Chapter 10. Gridded Data and LPS

10.1. Introduction

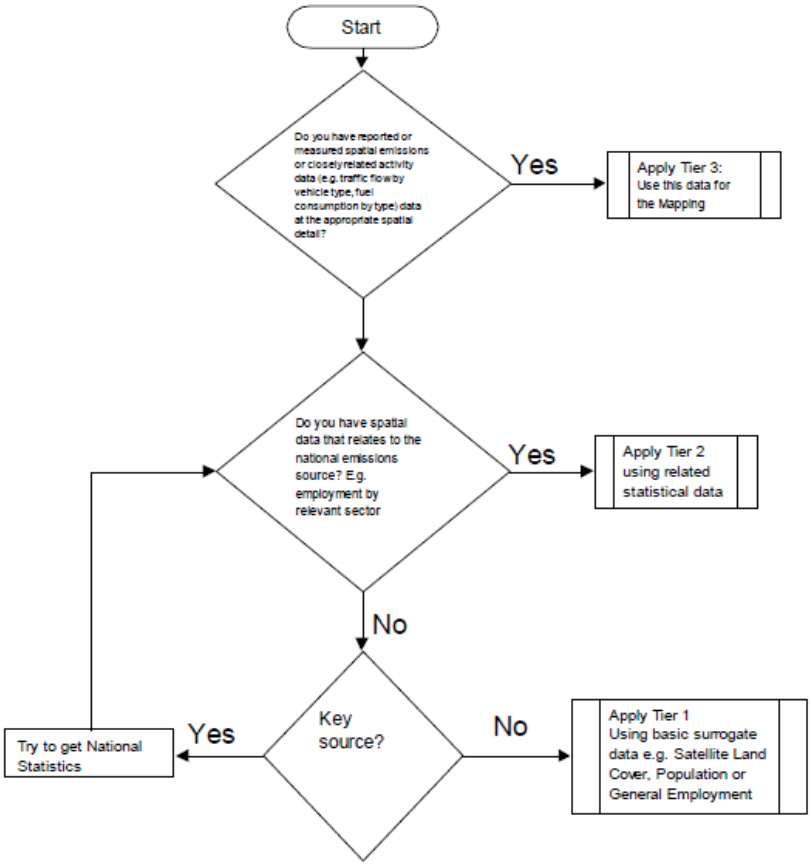
According to the Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/125) and the revised NEC Directive (2016/2284/EC), Belgium is required to report four-yearly its gridded emissions and emissions from LPS for the year x-2, starting in 2017.

By the 1st of May 2017, Belgium submitted LPS emission data of 2015 for all substances referred to in table 1 of the Guidelines taking into account the defined thresholds and being consistent with reporting under E-PRTR. Gridded emissions of 2015 were reported in the aggregated NFR sectors (GNFR) for NOx, NMVOC, SOx, NH3, PM2.5, PM10, BC, CO, Pb, Cd, Hg, dioxins and furans, PAHs, HCB and PCBs.

According to the 36th EMEP Steering Body decision on gridded data, Belgium uses the new EMEP grid with a spatial resolution of 0.1º x 0.1º lon-lat in the geographic coordinate World Geodetic System (WGS) latest revision, WGS 84.

The methodology for spatialisation of emissions is based on the guidelines provided in the Guidebook 2016 (EMEP / EEA, 2016). Following the decision tree from the guidebook (Figure 1) and analysing the available information, a tiered approach was used. This means that when point sources were known, these were chosen to map the emissions (Tier 3). In the cases where the emissions can be linked to statistical data, the emissions are spatialized using it (Tier 2). For sectors where little or no information is available for mapping, more general information is used for the spatialisation such as population or surface (Tier 1).

Figure 3-2 General decision tree for emissions mapping



Source: EMEP/EEA Guidebook 2016. Part A Chapter 7.Spatial mapping of emissions

Figure 1. Decision tree for choosing tiered approach

In addition to this analysis, the three Belgian regions try as much as possible to harmonize the methodologies for the common sectors. Where available, point sources are privileged.

A new regroupment of NFR-14 sectors is used for the gridded data compared to the previous submission in 2012. The GNFR sectors accounting for the national totals are summarised in Figure 2.

In addition, gridded emissions for the memo-items N_Natural and P_IntShipping were reported.

	Sectors for reporting of gridded data	SNAP	Comments
1	A_PublicPower	1	Public power plants
2	B_Industry	1+3+4+5+6	Industrial combustion and industrial process
3	C_OtherStationaryComb	2	Small combustion
4	D_Fugitive	4+5+9	
5	E_Solvents	6	
6	F_RoadTransport	7	
7	G_Shipping	8	
8	H_Aviation	8	Only LTO
9	I_Offroad	8	Including rail
10	J_Waste	9	Including waste water and waste incineration
11	K_AgriLivestock	10	
12	L_AgriOther	10	
13	M_Other	5	

Figure 2. GNFR sectors to be reported in 2017

Source: http://www.tfeip-secretariat.org/assets/Meetings/Presentations/Ghent-2014/1NewEMEPgrid.pdf

Next sections describe each GNFR sector, the NFR-14 sectors included, the methodology applied for the spatialisation and some examples of the results for the national totals.

10.2. Mapping Methodologies

10.2.1. GNFR A : PUBLIC POWER

This sector considers only the public electricity and heat production activities as mention in Table 1.

