Environment

Within this chapter:

Environmental stewardship

Part of the non-financial report

Our business operations impact the environment, generating greenhouse gas emissions, wastewater and waste. In addition, we use materials that can adversely affect the environment if not handled properly. At all our production sites, we meet a strict set of environmental regulations and continually adapt our processes to new regulatory requirements. Due to the growing scarcity of natural resources, we strive to use energy, water and materials as efficiently as possible.

Our approach to environmental stewardship

Minimizing negative environmental impacts and taking meaningful climate action requires a holistic approach. We aim to closely monitor detrimental emissions into the air, water and soil and do our best to prevent them. Our production sites are located in established industrial and commercial zones. Before acquiring a company – and thus its sites – we first conduct an ecological risk assessment, taking into consideration information from publicly accessible sources such as neighbors and non-governmental organizations (NGOs).

How we structure our environmental stewardship practices

Executive Board member Belén Garijo is responsible for environmental stewardship, which also covers climate impact mitigation, water management, waste and recycling, biodiversity, and plant and process safety. Our Group Environment, Health, Safety, Security, Quality function (EQ) steers all the related efforts Group-wide. At our individual sites, each site director is responsible for environmental stewardship as well as occupational health and safety at the operational level. At larger facilities, the site directors receive support and advice from Environment, Health and Safety (EHS) managers, with EHS coordinators performing this role at smaller facilities. These local EHS organizations report to and work in close collaboration with EQ.

In 2019, our EHS organization comprised **more than 200 EHS managers** – supported at the local level by further staff members. All new EHS managers are required to complete EHStart-up!, a three-day training course at our global headquarters in Darmstadt (Germany) covering topics such as energy efficiency and climate action, wastewater, occupational health and safety, process safety, and our Rapid Incident Report System (RIRS). All EHS managers participate in regular e-learning courses and classroom seminars on new requirements and regulations.

EQ senior leadership regularly reports on environmental stewardship performance to the Executive Board. Every six months, EQ prepares a report on environment, health and safety for the Executive Board. Focusing on the progress made, the report also covers climate action, water management, waste and recycling, as well as plant and process safety. The Executive Board uses this brief as a source of information and as documentation to support ISO 14001 and BS OHSAS 18001 certification.

Our Executive Board is responsible for approving overarching Group-wide guidelines such as our Environment, Health and Safety (EHS) Policy. Operational standards are approved by the head of EQ.

Within our business sectors, the Operations Leadership Committee (OLC) makes strategic decisions on emissions and energy, water and waste. The OLC consists of representatives from Healthcare, Life Science, Performance Materials, and our Group EQ function. Decisions made by the OLC and any resulting actions are implemented at the operational level within the respective business sector.

Whenever we design new sites or plants, we always involve EQ, which is responsible for reviewing the ecological aspects of a project and for advising our sites. Additionally, EQ performs detailed environmental impact assessments for large-scale projects.

INFO

OUR GROUP EQ FUNCTION (ENVIRONMENT, HEALTH, SAFETY, SECURITY, QUALITY)

Responsibilities of Environment, Health, Safety, Security, Quality (EQ):

- Develop and implement the Group EQ strategy
- Perform environmental and safety audits
- Conduct compliance audits
- Implement EQ management systems
- Conduct EQ improvement programs
- Provide advice and input on investments, process development and acquisitions
- Provide training

Responsibilities of local EHS units:

- Wastewater treatment
- Waste management
- Environmental analysis
- Plant safety
- Occupational health and safety
- Fire protection/risk prevention
- Approval procedures

Clearly defined incident reporting procedures

To review critical situations, near misses and environmental incidents as quickly as possible and take countermeasures, we have a set of reporting procedures in place that allow us to track the respective incident, its degree of severity and all risk mitigation efforts. We record all incidents Group-wide and report them to the Executive Board every six months.

In the event of major incidents, our digital **Rapid Incident Report System** (RIRS) promptly notifies the Executive Board as well as our Group EQ and Communications functions. Major incidents could include fatalities, accidents with multiple casualties, incidents that impact neighboring communities, or natural disasters such as earthquakes and flooding. Through the RIRS, we can quickly coordinate with all those involved and immediately inform the impacted sites of the respective incident.

Integration of Versum Materials and Intermolecular

In the course of integrating Versum Materials and Intermolecular, two companies we acquired in 2019, we are reviewing their existing management structures, policies, standards, and processes for environmental stewardship and are implementing our internal Group-wide requirements if necessary. We are furthermore reviewing their current process for collecting environmental-related indicators and are working to harmonize methodologies and timelines. Starting in 2020, we will be incorporating the environmental indicators for Versum Materials and Intermolecular into our reporting.

