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# GHG calculation example

This example demonstrates how to calculate GHGs with GWP and emission factors.

Updated over a week ago

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Please note that the numbers in this example may not be accurate for today's GHG calculations. This is a simplified calculation.

Assume that a gas bill's value is 14,356 m3 of natural gas.

Natural gas includes 3 different GHGs that have emission factors (EFs from 2012/2013, they should not be used for calculations today):

- Emission factor for Carbon dioxide= 1879g CO<sub>2</sub>/m<sup>3</sup>
- Emission factor for Methane = 0.037g CH<sub>4</sub>/m<sup>3</sup>
- Emission factor for Nitrous oxide = 0.033g N<sub>2</sub>O/m<sup>3</sup>

To get the correct GHGs emission from this activity, the amount of natural gas must be multiplied by each emission factor:

- 14.356 m<sup>3</sup> x 1879g CO<sub>2</sub>/m<sup>3</sup> = 26974924 g CO<sub>2</sub> ~ **27 t CO<sub>2</sub>**
- 14.356 m<sup>3</sup> x 0.037g CH<sub>4</sub>/m<sup>3</sup> = 531.172 g CH<sub>4</sub> ~ **0.0005 t CH<sub>4</sub>**
- 14.356 m<sup>3</sup> x 0.033 N<sub>2</sub>O/m<sup>3</sup> = 473.748 g N<sub>2</sub>O ~ **0.0005 t N<sub>2</sub>O**

## How to apply Global Warming Potential (GWP)?

GWP is a ratio that stands for the effect of the quantity of GHGs on climate change compared with an equal amount of carbon dioxide. It is based on Carbon dioxide, which is why carbon dioxide always has a GWP of 1.

For example:

GHG x emission factor	GWP			Expressed in Carbon Dioxide Equivalent (CO <sub>2</sub> e)
26974924 g CO <sub>2</sub> ~ 27 t CO <sub>2</sub>	X	1	=	<b>27 t CO<sub>2</sub>e</b>
531.172 g CH <sub>4</sub> ~ 0.0005 t CH <sub>4</sub>	X	28	=	<b>0.014 t CO<sub>2</sub>e</b>
473.748 g N <sub>2</sub> O ~ 0.0005 t N <sub>2</sub> O	X	265	=	<b>0.1325 t CO<sub>2</sub>e</b>

The GWP used in the example comes from [GHG protocol](#) (last updated 2013).

This demonstrates that quantities of methane and nitrous oxide at first glance seem small but contribute sizably to climate change.

Now when each of these emissions is expressed in a common unit. They can be summed up to provide a single value representing

the greenhouse gas emission resulting from that activity (burning natural gas).

$$27 \text{ t CO}_2\text{e} + 0.014 \text{ t CO}_2\text{e} + 0.1325 \text{ t CO}_2\text{e} = \mathbf{27.1465 \text{ CO}_2\text{e}}$$

This type of calculation is rare for most businesses. Usually, companies use emission factors (EFs) from public sources that already include the GWP.

**The most common formula:**

$$\begin{array}{rcl} \text{Activity data} & \times & \text{EF} & = & \text{CO}_2\text{e} \\ 14.356 \text{ m}^3 & \times & 2.02135 & = & 29,018006 \text{ CO}_2\text{e} \end{array}$$

The EF for this example is based on data from [DEFRA 2021](#).

**Please note, that the numbers 29,018006 CO<sub>2</sub>e and 27.1465 CO<sub>2</sub>e differ because the calculation example is based on EFs and GWPs from 2012/2013.**

#### Further reading on GHG calculations

- [GHG Protocol Calculation tools](#) – Enables companies and cities to develop comprehensive and reliable inventories of their GHG emissions.
- [Technical Guidance for Calculating Scope 3 Emissions](#) – Supplement to the Corporate Value Chain (Scope 3) accounting and reporting standard.

## Related Articles

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