Category		Title
NFR	2.C.7.c	Other metal production
SNAP	040303	Silicium production
	040304	Magnesium production (except 030323)
	040306	Alloyed metal manufacturing
	040307	Galvanizing
	040308	Electroplating
	040309z	Other
ISIC	2720	Manufacture of basic precious and non-ferrous metals
Version	Guidebook 2019	

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Contents

1 Overview

Emissions from source category 2.C.7.c Other metal production are generally not considered significant, since they contribute less than 1% to the national emissions of any pollutant.

Emissions from combustion in the metal production process are to be reported in source category 1.A.2.b (Combustion in Non-Ferrous Metal Production).

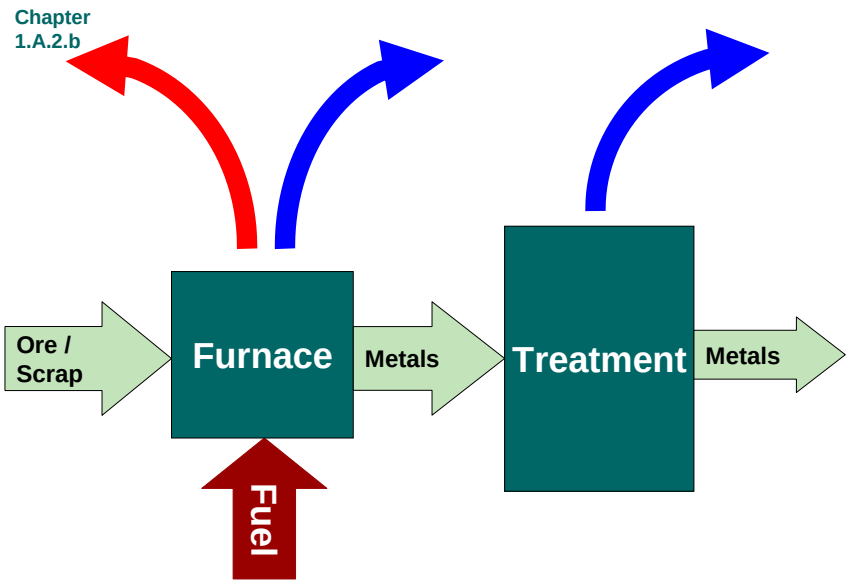
The present chapter only provides technical guidance for a Tier 1 estimate. There is some discussion of the methodologies for applying Tier 2 and Tier 3 estimates but no emission factors are presented.

2 Description of sources

2.1 Process description

Source category 2.C.7.c Other metal production addresses the production of all metals that are not covered by separate chapters in the present Guidebook. A generic process scheme is provided in Figure 2.1.

Figure 2.1 Generic process scheme for source category 2.C.7.c Other metal production



2.2 Techniques

The present chapter does not identify different techniques.

2.3 Emissions and controls

In addition to emissions arising from combustion activities in the production process, dust and heavy metals are also emitted as process emissions. Combustion emissions are to be reported under source category 1.A.2.b.

Important pollutants regarding the process emissions in this sector are SO_x, dust and metals. Significant process emissions of NO_x may also occur as a result of acid digestion using nitric acid. NO_x emissions in precious metal manufacturing may range from 7 to more than 150 kt/t of metal produced. Common emission control techniques are ESPs, baghouse filters, sulphuric acid plants and wet scrubbing. To limit diffuse emissions, proper sealing or hooding of processes may be applied (European Commission, 2014).

More information regarding emissions and control techniques in relation to non-ferrous metal production processes can be found in the revised Best Available Techniques Reference (BREF) document for the non-ferrous metal industry (European Commission, 2014) and the previous BREF document for the non-ferrous metal industry (European Commission, 2001).

Note that PM emission factors in the Guidebook represent primary emissions from the activities and not formation of secondary aerosol from chemical reaction in the atmosphere after release.

A number of factors influence the measurement and determination of primary PM emissions from activities and, the quantity of PM determined in an emission measurement depends to a large extent on the measurement conditions. This is particularly true of activities involving high temperature and semi-volatile emission components – in such instances the PM emission may be partitioned between a solid/aerosol phase and material which is gaseous at the sampling point but which can condense in the atmosphere. The proportion of filterable and condensable material will vary depending on the temperature of the flue gases and in sampling equipment.