Our commitment: Standards and standard operating procedures

Our approach to environmental stewardship is built on our **Group Environment, Health and Safety Policy** (EHS Policy), which has been approved by our Executive Board. Closely aligned with the requirements of the chemical industry's Responsible Care® Global Charter and the ISO 14001 environmental management standard, this policy underscores our leaders' responsibility for environmental stewardship, health and safety. It is also aimed at our suppliers, encouraging them to likewise adopt higher standards of environmental sustainability and safety. Our EHS Policy thus complements the Responsible Sourcing Principles of our Group Procurement function.

Internal guidelines, standards and standard operating procedures define how we put the principles of our EHS policy into practice. For instance, the EHS, Security and Quality Manual of Merck KGaA, Darmstadt, Germany describes how we **organize environmental stewardship and occupational safety Group-wide**. In addition to this manual, we have also put in place a number of other internal environmental stewardship standards such as our Air Emissions Standard, Waste Management Standard, Sustainable Water Management Standards, and Energy Management Standard.

Potential EHS risks posed by acquisitions, divestments or site closures are assessed within the scope of due diligence, a process defined in our EHS Due Diligence and Post Merger Transaction Standard. When performing audits, new sites are given priority.

We regularly review our internal guidelines, standards and standard operating procedures. In 2019, we updated and introduced multiple standards and processes such as our Fire Protection standard, which provides our sites with a clear set of fire protection requirements. In 2019, we furthermore established a new Laboratory Safety standard.

Material investments in environmental impact mitigation

Efforts to diligently prevent and monitor air, water and soil emissions entail significant expense on our part, as does proper waste disposal. In addition, we have set up provisions **for groundwater and soil remediation** to ensure that we can execute all the necessary measures. As of December 31, 2019, our provisions for environmental impact mitigation totaled € 142.7 million, 93% of which was attributable to Merck KGaA, Darmstadt, Germany.

Assessing environmental impacts and reporting violations

In general, we conduct risk-based assessments along with **internal and external audits** on all our production sites every three years with the goal of analyzing and minimizing our environmental footprint. Conducted by our Group EQ function, these assessments serve to ensure that our requirements are being met, with appropriate corrective measures being implemented as needed. In addition to audits, we also have grievance mechanisms in place to identify potential violations of our standards. In our Group EHS audits, we assess our sites' performance on a five-tier scale: "excellent", "good", "satisfactory", "poor", and "critical", which in turn determines how frequently an audit is conducted. If the findings are deemed to be good, we audit the facility less often, while significant violations can increase the frequency. In 2019, 93% of the 41 sites audited were rated as "good" or "satisfactory"; no site was rated "critical".

Apart from using audits to identify issues, we also encourage employees to report potential breaches of our standards to our Compliance unit. In the 2019 period, we recorded no significant violations of environmental laws or regulations Group-wide.

ISO 14001:2015 Group certificate

Since 2009, our company has held a Group ISO 14001 certificate that mandates all production sites with more than 50 employees to implement an **environmental management system with predefined indicators** for factors such as greenhouse gas emissions and water use. Other facilities are not obligated to undergo certification. The annual internal audit reports and management reviews carried out under the Group certificate afford us a better overview of how all our sites are performing.

81

of our sites worldwide are currently covered by our ISO 14001 certificate.

Every year we contract a third party to perform a certification audit. In 2019, a sample of ten sites underwent an audit for our Group certificate, with all audited facilities passing the audit. Beyond undergoing external inspections, we also conduct internal audits to ensure Group-wide compliance with our requirements.

Discussing environmental issues

By participating in a variety of industry associations and federations, we engage in a discourse on **overarching environmental issues**, sharing best practices and lessons learned. Additionally, we contribute to the dialogue on plant and process safety in our capacity as a member of the European Process Safety Center and the Commission on Process Safety of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Furthermore, we discuss topics of local relevance in meetings with members of the communities in the vicinity of our sites.

Biodiversity at our sites

Unsealed surfaces represent an important habitat for plants and animals. At our facilities, however, we are required to seal certain surfaces to minimize the risk of chemicals entering the ecosystem. Insofar as safety requirements permit, we seek to increase the proportion of unsealed surfaces.

climate action

Climate change is one of the major challenges of the 21st century. Our company is no exception when it comes to generating greenhouse gases. We are therefore working to reduce these emissions to mitigate our impact on the climate. This course of action matters not only to us, but to our customers and many other stakeholders as well. Changes in the climate can lead to planning and investment uncertainty. At the same time, statutory and regulatory requirements are being modified in a bid to encourage climate-friendly behavior. We believe that climate action and energy efficiency will pay off in the long run, benefiting both the environment and our business.

