4 HIGH CARBON MEDICAL PRODUCTS

4.2 GHG impact of anaesthetic gases (sevoflurane, desflurane, isoflurane) (ENV-11)

4.2.1 Documentation sheet

Description	**Primary indicator**: A. Greenhouse gas (GHG) impact of anaesthetic gases (sevoflurane, desflurane, isoflurane), in kg CO_2 eq per capita. **Secondary indicator(s):** B. Greenhouse gas (GHG) impact of anaesthetic gases (sevoflurane, desflurane, isoflurane), in tonnes CO_2 eq. C. Annual consumption of sevoflurane in the healthcare sector D. Annual consumption of isoflurane in the healthcare sector E. Annual consumption of desflurane in the healthcare sector
Rationale	Anaesthetic gases' use accounts for around 3% of the carbon footprint of the healthcare sector.[1]
Calculation	**Primary indicator (A):** • Numerator: GHG impact of anaesthetic gases (sevoflurane, desflurane, isoflurane) in kg CO2 eq • Denominator: Population of the corresponding year For each of the 3 gases analysed, the volume of gas has been calculated. GHG impact of anaesthetic gases (sevoflurane, desflurane, isoflurane) was based on the volume of sales for each gas multiplied by their greenhouse gas impact per liquid volume (kg CO_2 eq./mL), described in Table 1.[2]
Data source	PH documents (INAMI – RIZIV), sales volumes (IQVIA) published in Talbot et al.[2]
Technical definitions	The PH documents are an extract of invoices sent by hospitals to health insurance funds in order to obtain reimbursement for the portion of medication costs covered by compulsory health insurance. At the same time as reporting the delivery of medications covered by compulsory insurance, hospitals are also invited to transmit information on non-reimbursed deliveries.
International comparability	Based on one publication from Talbot et al. with data from 2023.[2]
Limitations	Data collected in Talbot et al. are limited to the hospital sector but are expected complete (based on sales). Administrative data collected by RIZIV – INAMI cover hospitals (general and psychiatric). However, for PH documents data, the possibilities for verifying the accuracy and the exhaustivity of the reported data are limited for the anaesthetic gases, and the information should therefore be considered with caution (particularly for data concerning desflurane). Ambulatory use has not been studied due to the lack of data sources.
Dimension	Environmental sustainability
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Reviewers	Marc De Falleur (INAMI – RIZIV), Alain Kalmar (BeSARPP)

4.2.2 Results

BELGIUM

Anaesthetic gases used in Belgium have a high global-warming potential (GWP). Their use must be reduced as much as possible, switching to other means of anaesthesia (intravenous, e.g. propofol) or, whenever this is not possible, gases with a low GWP must be used.[1,3] The Belgian Society of Anesthesiology, Resuscitation, Perioperative medicine and Pain management has published recommendations in 2023.[4]

Table 1 – Global-warming potential of anaesthetic gases

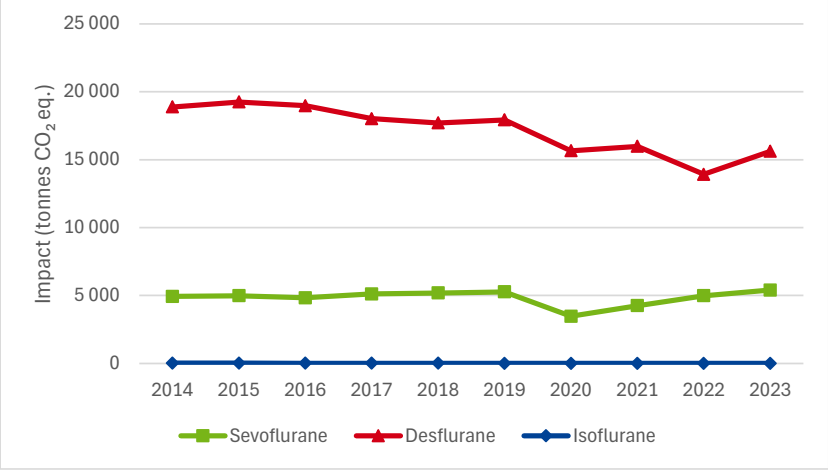
Anaesthetic gas	GWP (100)[a]	Greenhouse gas impact per liquid volume (kg CO_2 eq./mL)	ATC5
Desflurane	2590	3.795	N01AB07
Isoflurane	539	0.806	N01AB06
Sevoflurane	144	0.219	N01AB08

Source: Talbot et al.[2]

Sevoflurane is the most commonly used of the 3 gases. It has a global-warming potential lower than desflurane and isoflurane (see Table 1), and it is better tolerated than the latter by patients, hence its more important use.