Table 1. NFR-14 sectors included in GNFR A

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
A_PublicPower	**1A1a**	**Public electricity and heat production**

In Brussels Capital Region, the spatialisation of the emissions uses as base information, on the one hand the localisation of the municipal waste incinerator and turbojets, on the other hand the addition of installed power of CHP in each municipality. For the incinerator and the turbojets, the emissions are allocated to the specific point while for the CHP the emissions are split proportionally to the installed power. The final result is the sum of the emissions per cell in the grid.

In Wallonia, the spatialisation of the emissions is based on the localisation of point sources. For the E-PRTR plants, detailed emissions are available by plant and for the other plants (CHP), energy data are available and the emissions are calculated by using emission factors.

In Flanders, all emissions of the power plants, the municipal waste incinerators with energy recovery and the industrial CHP installations are allocated as a point source. The CHP installations of the tertiary and the agricultural sector are spatialized by the Geogremis tool (Janssen & Colles, 2004).

10.2.2. GNFR B : INDUSTRY

Sector GNFR B considers the combustion activities of the industrial sectors in NFR sector 1A as well as the process activites of NFR sector 2A to 2L (Table 2) excluding the solvents use.

Table 2. NFR-14 sectors included in GNFR B

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
B_Industry	1A1b	Petroleum refining
B_Industry	1A1c	Manufacture of solid fuels and other energy industries
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)
B_Industry	2A1	Cement production
B_Industry	2A2	Lime production
B_Industry	2A3	Glass production
B_Industry	2A5a	Quarrying and mining of minerals other than coal
B_Industry	2A5b	Construction and demolition
B_Industry	2A5c	Storage, handling and transport of mineral products
B_Industry	2A6	Other mineral products (please specify in the IIR)
B_Industry	2B1	Ammonia production
B_Industry	2B2	Nitric acid production
B_Industry	2B6	Titanium dioxide production
B_Industry	2B10a	Chemical industry: Other (please specify in the IIR)
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)
B_Industry	2C1	Iron and steel production
B_Industry	2C2	Ferroalloys production
B_Industry	2C3	Aluminium production
B_Industry	2C4	Magnesium production
B_Industry	2C5	Lead production

B_Industry	2C6	Zinc production
B_Industry	2C7a	Copper production
B_Industry	2C7b	Nickel production
B_Industry	2C7c	Other metal production (please specify in the IIR)
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)
B_Industry	2D3c	Asphalt roofing
B_Industry	2D3b	Road paving with asphalt
B_Industry	2H1	Pulp and paper industry
B_Industry	2H2	Food and beverages industry
B_Industry	2H3	Other industrial processes (please specify in the IIR)
B_Industry	2I	Wood processing
B_Industry	2J	Production of POPs
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)
B_Industry	2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)

The GNFR B sector in Brussels Capital region has only two sectors to be spatialized: 1A2gviii and 2H2. Emissions are spatialized using the environment permit database to identify industrial establishments in the region. Most of industrial activity in Brussels is small sized, thus the split of emissions consideres the density of points in the grid as a reference.

In Wallonia, the emissions are spatialized by using the energy balances by municipality. For each municipality, detailed emissions and energy consumptions from the E-PRTR point sources are known as well as for ETS plants, their locations and their energy consumptions and also for beer production plants, the locations and the emissions. The aggregated site specific energy consumption is substracted from the energy balance of the municipality and the residual energy consumption is used to calculate the emissions and are mapped by using industrial economic zone as surrogate. The emissions from the production of bread (2H1), from construction and demolition (2A5b) and storage of mineral products (2A5c) are mapped by using the part of the Sector Plan concerning the habitat zone and the economic zones.

In Flanders, all emissions (except NMVOC, POP's, particulate matter and heavy metals) of the facilities that are obliged to report their emissions according to a threshold (see IIR Chapter 1) are allocated as a point source. The emissions that are estimated in a collective way (below the threshold, see IIR Chapter 1) are spatialized by shapefiles per sector (distribution per km^2, per industrial zones or per municipality).
Emissions of NMVOC and POPs are allocated by the EISSA tool (Emission Inventory Support System Air, Sleeuwaert et al., 2012), either as point sources or by an allocation pattern.
Emissions of particulate matter and heavy metals are allocated as a point source (facilities with emissions above the threshold) or by shapefiles per sector (industrial zones, patterns of chemical facilities, pattern of iron and steel sector,…)(Decoene, 2012).
The locations of the point sources or the emissions that are spatialized otherwise are 'translated' to the right EMEP grid by means of a datawarehouse.

10.2.3. GNFR C : OTHER STATIONARY COMBUSTION

The sector GNFR C includes the emissions from the combustion on the commercial, the residential, agriculture and military sectors as detailed in Table 3.

Table 3. NFR-14 sectors included in GNFR C

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
C_OtherStationaryComb	1A4ai	Commercial/institutional: Stationary
C_OtherStationaryComb	1A4bi	Residential: Stationary
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary
C_OtherStationaryComb	1A5a	Other stationary (including military)

In Brussels Capital Region, there are emissions for sectors 1A4ai and 1A4bi. The spatialisation of emissions for the commercial sector is based on the office surfaces per municipality since service sector represents the main activity of the tertiary sector in the region. Regarding the residential sector, the split is based on the population.