Our contribution to climate action

We are taking action to mitigate our impact on the climate. Our **goal for 2020** is to reduce our direct greenhouse gas emissions (Scope 1) and indirect emissions (Scope 2) by 20% relative to the 2006 baseline, an objective set by the Executive Board in 2009. Scope 1 covers emissions that we produce ourselves, for instance by burning fossil fuels to generate power, while Scope 2 pertains to emissions from the consumption of purchased energy, such as electricity or district heating. Worldwide, 38 of our sites account for roughly 80% of our greenhouse gas emissions, which is why we are focusing our actions here. In 2019, we started developing a new climate target for the period leading up to 2030.

In past years, we focused our efforts on curbing greenhouse gas emissions through **energy efficiency** initiatives. By adapting and updating our systems and facilities, we are continually improving the energy efficiency of our research, production and buildings. We are also working to reduce process-related greenhouse gas emissions as well as emissions from our own power generation. When financially viable, we use renewable sources to generate our own power. Since 2019, we have been increasingly sourcing electricity from renewable sources.

How we structure our climate action

Our Group Environment, Health, Safety, Security, Quality (EQ) function is responsible for climate action within our company (Environmental stewardship), with our individual sites implementing the necessary measures at the local level.

Integration of Versum Materials and Intermolecular

In the course of integrating Versum Materials and Intermolecular, two companies we acquired in 2019, we are reviewing their existing management structures, policies, standards, and processes for climate action and energy management, and are implementing our internal Group-wide requirements if necessary. We are furthermore reviewing their current process for collecting greenhouse gas and energy consumption-related indicators and are working to harmonize methodologies and timelines. Starting in 2020, we will incorporate the greenhouse gas and energy efficiency indicators for Versum Materials and Intermolecular into our reporting.

Our commitment: Standards and legal frameworks

Energy Management and Emissions of Refrigerants, two of our Group EHS standards, enable energy and process-related emissions to be managed consistently across the Group. Through an audit process, we check compliance with all EHS standards on a random basis.

We know that **efficient energy management** plays a major role in climate action and is also important to our customers. With this in mind, 13 of our sites have decided to achieve ISO 50001 certification, the international standard for energy management.

In addition, we are subject to a wide array of **national and international energy and climate regulations**. In terms of energy efficiency and renewable energies, we are particularly impacted by the EU Energy Efficiency Directive (2012/27/EU), which stipulates that the affected companies must conduct regular energy audits or implement an ISO 50001-certified energy management system. The sites subject to these requirements are responsible for taking the requisite actions and furthermore undergo audits conducted by internal or external experts. The German federal Energy Services Act transposes the elements of the EU Energy Efficiency Directive into German law.

The EU Energy Performance of Buildings Directive (2018/844/EU) moreover sets the mandatory energy requirements for new buildings, for the major renovation of existing buildings, and for technical building systems. In Germany, this is also governed by the Energy Conservation Act and the Energy Conservation Ordinance, which were implemented by the operators of our plants and buildings with support from internal and external experts.

In Germany, our company is furthermore subject to additional statutory energy supply requirements such as the Energy Industry Act and the Renewable Energy Sources Act.

Our power plant in Darmstadt and our heating plant in Gernsheim (both in Germany) have made it necessary for us to participate in EU emissions trading since 2005. The European climate and energy policy up to the year 2030 is designed to achieve the goals of the 2015 Paris Climate Agreement, with EU emissions trading playing a key role in reaching the greenhouse gas reduction targets.

The amended **EU Emissions Trading Directive** (2003/87/EC) took effect in April 2018, thereby updating the legal framework for the fourth phase of the EU emissions trading program (2021 – 2030) and tightening the rules for free CO_2 allowances. Going forward, we will therefore have to purchase emission allowances that we are still largely obtaining for free during phase three (2013 – 2020).

Slight rise in energy consumption

We used 2,240 gigawatt hours of energy in 2019, versus 2,227 gigawatt hours in 2018. Our energy intensity relative to sales totaled 0.14 kilowatt hours per euro in 2019.

Our emissions

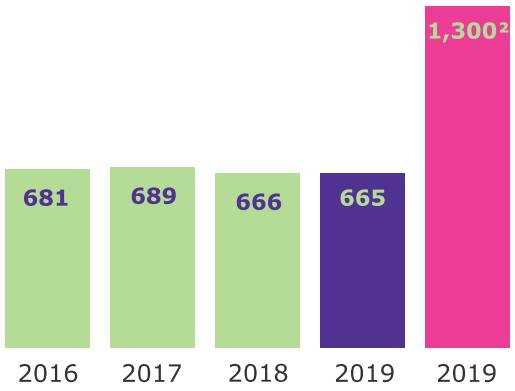
Despite growth in our operating business, we managed to **reduce our greenhouse gas emissions** by 15% relative to the 2006 baseline. Our process-related emissions slightly rose from 90,000 metric tons in 2018, to 93,000 metric tons in 2019. In the reporting year, we emitted 665,000 metric tons of CO_2 equivalents, versus 666,000 metric tons in 2018. Greenhouse gas emission intensity (Scope 1 and 2) amounted to 0.041 kg of CO_2eq per euro of net sales in this period.

