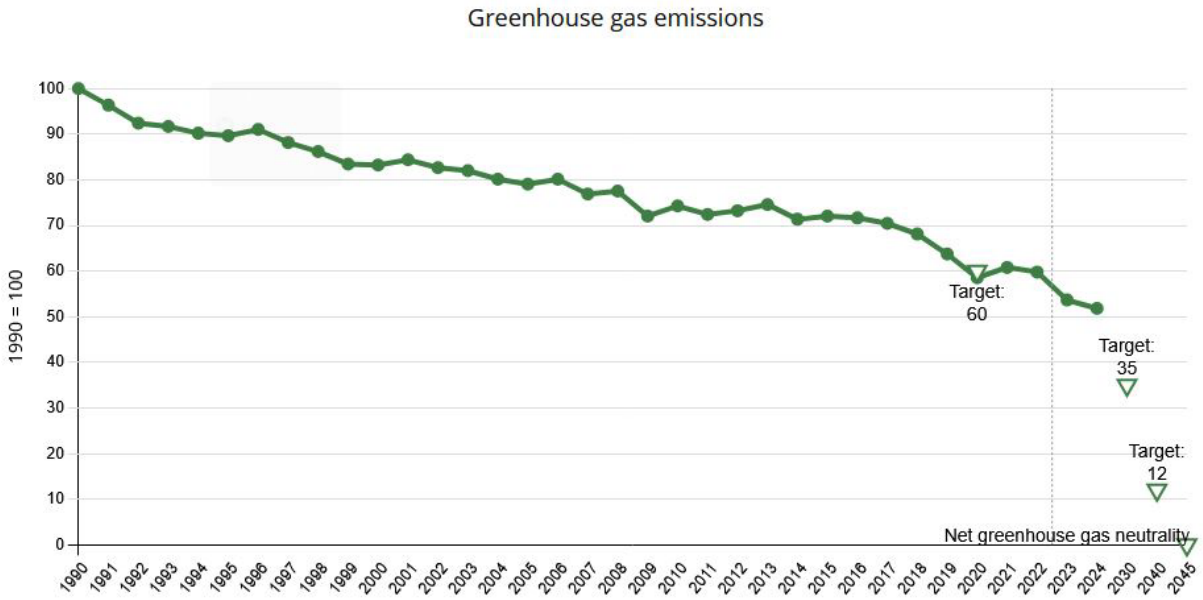
Climate protection – *Reducing greenhouse gases*

13.1.a Greenhouse gas emissions



Note(s):
Partly revised data. – 2024 provisional data.

Data source(s):
German Environment Agency

Definition
The indicator represents the index of emissions of the following greenhouse gases (substances or groups of substances, in CO_2 equivalents) compared to the base year 1990: Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), nitrogen trifluoride (NF_3), hydrofluorocarbons (HFCs/HFCs), perfluorocarbons (PFCs/HFCs) and sulphur hexafluoride (SF_6).

Intention
The average global temperature on the Earth's surface is rising continuously due to the increasing concentration of carbon dioxide (CO_2) and other greenhouse gases (GHG) in the atmosphere.

Target
Reduction by at least 65% by 2030 and by at least 88% by 2040, in both cases compared to 1990; greenhouse gas neutrality to be achieved by 2045

Content and progress
The global greenhouse effect arises from the impact of various gases on the Earth's atmosphere: short-wave solar radiation passes through almost unhindered and is re-emitted by the Earth's surface as long-wave infrared radiation. This thermal radiation is absorbed by greenhouse gases (GHGs) and re-emitted at various wavelengths. Depending on the gas, absorption behaviour and atmospheric lifetime vary. Therefore, individual greenhouse gases contribute to the greenhouse effect to different extents. To make their impact

comparable, it is expressed in so-called CO_2 equivalents. The year 1990 is used as the reference year for evaluating the development of greenhouse gas emissions.

The indicator records emissions of the most significant greenhouse gases caused by human activity: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), nitrogen trifluoride (NF_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). The annual collection and reporting of emissions data is conducted by the Federal Environment Agency (UBA) as part of international obligations – such as under the Paris Agreement, the United Nations Framework Convention on Climate Change (UNFCCC), and the Federal Climate Change Act (Bundes-Klimaschutzgesetz). The calculation follows the polluter pays and territorial principles, whereby relevant emission sources within Germany are recorded. Emissions from international maritime shipping and aviation are excluded. Emissions from land use, land-use change and forestry (LULUCF) are also not included in the indicator, in accordance with an agreement under the Kyoto Protocol. The LULUCF sector includes both emissions and removals of greenhouse gases through forests, arable land, grassland and wetlands.

Since 1990, greenhouse gas emissions in Germany have shown a long-term decline, interrupted only occasionally by temporary increases. Notable reductions occurred in 2009 as a result of the global financial and economic crisis, and again in 2020 due to pandemic-related effects such as reduced economic activity and passenger transport. As a result, the politically set target to reduce emissions by 2020 to below 60% of the 1990 level was achieved.

According to preliminary calculations by the UBA, greenhouse gas emissions fell by 48.2% between 1990 and 2024. In 2024, approximately 649 million tonnes of greenhouse gases were emitted, representing a decline of about 23 million tonnes or 3.4% compared to the previous year. If the trend of recent years continues, the target to reduce greenhouse gas emissions to 35% of the 1990 level by 2030 is likely to be narrowly missed.

In 2023, 88.4% of total greenhouse gas emissions were attributable to carbon dioxide (CO_2), 6.7% to methane (CH_4), 3.6% to nitrous oxide (N_2O), and 1.4% to fluorinated greenhouse gases. CO_2 emissions predominantly result from electricity and heat generation, while methane and nitrous oxide emissions primarily originate from agriculture. In 2024, the largest share of greenhouse gas emissions was attributed to the energy sector (28.5%). Industry accounted for 23.6%, transport for 22.0%, and the buildings sector for 15.5%. The remaining 10.4% was mainly attributed to agriculture, waste management, and other emitters.

Over the long-term comparison between 2023 and 1990, the reduction in greenhouse gas emissions in Germany stands at 46%, significantly higher than the preliminary average reduction across the European Union (EU-27), which is around 36%. Even greater reductions have been recorded in some Central and Eastern European countries – especially in the Baltic States: Estonia (–73%), Latvia and Lithuania (each –62%). With the exception of Cyprus (+52%), all Member States have managed to reduce their emissions. Compared to the previous year, when Ireland (+13%) and Spain (+6%) had still reported increases, a decline was also observed here – by 6% in Spain and 1% in Ireland.

Type of target
Target with specific target value

Assessment
For indicator 13.1.a, various targets are defined for different years. For the assessment, the politically defined target closest in time is relevant. Greenhouse gas emissions should be reduced to a maximum of 35% of the 1990 level by 2030.

If the trend observed over the past six years continues, the politically defined 2030 target will be narrowly missed. Indicator 13.1.a is therefore assessed as slightly cloudy for 2024.