



## Anthropogenic Greenhouse Gases

12/2020

Greenhouse gases covered by the Kyoto Protocol and the CO <sub>2</sub> Act	Residence time in atmosphere <sup>1,2</sup> (in years)	GWP <sup>2,3</sup>	Share in total greenhouse gas emissions, excl. deforestation <sup>4</sup>
<b>Carbon dioxide (CO<sub>2</sub>)</b> <ul style="list-style-type: none"> <li>Combustion of fossil thermal fuels and motor fuels (petroleum, natural gas, coal), cement production</li> <li>Deforestation/fire clearing in the tropics</li> </ul>	100–150	1	Globally ca. 74%, Switzerland ca. 80%
<b>Methane (CH<sub>4</sub>)</b> <ul style="list-style-type: none"> <li>Agriculture (livestock and fertilisation)</li> <li>Waste management (landfills, composting/fermentation, wastewater treatment)</li> <li>Use of fossil fuels</li> </ul>	12	25	Globally ca. 18%, Switzerland ca. 10%
<b>Nitrous oxide (N<sub>2</sub>O)</b> <ul style="list-style-type: none"> <li>Agriculture (soils and fertilisation)</li> <li>Smaller contributions from energy conversion, industry, and wastewater treatment</li> </ul>	114	298	Globally ca. 6%, Switzerland ca. 6%
<b>Synthetic greenhouse gases:</b>			Globally ca. 2%, Switzerland ca. 4%
<b>Hydrofluorocarbons (HFC)</b> <ul style="list-style-type: none"> <li>Cryogenic agents, foaming agents, propellants in aerosol sprays, solvents</li> </ul>	0.3–270	12–14'800	
<b>Perfluorinated carbon compounds (PFC)</b> <ul style="list-style-type: none"> <li>Production of semiconductors, solvents, heat carrier</li> </ul>	2'600–50'000	7'390–12'200	
<b>Sulphur hexafluoride (SF<sub>6</sub>)</b> <ul style="list-style-type: none"> <li>High voltage insulators, aluminium and magnesium casting, production of semiconductors</li> </ul>	3'200	22'800	
<b>Nitrogen trifluoride (NF<sub>3</sub>)</b> <ul style="list-style-type: none"> <li>Electronics industry</li> </ul>	740	17'200	
<b>Greenhouse gases not covered by the Kyoto Protocol and the CO<sub>2</sub> Act</b>			
<b>Chlorofluorocarbons (CFC and halocarbons)</b> <ul style="list-style-type: none"> <li>Use restricted/prohibited by the Montreal Protocol because of ozone layer destruction; in Switzerland emissions only from existing cooling/fire-extinguishing systems and foams</li> </ul>	1.3–1'700	Up to more than 10'000	Decreasing tendency due to ozone layer protection (Montreal Protocol, Kigali Amendment)
<b>New climate-relevant substances</b>			
<b>Hydrofluorether (HFE)</b> <ul style="list-style-type: none"> <li>Solvents, heat carriers</li> </ul>	0.2–136	11–14'900	Increasing tendency
<b>Sulphuryl fluoride (SO<sub>2</sub>F<sub>2</sub>)<sup>5</sup></b> <ul style="list-style-type: none"> <li>Pesticide</li> </ul>	36	4'780	

<sup>1</sup> Residence time in atmosphere: Time period after which 63.2% of the substance's initial amount left the atmosphere.

<sup>2</sup> Source: [Table 2.14](#) (Errata), IPCC AR4 (2007, Working Group 1). These values are also used for the greenhouse gas inventory in line with the most recent UNFCCC guidelines (more recent values published by the IPCC have not yet been adopted by the UNFCCC).

<sup>3</sup> Global Warming Potential (GWP): Relative measure of how much heat is trapped in the atmosphere by the different greenhouse gases (relative to CO<sub>2</sub>).

<sup>4</sup> Source: Switzerland's greenhouse gas inventory 2020 (values for Switzerland, 2018) and Climate Watch (global values, 2016).

<sup>5</sup> Papadimitriou et al. (2008, J. Phys. Chem. A, 112, 12657–12666) and Mühle et al. (2009, J. Geophys. Res., 114, D05306).