Between 2006 and 2019, we more than doubled our sales, which means that, relative to sales, our emissions dropped significantly.

These figures do not yet include the emissions associated with the acquisition of Versum Materials, which we completed in early October 2019. The corresponding emissions indicators have not yet been integrated into our reporting. Based on the figures Versum Materials reported for the previous two years (not calculated in accordance with our metrics), we are currently expecting this to add roughly 1.3 million metric tons of CO_2eq per year to our carbon footprint. The majority of these are process-related emissions. During the integration process, we are examining the root cause of these high emissions along with ways to curb them. Because we have no data available for Versum Materials dating back to 2006, we cannot incorporate these additional emissions into our current climate action target. However, we will be integrating these into the scope of our next target, which will take effect in 2021.

Total greenhouse gas emissions (metric kilotons)[1]

(Scope 1 and Scope 2 of the Greenhouse Gas Protocol)



[1)] In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline), greenhouse gas emissions have been calculated based on the current Group structure in the fiscal year and retroactively adjusted for acquisitions and divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

[2)] Estimated Versum Materials emissions. Because we have no data available for Versum Materials prior to 2017, we cannot retroactively calculate these data. For this reason, we will be reporting Versum Materials greenhouse gas emissions separately from other parts of the Group until 2020.

Climate impact mitigation

In 2019, our emissions reduction actions focused on **purchasing power from renewable energies**. Additionally, we utilize our own photovoltaic plants worldwide with a total output of approximately 2,300 kilowatts. Furthermore, we are taking steps to optimize the HVAC systems and heat exchanger networks at our global headquarters in Darmstadt (Germany), efforts that are already saving 1,100 metric tons of carbon dioxide per year. Improvements to the heat exchanger networks were initially carried out in a pilot plant and can be applied to other plants. Since 2012, our strategic Edison program has saved us approximately 89,000 megawatt hours of energy, the majority of which was electricity. In developing a new climate action target for 2030, we are **revising our approach to promoting energy efficiency**, including our Edison program, and therefore did not initiate any new measures in 2019.

Employees and climate action

We encourage our employees to do their part to protect the climate. Aside from regularly reporting on our **Group-wide climate actions** in our EHS newsletters, we also provide helpful information and tips on our intranet. Moreover, we support employees who prefer greener modes of transportation. For instance, we constantly update our pool of leased vehicles with more efficient models.

Green mobility

In recent years, we have significantly lowered the average CO_2 emissions of our company car fleet. Nevertheless, we will not succeed in reducing these emissions as planned by 20% by the end of 2020 (2013 baseline). Currently, we are working on new Group-wide guidelines and a list of measures in order to rapidly include new engine types in our fleet. Going forward, we will set a new reduction target based on the requirements stipulated by the new **worldwide harmonized light vehicle test procedure** (WLTP).

The average emission rate of our company car fleet in Darmstadt and Gernsheim (both Germany) is currently 120 g/km. Starting in 2020, we will be calculating and reporting this figure according to the WLTP. Our company fleet at these two sites consists of 24 electric cars (As of: December 2019), representing 16% of the motor vehicle pool. To encourage green mobility, we have installed an extensive charging infrastructure at our global headquarters in Darmstadt, part of which is available to our employees for their own personal use. In addition, we also provide charging stations for company and personal vehicles in France, India, Ireland, Switzerland, the United Kingdom, and the United States.

Subsidies for employees

At our German subsidiaries, we offer a subsidy of € 100 towards monthly lease payments to employees who opt for a **greener car model**. In the United States, we provide our employees with financial incentives to choose a more sustainable lifestyle. For example, employees can receive up to US$ 1,000 in subsidies towards the installation of solar power on their home and up to US$ 100 towards the cost of an energy audit. Employees are also eligible for as much as US$ 3,500 towards the purchase of a hybrid or electric vehicle that was designated as "SmartWay Elite" by the U.S. Environmental Protection Agency. To date, we have helped 59 of our U.S. employees install home solar power systems and motivated 366 people to purchase a qualifying hybrid or electric vehicle.

Job ticket and carpooling

We offer our workforce in Darmstadt a job ticket, an annual public transit pass whose cost we partially cover. In 2019, 4,265 employees made use of this option. They also have access to an online tool that helps them organize carpools.

Bike leasing and sharing in Germany

At our German sites, we also encourage our people to use **eco-friendly forms of transportation** through "bike4me", a program enabling them to lease a bike at favorable rates with payments coming out of their pre-tax income. In 2019, 339 of our employees entered into leasing agreements.