A range of filterable PM measurement methods are applied around the world typically with filter temperatures of 70-160°C (the temperature is set by the test method). Condensable fractions can be determined directly by recovering condensed material from chilled impinger systems downstream of a filter – note that this is condensation without dilution and can require additional processing to remove sampling artefacts. A common approach for total PM includes dilution where sampled flue or exhaust gases are mixed with ambient air (either using a dilution tunnel or dilution sampling systems) which collect the filterable and condensable components on a filter at lower temperatures (but depending on the method this can be 15-52°C).

The review identifies whether the PM emission factors (for TSP, PM_{10} and $PM_{2.5}$) represent total PM, filterable PM or whether the basis of the emission factor cannot be determined (see individual emission factor tables).

3 Methods

3.1 Choice of method

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 and the decision tree has been omitted. However, facility data may be used if they meet the criteria for quality as explained in the general guidance chapter on QA/QC in Part A of the Guidebook.

3.2 Tier 1 default approach

3.2.1 Algorithm

The Tier 1 approach uses the general equation:

$$E_{pollutant} = AR_{production} \times EF_{pollutant} \qquad (1)$$

where:

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

$AR_{production}$ = the activity rate for the metal production

$EF_{pollutant}$ = 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

The Tier 1 emission factor table is given in Table 3.1. The emission factors are adapted from the revised BREF document for the non-ferrous metal industry (European Commission, 2014) and applicable for precious metal production facilities controlled by a fabric filter, hot electrostatic precipitators and cyclone.

In Tier 1, no emission factors are available for heavy metals, since these depend heavily on the type of metal that is produced.

Table 3.1 Tier 1 emission factors for source category 2.C.7.c Other metal production

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	2.C.7.c	Other metal production			
Fuel	NA				
Not applicable					
Not estimated	NOx, CO, NH3, PM2.5, PM10, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs, HCB, PCP, SCCP				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	

TSP	16	kg/Mg metal produced	2	127	European Commission (2014)
SO_x	26	kg/Mg metal produced	3	232	European Commission (2014)

Note:
These PM factors represent filterable PM emissions only (excluding any condensable fraction).

3.2.3 Activity data

A lot of information on production statistics (for various source categories) is available from United Nations statistical yearbooks or national statistics.

Further guidance might also be provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

3.3 Tier 2 technology-specific approach

No Tier 2 technology-specific emission factors are provided here.

3.4 Tier 3 emission modelling and use of facility data

3.4.1 Algorithm

There are two different emission estimation methods that go beyond the technology-specific approach described above:

- detailed modelling of the metal production process;
- facility-level emission reports.

Detailed process modelling

A Tier 3 emission estimate using process details makes separate estimates for the consecutive steps in the production process of metal.

Facility-level data

Where facility-level emission data of sufficient quality (see the guidance chapter on QA/QC in Part A of the Guidebook) are available it is good practice to use these data. There are two possibilities:

- the facility reports cover all metal production in the country;
- facility-level emission reports are not available for all metal plants in the country.

If facility level data cover all metal production in the country, it is good practice to compare the implied emission factors (reported emissions divided by national metal production) with the default emission factor values or technology-specific emission factors. If the implied emission factors are outside the 95 % confidence intervals for the values given below, it is good practice to explain the reasons for this in the inventory report

If the total annual metal production in the country is not included in the total of the facility reports, it is good practice to estimate the missing part of the national total emissions from the source category, using extrapolation by applying:

$$E_{Total,pollutant} = \sum_{Facilities} E_{Facility,pollutant} + \left(National\ \ Production - \sum_{Facilities} Production_{Facility} \right) \times EF \quad (2)$$

where:

$E_{total,pollutant}$	=	the total emission of a pollutant for all facilities within the source category
$E_{facility,pollutant}$	=	the emission of the pollutant as reported by a facility
$Production_{total}$	=	the production rate in the source category
$Production_{facility}$	=	the production rate in a facility
$EF_{pollutant}$	=	the emission factor for the pollutant

Depending on the specific national circumstances and the coverage of the facility-level reports as compared to the total national metal production, it is good practice to choose the emission factor (*EF*) in this equation from the following possibilities, in decreasing order of preference:

- technology-specific emission factors, based on knowledge of the types of technologies implemented at the facilities where facility level emission reports are not available;
- the implied emission factor derived from the available emission reports:

$$EF = \sum_{Facilities} E_{Facility,pollutant} \Big/ \sum_{Facilities} Production_{Facility} \quad (3)$$

- the default Tier 1 emission factor. This option should only be chosen if the facility level emission reports cover more than 90 % of the total national production.

