Category		Title
NFR	2.H.2	Food and beverages industry
SNAP	040605	Bread
	040606	Wine
	040607	Beer
	040608	Spirits
	040625	Sugar production
	040626	Flour production
	040627	Meat, fish etc. frying / curing
ISIC		
Version	Guidebook 2019	

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Contents

1 Overview

This chapter addresses NMVOC emissions from food and beverages manufacturing, except emissions from vegetable oil extraction (it is good practice to report emissions from this activity in source category 3.D.3). Emissions from food manufacturing include all processes in the food production chain which occur after the slaughtering of animals and the harvesting of crops. Emissions from drink manufacturing include the production of alcoholic beverages, especially wine, beer and spirits. Emissions from the production of other alcoholic drinks are not covered in this edition. It is good practice to include emissions from the distribution of alcoholic beverages.

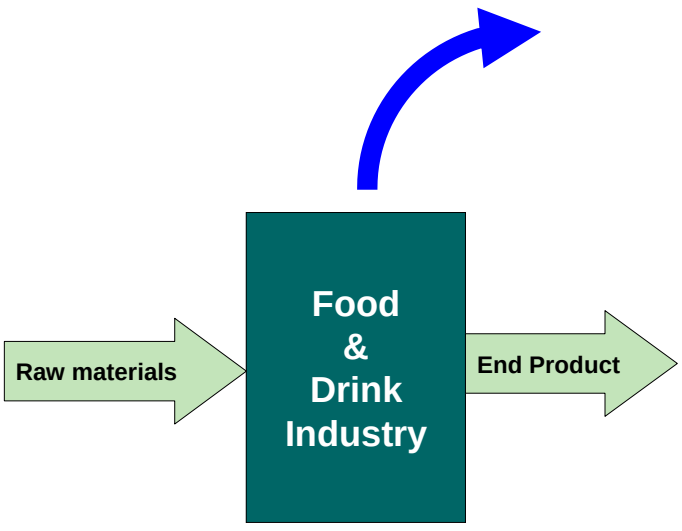
2 Description of sources

2.1 Process description

Food manufacturing may involve the heating of fats and oils and foodstuffs containing them, the baking of cereals, flour and beans, fermentation in the making of bread, the cooking of vegetables and meats, and the drying of residues. These processes may occur in sources varying in size from domestic households to manufacturing plants.

When making any alcoholic beverage, sugar is converted into ethanol by yeast. This is fermentation. The sugar comes from fruit, cereals or other vegetables. These materials may need to be processes before fermentation. For example, in the manufacture of beer, cereals are allowed to germinate, then roasted and boiled before fermentation. To make spirits, the fermented liquid is then distilled. Alcoholic beverages, particularly spirits and wine, may be stored for a number of years before consumption.

Figure 2-1 Process scheme for source category 2.H.2 Food and beverages industry



2.2 Techniques

2.2.1 Food manufacturing

Food processing may occur in open vessels without forced ventilation, closed vessels with periodic purge ventilation or vessels with continuous controlled discharge to atmosphere. In the larger plants, the discharges may be extremely odorous and consequently emission may be controlled using end-of-pipe abatement.

2.2.2 Drink manufacturing

Preparation of feedstock

Cereals used in the production of beer and some spirits are usually allowed to germinate before use. This process is called malting, and results in the conversion of starch into sugars.

Germinated cereals may then be roasted. The length of roasting varies depending on the type of grain and the type of beverage to be produced.

Before fermentation, cereals are often boiled in water to produce wort, which is then filtered to separate out the solid residues.

Grapes and other fruit used to make alcoholic beverages, are pressed to recover their juice, which is filtered to remove solid residues. Red wine is fermented with the grape skins remaining in the vat for the initial fermentation. The liquid wine is run off when the required colour and tannin have been obtained, and the remainder of the liquid is obtained by pressing.

The solid residues may be further processed into food for animals.

Fermentation

Fermentation occurs in large fermenting vessels and typically lasts for from one to three days. Some vessels are sealed, recirculating the carbon dioxide. Others, normally in smaller plants, vent to atmosphere via a water trap.

The yeast strain used for fermentation depends on the beverage.

The specific gravity of the fermenting mixture is measured regularly as an indication of the sugar content and thereby the degree of fermentation. Temperature controls may need to be used as most fermentation will only take place at 5-30^{o}C.

Distillation

After separating solids from the fermented product, distillation may be used to recover the alcohol and other volatile organic species. Additional flavourings may be added either before or after distillation. More than one stage of distillation may be used. The final distillate can now either be diluted to give a standard alcohol content and bottled, or, in the case of whisky, brandy, some gins and other spirits, undergo a period of storage (maturation) during which the flavour develops.

