



**Task Force on Climate-Related  
Financial Disclosures (TCFD) Report**

2022

# 1. Governance

## Management's role

The Chairman of the Board of Management holds direct responsibility for climate protection in his role as Chief Sustainability Officer. In keeping with their level of importance, climate-change-related topics and Bayer's climate strategy were discussed at a total of three meetings of the Board of Management, two meetings of the Supervisory Board and two meetings of the ESG Committee of the Supervisory Board in 2022.

The attainment of our Group target of reducing greenhouse gases by 2030 is factored into the long-term compensation of the Board of Management and Bayer's LTI-entitled managerial employees. The compensation-relevant target is based on Bayer's necessary contribution to an SBTi-validated 1.5 °C scenario. Climate protection is also an integral element of annual variable compensation.

The Chairman of the Board of Management is supported in this by the Public Affairs, Science, Sustainability & HSE Enabling Function and the sustainability departments within the divisions. The divisions handle the operational implementation of the climate protection measures at their sites with the support of the enabling functions. We have formed Group-wide working groups for the strategic and operational implementation of climate-change-related measures and a special working group to analyze various climate scenarios and their impacts on our business.

In addition, the Sustainability Council that was established in 2020 advises the Board of Management in all matters relating to sustainable development – including climate protection. In 2022, climate change and the related impacts and opportunities for Bayer were discussed at two meetings of the Sustainability Council.

The Board of Management of Bayer AG holds overall responsibility for an effective risk management system. The Audit Committee of the Supervisory Board reviews the appropriateness and effectiveness of the risk management system at least once a year, and also reports correspondingly to the full Supervisory Board.

## Board's oversight

Bayer AG is subject to German stock corporation law and therefore has a dual governance system consisting of the Board of Management and the Supervisory Board. The Board of Management manages the company based on a strategy that is geared toward its long-term success. The Supervisory Board oversees and monitors the Board of Management. Since 2022, the Supervisory Board has had its own ESG Committee, comprising the Chairman of the Supervisory Board and seven further members of the Supervisory Board. This focuses on Bayer's sustainable governance and business activities in the areas of environmental protection, social affairs and corporate governance (ESG) within the scope of responsibility of the Supervisory Board.

The Board of Management of Bayer AG holds overall responsibility for an effective risk management system. The Audit Committee of the Supervisory Board reviews the appropriateness and effectiveness of the risk management system at least once a year, and also reports correspondingly to the full Supervisory Board.

In our [Annual Report](#), we report in detail on the main elements of the Bayer Group's corporate governance structures and conformity with the recommendations of the German Corporate Governance Code, relevant corporate governance practices, the composition and procedures of the Board of Management, the Supervisory Board and their committees, and also on compensation in the Compensation Report along with the objectives to be defined and the underlying concepts.

### For more information:

- // [Bayer 2022 Sustainability Report](#) – Chapter 2.1 Corporate Governance Practices and Principles
- // [Bayer 2022 Sustainability Report](#) – Chapter 7. Climate Protection
- // [Bayer 2022 Sustainability Report](#) – Chapter 7.3 Climate Protection – Risk and Opportunity Analysis
- // [Bayer 2022 Annual Report](#) – Chapter 3.2 Opportunity and Risk Report

## 2. Strategy

### 2.1 Identification and impacts

Climate change affects us all and is one of the greatest challenges that humankind will face in the future. Bayer considers climate protection and the related reduction of greenhouse gas emissions to be a top priority. We support the Paris Agreement and the objective of limiting global warming to 1.5 °C relative to the preindustrial level. [The Science Based Targets initiative](#) (SBTi) has validated our target and confirms our contribution to fulfilling the Paris Agreement. We anticipate that our business areas of healthcare and agriculture will on the one hand be impacted by climate change, but on the other will also be part of the solution.

In 2022, we looked at the risks and opportunities stemming from the effects of climate change from various perspectives to better evaluate them in relation to our company and integrate them into our strategy and measures. Climate-related risks are already accounted for in our Group-wide Enterprise Risk Management (ERM) system.

### 2.2 Climate scenarios

We analyze the possible effects of climate change across two different scenarios. We use these scenarios to understand the impact of this factor on our business and to identify measures for mitigating risks and leveraging opportunities. With a cross-functional, cross-divisional team, we have identified relevant opportunities and risks for our business in both scenarios.

Building on [Assessment Report 6](#) of the Intergovernmental Panel on Climate Change (IPCC) and supplemented with further sources relevant to our business areas, we have drafted our scenario description. The basis comprises an optimistic scenario concerning climate change with warming of below 2 °C – the “Green Road” SSP1-2.6 (temperature increase of 1.8 °C by 2100 compared with the preindustrial age) – and one that is aligned to current global behavior – the “Rocky Road” SSP3-7.0 (temperature increase of 3.6 °C).



