# 2 AIR EMISSIONS

## 2.1 Annual direct GHG emissions (scope 1) in the healthcare sector (on-site fuel combustion and healthcare fleet) - production perspective (ENV-4)

### *2.1.1 Documentation sheet*

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| ***Description*** | **Primary indicator**:<br>A. Annual direct GHG emissions in the healthcare sector (human health activities Q-86), in kg per capita (production perspective)<br>**Secondary indicators:**<br>B. Annual direct GHG emissions in the healthcare sector, in tonnes<br>C. Annual direct GHG emissions in the healthcare sector, as a share of total direct GHG emissions |
| ***Rationale*** | The aim of this indicator is to focus on direct GHG emissions (scope 1) in the healthcare sector, so GHG emissions from on-site combustion of fossil fuels (e.g. fuel used in hospital boilers) or from the operation of the healthcare fleet. Greenhouse gases have a strong ability to absorb thermal radiation, and an increase in their concentration in the atmosphere leads to a rise in temperature. A decrease in direct GHG emissions means a higher contribution to climate change mitigation. This can help identify area of improvements such as the need to switch to cleaner energy sources, to better isolate builings or to promote the use of green vehicles.<br>In concertation with experts, it was decided to focus on the production perspective rather than the consumer perspective because this perspective is more transparent, has longer time series, and is based on more recent data. The difference between both perspectives in terms of results is minimum. |
| ***Calculation*** | Calculation are done by the Federal Planning Bureau for Eurostat based on regional and national emission inventories, an activity model and emission factors (activity data * emission factor) using NACE classification.<br>**Primary indicator (A):**<br>• Numerator: Annual direct GHG emissions in healthcare sector (Q86 – human health activities), in kg<br>• Denominator: Population of the corresponding year (calculated as mean of population at beginning and end of year)<br>**Indicator B:**<br>• Numerator: Annual direct GHG emissions in healthcare sector (Q86 – human health activities), in tonnes<br>• Denominator: /<br>**Indicator C:**<br>• Numerator: Annual direct GHG emissions in healthcare sector (Q86 – human health activities), in tonnes<br>• Denominator: Annual direct GHG emissions in total (all NACE activities) |
| ***Data source*** | Federal Planning Bureau (plan.be) and Eurostat: Air emissions accounts by NACE Rev. 2 activity [env_ac_ainah_r2__custom_19043223] [1] (Last update of data: 28/11/2025 23:00). Comparison with data updated on 13/12/2024 was also done.<br>Eurostat data were also compared with the following sources: NEHAP[2] (see indicator ENV-1 for a description of this model) and VITO (see the methodological note linked to indicators ENV-1, ENV-2 and ENV-3 for a description of this model). For VITO, it should be noted that Eurostat data released in 2023 were used. |
| ***Technical definitions*** | • Air Emissions Accounts record the flows of residual gaseous and particulate materials emitted by resident units (=economic activities) and flowing into the atmosphere. Natural flows of residual gaseous and particulate materials are excluded e.g. volcanos, forest |