Maturation

Wine is transferred to wooden casks after fermentation. Every 3 months the wine is decanted ("racked") from one cask to another to remove the sediment which collects during maturation. After maturation, which may take from a few weeks to several years, the wine is bottled (Burroughs and Bezzant, 1980).

Some spirits are transferred to wooden casks after distillation. Whisky and brandy are stored for a minimum of three years (usually longer). Some other spirits, such as gin, may occasionally be stored for shorter periods before sale. The final product is diluted to the appropriate alcohol strength and bottled.

2.3 Emissions

2.3.1 Food manufacturing

Emissions occur primarily from the following sources:

- the cooking of meat fish and poultry, releasing mainly fats and oils and their degradation products;
- the processing of sugar beet and cane and the subsequent refining of sugar;
- the processing of fats and oils to produce margarine and solid cooking fat;
- the baking of bread, cakes biscuits and breakfast cereals;
- the processing of meat and vegetable by-products to produce animal feeds;
- the roasting of coffee beans.

Where cooking or putrefaction is not involved, such as the production of fresh and frozen foods, emissions are considered negligible. Emissions from the pasteurisation of milk and the production of cheeses are also considered negligible.

2.3.2 Drink manufacturing

Emissions may occur during any of the four stages which may be needed in the production of an alcoholic beverage.

During preparation of the feedstock, the most important emissions appear to occur during the roasting of cereals and the drying of solid residues.

During fermentation, alcohol and other NMVOCs are carried out with the carbon dioxide as it escapes to atmosphere. In some cases, the carbon dioxide may be recovered, reducing the emission of NMVOC as a result.

During the distillation of fermentation products emissions are to be expected, but very little data is available. Losses occur as a result of poor maintenance and the use of old plant.

During maturation NMVOCs evaporate from the stored beverage. The mass of emission will be proportional to the length of the maturation period.

Some losses of spirit are to be expected during transfer of spirit to barrels for storage. The UK Customs & Excise allow for a maximum loss of 0.1% of alcohol production (Passant, 1993).

2.4 Controls

For food manufacturing, control techniques typically involve incineration or biological treatment, resulting in more than 90% destruction of NMVOCs.

For drink manufacturing, techniques for controlling emissions during the drying of residues exist and may involve condensers or bio-filters. Few if any control technologies are known for the evaporation of NMVOCs during maturation.

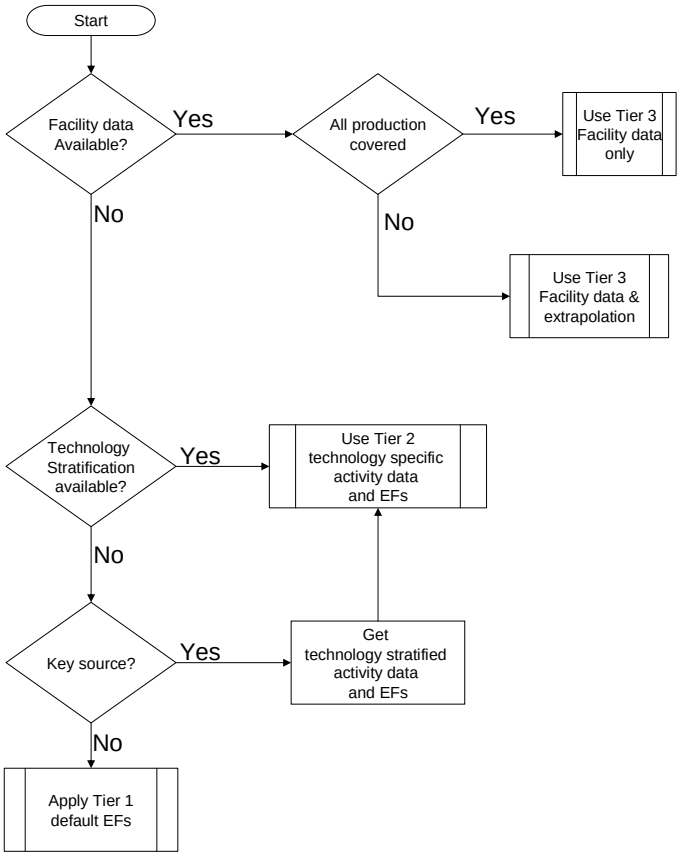
3 Methods

3.1 Choice of method

Figure 3-1 presents the procedure to select the methods for estimating process emissions from the Food and Beverages Industry. 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 2.H.2 Food and beverages industry



3.2 Tier 1 default approach

3.2.1 Algorithm

The Tier 1 approach for process emissions from the food and beverages industry uses the general equation:

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

This equation is applied at the national level, using annual national total food and beverages production.