#### Green Road (SSP1-2.6)

- // The Green Road scenario assumes a rise in average global temperature compared with the preindustrial age of 1.7 °C by between 2041 and 2060. Between 2081 and 2100, the temperature is likely to have risen by 1.8 °C compared with the preindustrial age.
- // This scenario is marked by the rapid implementation of ambitious and globally coordinated climate-related laws and rules that in the short term can also include transformational requirements and new regulations for companies. The rapid reduction in greenhouse gas emissions leads to less severe weather- and climate-related effects.



#### Rocky Road (SSP3-7.0)

- // The Rocky Road scenario assumes the rise in average global temperature compared with the preindustrial age to be around 2.1 °C by between 2041 and 2060, and probably 3.6 °C by between 2081 and 2100.
- // In this scenario, we expect less ambitious laws and provisions that will vary widely from one region to another, leading to a slower pace of emissions reduction and thus more intensive weather- and climate-related changes in all regions of the world. The varying levels of ambition also lead to additional trade barriers that can be manifested in measures such as a Carbon Border Adjustment Mechanism (CBAM).

In our analysis of the effects of climate change, we go beyond the customary Enterprise Risk Management time horizons and instead apply the following time horizons:

- // Short term (2021–2025)
- // Medium term (2026–2035)
- // Long term (2036–2050)

## 2.3 Climate impact drivers

Based on the overarching description, we have identified nine climate impact drivers of materiality for Bayer so as to analyze the effects regulatory and physical changes will have on our business in more detail. The goal of the analysis is to identify the relevance and change potential in relation to Bayer and our fields of business and to derive suitable measures.

Separately, we assess the opportunities and risks associated with the nine climate impact drivers shown in the graphic – in each case based on the various time horizons and on the Green Road and Rocky Road scenarios.

Climate Impact Drivers		Short term (2021–2025)		Medium term (2026–2035)		Long term (2036–2050)	
		Risk	Opportunity	Risk	Opportunity	Risk	Opportunity
<b>Transitional impact drivers</b>							
Laws, regulations, policies		●	●	●	●	●	●
		●	●	●	●	●	●
Carbon taxation/pricing, carbon border adjustment & offsetting		●	●	●	●	●	●
		●	●	●	●	●	●
Commodity prices		●	●	●	●	●	●
		●	●	●	●	●	●
End customer/customer/market		●	●	●	●	●	●
		●	●	●	●	●	●
Food security		●	●	●	●	●	●
		●	●	●	●	●	●
<b>Acute physical impact drivers</b>							
Extreme weather events		●	●	●	●	●	●
		●	●	●	●	●	●
<b>Chronic physical impact drivers</b>							
Permanent water cycle		●	●	●	●	●	●
		●	●	●	●	●	●
Diseases		●	●	●	●	●	●
		●	●	●	●	●	●
Temperature		●	●	●	●	●	●
		●	●	●	●	●	●

The Green Road (SSP1-2.6) = The Rocky Road (SSP3-7.0) = Relevance = low high

Below we provide insight into the assessments of the individual climate impact drivers.

### Transitional impact drivers

Based on the Paris Agreement, the most important countries and regions in which Bayer operates have committed to limiting global warming by reducing their greenhouse gas emissions.

// One example is the European Union’s Green Deal, the goal of which is to accelerate the transition to an emissions-free future and achieve climate neutrality by 2050. Consequently, the EU is expected to further increase costs for the emission of greenhouse gases (e.g. through CO<sub>2</sub> regulations such as the EU emissions trading system (EU-ETS) or a carbon tax), adjust financing incentives (e.g. through the EU taxonomy) and drive forward technological changes (e.g. through the promotion of renewable energies and hydrogen technologies).

// China has committed to attaining net zero emissions by 2060 and is therefore expected to introduce further regulations in this connection.

Through our strategy for achieving climate neutrality and reducing greenhouse gas emissions on the pathway to a 1.5 °C scenario, we are reducing the risk of additional costs caused by the expected regulations.

We continuously analyze the further effects of regulatory changes on our business. National and international CO<sub>2</sub> reduction targets could lead to the abandonment of fossil fuels and impact the demand for fuels from biomass (biofuels), for example. Depending on the regulators' decision, this could lead to either increased or reduced demand for biofuels. This decision could impact our sales markets, as some of our customers grow corn for the production of biofuels.