In Wallonia, the emissions are spatialized by using the energy balances by municipality. The distribution of emissions is made on the ETS plants locations and on the commercial and institutional surface by municipality (1A4Ai), on the basis of the population (1A4bi) and on the basis of the agricultural plot (1A4ci).

In Flanders, the emissions (except PAHs) of the commercial/institutional sector (1A4ai), the residential sector (1A4bi) and the agricultural sector (1A4ci) are spatialized by the Geogremis tool. Emissions of PAHs are allocated by the EISSA tool by an allocation pattern.
The locations of the emissions that are spatialized by the allocation pattern are 'translated' to the right EMEP grid by means of a datawarehouse.

10.2.4. GNFR D : FUGITIVE

The sector GNFR D gathers fugitive emissions from different activities involving solid, liquid and gaseous fuels. The NFR sectors included are detailed in Table 4.

Table 4. NFR-14 sectors included in GNFR D

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining / storage
D_Fugitive	1B2av	Distribution of oil products
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)
D_Fugitive	1B2d	Other fugitive emissions from energy production

Brussels Capital Region reports emissions for the distribution of oil products and it is based on the placement of Brussels harbour and also on the proportion or the surface of the region on the grid since there is no more precise data concerning this sector.

In Wallonia, the localizations of the petroleum stocks are known. The 'PICC' data (Mapping project in the Walloon region) are used to localise petroleum stations. Concerning the gas transportation, the emissions are disagragated by municipality by using gas consumption by municipality as surrogate and then mapped on the municipality with the grid of gas canalizations.

In Flanders, all emissions (except NMVOC and POP's) of the facilities that are obliged to report their emissions according to a threshold (see IIR Chapter 1) are allocated as a point source. Emissions of NMVOC and POPs are allocated by the EISSA tool, either as point sources or by an allocation pattern. The locations of the point sources or the emissions that are spatialized otherwise are 'translated' to the right EMEP grid by means of a datawarehouse.

10.2.5. GNFR E : SOLVENTS

The sector GNRF E includes the use of solvent products as described in Table 5.

Table 5. NFR-14 sectors included in GNFR E

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
E_Solvents	2D3a	Domestic solvent use including fungicides
E_Solvents	2D3d	Coating applications
E_Solvents	2D3e	Degreasing
E_Solvents	2D3f	Dry cleaning
E_Solvents	2D3g	Chemical products
E_Solvents	2D3h	Printing
E_Solvents	2D3i	Other solvent use (please specify in the IIR)
E_Solvents	2G	Other product use (please specify in the IIR)

Due to the variety of activities included in this sector, the Brussels Capital Region emissions were spatialized per NFR sector in order to use the best available information. Sectors 2D3a and 2D3f use the population data for the split of emissions in the cells. This is coherent with the inventory were population is the main driver for these sectors. Sector 2D3d is spatialized with 2 datasets. Domestic coating uses population data while industrial coating uses the location of establishements on the basis of Environmental permit database; the split of emissions consideres the density of points as a reference. Moreover, emissions from the establishements submitted to the obligation of reporting the NMVOC emissions under the VOC solvents Emissions Directive are allocated directly to their location. Sector 2D3e emissions are spatialized using the information of NMVOC balance under VOC solvents emissions Directive. Finally, sector 2D3h uses the same methodology as in industrial coating,

companies that submit NMVOC balace are located in the grid and the small companies emissions are distributed according to the density of pints in the grid. The final result is the sum of emissions in each cell of the grid.

For Wallonia, the emissions coming from the yearly reporting obligation by the industrial companies via the integrated environmental report are located on the basis of the geographic coordinates of the companies. The other emissions mainly coming from domestic solvent use are located on the basis of the population data.

In Flanders, all emissions (except NMVOC and POP's) of the facilities that are obliged to report their emissions according to a threshold (see IIR Chapter 1) are allocated as a point source. Emissions of NMVOC and POPs are allocated by the EISSA tool, either as point sources or by an allocation pattern. Emissions of particulate matter (smoking of tobacco) and heavy metal emissions (due to firework) are spatialized with a shape file based on the population pattern.
By spreading the emission data rounding errors occur for some pollutants/sectors. This error is relatively big for dioxine emissions (spreading of small numbers and a limitation of the number of decimals by the datawarehouse, which increases the error, e.g. the emissions by smoking of tobacco differ significantly in absolute value between the time series (February 2017) and the gridded data (0.00007 vs. 0.0006 g-teq).
The locations of the point sources or the emissions that are spatialized otherwise are 'translated' to the right EMEP grid by means of a datawarehouse.

10.2.6. GNFR F : ROAD TRANSPORT

Road transport emissions reported under GNFR F include NFR sectors described in Table 6.

Table 6. NFR-14 sectors included in GNFR F

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
F_RoadTransport	1A3bi	Road transport: Passenger cars
F_RoadTransport	1A3bii	Road transport: Light duty vehicles
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion

Brussels Capital Region uses a combination of road shapefiles and specific emissions factors by driving mode from COPERT in order to generate the gridded emissions for GNFR F sector. The first step is to determine the lengths of road sections for the 3 driving modes (highway, rural/suburban and urban) in each cell of the grid. For each driving mode, the total emissions at the regional level are affected to a given cell proportionally to the cumulated length of the road sections in the cell compared to the whole Region. Finally, the emissions from the 3 driving modes are summed for each cell.