Figure 1 shows the GHG emissions in tonnes CO_2 eq caused by use of anesthetic gases in hospital in Belgium.[2] Desflurane has the most important impact, while isoflurane is barely used.

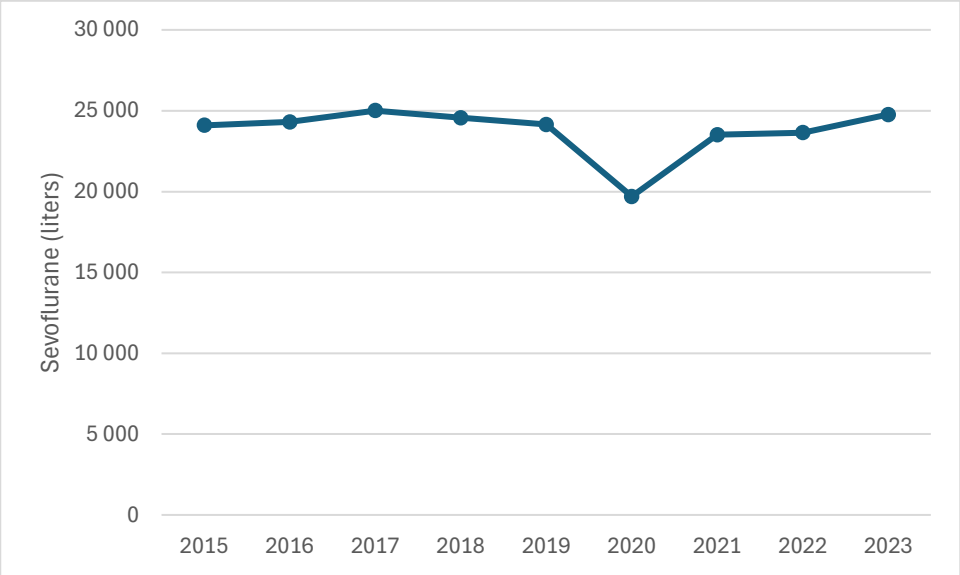
Figure 1 – GHG impact of anaesthetic gases in Belgium (2014-2023)



Source: Talbot et al.[2]

[a] Hundred global warming potential: a gas with a GWP(100) of 10 means that 1 kg of the gas is equivalent to 10 kg of CO_2 regarding global-warming potential over 100 years.

Figure 2 – Sevoflurane consumption (2015-2023)

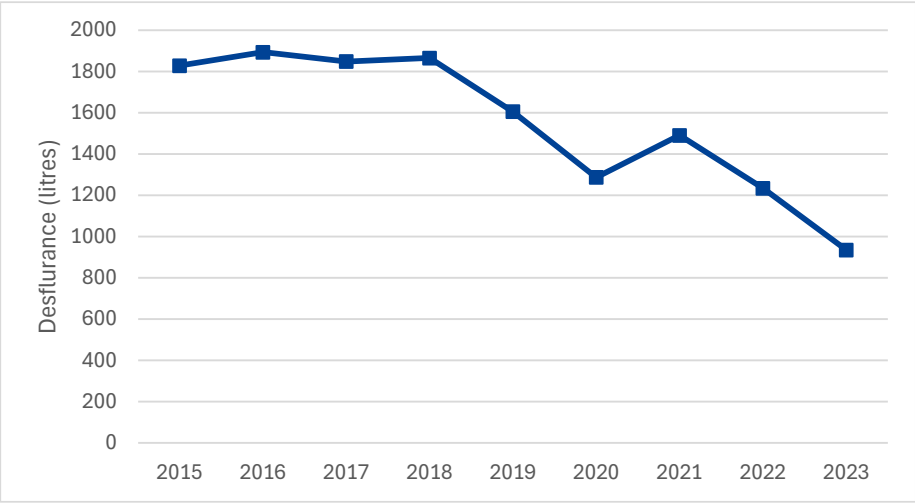


Source: INAMI – RIZIV (PH documents)

Sevoflurane consumption has increased by 5.9% over the period (Figure 2), the dip in 2020 can probably be explained by the reduction in elective surgery activity due to the COVID pandemic.