As one of the world's biggest CO<sub>2</sub> emitters, the agriculture industry can also play a key part in protecting the climate and thus mitigating climate risks – for example through the capture of CO<sub>2</sub> in farmland. For more information on our target of reducing greenhouse gas emissions in agriculture by 30%, please see the Focus on: Agriculture chapter in our 2022 Sustainability Report.

### Physical impact drivers

Weather and climate effects are of particular significance for the Crop Science Division and are accounted for in both strategic planning and the seasonal business risk. These effects are intensifying as a result of climate change, and both short-term (extreme) weather events and long-term climate changes will increase further.

#### Acute physical impact drivers

All climate models anticipate an increase in extreme weather conditions (such as drought, heavy rains and storms) that present an elevated risk of crop losses and therefore also pose risks for the agricultural value chain as a whole. Despite all precautions, operations at our sites or those of our customers may be disrupted and crop failures may occur as a result of extreme weather events and natural disasters. In the IPCC forecasts, the intensity of such events varies widely from one region to the next. In the IPCC's regional fact sheets for the Central North America (CNA) region, for example, extreme precipitation is predicted to increase; the South American Monsoon (SAM) region is expected to experience both a delay in the monsoon season and intensified droughts.

In addition to risks, however, climate change can also create opportunities for our business. Bayer's product range and innovative capability – particularly in the agricultural value chain – will create a foundation for leveraging new options and sales opportunities in the future against the background of climate change. As a seed producer, we already offer plants with increased resistance to extreme weather conditions, including short-stature corn that is less susceptible to storms (for more information, please see the Focus on: Agriculture chapter in our 2022 Sustainability Report).

We also enable farmers to react better and more quickly to extreme weather conditions with our FieldView™ digital farming platform. For more information, please see Chapter 3.6 Crop Science in our 2022 Sustainability Report.

#### Chronic physical impact drivers

The long-term natural and physical effects of climate change will have a particular impact on the permanent water cycle (for example through a transition to a wetter or drier climate or a delay in the monsoon season), the spread of diseases and insect pests, and further coupling effects of temperature changes. These effects will be particularly relevant for our agricultural business.

We develop strategies to help farmers increase their resilience against the effects of climate change. At the same time, we want to help farmers reduce their own greenhouse gas emissions and cultivate healthy crops. As there are no uniform solutions in agriculture, farmers need numerous options from which they can select the most suitable for their fields and the prevailing local conditions.

In addition, health risks such as cardiovascular disease can also intensify due to hotter summer months or more frequent heatwaves. This could create increased demand for products for cardiovascular disease or nutritional supplements.

## 2.4 Next steps

As data models and insights into climate change are constantly evolving, we will continue to expand and refine our scenario description and analysis in 2023 and beyond. At the same time, we are enhancing our analytical capabilities and expanding our climate models e.g. in order to better understand how various climate zones are changing. By doing this, we want to be in a position to describe future challenges and opportunities as accurately as possible to derive short-, medium- and long-term mitigation measures. Findings from these analyses will play a bigger role in our strategic, portfolio and operational processes.

We also participate in the Value Chain Risk to Resilience working group of the international [Business for Social Responsibility](#) network. In addition, we have developed agriculture- and forestry-specific scenario descriptions together with a working group of the WBCSD. Through dialogue in various forums and with different stakeholders, we improve our own analyses and aim to help improve the identification of regulatory and physical climate risks and climate resilience measures throughout the entire supply chain.

## 2.5 Targets – roadmap to net zero

We support the Paris Agreement and the objective of limiting global warming to 1.5 °C relative to the preindustrial level. [The Science Based Targets initiative](#) (SBTi) has validated our target and confirms our contribution to fulfilling the Paris Agreement.