The methodology in Wallonia is the same as in the Brussels Capital Region.

In Flanders, also COPERT is used to generate gridded data of the road transport sector. The emissions are allocated over road segments. At the borders of Flanders, the fraction of the road segment that is situated in Flanders is calculated, and this split factor is used to calculate the fraction of the emissions that can be attributed to Flanders. Due to this methodology it is possible that a slight difference occurs between the total gridded data of the road transport sector and the total of the NFR-codes 1A3b reported for the time series (February 2017).

10.2.7. GNFR G : SHIPPING

The GNFR G sector includes international inland waterways and national navigation (Table 7).

Table 7. NFR-14 sectors included in GNFR G

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
G_Shipping	1A3di(ii)	International inland waterways
G_Shipping	1A3dii	National navigation (shipping)

Brussels Capital Region only reports emissions from sector 1A3dii. Emissions are distributed according to the length of the canal among the cells. The canal is the only navigable waterway in the region.

In Wallonia, the emissions for inland waterway transport are divided into navigable rivers.

For the Flemish Region, the spatialized emissions of the sector G_Shipping are calculated with the EMMOSS model (see also § 3.4.2.4). Because a part of the emissions of the sector 1A3di(ii) falls outside the grid attributed to Belgium, a difference between the gridded data and the data reported for the NFR-code 1A3di(ii) occurs. Due to different runs with the EMMOSS model that have to be done to calculate the emissions that are reported for the time series (February 2017) on the one hand and the gridded emissions on the other hand, slight differences between the gridded data and the data reported for the NFR-codes 1A3dii can occur.

10.2.8. GNFR H : AVIATION

The GNFR H sector includes sectors described in Table 8.

Table 8. NFR-14 sectors included in GNFR H

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
H_Aviation	1A3ai(i)	International aviation LTO (civil)
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)

There is no aviation activity in Brussels Capital Region. Brussels International Airport is located in Flanders region.

In Wallonia, the emissions for each airport are distributed on the grid (two commercial airports and four tourism airports).

In the Flemish Region the gridded emission data due to aviation activity are calculated with the EMMOL model. The calculation is based on EUROCONTROL/BELGOCONTROL data from airports and fuel amounts. The distribution pattern is taken from Decoene (2012).
For PM2.5, PM10 and BC only LTO emissions are reported for the gridded data. When the whole time series was reported (February 2017) no distinction was made between LTO and cruise emissions for these pollutants. This results in a difference between the emissions reported for the time series and the emissions reported for the gridded data.

10.2.9. GNFR I : OFFROAD

Sector GNFR I includes the NFR sectors described in Table 9.

Table 9. NFR-14 sectors included in GNFR I

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
I_Offroad	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)
I_Offroad	1A3c	Railways
I_Offroad	1A3ei	Pipeline transport
I_Offroad	1A3eii	Other (please specify in the IIR)
I_Offroad	1A4aii	Commercial/institutional: Mobile
I_Offroad	1A4bii	Residential: Household and gardening (mobile)
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery
I_Offroad	1A4ciii	Agriculture/Forestry/Fishing: National fishing
I_Offroad	1A5b	Other, Mobile (including military, land based and recreational boats)

The offroad sector includes a variety of sectors industry, agriculture, residential, railways and pipelines transport.

The spatialisation of the offroad sector in Brussels Capital Region is done by NFR sector. The emissions for 1A2gvii and 1A3eii follows the same methodology as sector 1A2gviii (Chapter **Fout! Verwijzingsbron niet gevonden.**.). The sector 1A4bii is distributed using as population as the reference. Emissions from sector 1A4cii are allocated to the cells where agriculture and forest activities take place in the region. The distribution of emissions from 1A5b uses the proportion of the surface in the grid. Finally, emissions from sector 1A3c are distributed using the length of the rail network per cell.

In Wallonia, the sector 1A2gviii is distributed by using offroad emissions from industrial point sources. Emissions from sector 1A3c are distributed using railway sections on which the oil-fueled trains run. The gridding of the sector 1A3e is based on point sources emissions (gas compression plants, harbours and air ports). The sector 1A4bii is distributed using habitat areas and the sector 1A4cii is distributed using the data of the agricultural plot and the Sector Plan covering forests and parks.

In Flanders, most off-road emissions (1A2gvii, 1A3eii, 1A4bii, 1A4cii, part of 1A5b) are calculated with the OFFREM model. To allocate the emissions spatially different shapefiles are used according to the sector (Decoene, 2012).
To spread the railways emissions (1A3c) a shapefile of the railways is used. The emissions are allocated over railway segments. At the borders of Flanders, the fraction of the railway segment that is situated in Flanders is calculated, and this split factor is used to calculate the fraction of the emissions that can be attributed to Flanders. Due to this methodology it is possible that a slight difference occurs between the gridded railways emission data and the emissions reported in the NFR-codes 1A3c for the time series (February 2017).
Emissions reported in the sector 1A3ei are point sources.
Emissions of military aviation (also reported in 1A5b) are calculated with the EMMOL model. The allocation pattern is taken from Decoene (2012).
Emissions of national fishing (1A4ciii) are part of the EMMOSS model, and are calculated in Flanders. Because all emissions of national fishing take part in the Channel (North Sea), and this sea falls outside the grid attributed to Belgium, the emissions of national fishing are not included in the gridded data.
The locations of the point sources or the emissions that are spatialized otherwise are 'translated' to the right EMEP grid by means of a datawarehouse.