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| | fires. Also excluded are air emissions arising from land use, land use changes and forestry as well as any indirect emissions.<br>• To calculate GHG emissions, the following formula was applied: carbon dioxid ($CO_2$) + 265 x nitrous oxide ($N_2O$) + 28 x methane ($CH_4$)[1] + fluorinated gases (i.e. hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride ($SF_6$) and natrium trifluoride ($NF_3$)) expressed in $CO_2$ equivalents. $CO_2$ emissions related to biofuel consumption are not included in the total $CO_2$ emissions. Therefore, they are not accounted for in the calculation of GHG emissions.<br>• The healthcare sector was identified via the statistical classification of economic activities in the European Community (NACE Rev. 2): Human health activities (Q86) (excluding residential care).<br>• The indicator includes the emissions of greenhouse gases by production activities. It excludes emissions by households for transportation and other purposes.<br>• For the calculation per capita, the average population of the reference year (calculated as the arithmetic mean of the population on 1st January of two consecutive years) is used as denominator.<br>• More details on the methodology:<br>https://ec.europa.eu/eurostat/web/environment/methodology [3] |
| ***International comparability*** | Statistical Classification of Economic Activities in the European Community (NACE) https://ec.europa.eu/eurostat/web/nace/overview) allows European comparison. For a description of NACE-Bel, see:<br>https://statbel.fgov.be/sites/default/files/Over_Statbel_FR/Nomenclaturen/NACE-BEL%202008_FR.pdf (pp. 465-474) [4]<br>However, comparability between country is not guaranteed. Differences in the allocation of road transport emissions to NACE activities across countries can for example have a noticeable effect and may affect cross-country comparability. A study performed by Eurostat has showed important variations between countries regarding the share of CO2 emissions from road transport by economic activity, with coefficients of variance greater than 40% for each of the NACE activities, suggesting that the comparability across countries is most likely not given. [5] |
| ***Limitations*** | The data come from a model based on activity, not on measurements.<br>Residential care activities and social work activities without accommodation (Q87–Q88) were aggregated, making it impossible to isolate data for Q87 alone. Consequently, only human health activities (Q86) are considered as a proxy for the health care system, while residential care activities were excluded.<br>Differences with other EU countries and jumps observed in data (in 2015 and 2021) can partly be explain by methodological factors:<br>• Since 2021, Wallonia has applied a new and more accurate method to estimate energy consumption (more especially natural gases), based on data directly obtained from distribution network operators (as already implemented in Brussels and Flanders before 2021). Nevertheless, previous years were not retroactively modified, which can partly explain a jump in data in 2021 in Wallonia.<br>• Emissions from road transport data[2] (total quantities emitted) are based on national/regional emissions inventories and the COPERT 5 model and allocation keys among NACE sectors vary between countries. In Belgium the allocation key is based on excise duties for Eurostat 2025 data, whereas previous estimates (e.g. 2024 data) relied |

1 Global warming potential (GWP) values from the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) were used (https://ghgprotocol.org/sites/default/files/2024-08/Global-Warming-Potential-Values%20%28August%202024%29.pdf )

2 Other emissions (non-vehicle fuel emissions) are based on the emission inventories of the regions and the federal level (CRF/CRT, LRTAP, fluorinated gas inventories, etc.). Some of these data can be directly attributed to sector Q86, while others are broader aggregates that are then allocated across NACE branches based on a distribution key derived from the energy consumption of the different branches.

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| | on vehicle registrations. Excise duties are considered more reliable; however, this new approach appears to have an important impact for Q86 emissions: GHG emissions in human health activities in Eurostat version released in 2024 are quite stable across the years while an important increase is observed in Eurostat version released in 2025 (see details in "data sources comparison").<br>• Excise duties are calculated on a five-year basis (2010, 2015, 2020) using an "structural survey" of the National Bank of Belgium while intermediate years are based on less detailed surveys and extrapolations. As 2014 is based on an extrapolation of 2010 data, a jump in excise data is observed in 2015, which can partly explain the 2015 jump in GHG emissions. |
| ***Dimension*** | Environmental sustainability |
| ***Related indicators*** | ENV-1 GHG emission footprint in the healthcare sector, ENV-8 Annual fossil energy consumption in the healthcare sector |
| ***Supervisor*** | Sophie Gerkens |
| ***Reviewers*** | Jehan Charlier |

### 2.1.2 Results

**BELGIUM**

In 2023, human health activities (Q86) generated direct greenhouse gas emissions (GHG) of 1 296 864.17 tonnes of $CO_2$ equivalents (see Table 1).

While direct GHG emissions from all economic activities decreased between 2012 and 2023, from 95.3 to 79.8 million tonnes of $CO_2$ eq, the trend for human health activities increased, and almost doubled (see Figure 1 and Table 1). Consequently, the share of direct GHG emissions from human health activities within total emissions from all economic activities increased (see Table 1).

However, it is important to note that Belgium changed its methodology (with retroactive adjustments) and based on the previous methodology, direct GHG emissions in human health activities were more stable (585 202 t CO2 eq in 2012 and 586 578 t CO2 eq in 2022, +0.2%).

**ANALYSIS BY TYPE OF GAS**

Regarding human health activities, $CO_2$ is the dominant greenhouse gas, representing 96.9% of total emissions in 2023. Furthermore, $CO_2$ emissions have risen sharply, increasing by 84% between 2012 and 2023. These emissions result from on-site combustion of fossil fuels (e.g., fuel used in hospital boilers) and the operation of the healthcare fleet[3]. However, it is currently challenging to determine which source has the greatest impact. Starting mid-2026, $CO_2$ emissions from road transport will be reported separately, enabling a more accurate assessment of the contribution of the healthcare fleet to the healthcare system's GHG emissions. It should also be noted that in the report of the NEHAP 2025[2] vehicles fuel use represented 25% of direct emissions (see ENV-1) but this seems to be based on the previous Eurostat method, in which road transports were estimated based on the number of vehicle registrations rather than excise duties (see also the analysis by sources and the limitations in the documentation sheet).