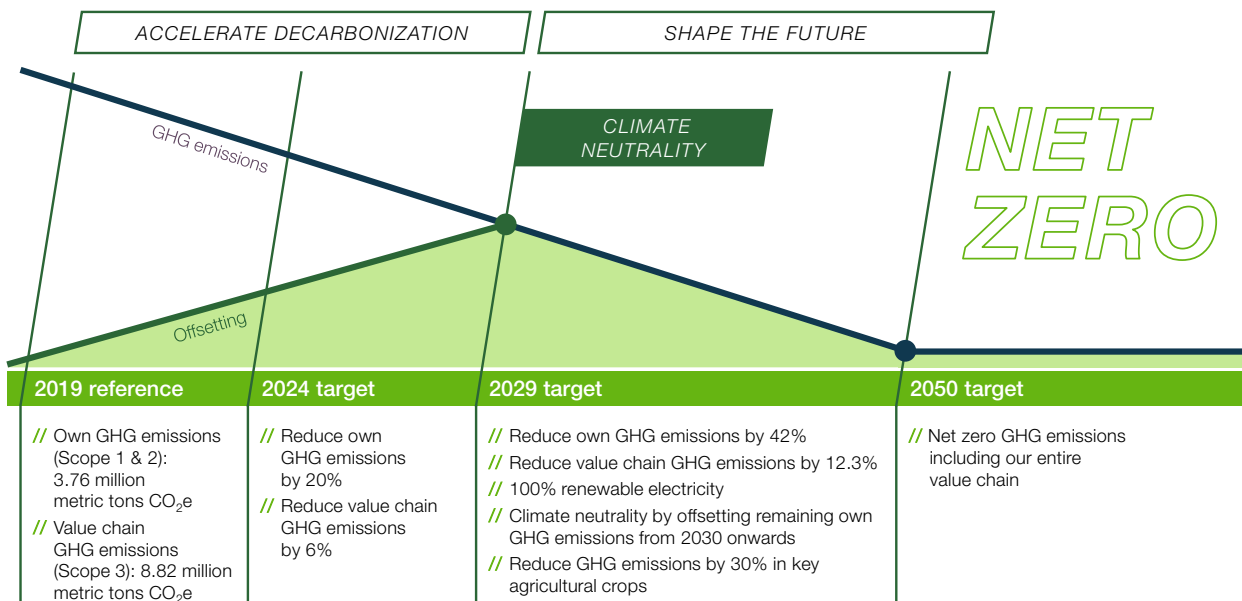
The attainment of our Group target of reducing greenhouse gases by 2030 is factored into the long-term compensation of the Board of Management and Bayer’s LTI-entitled managerial employees. The compensation-relevant target is based on Bayer’s necessary contribution to an SBTi-validated 1.5 °C scenario. Climate protection is also an integral element of annual variable compensation.

Through our strategy for achieving climate neutrality and reducing greenhouse gas emissions on the pathway to a 1.5 °C scenario, we are reducing the risk of additional costs caused by the expected regulations.

### Net zero target

Bayer has undertaken to achieve a net zero target for greenhouse gas emissions throughout the entire value chain by 2050 or earlier. As an external expression of commitment to net zero greenhouse gas emissions, the company also signed the [Business Ambition for 1.5 °C](#), a campaign of the SBTi in partnership with the UN Global Compact and the [We Mean Business Coalition](#).

### Roadmap to Net Zero



GHG = greenhouse gas

### Medium-term climate targets by 2030

Bayer aims to achieve climate neutrality at all its own sites by 2030. To attain that target, we intend to reduce our own emissions – the so-called Scope 1 and Scope 2 emissions – by 42% relative to the reference year 2019 by the end of 2029. This target on the pathway to a 1.5 °C scenario was reviewed and acknowledged by the SBTi.

We have set a reduction target for Scope 3 emissions of 12.3% by 2029 (relative to 2019) for our value chain. This target was also reviewed and acknowledged by the SBTi.

### Interim targets by 2024

By 2024, we aim to reduce our own (Scope 1 and Scope 2) emissions by 20% and our emissions in the value chain (Scope 3) by 6% (relative to 2019) in line with the reduction pathway of our Science Based Target (SBT).

## 2.6 Climate policy engagement and management

Externally, we advocate for a climate position in line with our ambitious targets and demand that our partners also undertake decarbonization measures in accordance with the Paris Agreement. We have therefore published a detailed list of our [climate policy lobbying](#) activities.

In line with our goals, we critically scrutinize our memberships in relevant industry associations and their positions as regards climate policy measures. The analysis forms the basis for Bayer's further efforts to advocate for scientifically founded policies to combat climate change through its member associations. In developing this approach, we have worked together with [Climate Action 100+](#), an investor initiative that cooperates with the world's biggest industrial companies on the issue of climate change.

To ensure maximum transparency in this process, Bayer has published the results in the [Industry Association Climate Review](#) since 2021.

This report compares the climate policy positions of our industry associations with our own climate goals. As our industry associations represent us in the public debate, we disclose where we agree with these positions and where they diverge from ours. It is of paramount importance to us that we maintain a dialogue with our associations to achieve an amicable solution. Where differences exist, dialogue enables us to take measures to close these gaps. We disclose both our achievements and the challenges that still lie ahead of us in our current [Industry Association Climate Review – Engagement Update 2022](#).