Due to its high global-warming potential (see Table 1), desflurane's use has been restricted in EU since 1 January 2026[5] and in UK since 2024.[6] Figure 3 shows its consumption in Belgium (in hospitals) for the 2012-2023 period: a decrease of 48.8% is observed. These results should be treated with caution, as they are not consistent with those from another source (IQVIA) which shows a higher consumption of desflurane. This might be due to some use not being registered in PH documents (e.g. consumption not reimbursed).

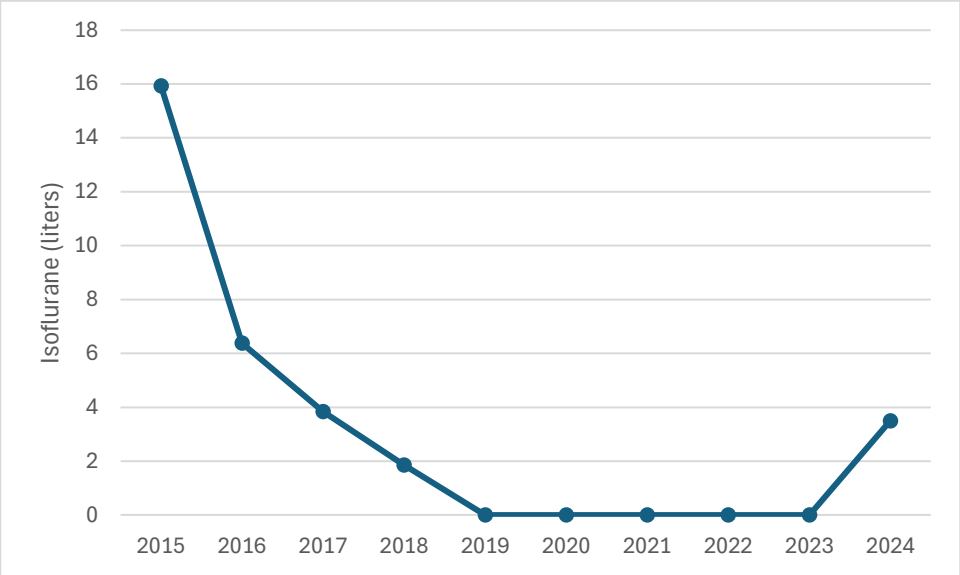
Figure 3 – Desflurane consumption (2015-2023)



Source: INAMI – RIZIV (PH documents)

Isoflurane's use is very small (Figure 4) compared to desflurane and sevoflurane (see Figure 1). It is still widely used in veterinary medicine.

Figure 4 – Isoflurane consumption (2015-2024)