Furthermore, our employees throughout Germany can also use the Call a Bike service offered by Deutsche Bahn, the German railway company, to borrow a bike free of charge for the first half hour. Deutsche Bahn has set up further bike sharing stations around our sites in Darmstadt. We sponsored 100 bikes in the city in 2019.

Switching to sea freight

In an effort to lower greenhouse gas emissions resulting from the transport of our products, we use **sea freight rather than air shipping** whenever possible. However, this is only an option for products that can withstand protracted transport times undamaged. At the same time, we cannot allow the quality of customer service to suffer due to lengthy transport. Given all these factors, raw materials such as mica are transported primarily by ship.

Transparency for CO_2 emissions and energy consumption

The CDP (formerly the Carbon Disclosure Project) assesses the ways in which companies are working to lower greenhouse gas emissions and minimize the risks and consequences of climate change, along with their success and strategy for doing so. The CDP rating scale ranges from A to D-, with A being the top score. In 2019, our company received a "C", thus maintaining the result achieved in 2018 (likewise C).

Since 2008, we have been reporting in detail on our climate actions as stipulated by the CDP, particularly Scope 1 and 2. Regarding Scope 3, we only track emissions from business travel and employee commuting, from our waste management activities, and from the production and transportation of fuels and energy. We are working to create transparency for other Scope 3 categories such as the production of our raw materials, which we are not reporting because we lack sufficient data. However, we intend to remedy this issue in the coming years.

waste and recycling

Although waste contains valuable raw materials that can be reused in the production stream, it can also pose a risk to the environment. We therefore consider it essential to prevent or recycle as much of our waste as possible.

Our approach to waste and recycling

Because we want to reduce our environmental footprint, we strive to both limit the loss of raw materials and reduce the impact of our waste disposal practices on the environment. To this end, we are working to lower the Waste Score of Merck KGaA, Darmstadt, Germany, our key waste management indicator, by 5% by 2025 (2016 baseline).

We generally try to prevent the generation of waste, for instance by developing new production processes or optimizing existing ones. Since this is not always feasible, we do our best to reuse the accrued waste to produce materials or generate energy. We support the circular economy approach through our Waste Scoring System and the related goal of recycling. Waste separation makes it possible to **recover and recycle raw materials**, while unrecyclable waste is discarded in an environmentally sustainable manner in line with the strictest waste disposal standards. In doing so, we comply with local legal regulations and take into account the available disposal options.

Responsibility for the waste disposal process

As a generator of waste, we are responsible for the ultimate disposal of our waste products and therefore choose our service providers with the utmost care, contractually stipulating disposal requirements. We conduct random audits to verify their **compliance with our disposal standards**, especially when it comes to hazardous waste.

How we organize our waste management and recycling

Our Group Environment, Health, Safety, Security, Quality (EQ) function bears overall responsibility for our waste management and recycling practices, while our EHS managers are in charge of implementing our guidelines and requirements at our individual sites (see Environmental stewardship). At both the Group level and in the United States, we have established **waste expert network groups** whose members share their waste management expertise and best practices with one another.

Waste management forms part of our Group-wide environmental management system, which is certified to ISO 14001. As well as undergoing external certification, we also conduct internal EHS audits to review our waste management practices. Moreover, in an effort to ensure Group-wide compliance with our environmental standards, we regularly host activities such as EHS forums and conferences to keep our local EHS managers and site directors informed on various waste disposal matters and raise awareness for the topic.

Integration of Versum Materials and Intermolecular

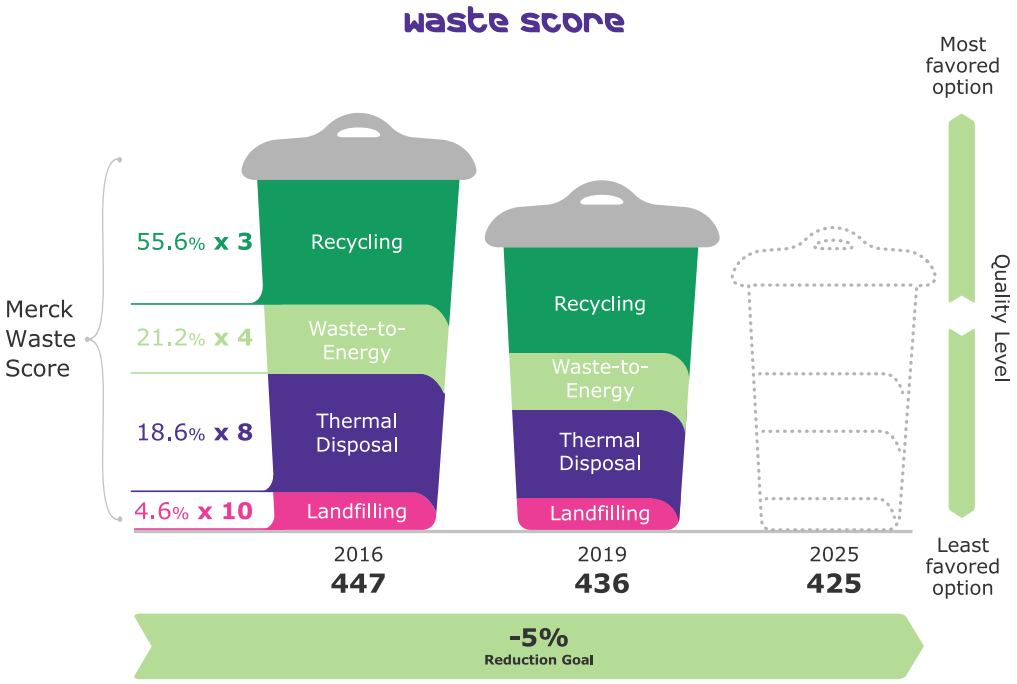
In the course of integrating Versum Materials and Intermolecular, two companies we acquired in 2019, we are reviewing their existing management structures, policies, standards, and processes for waste management and recycling, and implementing our internal Group-wide requirements if necessary. We are furthermore reviewing their current process for collecting waste-related indicators and are working to harmonize methodologies and timelines. Starting in 2020, we will incorporate the waste indicators for Versum Materials and Intermolecular into our reporting.