### For more information:

- // [Bayer 2022 Sustainability Report](#) – Chapter 7. Climate Protection
- // [Bayer 2022 Sustainability Report](#) – Chapter 7.2 Climate Protection – Climate Strategy
- // [Bayer 2022 Sustainability Report](#) – Chapter 7.3 Climate Protection – Risk and Opportunity Analysis
- // [Bayer 2022 Sustainability Report](#) – Chapter Focus on: Agriculture – Enabling a Climate-Smart Agriculture
- // [Bayer 2022 Sustainability Report](#) – Chapter 3.6 Crop Science – Use of digital technologies
- // Bayer 2022 CDP Climate Report – [www.bayer.com/cdp-climate](http://www.bayer.com/cdp-climate)
- // [Bayer Industry Association Climate Review 2021](#)
- // [Bayer Industry Association Climate Review Update 2022](#)

## 3. Risk Management

As an international life science enterprise, we are exposed to a wide range of internal and external developments and events that could significantly impact the achievement of our financial and nonfinancial targets. Opportunity and risk management is therefore an integral part of corporate management at Bayer. We regard opportunities as positive deviations, and risks as negative deviations, from projected or target values for potential future developments. In addition, our risk definition is supplemented by potential negative impacts that our business operations could have, for example, on environmental or social matters.

We have implemented a holistic and integrated risk management system designed to ensure the continued existence and future target attainment of the Group through the early identification, assessment and treatment of risks. Our risk management system is aligned to internationally recognized standards and principles such as the ISO 31000 standard of the International Organization for Standardization, and is defined and implemented with the help of binding Group regulations.

Responsibility for the identification, assessment, treatment and reporting of risks lies with the operational business units in the divisions and enabling functions. The risk managers are responsible for identifying risks.

In 2022, we looked at the risks and opportunities stemming from the effects of climate change from various perspectives to better evaluate them in relation to our company and integrate them into our strategy and measures. Climate-related risks are already accounted for in our Group-wide Enterprise Risk Management (ERM) system.

### **For more information:**

// [Bayer 2022 Annual Report](#) – Chapter 3.2 Opportunity and Risk Report

// [Bayer 2022 Sustainability Report](#) – Chapter 2.8 Risk Management

// [Bayer 2022 Sustainability Report](#) – Chapter 7.3 Climate Protection – Risk and Opportunity Analysis



## 4. Metrics and Targets

### 4.1 Climate reporting

We have committed to transparently communicating our climate targets and progress, as well as the impact that climate change has on Bayer.

Through our longstanding and continuous participation in [CDP](#), we disclose our climate-related activities and progress with a high degree of detail.

Bayer supports the recommendations of the [Task Force on Climate-Related Financial Disclosures](#) (TCFD) with respect to reporting on this topic.

### 4.2 Measures to achieve our climate targets

We have developed a net zero roadmap to achieve our ambitious climate targets. This roadmap comprises various measures in the areas of energy and efficiency, governance and offsetting. To implement our long-term climate strategy, we focus on reducing the greenhouse gas emissions associated with our operations and on strengthening the resilience of our business areas.

#### Energies & efficiencies

- // Electricity from renewable energies: by 2029, we intend 100% of the electricity we purchase to be derived from renewable sources. We have defined specific criteria for the procurement of renewable electricity and this information is published on our [website](#). These criteria include the geographical proximity between power generation locations and Bayer's sites, the use of new production sources and a focus on wind and solar energy. The criteria are based on the [next-generation green power guidelines](#) of the WWF (World Wide Fund for Nature). In 2022, we pressed ahead with the conversion of our Group-wide electricity procurement, and renewable energies now account for 32.6% of our total purchased electricity volume.
- // Investment in efficiency measures and renewable energies: to achieve an absolute reduction in our remaining emissions, we intend to invest €500 million in renewable energies and in increasing the energy efficiency of our facilities and buildings by 2030. We are investing in process innovations, more efficient facilities and building technology, and in the implementation and optimization of energy management systems, particularly at our production sites. Capital expenditure projects are underway at various sites to advance the use of climate-neutral technologies such as geothermal energy or emissions-free steam production.

#### Governance

- // Capital investment and an internal CO<sub>2</sub> price: we are aligning our capital expenditures to our goal of achieving net zero greenhouse gas emissions by 2050. This is in line with the international goal of limiting global warming to 1.5 °C. To drive this transition, we have launched a pilot project and established an internal CO<sub>2</sub> price of €100 per metric ton of CO<sub>2</sub> for the calculation of our capital expenditure projects.
- // Investment decisions: we perform a voluntary ecological assessment for capital expenditure projects exceeding €10 million. Emissions reduction and efficiency measures are integral to these evaluations.