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

In cases where specific abatement options are to be taken into account a Tier 1 method is not applicable and a Tier 2 ort Tier 3 approach must be used.

3.2.2 Default emission factors

The Tier 1 approach needs emission factors for all relevant pollutants. These emission factors integrate all sub-processes within the industry from the feed of raw material to the final shipment of the products off site. The default emission factor for NMVOC emissions from food and beverages production, as given in Table 3-1, has been derived from the Tier 2 emission factors for NMVOC presented in an earlier version of the Guidebook, all recalculated to kg/Mg product produced. A very large 95% confidence interval has been applied to this factor, because of the variety in the emission factors for the processes that are included in this source category.

Only the process emissions are to be taken into account in this source category. Emissions originating from combustion activities within the industry are to be reported in the relevant chapter for combustion (source category 1.A.2.e).

Table 3-1 Tier 1 emission factors for source category 2.H.2 Food and beverages industry

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	2	kg/Mg product produced	0.3	150	EMEP/EEA (2006)

3.2.3 Activity data

The relevant activity statistics are based on the national production figures, including:

- total production of home-killed meat, including meat subsequently canned;

- total fish and seafood landed;
- total production of poultry meat;
- total sugar production;
- total production of fats excluding butter;
- total production of bread;
- total production of cakes, biscuits and breakfast cereals;
- total production of compound feedstuffs for cattle, pigs, poultry and other animals;
- total weight of beans roasted to produce coffee;
- total production of wine;
- total production of beer and cider;
- total production of spirits.

The principal information source for these production data will be the country's national statistics of production.

International statistics for drink manufacturing activities are also provided by the World Drink Trends, 1993. NTC Publications Ltd., ISBN 1 870562 63 1.

For use in Tier 1, the total mass of these products has to be determined by adding all the production figures together.

3.3 Tier 2 technology specific approach

3.3.1 Algorithm

The Tier 2 approach is similar to the Tier 1 approach. To apply the Tier 2 approach, both the activity data and the emission factors need to be stratified according to the different techniques that may occur in the country. In the case of food and beverages production, these techniques are the various kinds of food and beverages produced (e.g. bread, sugar, wine, beer).

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

Stratify the food and beverages production in the country to model the different product and process types occurring in the national food and beverages industry into the inventory by

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

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

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:

$$E_{pollutant} = AR_{production} \times EF_{technologypollutant} \quad (3)$$

where:

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

$AR_{production}$ = the activity rate for the food and beverages production

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

The emission factors in this approach still will include all sub-processes within the industry between the feeding of raw materials until the produced food and beverages are shipped to the customers.

3.3.2 Technology specific emission factors

This section provides NMVOC emission factors for different food and beverage products manufactured in the industry. All emission factors are taken from an earlier version of the Guidebook, and the original reference to these factors is not always clear. Again, the tables below only include emissions from the processes within the industry; emissions from combustion activities are not included and it is good practice to report these in source category 1.A.2.e.

This section has been split in two separate parts: the first part discusses the original referenced (background) emission factors used to derive the default emission factors. The latter are presented in the second part of this section, for food as well as for drinks. It is recommended to use the product-based default emission factors in the second part of this section, relevant activity statistics for these factors are more likely to be available.

Emission factors presented in this section are based on the following assumptions:

- 0.15 tonne of grain is required to produce 1 tonne of beer (Passant, 1993).
- Malt whiskies are typically matured for ten years. Grain whiskies are typically matured for six years. It is assumed that brandy is matured for three years and that other spirits are not matured.
- Beer is considered to be typically 4% alcohol by volume and to weigh 1 tonne per m^3.
- If no better data is available, spirits are assumed to be 40% alcohol by volume.
- Alcohol (ethanol) has a density of 789 kg/m^3.

Background emission factors

Table 3-2 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Animal rendering

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Animal rendering				
Region or regional conditions					
Abatement technologies	uncontrolled				
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.33	kg/Mg meat	0.11	0.98	Passant (1993)

Table 3-3 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Fish meal processing

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Fish meal processing				
Region or regional conditions					
Abatement technologies	uncontrolled				
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	1	kg/Mg fish	0.35	3.1	Passant (1993)

Table 3-4 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Grain drying

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605 040606	Bread Wine			
Technologies/Practices	Grain drying				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	1.3	kg/Mg grain dried	0.13	13	US EPA (1985)

Table 3-5 Tier 2 emission factors for source category 2.H.2 Food and drink, Hop processing