10.2.10. GNFR J : WASTE

Sector GNFR J considers the NFR sectors detailed in Table 10. The emissions from municipal incinerators with energy recovery are included in sector GNFR A.

Table 10. NFR-14 sectors included in GNFR J

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land
J_Waste	5B1	Biological treatment of waste - Composting
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities
J_Waste	5C1a	Municipal waste incineration
J_Waste	5C1bi	Industrial waste incineration
J_Waste	5C1bii	Hazardous waste incineration
J_Waste	5C1biii	Clinical waste incineration
J_Waste	5C1biv	Sewage sludge incineration
J_Waste	5C1bv	Cremation
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)
J_Waste	5C2	Open burning of waste
J_Waste	5D1	Domestic wastewater handling
J_Waste	5D2	Industrial wastewater handling
J_Waste	5D3	Other wastewater handling

J_Waste	5E	Other waste (please specify in IIR)

Brussels Capital Region reports emissions from composting and cremation. There is one establishement for each activity and the emissions are allocated to the grid cell where the installation is located.

In Wallonia, the spatialisation of the emissions is based on the localisation of point sources (E-PRTR plants).

In Flanders, all emissions (except NMVOC and POPs) of the facilities that are obliged to report their emissions according to a threshold (see IIR Chapter 1) are allocated as a point source (most waste incineration facilities have energy recovery, hence the emissions are allocated in the GNFR-sector A_PublicPower). Emissions of NMVOC and POPs are allocated by the EISSA tool, either as point sources or by an allocation pattern.
The emissions due to Open burning of waste are spread according to the same method that was used to spatialize the off-road emissions by households (pattern based on the land use and the degree of urbanization (Decoene, 2012).
The emissions of domestic waste water handling are spread according to a pattern of residents who are not connected to the sewage network (personal communication, Flemish Environment Agency, Team Unlocking Sewer Database).
The locations of the point sources or the emissions that are spatialized otherwise are 'translated' to the right EMEP grid by means of a datawarehouse.

10.2.11. GNFR K : AGRICULTURE - LIVESTOCK

Sector GNFR K considers the NFR sectors detailed in Table 11.

Table 11. NFR-14 sectors included in GNFR K

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
K_AgriLivestock	3B1a	Manure management - Dairy cattle
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle
K_AgriLivestock	3B2	Manure management - Sheep
K_AgriLivestock	3B3	Manure management - Swine
K_AgriLivestock	3B4d	Manure management - Goats
K_AgriLivestock	3B4e	Manure management - Horses
K_AgriLivestock	3B4f	Manure management - Mules and asses
K_AgriLivestock	3B4gi	Manure mangement - Laying hens
K_AgriLivestock	3B4gii	Manure mangement - Broilers
K_AgriLivestock	3B4giii	Manure mangement - Turkeys
K_AgriLivestock	3B4giv	Manure management - Other poultry
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in IIR)

In Wallonia, emissions of NH_3, NOx, NMVOC and PM coming from the livestock (NFR sector 4B) have been spatially distributed firstly across the municipalities, thanks to national and regional statistics

giving the number of heads by municipalities. However, these numbers are not available for every year. So we used the latest information available (2015 for cattle, poultry, swine, 2012 for ovines and goats and 2010 for horses) and these repartitions were used with the 2015 regional activity data for Wallonia. Once the emissions of livestock have been calculated by municipality, the agricultural plot has been used to distribute the emissions according to the type of land used (agricultural emissions occurs only on crop and pasture).

In Flanders the ammonia emissions of manure management are calculated with the EMAV model (see also IIR Chapter 5). The emissions of the GNFR-sector K_AgriLivestock (NH_3, NO (reported as NOx) and NMVOS) are spread according to a pattern of animals per community. This pattern takes into account the manure management system, animal number and category at each farm, further aggregated per community.

10.2.12. GNFR L : AGRICULTURE OTHER

Sector GNFR K considers the NFR sectors detailed in Table 12.

Table 12. NFR-14 sectors included in GNFR L

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
L_AgriOther	3Da1	Inorganic N-fertilizers (includes also urea application)
L_AgriOther	3Da2a	Animal manure applied to soils
L_AgriOther	3Da2b	Sewage sludge applied to soils
L_AgriOther	3Da3	Urine and dung deposited by grazing animals
L_AgriOther	3Da4	Crop residues applied to soils
L_AgriOther	3Db	Indirect emissions from managed soils
L_AgriOther	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products
L_AgriOther	3De	Cultivated crops
L_AgriOther	3Df	Use of pesticides
L_AgriOther	3I	Agriculture other (please specify in the IIR)

In Wallonia, emissions of NH_3, NOx, NMVOC and PM coming from the agricultural soils (NFR sector 4D) have been distributed following the same approach as emissions of livestock. The 2015 Belgian statistics provide the agricultural area by municipality. This allows calculations of grazing, manure application and fertilizing emissions by municipality. The sum of these emissions is than distributed thanks to the agricultural plot accross the crop and pasture areas.

In Flanders the emissions of the sector 3D are calculated with the EMAV model (see also IIR Chapter 5). The emissions of the GNFR-sector L_AgriOther are spread according to a pattern of animal number, the available cropland/grassland and crop type per community. The pattern also takes into account the amount of organic fertiliser used in each agricultural zone.

