

Assessment of emissions avoided using BASF climate protection products

BASF regularly assesses the emissions avoided through the use of BASF climate protection products along their entire life cycles as part of its corporate carbon footprint. Our calculations of avoided greenhouse gas (GHG) emissions are based on the chemical industry standard of the International Council of Chemical Associations (ICCA) and the World Business Council for Sustainable Development (WBCSD), published in 2013 and updated in December 2017. For the year 2018 we calculated that the use of selected BASF products for climate protection, sold in the reporting year, enables customers to reduce their GHG emissions from 1,000 to 360 million metric tons of CO₂e, thus preventing 640 million metric tons of CO₂e emissions.

BASF's products for climate protection encompass product groups that completely fulfil basic sustainability requirements and have a substantial contribution in the areas of energy efficiency and climate protection along their value chains from production through use to disposal. Relevant product groups were selected from among the about 60,000 BASF solutions that have been systematically assessed regarding their sustainability performance. From the selected subset, 22 different product groups for the construction & residential, energy, transportation, industry and agriculture sectors were considered for the calculation.

The calculation of avoided GHG emissions is based on individual life cycle analyses (LCAs) that we conduct using BASF's proven Eco-Efficiency Analysis or Life Cycle Assessment according to ISO 14040/14044. Hence, avoided emissions are the difference

between the life cycle greenhouse gas emissions from our solution and the solution it is compared to for achieving the same user benefit. Life cycle avoided emissions almost always arise from the efforts of multiple partners along the value chain. Attributing these avoided emissions to individual partners or products is challenging due to a variety of reasons. Nevertheless, we have assessed the individual contribution of our climate protection products to their respective value chain using an economic allocation approach and concluded that on average 5% of the emissions avoided in 2018 are attributable to BASF.

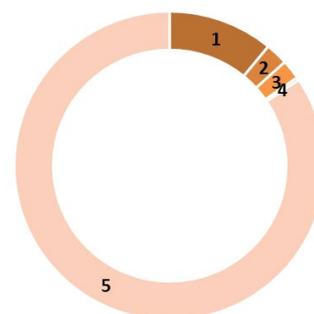
BASF products are involved in many climate protection technologies. Therewith we enable energy efficiency and climate protection in a variety of sectors, such as in the construction industry, in the automotive industry, and in industrial processes. Examples from our portfolio of climate protection products are given below:

- Building & Living: Chemical insulation materials based on expanded polystyrene such as Neopor® and Styropor® have excellent thermal insulation properties. They are among others used as part of an External Thermal Insulation Composite System to improve the thermal insulation of outer walls, thereby reducing energy consumption and GHG emissions.
- Industry: BASF catalysts decompose nitrous oxide from production of nitric acid and adipic acid. The catalyst transforms the highly potent greenhouse gas nitrous oxide almost completely into the components of air, nitrogen and oxygen.
- Energy generation: Wind and solar power help to mitigate greenhouse gas emissions. BASF products contribute to making technologies for generating energy from wind and sun more efficient, such as epoxy systems and other materials to produce rotor blades, grouting materials for the construction of the foundation of wind turbines or sodium nitrate as thermal energy storage media for all concentrated solar power technologies.
- Agriculture: BASF's nitrification inhibitor ensures that the ammonium contained in fertilizers is metabolized more slowly by bacteria in the soil, thus resulting in a reduction in nitrous oxide. The fertilizer can supply crops with nutrients more efficiently, and the crop requires fertilization much less frequently. This decreases greenhouse gas emissions.

Emission Avoidance through the Use of BASF Products by Sector in which the Products are Used

(in million t CO₂ equivalents):

1	Housing & Construction	70
2	Industry	15
3	Transportation	13
4	Agriculture	2
5	Renewable Energies	540



Examples of climate protection products preventing GHG emissions through their use

	Insulation materials	N ₂ O decomposition catalysts	Solutions for wind energy
Customer solution to reduce emissions			
Total emissions prevented through the use of solution*	Installation of insulation material 64.0 million tons CO ₂ e	Catalyst filling 13.7 million tons CO ₂ e	Wind turbines 241.7 million tons CO ₂ e
BASF's estimated share of the cost of the solution	10 – 50%	> 90%	0.1 – 0.3%
Emission reductions assigned to BASF based on share of costs	9.6 million tons CO ₂ e	13.3 million tons CO ₂ e	0.32 million tons CO ₂ e

* Calculated based on the volume of products sold in 2018