Our commitment: Group-wide EHS standard

Our Group-wide EHS Waste Management Standard provides a **consistent framework for waste management across all our sites**, defining organizational structures and minimum requirements. It also stipulates that all facilities document their waste by type and quantity and report these data to our Group EQ function.

Systematic waste reduction

Within our company we use a variety of methods for recycling and disposing of waste, each of which has a different impact on the environment. To systematically account for these impacts in our waste reduction efforts, we have created our Waste Scoring System, which allows us to compare the amount of waste our individual sites generate and track our various waste streams. Under this system, the volume of waste is assigned to one of five categories: landfilling, thermal disposal, waste-to-energy, recycling, and prevention. This is then multiplied by a factor that increases based on the disposal method’s environmental impact. The sum of the scores from each category provides the total Waste Score of Merck KGaA, Darmstadt, Germany. Prevented waste is multiplied by a factor of zero, thus lowering the overall result.



Reducing the environmental impacts of waste

In 2017, we calculated our Group-wide Waste Score for 2016. Taking this as a baseline, our goal is to shrink the environmental footprint of our waste disposal by 5% by 2025. To achieve this objective, we constantly examine our production processes and disposal methods to identify potential areas for improvement. We are supported in this endeavor by two waste expert network groups that regularly discuss best practices, share lessons learned across our sites, and drive the transition to greener disposal methods across the Group. In general, all sites are expected to do their part to achieve this goal.

Relative to 2018, the amount of waste we generated in 2019 decreased slightly, totaling 244 metric kilotons (2018: 245 metric kilotons). Soil, construction and demolition waste continue to account for the majority of our total waste, representing 31%, the same as in 2018. Our Waste Score does not factor in this type of waste, which can rarely be avoided and must be disposed in accordance with clearly prescribed methods.

Advancing the circular economy

In early 2019, we rolled out our ProMec initiative at our Darmstadt (Germany) site. This program aims to promote a sustainable, resource-efficient circular economy by expanding our existing solvent recycling program, thereby minimizing the negative environmental impacts from the disposal of our production waste. Through the pilot, we are now recycling approximately 1,300 metric tons of liquid production waste per year.

Optimizing processes to reduce solvent usage

In 2019, we optimized the manufacturing process for puromycin, one of our active ingredients used in research, at our site in Jerusalem (Israel). Per production batch, we are now replacing 4,000 liters of the carcinogenic solvent dichloromethane with 200 liters of methanol. In 2019, we thus saved 8,000 liters of dichloromethane.

Educating employees on proper waste disposal

In 2019, our Life Science business sector created a set of more than 70 different signs on waste, recycling and composting. The designs are available in four languages to all business sectors. They provide a flexible, uniform and easy-to-understand system which educates employees on site-specific waste, recycling, and composting requirements.

water management

With water scarcity affecting more and more regions worldwide, sustainable water management is a key focus of our environmental stewardship. After all, we too depend on the availability of water. However, our wastewater may contain traces of substances such as heavy metals or active pharmaceutical ingredients. Our water management practices comply with all applicable water protection laws, which are becoming increasingly stringent.

Our approach to sustainable water management

To us, sustainable water management means not negatively impacting the aquatic ecosystems from which we obtain freshwater, or into which we discharge treated wastewater.

To promote sustainable, efficient water management practices, we use an assessment tool from the European Chemical Industry Council (Cefic) to evaluate the water management systems across our facilities. Based on this assessment, our sites draw up an action plan and implement it step by step.