10.2.13. GNFR M : OTHER

Table 13. NFR-14 sectors included in GNFR M

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
M_Other	6A	Other (included in national total for entire territory) (please specify in IIR)

Emissions for the GNFR sector M Other were not estimated.

10.2.14. GNFR N : NATURAL

Table 14. NFR-14 sectors included in GNFR N

NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname
N_NATUREL	11C	Other natural emissions (please specify in IIR)

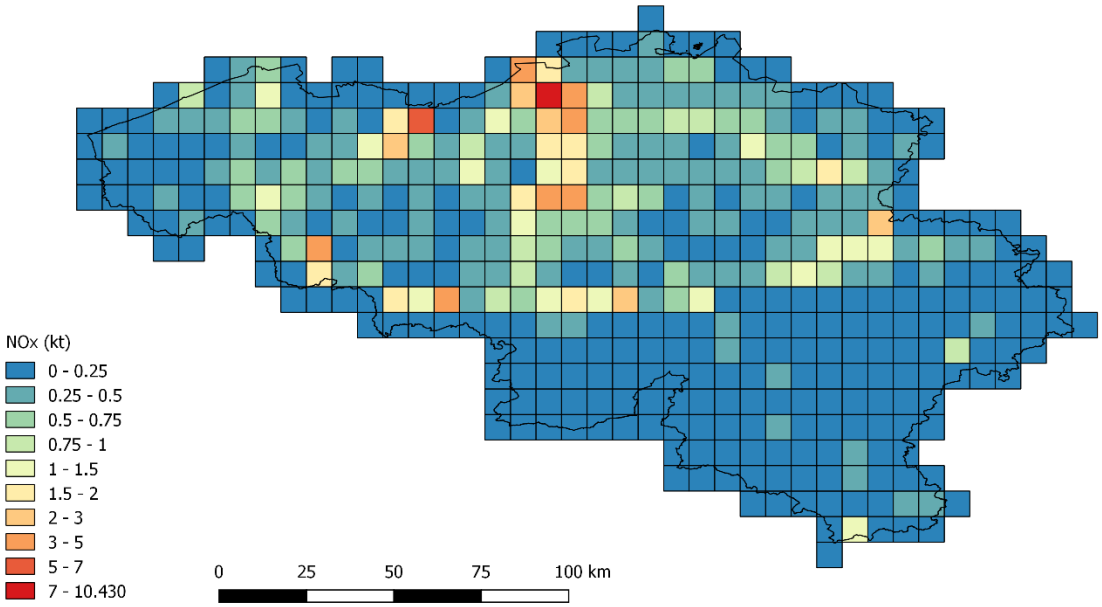
In Wallonia, this sector is distributed using the Sector Plan covering forests.

In Flanders, the emissions of this sector are distributed based on the available cropland/grassland and forest areas in Flanders.

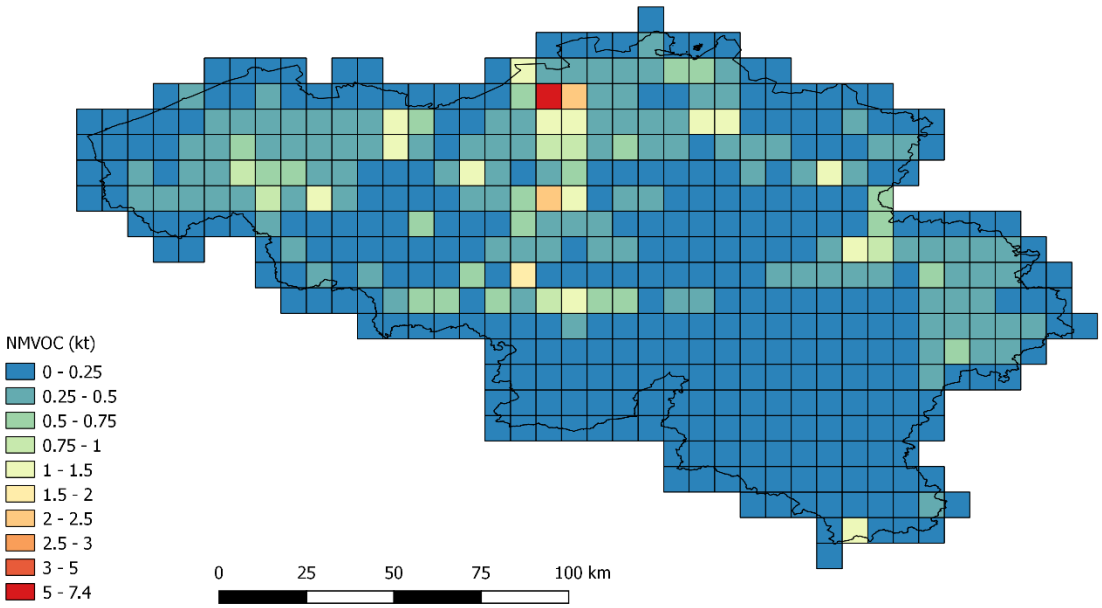
10.3. Gridded emissions: Results

The following figures show the gridded national totals for NO_x, NMVOC, SO_x, NH_3 and PM2.5. In general the largest parts of the emissions are located in the most densely populated regions in the North of Belgium. Antwerp is a hot spot for most pollutants due to its great industrial, urban and traffic activities. For NH_3, the greatest source is agriculture, with a large activity in the North West of Belgium.

