

Global projection of F-gas emissions shows high increase until 2050

New study for the German Federal Environmental Agency
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 Presented by GTZ-Proklima at the 21st Meeting of the Parties to the Montreal Protocol

Global emissions of fluorinated greenhouse gases (F-gases) will amount to 4 GT CO₂ eq. by 2050 if no political mitigation measures are taken. The contribution of F-gases to global warming will increase from 1.3% (2004) to 7.9% of the projected direct CO₂ emissions. In case of CO₂ mitigation, the share of F-gas emissions would be significantly higher in 2050. This is the result of the German study "Projections of global emissions of fluorinated greenhouse gases in 2050".

Emissions of fluorinated greenhouse gases (F-gases including HFCs, PFCs and SF₆) have increased significantly in recent years and are estimated to rise further in response to phase out ozone-depleting substances (ODS) under the Montreal Protocol. HFCs are produced for use in various sectors including refrigeration, air conditioning, foam blowing, and other fields of application. HFC-23 is generated as a by-product in HCFC-22 manufacture. PFCs and SF₆ are used in certain industrial processes. Banks and emissions of HFCs, PFCs and SF₆ in the year 2050 are projected in a business-as-usual scenario. For each sector of application, specific assumptions and growth rates in developed and developing countries are applied.

Population growth and economic development are based on scenarios by IPCC (Special Report on Emission Scenarios, 2000) and reflect globalisation, industrialization and rapid change towards a service and information economy. Assumptions of the business-as-usual scenario include:

- Existing political measures and phase-out schedules are implemented.
- Emission rates comprise use-phase and disposal emissions and remain unchanged.
- Share of different HFC types remains constant in the various application sectors.
- The share of alternative technologies remains unchanged.

Estimates are based on GWP₁₀₀ to weigh individual substances in formulating the total emission values. HFCs will account for 92% of total F-gas emissions, PFCs for 3% and SF₆ for 5% in 2050.

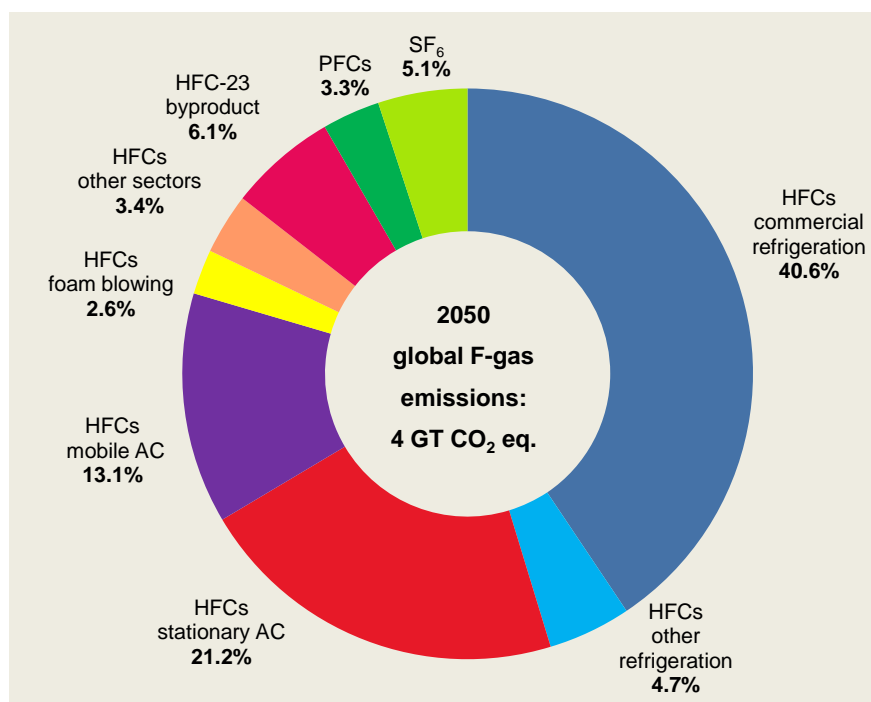


Figure 1: Breakdown of emission sources of global F-gas emissions. The sectors of commercial refrigeration, stationary air conditioning and mobile air conditioning will contribute 75% of F-gas emissions in 2050.