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040607	Beer			
Technologies/Practices	Barley Malting				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.55	g/Mg barley	0.055	5.5	Passant (1993)

Table 3-6 Tier 2 emission factors for source category 2.H.2 Food and drink, Hop processing

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606	Wine			
Technologies/Practices	Hop processing				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	7.8	g/Mg beer	2.8	22	UBA (1981)

Table 3-7 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Fermentation

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606 040607 040608	Wine Beer Spirits			
Technologies/Practices	Fermentation				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	2	kg/Mg alcohol	0.7	6	Passant (1993)

Table 3-8 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Casking

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606 040607 040608	Wine Beer Spirits			
Technologies/Practices	Casking				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.5	kg/Mg alcohol	0.17	1.5	Passant (1993)

Table 3-9 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Maturation

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606 040607 040608	Wine Beer Spirits			
Technologies/Practices	Maturation				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	20	kg/Mg alcohol	10	40	Passant (1993)

Table 3-10 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Handling of agricultural products

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)					
Technologies/Practices	Handling of agricultural products (grains, soya)				
Region or regional conditions					
Abatement technologies	uncontrolled				
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
PM10	24	g/ton	8	70	Vrins (1999)

Default emission factors based on products: food

This subsection present the Tier 2 emission factors for the food products based on the products produced. These are expected to be more useful than the background emission factors presented in the preceding section, because better activity statistics will be available for these factors.

Table 3-11 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Bread (typical)

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Bread, typical				
Region or regional conditions	Europe				
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	4.5	kg/Mg bread	0.45	45	EMEP/EEA (2006)

Table 3-12 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Bread (typical)

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Bread, typical				
Region or regional conditions	North America				
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	8	kg/Mg bread	0.8	80	EMEP/EEA (2006)

Sponge-dough bread

It is not typical to use the sponge dough process in the manufacturing of bread in Europe. For completeness however, the default emission factors are presented here.

Table 3-13 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Sponge-dough

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Sponge-dough bread				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	8	kg/Mg bread	2.7	24	Henderson (1977)

Table 3-14 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, White bread

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	White bread				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	4.5	kg/Mg bread	1.5	14	Bouscaren (1992)

Table 3-15 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, White bread (shortened process)

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	White bread shortened process				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	2	kg/Mg bread	0.7	6	Bouscaren (1992)

Table 3-16 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Wholemeal bread

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Wholemeal bread				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	3	kg/Mg bread	1	9	Bouscaren (1992)

Table 3-17 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Light Rye bread

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Light Rye bread				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	3	kg/Mg bread	1	9	Bouscaren (1992)

Table 3-18 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Cakes, biscuits and breakfast cereals

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040605	Bread			
Technologies/Practices	Cakes, biscuits and breakfast cereals				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	1	kg/Mg product	0.1	10	EMEP/EEA (2006)

Table 3-19 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Meat, fish and poultry

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040627	Meat, fish etc. frying / curing			
Technologies/Practices	Meat, fish and poultry				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.3	kg/Mg product	0.03	3	EMEP/EEA (2006)

Table 3-20 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Sugar

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040625	Sugar production			
Technologies/Practices	Sugar				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	10	kg/Mg sugar	1	100	EMEP/EEA (2006)

Table 3-21 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Margarine and solid cooking fats

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)					
Technologies/Practices	Margarine and solid cooking fats				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	10	kg/Mg product	1	100	EMEP/EEA (2006)

Table 3-22 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Animal feed

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)					
Technologies/Practices	Animal feed				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	1	kg/Mg feed	0.1	10	EMEP/EEA (2006)

Table 3-23 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Coffee roasting

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)					
Technologies/Practices	Coffee roasting				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.55	kg/Mg beans	0.18	1.7	Rentz et al. (1991)

Default emission factors based on products: drinks

This subsection present the Tier 2 emission factors for alcoholic beverages based on the products produced. These are expected to be more useful than the background emission factors presented in section 0 because better activity statistics will be available.