Nitrous oxide ($N_2O$) also plays a role in human health activities, but the impact was smaller (2.8% of GHG emissions in 2023) and emissions from this gas decreased between 2012 and 2023 (-50%). Other gases accounted for less than 0.3%.

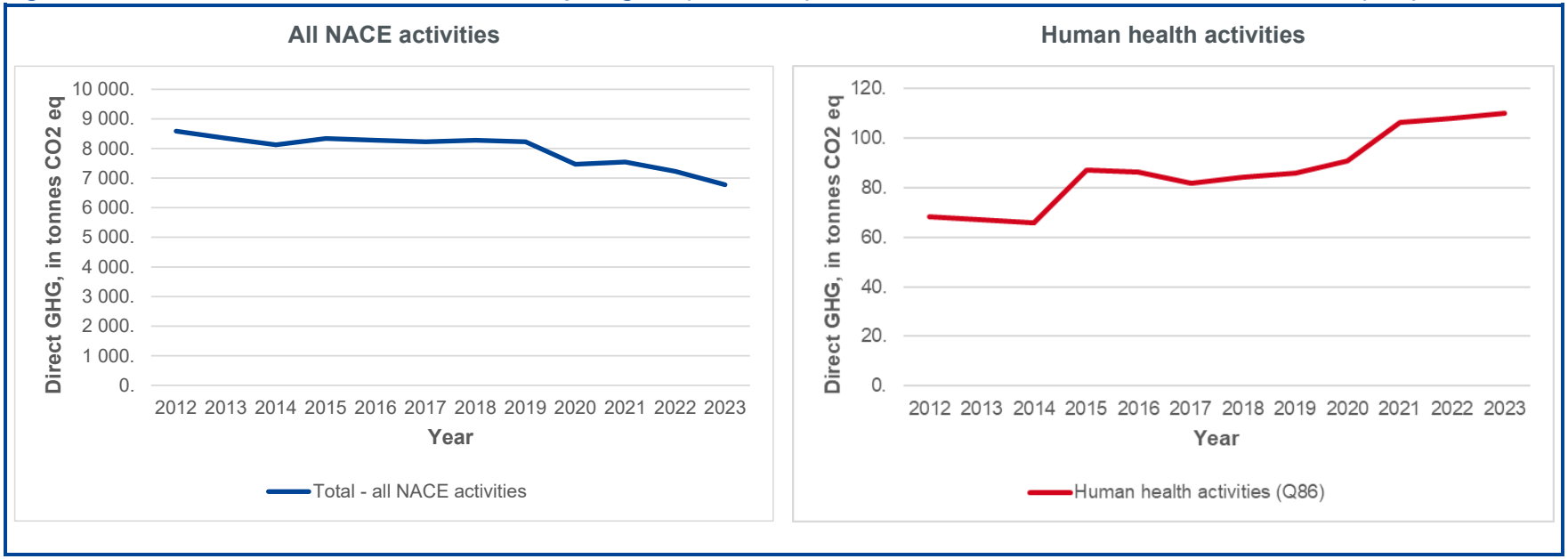
[3] Including ambulance, nursing home cars and other company cars

**Table 1 – Annual direct GHG emissions in human health activities (Q86), Belgium (2012-2024)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | (2024*) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Annual direct GHG emissions in human health activities (Q86)* | | | | | | | | | | | | | |
| *In kg $CO_2$ eq per capita* | 68.45 | 67.21 | 66.07 | 87.20 | 86.26 | 81.69 | 84.36 | 85.91 | 90.87 | 106.43 | 108.02 | 110.09 | *(111.18)* |
| *In tonnes $CO_2$ eq* | 760 311 | 749 968 | 740 541 | 983 159 | 977 493 | 929 259 | 963 936 | 987 027 | 1 048 481 | 1 233 168 | 1 261 652 | 1 296 864 | *(1 318 465)* |
| *As a share of total direct GHG emissions (%)* | 0.80% | 0.81% | 0.81% | 1.05% | 1.04% | 0.99% | 1.02% | 1.04% | 1.22% | 1.41% | 1.49% | 1.62% | *(1.63%)* |

