

Implementation in Germany

As a party to the Geneva Convention on Air Pollution and as an EU Member State, Germany has committed itself to significantly reducing its total annual emissions of the pollutants NO_x, SO₂, NMVOC, NH₃ and PM_{2,5} in the coming years. The reduction targets for 2020 set out in the Gothenburg Protocol and the NEC Directive and the reduction commitments to be met from 2030 onwards under the new NEC Directive are presented in Table 1. In order to achieve the reduction targets, a successful energy system transformation, a reduction in ammonia emissions from agriculture and measures in the transport sector are particularly necessary. In May 2019, the German Federal government presented a national air pollution control programme that identifies measures which can be used to achieve the reduction targets:

<https://www.umweltbundesamt.de/nlrp2019>.

The national annual emissions for all relevant air pollutants are recorded at the Federal Environment Agency in the "Central System Emissions" database. Emissions data, forecasts and measures are regularly reported to the EU Commission and the UNECE.

Tab. 1

Emission reduction commitments under the Gothenburg Protocol and the new NEC Directive

Reduction targets compared to base year 2005

	from 2020	from 2030
SO ₂	21%	58%
NO _x	39%	65%
NMVOC	13%	28%
NH ₃	5%	29%
PM _{2,5}	26%	43%

Source: NEC Directive (EU) 2016/2284

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The Gothenburg Protocol
A landmark for clean air
and climate action



Cross-border cooperation

According to WHO data, air pollution kills seven million people worldwide every year. It is by far the world's largest single environmental health risk and a leading cause of death by cancer. Air pollution is, in addition, closely linked to numerous environmental problems such as acidification and eutrophication of ecosystems.

Since air pollution does not stop at national borders, effective mitigation of air pollution can only be achieved through good international cooperation. For this reason, the Parties to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) adopted the Gothenburg Protocol in 1999 with the aim to limit their total annual emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC) and ammonia (NH_3) by 2010.

The Geneva Convention on Air Pollution

The Convention on Long-Range Transboundary Air Pollution (CLRTAP) of the United Nations Economic Commission for Europe (UNECE), also known as the Geneva Convention on Air Pollution, was adopted in Geneva on 13 November 1979. Fifty-one parties have signed the Convention, including all EU Member States, the EU Commission, many Eastern European and Central Asian states, as well as the USA and Canada. To date, the Convention has been stipulated in concrete terms by eight **protocols** containing legally binding mitigation targets.

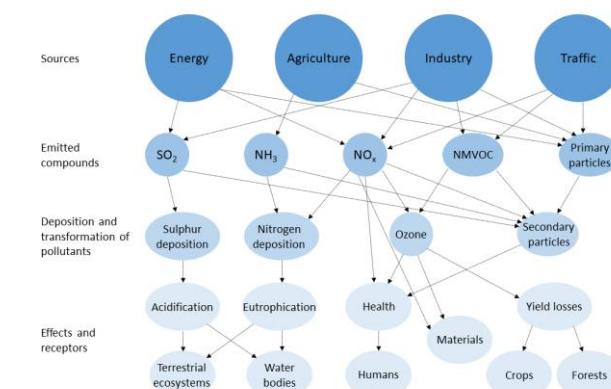
The new Gothenburg Protocol

In May 2012, the Parties to CLRTAP adopted a comprehensive amendment to the Gothenburg Protocol. This new protocol entered into force on 7 October 2019 after ratification by 18 countries in Europe and North America.

The amended Protocol sets emission reduction targets for 2020 and beyond for the five major air pollutants: sulphur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3), volatile organic compounds (VOCs) and fine Particulate Matter ($\text{PM}_{2.5}$). The reduction commitments are expressed as percentage reductions compared to 2005 emissions. The amended Protocol marks an important step by specifically including black carbon (BC) as a component of $\text{PM}_{2.5}$. BC is 680 times more heat trapping than CO_2 . Due to its cross-contaminant approach, the Gothenburg Protocol is also called the Multi-pollutant and Multi-effect Protocol. The following figure shows the most important sources and effects of air pollutants.

Fig. 1

Sources and effects of relevant air pollutants



Relevant air pollutants

SO_2 – Sulphur dioxide

NO_x – Nitrogen oxides, collective name for gaseous oxides of nitrogen (including nitrogen monoxide (NO) and nitrogen dioxide (NO_2))

NMVOC – Non-methane volatile organic compounds

NH_3 – Ammonia

$\text{PM}_{2.5}$ – Fine particulate matter with an aerodynamic diameter of less than 2.5 micrometres. A distinction is made between primary particles emitted directly and secondary particles formed in the atmosphere from precursors (e.g. NO_x , SO_2 , NH_3).

BC – Black Carbon, soot particles

O_3 – Ozone. O_3 is not released directly but is formed by complex photochemical processes from precursors (e.g. NO_x and NMVOC) during intense solar radiation.

Cooperation in Europe

International agreements such as the Gothenburg Protocol also set the framework for regulations at European level, e.g. the NEC Directive (NEC = National Emission Ceilings). Adopted in 2001, the NEC Directive sets emission ceilings for the air pollutants SO_2 , NO_x , NMVOC and NH_3 , and has stipulated compliance since 2010.

A new NEC Directive entered into force on 31 December 2016. The new directive transposes the reduction commitments for 2020 agreed by the EU and its Member States under the amended Gothenburg Protocol of 2012. The more ambitious reduction commitments agreed for 2030 are designed to reduce the health impacts of air pollution by half compared with 2005.