Table 3-24 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Wine

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606	Wine			
Technologies/Practices	Wine unspecified colour				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.08	kg/hl wine	0.008	0.8	EMEP/EEA (2006)

Table 3-25 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Red Wine

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606	Wine			
Technologies/Practices	Red whine				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.08	kg/hl wine	0.03	0.24	EMEP/EEA (2006)

Table 3-26 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, White Wine

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040606	Wine			
Technologies/Practices	White wine				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.035	kg/hl wine	0.012	0.11	EMEP/EEA (2006)

Table 3-27 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Beer

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040607	Beer			
Technologies/Practices	Beer (including de-alcoholized)				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.035	kg/hl beer	0.012	0.11	EMEP/EEA (2006)

Table 3-28 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Spirits

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040608	Spirits			
Technologies/Practices	Spirits unspecified sort				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	15	kg/hl alcohol	1.5	150	EMEP/EEA (2006)

Table 3-29 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Malt Whisky

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040608	Spirits			
Technologies/Practices	Malt whisky				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	15	kg/hl alcohol	7.5	30	EMEP/EEA (2006)

Table 3-30 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Grain Whisky

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040608	Spirits			
Technologies/Practices	Grain whisky				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	7.5	kg/hl alcohol	3.8	15	EMEP/EEA (2006)

Table 3-31 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Brandy

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040608	Spirits			
Technologies/Practices	Brandy				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	3.5	kg/hl alcohol	1.2	11	EMEP/EEA (2006)

Table 3-32 Tier 2 emission factors for source category 2.H.2 Food and beverages industry, Other spirits

Tier 2 emission factors					
	Code	Name			
NFR Source Category	2.H.2	Food and beverages industry			
Fuel	NA				
SNAP (if applicable)	040608	Spirits			
Technologies/Practices	Other spirits				
Region or regional conditions					
Abatement technologies					
Not applicable	NOx, CO, SOx, NH3, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs				
Not estimated	TSP, PM10, PM2.5, BC				
Pollutant	**Value**	**Unit**	**95% confidence interval**		**Reference**
			Lower	**Upper**	
NMVOC	0.4	kg/hl alcohol	0.13	1.2	EMEP/EEA (2006)

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:

$$EF_{technology,abated} = (1 - \eta_{abatement}) \times EF_{technology,unabated} \quad (4)$$

For the activities in the food industry, it is assumed that abatement equipment reduces the emissions by 90% (Guidebook, 2006). However, no specification of the equipment is given.

No further information is available on abatement efficiencies of reduction measures in the food and beverages industry.

3.3.4 Activity data

The relevant activity statistics are based on the national production figures, including:

- total production of home-killed meat, including meat subsequently canned;
- total fish and seafood landed;
- total production of poultry meat;
- total sugar production;
- total production of fats excluding butter;
- total production of bread;
- total production of cakes, biscuits and breakfast cereals;
- total production of compound feedstuffs for cattle, pigs, poultry and other animals;

- total weight of beans roasted to produce coffee;
- total production of wine;
- total production of beer and cider;
- total production of spirits.

The principal information source for these production data will be the country's national statistics of production.

International statistics for drink manufacturing activities are also provided by the World Drink Trends, 1993. NTC Publications Ltd, ISBN 1 870562 63 1.

3.4 Tier 3 emission modelling and use of facility data

Tier 3 is not available for this source category.

4 Data quality

4.1 Completeness

No specific issues.

4.2 Avoiding double counting with other sectors

No specific issues.

4.3 Verification

4.3.1 Best Available Technique emission factors

There is a BREF document available for the Food and Drink industry (European Commission, 2006). However, this document only describes BAT for this sector and does not suggest numerical values for the emissions.

4.4 Developing a consistent time series and recalculation

No specific issues for Tier 1 and 2

For Tier 3 using facility level data, it might occur that a different selection of facility level data is included in different years. This can lead to time series inconsistencies. Moreover, PRTR data generally are available for specific years only. Splicing such recent reported data under EPRTR/EPER with historical data could be used to get consistent time series. Splicing could be used for both the activity data and the country specific emission factors.

Unexpected discontinuities in time series can occur when specific food and beverage works come into operation or are closed in specific years. If this happens, it is good practice to clearly document such explanations in the inventory archives.

4.5 Uncertainty assessment

Uncertainties in the emissions from the production of food and beverages are generally expected to be greater than a factor of 2. All Tier 1 and Tier 2 emission factors provided in this Guidebook have a 95% confidence interval with them.

The uncertainty in emissions from spirits will also be greater than a factor of 2 unless the type of spirit produced is identified. If this is the case, then the uncertainty in emissions from spirits will be less than a factor of 2.

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

For food processing, major facilities may be identified and national emissions could be disaggregated based on plant capacity or employment. For the emissions remaining, it is good practice to disaggregate data by population.

The manufacture of most beverages is associated with particular regions of a country. The lowest level of accuracy is obtained by disaggregating the net emission according to population density. Greater accuracy is achieved by identifying regions where particular beverages are produced and confining the distribution of emissions to those regions.

4.8 Reporting and documentation

No specific issues.

5 References

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Vrins, E. (1999), Fijnstof-emissies bij op- en overslag, Rapport Vr008, Randwijk (in Dutch).

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.