Besides evaluating our approach to water stewardship, we have also set the goal of **reducing our water use at sites in water stressed areas by 10% by 2020**, relative to the 2014 baseline. To this end, we are systematically analyzing our water use data utilizing tools such as the Water Risk Filter of the World Wide Fund For Nature (WWF) and the Aqueduct Water Risk Atlas of the World Resources Institute (WRI). These help us determine whether a site is located in a water-stressed area, which occurs when the water withdrawn exceeds the amount of water renewed.

At the same time, it is our responsibility to minimize the impact of our wastewater across all our sites, which is why our regular EHS audits also review **site-specific water management** practices at our production and development facilities.

Our water management efforts focus more heavily on our manufacturing sites than our administrative facilities because they have a greater potential for impacting local aquatic ecosystems.

How we organize our water management

Our Group Environment, Health, Safety, Security, Quality (EQ) function (see also "Environmental stewardship") bears overall responsibility for water management. At our sites, engineers work in close collaboration with our EHS managers to conserve water and treat wastewater.

Integration of Versum Materials and Intermolecular

In the course of integrating Versum Materials and Intermolecular, we are reviewing their existing management structures, policies, standards, and processes for water management, and implementing our internal Group-wide principles if necessary. We are furthermore reviewing their current process for collecting water and wastewater-related indicators and are working to harmonize methodologies and timelines. Starting in 2020, we will incorporate the water and wastewater indicators for Versum Materials and Intermolecular into our reporting.

Our commitment: Standards and procedures

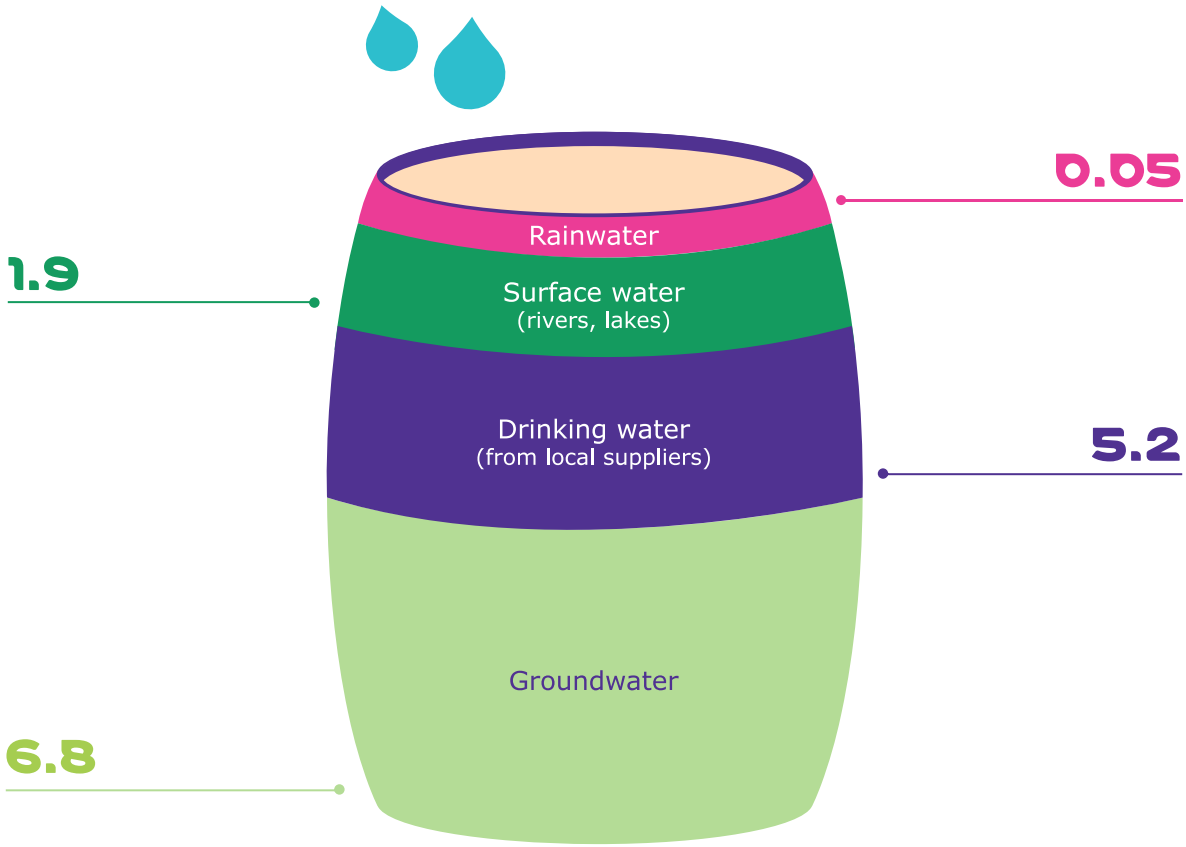
Our Group-wide "Sustainable Water Management Part 1 – Wastewater" and "Sustainable Water Management Part 2 – Water use and stormwater protection" standards detail the way we integrate **modern mechanisms of sustainable water management** into our management system. Both are based on the commitments we made under the global Responsible Care® initiative. Our "Wastewater" standard provides us with a method of assessing our wastewater discharge into the ecosystem, while "Water use and stormwater protection" sets out Group-wide requirements for the responsible use of water as a resource. In addition, it establishes a way for us to manage the risks that arise from direct or indirect water abstraction and also covers risks such as contaminated rainwater and flooding. We perform internal audits to verify that our sites comply with these standards. They are all required to measure and assess the risks and impacts of the hazardous substances in their wastewater and to analyze water withdrawal and rainwater risks.

