

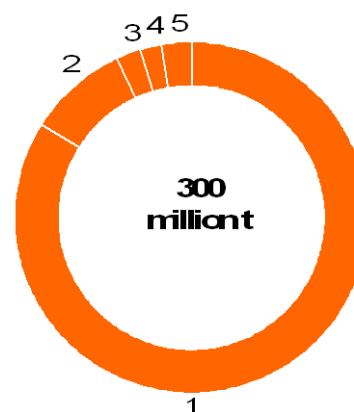
BASF's Corporate Carbon Footprint 2013: Assessment of Emissions Avoided Through the Use of BASF Climate Protection Products



The emissions avoided through the use of BASF climate protection products sold in 2013 were calculated. Relevant product groups were selected from among the BASF products that, in the course of their use and application by BASF customers, generate along their entire lifecycle less greenhouse gas emissions than relevant alternatives and where the eco-efficiency is at least as good as that of the alternatives. Nearly 40 different product groups for the housing & construction, transportation, industry and agriculture sectors were taken into account in the Corporate Carbon Footprint. These account for approximately 9% of total BASF sales in 2013. The calculations show that the use of our climate protection products sold in 2013 avoids a total of 300 million tons of greenhouse gas emissions. These products therefore help our customers reduce their CO₂ footprint from about 1325 million tons to approximately 1025 million tons CO₂e.

Emission Avoidance through the Use of BASF Products by Sector in which the Products are Used (in million t CO₂ equivalents):

1	Housing & Construction	246
2	Industry	31
3	Transportation	7
4	Agriculture	7
5	Further Products	9



Detailed Results and Methodology

Products for the construction and residential sector make the biggest contribution to the avoidance of greenhouse gas emissions with 246 million tons. These mainly consist of cement additives and insulating materials for the renovation of existing buildings. In the other sectors, products such as plastics for lightweight vehicle construction, nitrification inhibitors for agriculture and materials for the generation of solar and wind energy contribute to emission avoidance. We strive to identify additional climate protection products each time the Corporate Carbon Footprint is prepared. BASF draws on its many years of experience with environmental performance assessments in the calculation of emission reductions. The emission avoidance potential of

climate protection products was determined based on the sales volume in 2013 and the respective product-specific avoidance potential for a defined application. To calculate the avoidance potential (kg of CO₂e reduction / kg of product) of a product group, the CO₂ emissions of the BASF product based on an eco-efficiency analysis over the entire lifecycle were compared to a conventional alternative or also to the same application without the use of the BASF product. This means that emission avoidance is accumulated over several years, depending on the lifespan of the product. Examples include insulation materials for houses with a lifespan of 50 years or plastics for lightweight automobile construction with a lifespan of 200,000 km.

We calculate the avoided emissions for each product group separately in comparison to a relevant alternative in the market. When it comes to using insulating materials for the renovation of existing buildings for example, this is the non-use of insulating materials. Using insulating materials in new construction is required by law. In this case we therefore compare our products to the use of other insulating materials that also meet the legal requirements. If there is more than one relevant alternative available in the market, all relevant alternatives were considered as the reference for the analysis. Emission avoidance factors from external studies were used for a few products where eco-efficiency analyses have not yet been conducted. For some products such as the nitrous oxide decomposition catalyst, the emissions avoided in the facilities of our customers in the year 2013 are known and were used accordingly.

100 percent of the emission avoidance potential was credited to the BASF product where the BASF product is largely responsible for avoiding the respective emissions. That is the case when the product and / or technology in question would not exist without the BASF product. This applies to most of the products under consideration. In cases where the BASF product merely contributes towards improving the overall solution, the BASF product was only credited with a corresponding proportion of the emissions that were avoided (value-based allocation). Examples include chemicals for solar cell production as well as coatings and resins for wind turbines.

The methodical approach to determining emission avoidance was confirmed in an expert opinion issued by Öko-Institut e.V. Freiburg in 2009 in the course of preparing the 2008 Corporate Carbon Footprint. The assumptions underlying the determination of emission avoidance potential can change over the years based on technological progress and changing social behavior. We therefore verify these regularly.

For comparison purposes, we have calculated the greenhouse gas emissions that would have been released without the use of our climate protection products and technologies sold in 2013: instead of about 1025 million tons of CO₂e approximately 1325 million tons would have been emitted. We based this calculation on the existing eco-efficiency analyses and determined the greenhouse gas emissions of the comparative system throughout the entire lifecycle.

Examples for the Calculation of Emission Avoidance Through the Use of BASF Climate Protection Products

Housing and Construction Sector

Polystyrene and Polyurethane Insulation for Buildings

The calculation of the avoided emissions from polystyrene and polyurethane insulating materials in existing buildings is based on a comparison of the heating requirements of an insulated building (renovated existing building) and an uninsulated building over the entire 50-year lifecycle. Greenhouse gas emissions are avoided with the use of insulation since gas consumption is reduced. Sales of insulating materials for the renovation of existing buildings were taken into account to calculate the emission avoidance potential. 100 percent of the emission avoidance potential was allocated to the insulating materials.

The system boundaries for the insulation with polystyrene were defined as follows: The lifespan of the building including insulation is 50 years and 1 m² of insulating material with a thickness of 10 cm is used per square meter of living space. The thermal conductivity of the insulation material amounts to 0.04 W/m*K and the U-value of the insulated wall is 0.31 W/m²*K. The type of heating is 100 percent natural gas. Insulation reduces the energy that is consumed to heat the building from 300 KWh per year and m² to 186 KWh per year and m².

Transportation Sector

Motor Vehicle Fuel Additives

The emission avoidance potential was calculated based on the fuel consumption of a mid-size vehicle with and without the use of fuel additives. 100 percent of the emissions avoided thanks to the reduction in fuel consumption were allocated to the fuel additive.

The system boundaries were defined as follows: Average fuel consumption of a mid-size vehicle: 8.7 liters per 100 km for gasoline and 8 liters per 100 km for diesel, respectively, over a lifespan of 200,000 km; fuel consumption is reduced by up to 1 percent with the use of the fuel additive.

Agriculture Sector

Nitrification Inhibitor

The calculation of the emission avoidance potential of the BASF nitrification inhibitor is based on the comparison of ammonium-based nitrogen fertilizer with and without nitrification inhibitor. BASF nitrification inhibitor affects the formation of nitrates in the soil so that the nitrate concentration precisely meets the needs of the plant. This means the fertilizer is used more efficiently and less of the highly potent greenhouse gas N₂O is produced than without the use of the inhibitor. 100 percent of the emission avoidance potential was allocated to the nitrification inhibitor.

The system boundaries were defined as follows: With consistent yields and typical crop rotation over three years, 1% of nitrogen in fertilizer is emitted as nitrous oxide with normal fertilizer application without nitrification inhibitor, and 0.5% with nitrification inhibitor.