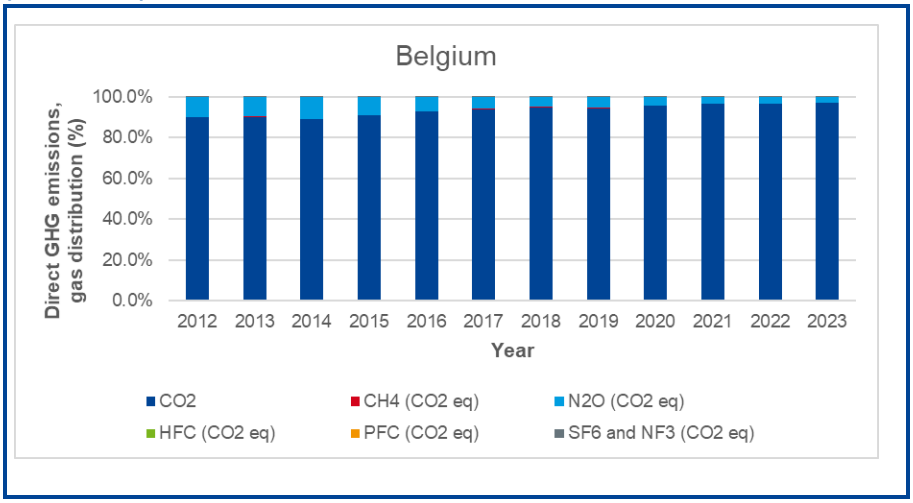
** First estimates. Source: Eurostat 2025 (Air Emissions Accounts)*

**Figure 1 – Direct GHG emissions in tonnes $CO_2$ eq, Belgium (2012-2023), all NACE activities and human health activities (Q86)**




*Eurostat 2025 (Air Emissions Accounts)*

**Figure 2 – Direct GHG emissions in human health activities (Q86), gas distribution, Belgium (2012-2023)**




*Eurostat 2025 (Air Emissions Accounts)*

**Table 2 – Direct GHG emissions in tonnes $CO_2$ eq by gas, percentage change between 2012 and 2023, Belgium**

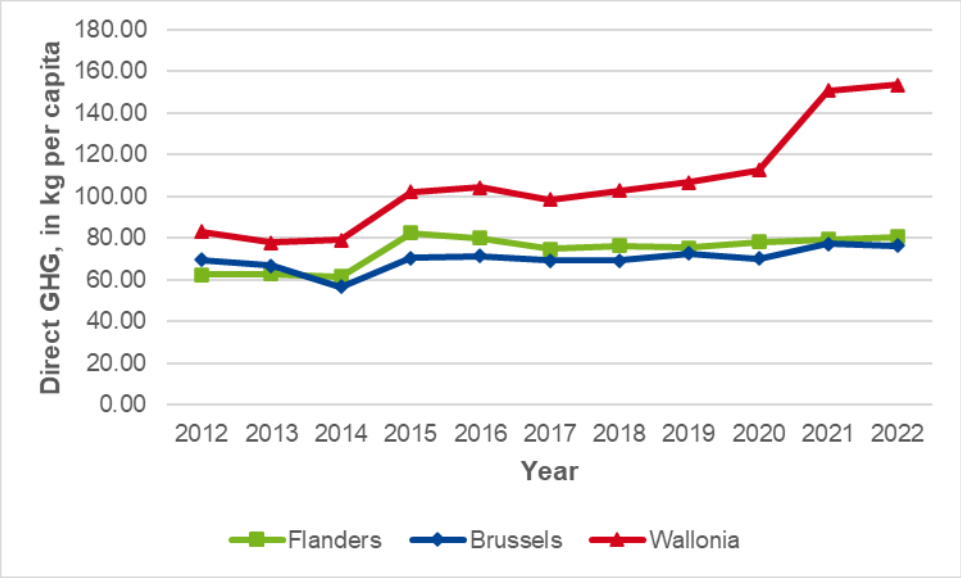
| | Belgium | | |
|---|---|---|---|
| | 2012 (%) | 2023 (%) | % change |
| ***$CO_2$*** | 683 129.7 (89.8%) | 1 257 037.8 (96.9%) | **+84.0%** |
| ***$CH_4$ ($CO_2$ eq)*** | 1 035.2 (0.1%) | 2 347.3 (0.2%) | **+126.8%** |
| ***$N_2O$ ($CO_2$ eq)*** | 74 268.4 (9.8%) | 36 664.6 (2.8%) | **-50.6%** |
| ***HFC ($CO_2$ eq)*** | 1 719.3 (0.2%) | 759.6 (0.1%) | **-55.8%** |
| ***PFC ($CO_2$ eq)*** | 0.04 (<0.1%) | 0.0 (0%) | **-100.0%** |
| ***$SF_6$ and $NF_3$ ($CO_2$ eq)*** | 158.9 (<0.1%) | 54.8 (<0.1%) | **-65.5%** |
| ***Total*** | 760 311.5 | 1 296 864.2 | **+70.6%** |