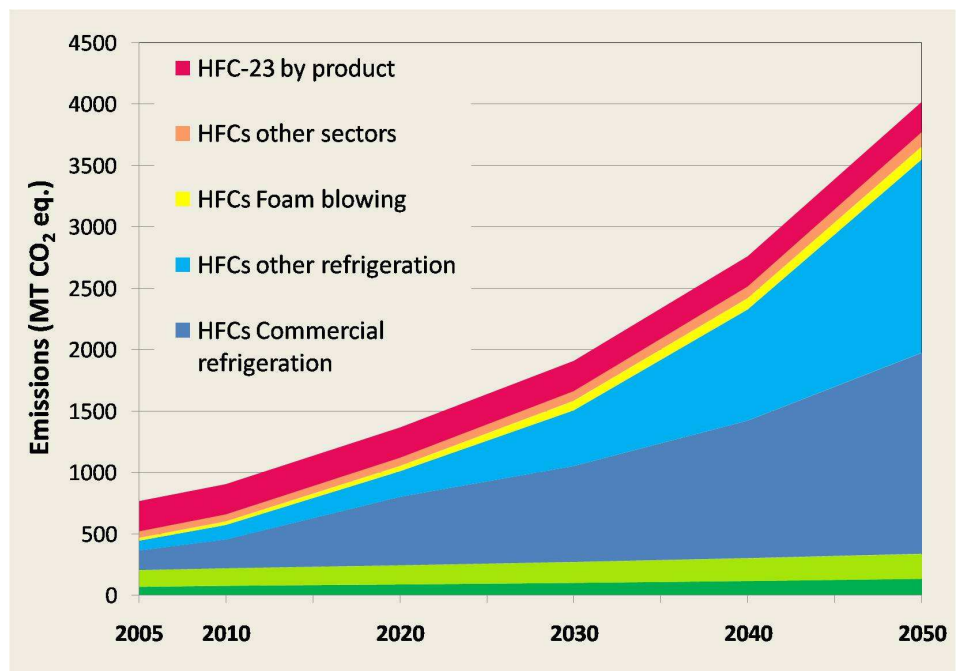


Figure 2: The steep rise in F-gas emissions until 2050 is primarily caused by the expansion of the refrigeration and air conditioning sector, especially the commercial refrigeration sector.

Global F-gas emissions in 2050 are projected to contribute ca. 7.9% of projected global CO₂ emissions in business-as-usual scenarios (combined scenario A1B and B1 from Special Report on Emission Scenarios, 2000). In 2004, the share of F-gas emissions amounted to 1.3% only.

Emissions from developing countries will exceed emissions from developed countries in most sectors. In the business-as-usual scenario outlined, developing countries will account for 75% of total emissions of fluorinated greenhouse gases in 2050. They hence play a key role in measures to reduce F-gas emissions. Per capita emissions will range at 0.42 t in developing countries and 0.68 t in developed countries (global average: 0.46 t per capita).

In comparison to earlier projections of future HFC emissions (e.g. Velders et al. 2009), the following differences should be noted:

- Sector-specific growth rates for developed and developing countries were used for the projections of F-gas emissions by sector.
- For some sectors, projections of HFC banks and emissions in 2020 by UNEP TEAP (2009) were used as baseline.
- Long-term growth rates incorporate not-in-kind alternatives to ODS and market saturation for various products containing HFCs. Thus, long-term growth rates are lower than short-term rates.

This study, just as other studies, underlines the urgent need for mitigation measures of F-gas emissions.

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The study is available online at
<http://www.umweltbundesamt.de/produkte-e/index.htm>.