#### Climate neutrality

- // We will offset those of our emissions (Scope 1 and 2) that still remain following reduction through technological measures and cannot be avoided (such as greenhouse gas emissions generated by chemical processes or through business travel) by purchasing certificates from climate protection projects that meet recognized quality standards. By doing so, we aim to achieve climate neutrality for our own sites by 2030. These projects need to have a connection to our business. In this respect, too, we have established specific criteria for procuring certificates from climate protection projects. In this process, we focus on

nature-based climate solutions, preferably concerning forestry and agriculture projects. We will also invest in innovative projects to promote the development of voluntary emissions trading. On our [website](#), we report on our strategy and the projects we support.

- // We offset more than 450,000 metric tons of our greenhouse gas emissions in 2022 by financing reforestation and forest conservation projects, for example in Brazil, Guatemala, Indonesia, Nicaragua, Peru, Zambia and Zimbabwe.
- // LEAF Coalition: the destruction of forests is a pressing global challenge, especially considering that forest conservation is one of the most important measures for protecting biodiversity and the climate. Within the framework of its activities to protect forests, Bayer is a participant in the LEAF (Lowering Emissions by Accelerating Forest finance) Coalition. LEAF has mobilized more than US\$1.5 billion since 2021 to initiate the biggest public-private effort to protect the rainforests. We clearly advocate enforcement of the corresponding laws to protect the Amazon rainforest, which also involves driving forward the sustainable intensification of agriculture in Brazil to prevent further deforestation. Certificates from activities undertaken in connection with LEAF are expected to be part of our offsetting portfolio beginning in 2023.

### Value chain (Scope 3)

By 2029, we aim to reduce greenhouse gas emissions along the upstream and downstream value chain (Scope 3) by at least 12.3% (reference year 2019) through cooperation with suppliers and customers. This target was validated and acknowledged by the [Science Based Targets initiative](#) (SBTi). As the ability of one company on its own to reduce greenhouse gas emissions along the value chain is only limited, Bayer has joined together with other companies within various initiatives. Together, we aim to ascertain the level of greenhouse gas emissions and climate risks and develop reduction targets and strategies within the scope of programs such as the [Together for Sustainability](#) (TfS) initiative of the chemical industry.

Bayer heads up the working group on reducing greenhouse gas emissions in the supply chain. The goal is to standardize the calculation of a product-related carbon footprint (PCF) for the chemical industry. At the same time, an approach is being developed to pass on the PCF within the value chain. The plan is to share results from the TfS working group with the [Partnership for Carbon Transparency](#) (PACT) of the [World Business Council for Sustainable Development](#) (WBCSD). PACT develops climate approaches across industries. As a member of the WBCSD, we are working on suitable measures there as well.

Through the Supply Chain Initiative of [CDP](#) (formerly the Carbon Disclosure Project), we ask our strategically important suppliers and those who account for a significantly high proportion of our emissions in the value chain to provide us with more exact greenhouse gas emissions data. Using the methods of the Supply Chain Initiative, we aim to learn more about the greenhouse gas emissions of our suppliers and the share of these emissions attributable to products and services sourced by us. We also ascertain reduction targets and the use of renewable energies. The goal is to better integrate data collected by our suppliers into the calculation of our emissions for the value chain. By applying the Supply Chain Initiative methods, furthermore, we aim to identify potential for reducing greenhouse gas emissions among our suppliers and incorporate this potential into our supplier development efforts (please see also Chapter 4.2 Sustainability in the Supply Chain in our 2022 Sustainability Report).

In 2021, we – like our biggest transport and logistics partners and various industrial companies – began to implement the IT solution [EcoTransIT World](#) for automatic calculation of transport-related greenhouse gas emissions. EcoTransIT World is geared toward continuously evolving and harmonizing the methods for determining emissions in the transport sector worldwide and thus creating a globally recognized methodology. Bayer is also a member of the EcoTransIT World Initiative.

Furthermore, we take advantage of the [Pharmaceutical Supply Chain Initiative](#) (PSCI) working group to engage in dialogue within the pharmaceutical industry about measures to reduce Scope 3 emissions.

For more information on our target of reducing greenhouse gas emissions in agriculture by 30%, please see also the Focus on: Agriculture chapter in our 2022 Sustainability Report.