*Eurostat data 2025 (Air Emissions Accounts)*

## REGIONAL COMPARISON

For human health activities, direct GHG emissions per capita increased across all regions, with the most pronounced rise observed in Wallonia in 2021 (see Figure 3 and Table 3). However, the sharp increases observed across all regions in 2015 and in Wallonia in 2021 can be partially attributed to methodological factors (see the limitations in the documenation sheet).

**Figure 3 – Direct GHG emissions, in kg per capita, by region (2012-2022)**




*Sources: National planning bureau 2025. Wallonia: data gaps in 2021 due to a change in methodology, without retroactive adjustments.*

**Table 3 – Direct GHG emissions, in kg per capita, by region (2012-2022)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Flanders*** | 62.5 | 62.7 | 61.7 | 82.5 | 80.0 | 74.9 | 76.4 | 75.5 | 78.3 | 79.3 | 80.5 |
| ***Brussels*** | 69.5 | 66.7 | 56.7 | 70.5 | 71.4 | 69.3 | 69.4 | 72.7 | 70.1 | 77.2 | 76.2 |
| ***Wallonia*** | 82.9 | 78.0 | 79.0 | 102.1 | 104.2 | 98.5 | 102.9 | 106.8 | 112.4 | 150.6 | 153.5 |

*Sources: National planning bureau 2025.*

## INTERNATIONAL COMPARISON

Expressed in kilograms per capita, direct GHG emissions from human health activities in Belgium were higher and showed an upward trend compared to the stable EU averages (see Figure 4). Across EU countries, emissions vary substantially in magnitude and in 2023, Belgium recorded the highest level of direct GHG emissions in human health activities among all EU member states (see Figure 5).

Concerning the evolution per type of gas, important variations can be observed between Belgium and EU-27 countries. The share of $CO_2$ in total emissions was slightly lower and more stable in the EU-27 than in Belgium, with 87.1% of direct GHG emissions in kg per capita in 2023 (96.9% in Belgium), showing an increase of +0.5% of $CO_2$ compared to 2012 (+73.5% in Belgium, see Table 4).

Although methane emissions per capita were low in Belgium, a substantial increase was observed, rising by 113.8% between 2012 and 2023, whereas the EU-27 average declined by 19.9% over the same period. As a result, by 2023, Belgium reached a level comparable to the EU-27.

However, comparison between countries should be used with cautions as methodological factors can partly explain differences (see the limitations in the documentation sheet).

**Figure 4 – Direct GHG emissions in human health activities, in kg $CO_2$ eq per capita, European comparison (2012-2023)**