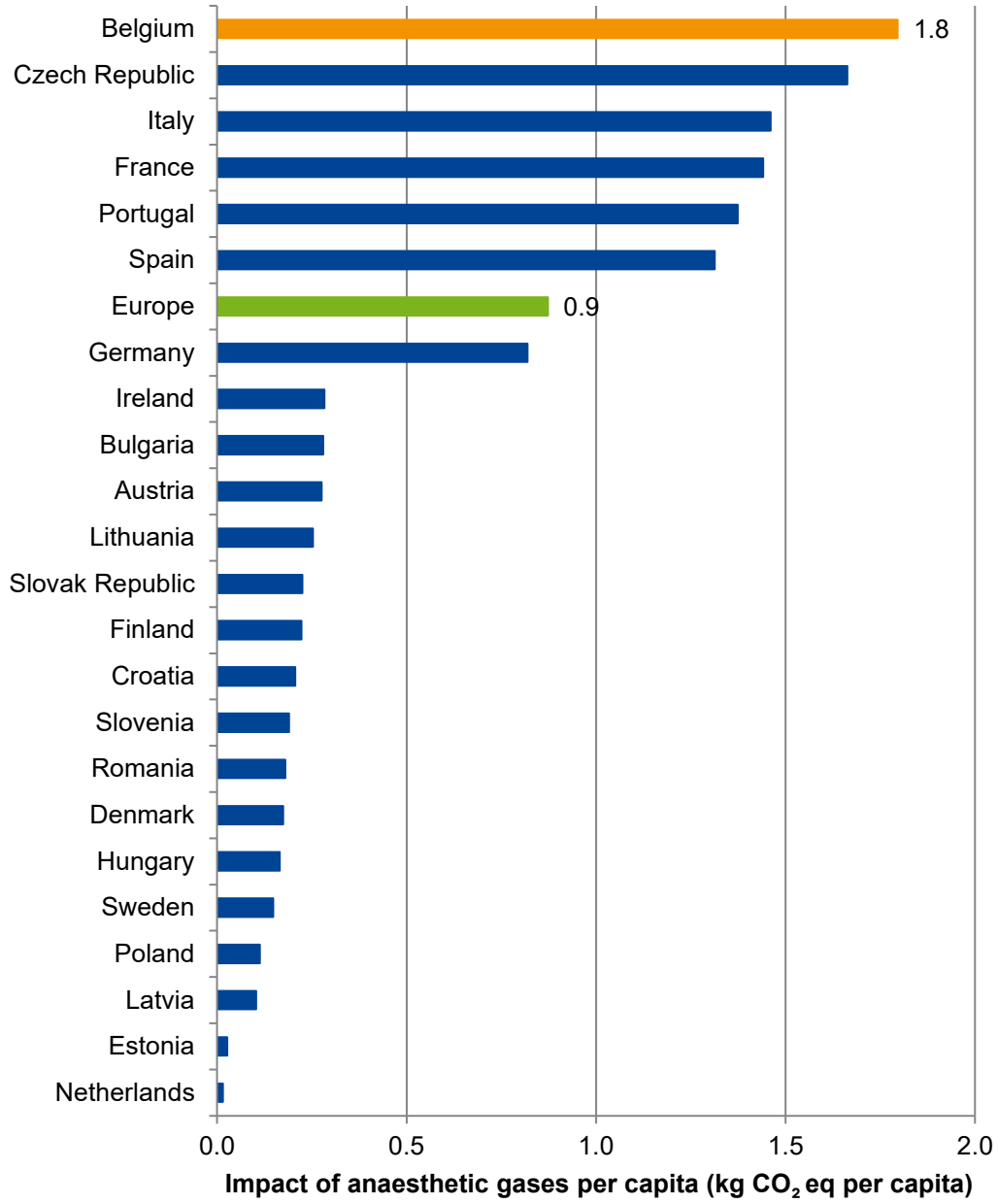


Source: INAMI – RIZIV (PH documents ; 2024: extrapolation from incomplete data)

INTERNATIONAL COMPARISON

GHG impact of anaesthetic gases in Belgium is twice as high as the European average (1.8 kg CO_2 eq per capita for Belgium, 0.9 for 22 European countries, see Figure 5). Belgium has the highest impact compared to all EU countries included in the analysis.

Figure 5 – GHG mpact of anaesthetic gases, in kg CO_2 per capita (2023)



Source: Talbot et al. (Europe = all countries from EU-27 individually represented on the graph + UK + Norway)

KEY POINTS

Anaesthetic gases with high GHG impact must be reduced whenever possible

- Anaesthetic gases have a high global-warming potential; their use must be limited. This can be achieved by favouring use of intravenous anaesthesia (e.g. total intravenous anaesthesia, TIVA), selecting gases with low global-warming when gas use is unavoidable, and, whenever possible, using minimal-flow anaesthesia workstations.
- Belgian use of Desflurane has been decreasing over the 2015-2024 period, but not enough compared to other European countries. Sevoflurane is the most used gas and its consumption

has increased by 5.9% over the 2015-2024 period. A room for improvement therefore remains in Belgium.

- As a consequence, GHG impact of anaesthetic gas was twice as high in Belgium in 2023 (1.8 kg CO_2 eq per capita) compared to the European average (0.9 kg CO_2 eq per capita, for 22 countries).
- EU regulation 24/573 prohibits the use of desflurane as an inhalation anaesthetic from 1 January 2026, except where such use is strictly required and no other anaesthetic gas can be used on medical grounds. Improvements are therefore expected.

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