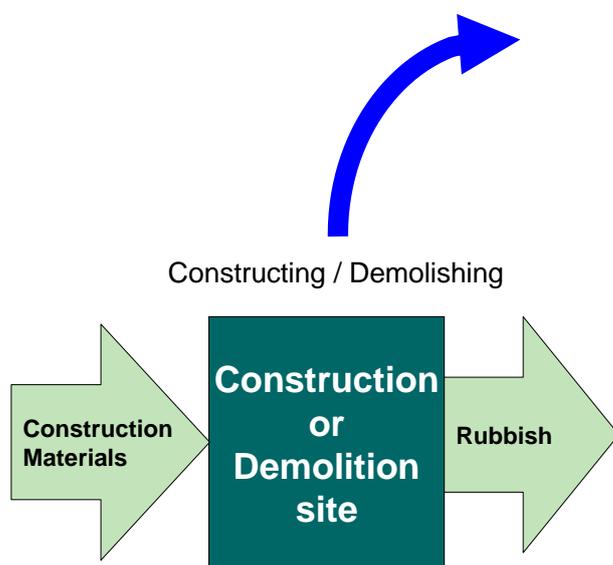The present chapter does not include any emissions from combustion activities.

Constructing / Demolishing

Construction Materials

Construction or Demolition site

Rubbish

Figure 2.1   Simplified process scheme for source category 2.A.5.b Construction and demolition

2.2   Techniques

Standard techniques are assumed for this source.

2.3   Emissions and controls

In the process, quite some dust emissions occur and potentially NMVOCs may also be emitted when using some materials. Also, depending on the materials and construction/demolition site, other pollutants may be emitted. However, this chapter only provides guidance on estimating emissions of particulates.

3   Methods

3.1   Choice of method

Since only a Tier 1 default approach for this chapter is presented, the description of choice of method and the decision tree normally presented in this subsection are omitted.

3.2   Tier 1 default approach

The present subsection provides default emission factors for this source category. Since it is only a minor source of emissions and not a key category, only Tier 1 default emission factors are provided.

3.2.1   Algorithm

The Tier 1 approach uses the general equation:

$$E_{pollutant} = AR_{production} \times EF_{pollutant} \tag{1}$$

Where:

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

$AR_{production}$ =   the floor area of the building constructed

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

The Tier 1 emission factors assume an averaged or typical technology and abatement implementation in the country and integrate all sub-processes.

3.2.2   Default emission factors

Default emission factors for particulate matter (PM) emissions from construction and demolition are provided in

Table 3.1. The emission factors are derived from the Coordinated European Particulate Matter Emission Inventory Program (CEPMEIP) study (Visschedijk *et al*., 2004).

Table 3.1   Tier 1 emission factors for source category 2.A.5.b Construction and demolition

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	2.A.5.b	Construction and demolition			
Fuel	NA				
Not applicable	NOx, CO, SOx, NH$_3$, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, HCH, PCBs, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB				
Not estimated	NMVOC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
TSP	0.162	kg/m^2/year	0.0123	2.15	Visschedijk et al. (2004)
PM$_{10}$	0.0812	kg/m^2/year	0.0123	0.538	Visschedijk et al. (2004)
PM$_{2.5}$	0.00812	kg/m^2/year	0.00123	0.0538	Visschedijk et al. (2004)

For comparison, the default EF given by US EPA (2011) (AP-42, 13.2.3) is 2.69 Mg TSP/hectare/month of activity, which equals to 3.22 kg TSP/m^2/year. The default EF is based on measurements in the surroundings of shopping centre and apartment construction projects. The conditions were: medium level activity, moderate silt content and semiarid climate.

3.2.3   Activity data

The emission factors in

Table 3.1 are provided in kg/m²/year, where the area in m² refers to the floor area of the building constructed or demolished. Total annual statistics on this floor area are therefore necessary to calculate the emission from this source.

3.3   Tier 2 technology-specific approach

Not available for this source.

3.4   Tier 3 emission modelling and use of facility data

3.4.1   Methodology

A detailed methodology for analysis of emissions from construction and demolition is provided by US EPA (2011): "AP-42, Compilation of Air Pollutant Emission Factors". A survey of the compilation of formulas relevant for construction and demolition are presented in Table 3.2.

Table 3.2   **Methodologies for estimation of emissions from construction and demolition provided in AP-42, chapter 13.2.3 "Heavy construction operations" (US EPA, 2011).**

I. Demolition and debris removal	1. Demolition of buildings or other (natural) obstacles such as trees, boulders etc.
	  a. Mechanical dismemberment ("headache ball") of existing structures
	  b. Implosion of existing structures
	  c. Drilling and blasting of soils (general)
	  d. General land clearing
		na
		na
		AP-42; 11.9/na
		AP-42; 11.9

	2. Loading of debris into trucks	AP-42; 13.2.4
	3. Truck transport of debris	AP-42; 13.2.1 AP-42; 13.2.2
	4. Truck unloading of debris	AP-42; 13.2.4
II. Site preparation (earth removal)	1. Bulldozing	AP-42; 11.9
	2. Scrapers unloading topsoil	AP-42; 11.9
	3. Scrapers in travel	AP-42; 11.9
	4. Scrapers removing topsoil	AP-42; 13.2.3
	5. Loading of excavated material into trucks	AP-42; 13.2.4
	6. Truck dumping of fill material, road base, or other materials	AP-42; 13.2.4
	7. Compacting	AP-42; 11.9
	8. Motor grading	AP-42; 11.9
III. General construction	1. Vehicular traffic	AP-42; 13.2.1 AP-42, 13.2.2

	2. Portable plants
	  a. Crushing
	  b. Screening
	  c. Material transfers
		
		AP-42; 11.19.2
		AP-42; 11.19.2
		AP-42; 13.2.4

	3. Other operations	AP-42; 11

3.4.2   Activity data

The methodologies provided by US EPA with AP-42 require very detailed local data e.g. material silt content, road surface silt content, material moisture content, medium wind speed, mean

vehicle weight, mean vehicle speed etc. Collection of such data is likely to be possible only for individual large point sources.

4   Data quality

There are no specific data quality issues for this source category.

5   Glossary

AR$_{production}$	the activity rate for construction and demolition (floor area of building constructed)
E $_{pollutant}$	the emission of the specified pollutant
EF $_{pollutant}$	the emission factor for this pollutant

6   References

US EPA 2011. AP-42, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition (with revisions till January 2011). Available at: http://www.epa.gov/ttn/chief/ap42/.

Visschedijk, A.J.H., Pacyna, J., Pulles, T., Zandveld, P. and Denier van der Gon, H., 2004. 'Coordinated European Particulate Matter Emission Inventory Program (CEPMEIP)'.I In: Dilara, P. *et al.* (eds.), *Proceedings of the PM emission inventories scientific workshop, Lago Maggiore, Italy, 18 October 2004*. EUR 21302 EN, JRC, pp. 163–174.

7   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.