#### For more information:

- // [Bayer 2022 Annual Report](#) – Chapter 1.2 Strategy and Management – Sustainability
- // [Bayer 2022 Sustainability Report](#) – Chapter Sustainability Strategy
- // [Bayer 2022 Sustainability Report](#) – Chapter 3.6 Product Stewardship – Crop Science
- // [Bayer 2022 Sustainability Report](#) – Chapter 7.2 Climate Protection – Climate Strategy
- // [Bayer 2022 Sustainability Report](#) – Chapter 7.3 Climate Protection – Risk and Opportunity Analysis
- // [Bayer 2022 Sustainability Report](#) – Chapter 8.1 Environmental Protection and Safety – Management Approach
- // <https://www.bayer.com/en/agriculture/article/carbon-zero-future-for-agriculture>

## 4.3 Metrics

At Bayer, air emissions are primarily caused by the combustion of primary energy sources such as gas and oil. These are used to generate electricity, steam and auxiliary energy (such as for heating and cooling) for the manufacture of our products. Further emissions derive from chemical processes in which coal and other energy sources are required to produce chemical reactions. Emissions are also generated by our vehicle fleet and in the extraction and processing of raw materials.

In reporting greenhouse gas emissions, we take account of the recommendations of the Greenhouse Gas Protocol (GHG Protocol). Direct emissions from our own power plants, vehicles, waste incineration plants and production facilities (Scope 1) and indirect emissions from the procurement of electricity, steam and cooling energy (Scope 2) are determined at all environmentally relevant sites whose annual energy consumption exceeds 1.5 terajoules. In this connection, we have drafted Group regulations for the Group-wide recording of greenhouse gas emissions. In line with the GHG Protocol, we report indirect emissions (Scope 2) according to both the location-based and the market-based method.

### Scope 1, Scope 2 and Scope 3 Emissions

<b>Greenhouse Gas Emissions (Scope 1 and 2)</b>			
Million metric tons of CO <sub>2</sub> equivalents	2020	2021	2022
Scope 1: Direct emissions <sup>1</sup>	2.01	1.93	1.91
of which carbon dioxide (CO <sub>2</sub> )	1.96	1.90	1.85
of which ozone-depleting substances	0.011	0.011	0.011
of which partially fluorinated hydrocarbons (HFCs)	0.022	0.014	0.039
of which nitrous oxide (N <sub>2</sub> O)	0.008	0.007	0.007
of which methane (CH <sub>4</sub> )	0.003	0.003	0.003
Scope 2: Indirect emissions <sup>2</sup> according to the location-based method	1.75	1.56	1.56
Scope 2: Indirect emissions <sup>2</sup> according to the market-based method <sup>3</sup>	1.57	1.24	1.12
<b>Total greenhouse gas emissions (Scope 1 and 2) according to the market-based method<sup>3</sup></b>	<b>3.58</b>	<b>3.17</b>	<b>3.03</b>
of which offset greenhouse gas emissions <sup>4</sup>		0.3	0.45
Specific greenhouse gas emissions (kg CO <sub>2</sub> e/€ thousand external sales) according to the market-based method <sup>3, 5</sup>	86.55	71.95	59.72

<sup>1</sup> In line with the GHG Protocol, we also report the direct emissions resulting from the generation of energy for other companies that is sold as a site service. In 2022, these emissions corresponded to 0.13 million metric tons of CO<sub>2</sub> equivalents.

<sup>2</sup> Typically, CO<sub>2</sub> accounts for 97% of all energy-related greenhouse gas emissions. When determining indirect emissions, our calculations are therefore limited to these greenhouse gases and we indicate all emissions in CO<sub>2</sub> equivalents.

<sup>3</sup> For Bayer, the market-based method of the GHG Protocol most reliably reflects the values for Scope 2 emissions and the success of emissions reduction measures, so we apply emissions volumes calculated using this method when calculating the total and specific greenhouse gas emissions.

<sup>4</sup> Corresponds to a share of 14.9% of Scope 1 and 2 emissions in 2022.

<sup>5</sup> Specific Bayer Group emissions are calculated by adding together direct emissions and indirect emissions calculated using the market-based method of the GHG Protocol (Scope 2), then dividing the total volume by the external sales volume.

In 2022, Bayer participated in European emissions trading with a total of five plants. The CO<sub>2</sub> emissions of these plants amounted to more than 290,000 metric tons.

Due to the varying depth of value creation, direct and indirect greenhouse gas emissions (Scope 1 and Scope 2) are unequally distributed among our divisions. Our raw material extraction activities, including treatment and downstream processing, for the manufacture of the crop protection intermediates of Crop Science are especially energy-intensive – this division therefore accounts for the greatest share of our greenhouse gas emissions.