3.4.2 Tier 3 emission modelling and use of facility data

Metal production plants could be major industrial facilities and emission data for individual plants might be available through a pollutant release and transfer registry (PRTR) or another emission reporting scheme. When the quality of such data is assured by a well developed QA/QC system and the emission reports have been verified by an independent auditing scheme, it is good practice to use such data. If extrapolation is needed to cover all metal production in the country either the implied emission factors for the facilities that did report, or the emission factors as provided above could be used (see section 3.2.2 of the present chapter).

No generally accepted emission models are available for production of 'other metals'. Such models could be developed, however, and used in national inventories. If this happens, it is good practice to compare the results of the model with a Tier 1 or Tier 2 estimate to assess the credibility of the model. If the model provides implied emission factors that lie outside the 95 % confidence intervals indicated in the tables above, it is good practice to include an explanation for this in the documentation with the inventory and preferably reflected in the Informative Inventory Report.

3.4.3 Activity data

Since PRTRs generally do not report activity data, such data in relation to any reported facility-level emissions are sometimes difficult to find. A possible source of facility-level activity data might be the registries of emission trading systems.

In many countries national statistics offices collect production data at the facility level but these are in many cases confidential. However, in several countries national statistics offices are part of the national emission inventory systems and the extrapolation, if needed, could be performed at the statistics office, ensuring that confidentiality of production data is maintained.

4 Data quality

4.1 Completeness

Care must be taken to include all emissions, from combustion as well as from processes. It is good practice to check whether the emissions reported as 'included elsewhere' (IE) under source category 2.C.7.c are indeed included in the emission reported under combustion in source category 1.A.2.b.

4.2 Avoiding double counting with other sectors

Care must be taken that the emissions are not double counted in processes and combustion. It is good practice to check that the emissions reported under source category 2.C.7.c are not included in the emissions reported under combustion in source category 1.A.2.b.

4.3 Verification

4.3.1 Best Available Techniques (BAT) emission factors

BAT emission limit values are available from the revised BREF document for the non-ferrous metal industry (European Commission, 2014).

The BREF document describes the technologies necessary to achieve BAT emission levels. For the present source category, no generic emission concentrations could be identified that may be compared against the Tier 1 estimate. However, some numbers for different techniques and processes are available in the BREF document and may be used for verification purposes.

4.4 Developing a consistent time series and recalculation

No specific issues.

4.5 Uncertainty assessment

No specific issues.

4.5.1 Emission factor uncertainties

No specific issues.

4.5.2 Activity data uncertainties

No specific issues

4.6 Inventory quality assurance/quality control (QA/QC)

No specific issues

4.7 Gridding

No specific issues

4.8 Reporting and documentation

No specific issues

5 Glossary

$AR_{production, technology}$	the production activity rate within the source category, using a specific technology
$AR_{production}$	the activity rate for other metal production
$E_{facility, pollutant}$	the emission of the pollutant as reported by a facility
$E_{pollutant}$	the emission of the specified pollutant
$E_{total, pollutant}$	the total emission of a pollutant for all facilities within the source category
$EF_{country, pollutant}$	a country-specific emission factor
$EF_{pollutant}$	the emission factor for the pollutant
$EF_{technology, abated}$	the emission factor after implementation of the abatement
$EF_{technology, pollutant}$	the emission factor for this technology and this pollutant
$EF_{technology, unabated}$	the emission factor before implementation of the abatement
$Penetration_{technology}$	the fraction of production using a specific technology
$Production_{facility}$	the production rate in a facility
$Production_{total}$	the production rate in the source category
$\eta_{abatement}$	the abatement efficiency

6 References

European Commission, 2001. Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques (BREF) in the Non-Ferrous Metal Industries, December 2001, (https://eippcb.jrc.ec.europa.eu/reference/), accessed 23 July 2019.

European Commission, 2014. Integrated Pollution Prevention and Control (IPPC). Final Draft Reference Document on Best Available Techniques for the Non-Ferrous Metals Industries. Draft October 2014, (https://eippcb.jrc.ec.europa.eu/reference/), accessed 23 July 2019.

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.