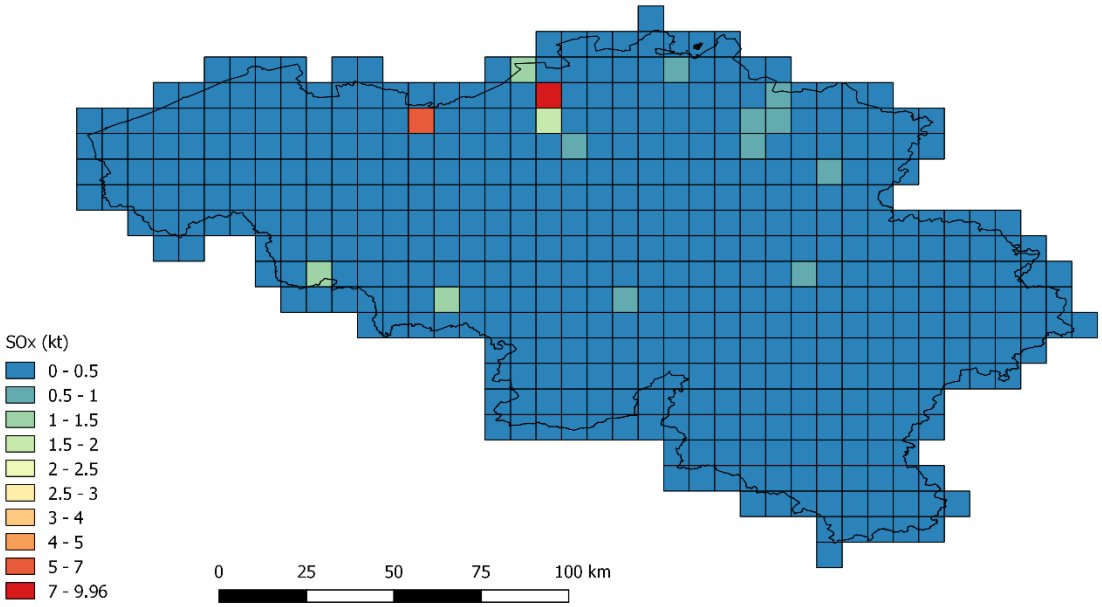
National Total NOx, 2015



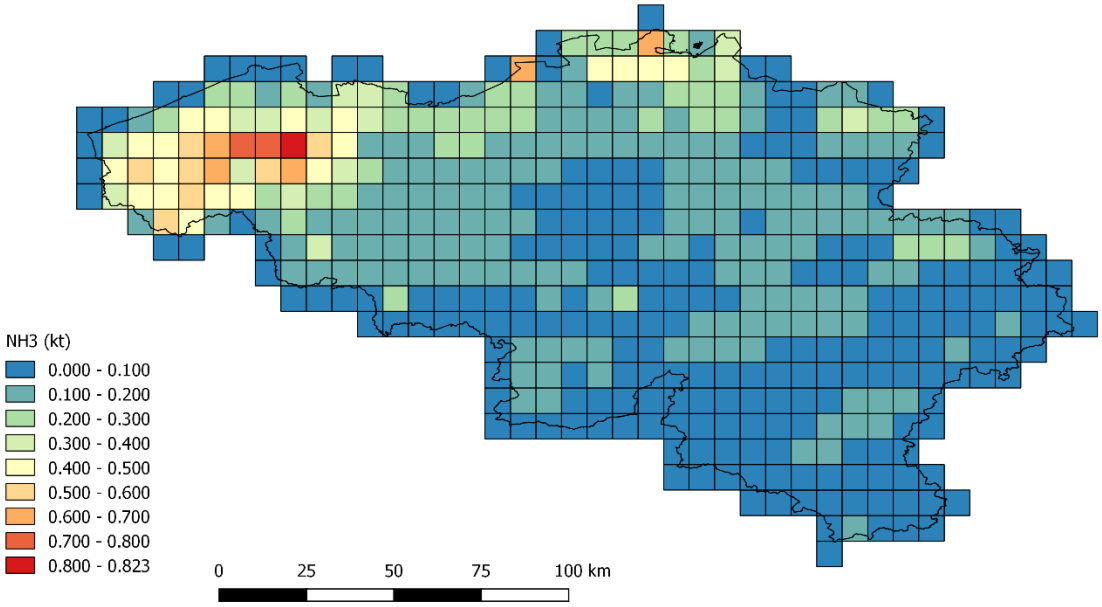
National Total NMVOC, 2015



National Total SOx, 2015



National Total NH3, 2015



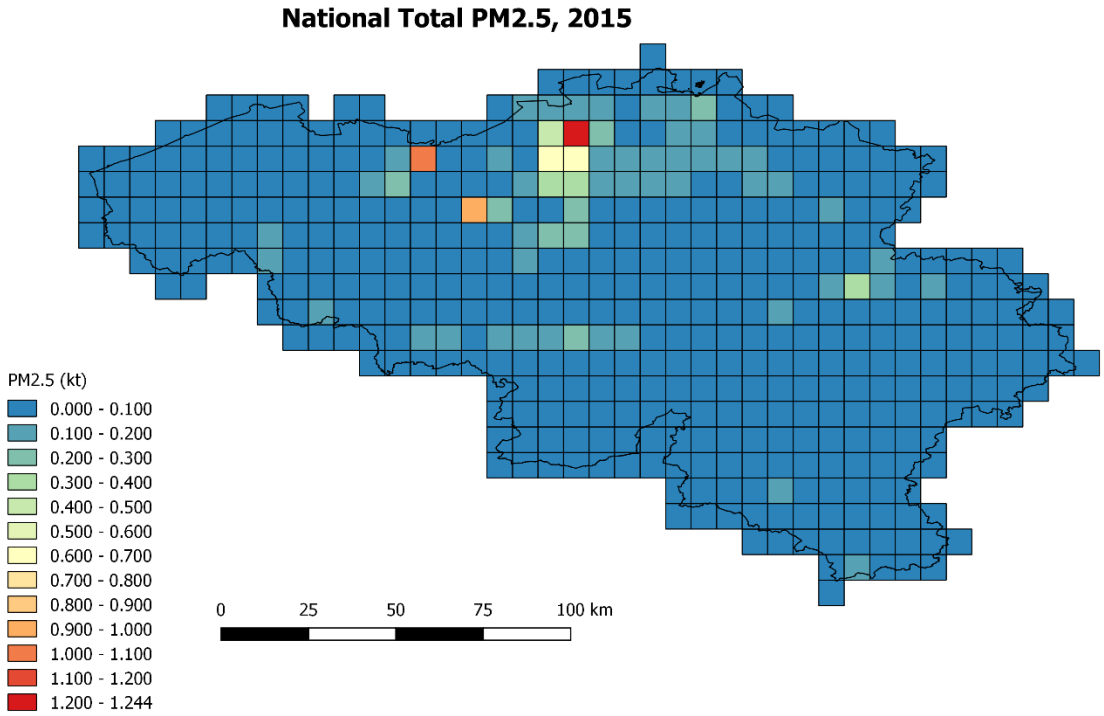


Figure 3: Gridded national total emissions for NOx, NMVOC, SOx, NH3 and PM2.5 in 2015.

10.4. LPS data

Large Point Sources are defined as facilities whose combined emissions, within the limited identifiable area of the site premises, exceed at least one of the threshold values for the 14 