### Greenhouse Gas Emissions by Division (Scope 1 and 2)

Million metric tons of CO <sub>2</sub> equivalents	2020	2021	2022
Scope 1: Direct emissions <sup>1</sup>	2.01	1.93	1.91
of which Crop Science	1.65	1.61	1.58
of which Pharmaceuticals	0.19	0.18	0.18
of which Consumer Health	0.02	0.02	0.02
of which other <sup>2</sup>	0.16	0.13	0.14
Scope 2: Indirect emissions <sup>3</sup> according to the market-based method <sup>4</sup>	1.57	1.24	1.12
of which Crop Science	1.38	1.06	0.93
of which Pharmaceuticals	0.13	0.12	0.11
of which Consumer Health	0.06	0.05	0.05
of which other <sup>2</sup>	0.004	0.003	0.03

<sup>1</sup> In line with the GHG Protocol, we also report the direct emissions resulting from the generation of energy for other companies that is sold as a site service.

<sup>2</sup> These include greenhouse gas emissions from the vehicle fleet and emissions caused by the enabling functions.

<sup>3</sup> Typically, CO<sub>2</sub> accounts for 97% of all energy-related greenhouse gas emissions. When determining indirect emissions, our calculations are therefore limited to these greenhouse gases and we indicate all emissions in CO<sub>2</sub> equivalents.

<sup>4</sup> For Bayer, the market-based method of the GHG Protocol most reliably reflects the values for Scope 2 emissions and the success of emissions reduction measures, so we apply emissions volumes calculated using this method when calculating the total and specific greenhouse gas emissions.

### Value chain (Scope 3)

The GHG Protocol Corporate Value Chain (Scope 3) Accounting & Reporting Standard bindingly regulates the reporting of all indirect greenhouse gas emissions from the value chain and separates these emissions into 15 categories. Emissions from eight Scope 3 categories are of material importance to Bayer and together account for our total Scope 3 emissions. We describe the procedures applied by Bayer in the individual categories in detail in the [Report to CDP](#).

In accordance with the guidelines of the Science Based Targets initiative (SBTi), the calculation of our reduction target for Scope 3 emissions utilizes only the five major categories that made up the biggest portion of our Scope 3 emissions (88%) in the reference year 2019. We also separately report this in the following table. For more information on initiatives to reduce Scope 3 emissions, please see Chapter 7.2 Climate Strategy in our 2022 [Sustainability Report](#).

Compared to 2021, the Scope 3 emissions relevant to our reduction target rose by around 0.99 million metric tons, corresponding to an increase of 12.5%. The rise in Scope 3 emissions is primarily due to business growth, the replenishment of inventories and an increase in air freight and business travel. The category 3.1 (purchased goods and services) accounts for the most significant share of our Scope 3 emissions, at 77%.

**Greenhouse Gas Emissions in the Value Chain (Scope 3)**

Million metric tons of CO <sub>2</sub> equivalents	2020	2021	2022
Scope 3: Indirect emissions from our upstream and downstream value chain (by materiality) <sup>1</sup>	8.91	8.69	9.64
of which indirect emissions from our upstream and downstream value chain to attain the SBT <sup>2, 3</sup>	7.93	7.91	8.90
of which (3.1) purchased goods and services	6.15	6.08	6.87
of which (3.2) capital goods	0.40	0.46	0.51
of which (3.3) fuel- and energy-related activities	0.63	0.63	0.55
of which (3.4) (upstream) transportation and distribution	0.70	0.71	0.82
of which (3.6) business travel	0.06	0.03	0.15
Progress in the reduction of Scope 3 emissions compared to the reference year 2019 <sup>4, 5</sup>	-10%	-10%	+1%

2021 figures restated

<sup>1</sup> Emissions from eight Scope 3 categories are of material importance to Bayer and together represent our total inventory of Scope 3 emissions: (3.1) purchased goods and services, (3.2) capital goods, (3.3) fuel- and energy-related activities, (3.4) (upstream) transportation and distribution, (3.5) waste generated in operations, (3.6) business travel, (3.7) employee commuting and (3.12) end-of-life treatment of sold products.

<sup>2</sup> Science Based Target

<sup>3</sup> For the calculation of our reduction target for Scope 3 emissions in line with SBTi, 88% of total materially important Scope 3 emissions in the reference year 2019 are considered (target inventory). The following Scope 3 categories are covered: (3.1) purchased goods and services, (3.2) capital goods, (3.3) fuel- and energy-related activities, (3.4) (upstream) transportation and distribution and (3.6) business travel.

<sup>4</sup> 2029 target: 12.3% reduction

<sup>5</sup> All greenhouse gas emissions from air travel in 2020, 2021 and 2022 were offset.

**For more information:**

// [Bayer 2022 Sustainability Report](#) – Chapter 7.4 Climate Protection – Greenhouse Gas Emissions

// We address our climate protection activities in our latest report to CDP (formerly the Carbon Disclosure Project): [www.bayer.com/cdp-climate](http://www.bayer.com/cdp-climate)

## Masthead

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