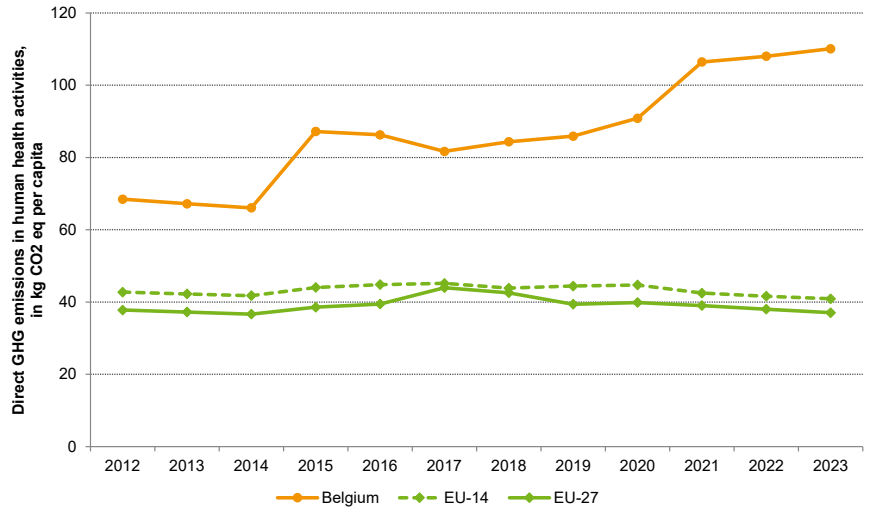
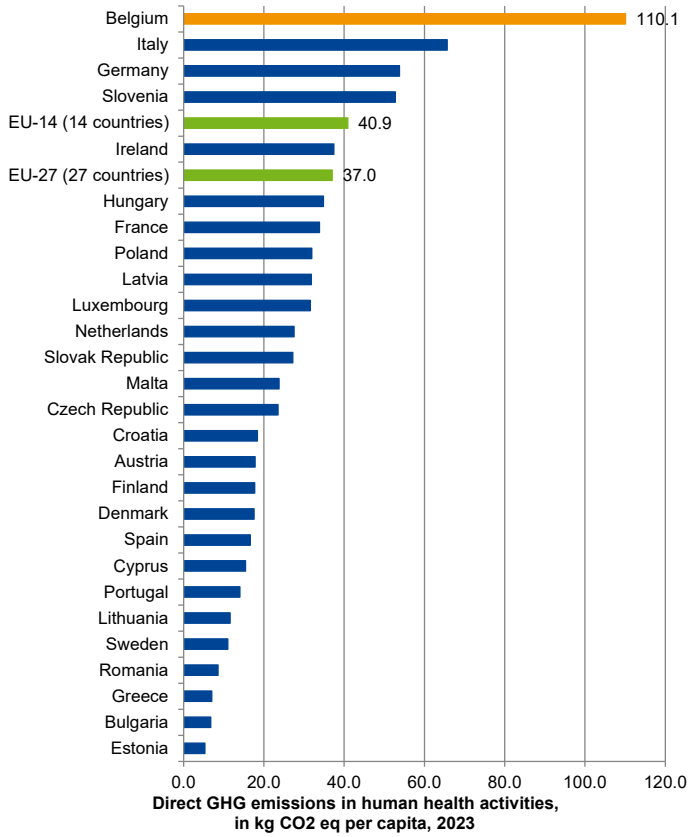



**Figure 5 – Direct GHG emissions in human health activities, in kg $CO_2$ eq per capita, European comparison (2022)**




*Sources: Eurostat 2025 (Air Emissions Accounts)*

**Table 4 –Direct GHG emissions in kg CO2 eq per capita, by gas, percentage change between 2012 and 2023, Belgium and EU-27**

| | Belgium | | | EU-27 | | |
|---|---|---|---|---|---|---|
| | 2012 | 2023 | % change | 2012 | 2023 | % change |
| ***$CO_2$*** | 61.505 | 106.710 | 73.5% | 32.100 | 32.268 | 0.5% |
| ***$CH_4$ ($CO_2$ eq)*** | 0.093 | 0.199 | 113.8% | 0.249 | 0.200 | -19.9% |
| ***$N_2O$ ($CO_2$ eq)*** | 6.687 | 3.112 | -53.5% | 4.040 | 3.300 | -18.3% |
| ***HFC ($CO_2$ eq)*** | 0.155 | 0.064 | -58.3% | 1.280 | 1.219 | -4.8% |
| ***PFC ($CO_2$ eq)*** | 0.000 | 0.000 | - | 0.011 | 0.015 | 42.5% |
| ***$SF_6$ and $NF_3$ ($CO_2$ eq)*** | 0.014 | 0.005 | -67.5% | 0.052 | 0.041 | -22.2% |
| ***Total*** | 68.5 | 110.1 | 60.8% | 37.7 | 37.0 | -1.8% |