pollutants identified in table 1 of the EMEP Reporting Guidelines. Belgium reported LPS data for 2015 according to this definition, including information on stack height class.

Belgium reported emissions for 2015 from 308 facilities, of which 225 in Flanders, 2 in the Brussels Capital Region and 81 in Wallonia. Most facilities are from the industrial or agricultural sectors.

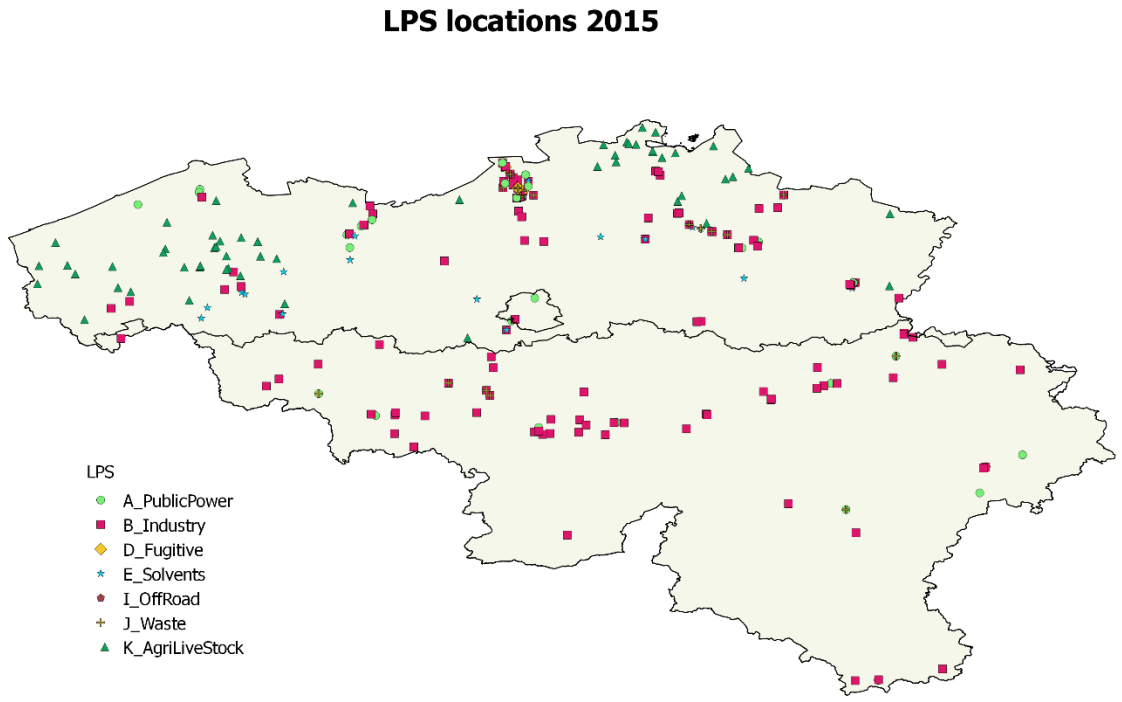


Figure 4: Location of LPS in 2015

10.5. Bibliography

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