*Sources: Eurostat 2025 (Air Emissions Accounts)*

## DATA SOURCES COMPARISON

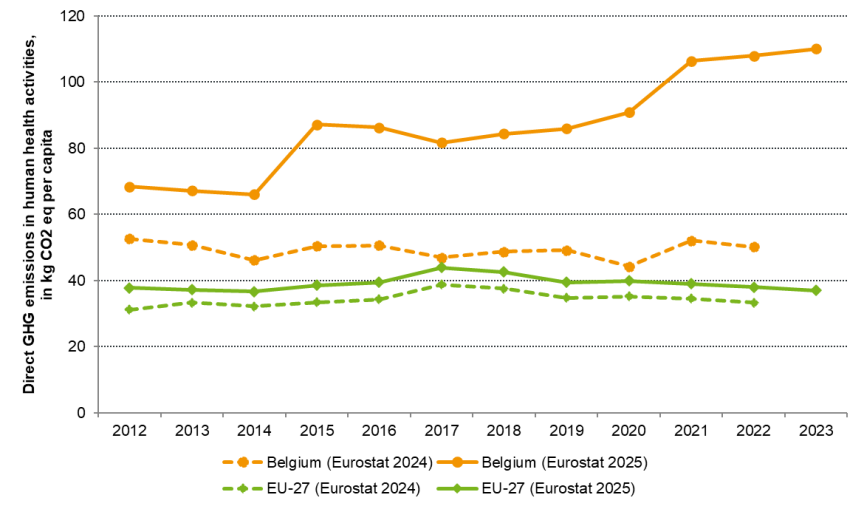
While direct GHG emissions from the VITO model and Eurostat's 2024 data were quite similar, and slightly lower than those estimated by the NEHAP model (see ENV-1 for a description of VITO and NEHAP models), a significant increase is observed in Eurostat's 2025 data (see Table 5). Between 2024 and 2025, Belgium introduced a new method for estimating emissions from road transport (see the documentation sheet), which appears to have an important impact on results (see Figure 6). However, even if Belgium remained high compared to other countries (also based on data released in 2024), as mentioned in the documentation sheet, comparability per NACE activity between country is not guaranteed.

**Table 5 – Direct GHG emissions in kt $CO_2$ eq, 2022, comparison by sources**

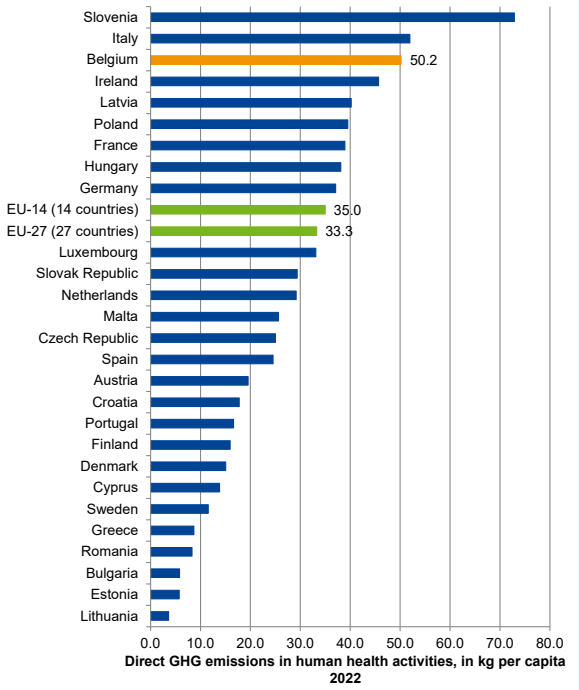
| | NEHAP | VITO | Eurostat (released on 12/2024) | Eurostat (released on 11/2025) |
|---|---|---|---|---|
| ***Human health activities (Q86)*** | - | 588.11 | 586.58 | 1 296.86 |
| ***Human health activities, residential care activities and social work activities (Q86-Q87-Q88)*** | 1 083.00 | 909.83 | 908.22 | 1 675.95 |

*Sources: NEHAP 2025,[2], VITO 2025, Eurostat 2024 and Eurostat 2025.*

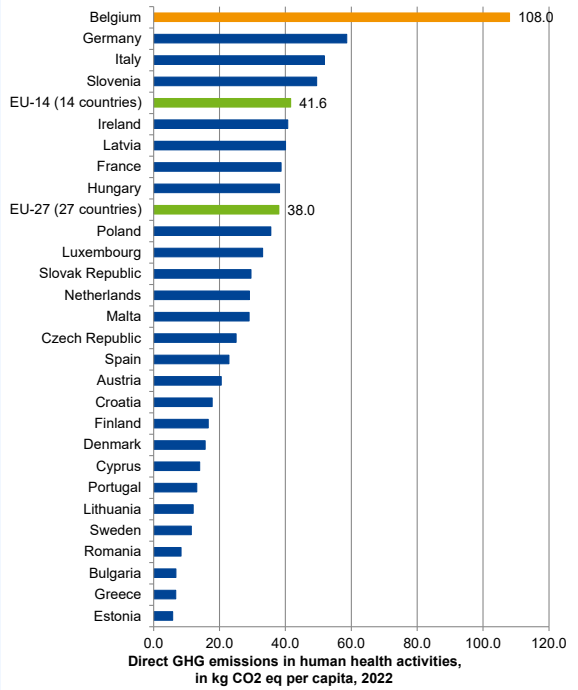
**Figure 6 – Direct GHG emissions in kg $CO_2$ eq per capita, 2012-2023, Eurostat 2024 and 2025**




Eurostat data released in 2024




Eurostat data released in 2025




*Source: Eurostat 2024 and 2025*

## DISCUSSION

The elevated level of direct GHG emissions is also related to the high fossil energy consumption in human health activities observed in indicator ENV-8. While potential causes could be a high energy intensity of healthcare facilities, the reliance on fossil fuels for heating and cooling, the relatively high density of hospitals per capita and a carbon-intensive healthcare fleet, methodological differences in data reporting between countries but also within Belgium may also have contributed to the wrong performance of Belgium for this indicator.

## KEY POINTS

- Direct GHG emissions (Scope 1) in the healthcare sector include emissions from on-site combustion of fossil fuels (e.g. fuel used in hospital boilers) and from the operation of the healthcare fleet. The healthcare sector was identified using the statistical classification of economic activities in the European Community (NACE Rev. 2), specifically code Q86, which covers human health activities (excluding residential care).
- Annual direct GHG emissions in human health activities in Belgium increased from 760 311.5 t $CO_2$ eq in 2012 to 1 296 864.2 t $CO_2$ eq in 2023 (+70.6%). However, it is important to note that Belgium changed its methodology to better estimate emissions from road transports (with retroactive adjustments) and based on the previous methodology, direct GHG emissions were more stable (585 202 t $CO_2$ eq in 2012 and 586 578 t $CO_2$ eq in 2022, +0.2%).
- While $CO_2$ is the dominant greenhouse gas (96.9% in 2023), it is currently challenging to determine which $CO_2$ source has the greatest impact. Nitrous oxide ($N_2O$) also plays a role in human health activities but the impact was smaller (2.8% of GHG emissions in 2023) and emissions from this gas decreased between 2012 and 2023 (-50%). Other gases (methane ($CH_4$) and fluorinated gases) accounted for less than 0.3%.
- At the regional level, Wallonia reported higher per capita emissions in 2022 (153.5 kg $CO_2$ eq per capita), compared to Flanders (80.5 kg $CO_2$ eq per capita) and Brussels (76.2 kg $CO_2$ eq per capita). In this case, methodological factors were not the main explanation as the methodology was more aligned between regions since 2021. A more in-depth analysis of these disparities is therefore required to identify their underlying causes.
- At the European level, direct GHG emissions per capita were generally lower and more stable in other countries. In 2023, Belgium recorded 110.1 kg $CO_2$-eq per capita, representing a 60.8% increase compared to 2012, whereas the EU-27 average stood at 37.0 kg $CO_2$-eq per capita, a slight decrease of 1.8% over the same period. Notably, Belgium reported the highest level of direct GHG emissions from human health activities among all EU member states in 2023. However, it is also important to note that the new methodology introduced in Belgium to better estimate emissions from road transport strongly influenced this result. Under the previous methodology, Belgium's emissions were consistently higher than the EU average but remained closer and more stable (50.2 kg $CO_2$-eq per capita in Belgium in 2022, compared to 33.3 and 35.0 kg $CO_2$ eq per capita in the EU-27 and EU-14, respectively).
- While potential causes of high direct GHG emissions in Belgium could be a high energy intensity of healthcare facilities, the reliance on fossil fuels for heating and cooling, the relatively high density of hospitals per capita and a carbon-intensive healthcare fleet, methodological differences in data reporting between countries may also have contributed to the observed gap. Results should therefore be used with cautions and further investigations are needed. In one of their reports, Eurostat reported that comparability per NACE activity between country was not guaranteed. [5].
- In conclusion, even if methodological differences in data reporting between countries but also within Belgium may have contributed to the observed poor performance of Belgium regarding direct GHG emissions in human health activities, the expected decrease seems far from being achieved, and continued efforts remain essential.

## REFERENCES


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