In addition to these efforts, we are constantly optimizing our production and treatment processes to minimize, for instance, the amount of active pharmaceutical ingredient residues in our wastewater. Furthermore, all our pharmaceutical manufacturing facilities have wastewater treatment plants and regularly assess the composition of their wastewater.

Water withdrawn from our own sources

For the most part, we draw our process water from our own wells and source drinking water from local suppliers. In no instances do we compromise sensitive water sources. However, in the course of our sustainable water management activities, we keep an eye on trends that could potentially lead to sources being reclassified as sensitive.

Water abstraction (millions of m^3) – 2019[1]



[1] The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.

The cooling water used for our production processes generally runs in a circular system. Depending on regulatory standards and the energy footprint, we sometimes use freshwater for cooling in a once-through system. For certain applications, we treat production wastewater and reuse it. In 2019, we recycled a total of 23.3 million cubic meters of water.

Comprehensive analyses

We make use of the **Self-Assessment of the European Chemical Industry Council** (Cefic), which was initially utilized to survey our sites' water management practices. We continuously analyze the environmental impacts from our discharged water, and, as needed, take site-specific steps to address potential issues.

Curbing water use

We seek to minimize our impact on the water situation in the vicinity of our sites. In 2019, we consumed 14 million cubic meters of water in total, with 784,661 cubic meters originating in water-stressed areas. This figure includes our manufacturing sites in Mexico City (Mexico), Mollet del Vallès (Spain), Kankakee (Illinois, USA), Norwood (Ohio, United States), Savannah (Georgia, United States), Hsinchu and Taoyuan (both in Taiwan). These seven sites must both **transparently report their water use** and identify the process steps that require a particularly high volume of water. Building on this information, we draw up action plans to help our individual facilities lower their water consumption. We aim to achieve a 10% reduction in annual water use in water-stressed regions by 2020 (2014 baseline). By the end of 2019, the respective sites had curbed their water use by approximately 21% versus 2014. The sharp increase over the previous year (2018: 11%) was partly due to production declines at our site in Savannah (Georgia, United States).

Assessing our water management practices

In addition to reporting on our climate action efforts, we also report water-related data to the CDP (formerly known as the Carbon Disclosure Project). This initiative collects environmental data from companies once a year, evaluating their processes and performance on a scale from A to D-. In 2019, we were awarded a "B" for our water management (2018: B-).

Our wastewater

In 2019, we generated 13.2 million cubic meters of wastewater. This consisted of around 9.3 million cubic meters of freshwater, which was directly discharged into surface waters, and 3.9 million cubic meters of other water, which was treated at external treatment plants or disposed of in an ecologically sustainable manner. Approximately 50% of our total wastewater was discharged by three sites. Our Gernsheim site in Germany discharges its treated wastewater into the Rhine River and our Onahama facility in Japan into the Pacific Ocean. The wastewater generated by our Darmstadt (Germany) site is purified in our treatment plants before being discharged into Schwarzbach/Ried creek, a tributary of the Rhine River. The volume of treated wastewater we discharge represents approximately 4% of the average water volume of the Schwarzbach/Ried creek. At the end of 2019, we were issued a new discharge permit for the period from 2020 to 2034; we meet all the requirements stipulated by the permit. We constantly invest resources in our various sites to meet the increasingly stringent quality standards set forth by law, and consistently coordinate our efforts with the respective authorities.

Wastewater continuously monitored

Our two sustainable water management standards also cover the topic of wastewater. Our individual sites are responsible for assessing their wastewater management practices and identifying the areas that need improvement. They must also comply with the respective requirements imposed by local authorities. An **expert has been appointed for each of our business sectors** to provide guidance for our sites.

Antibiotic residues in wastewater

We process antibiotic active ingredients in small quantities. The wastewater generated from these activities is subject to an additional purification process before being discharged into the environment. In 2018, we conducted a systematic, Group-wide assessment of our ecological impacts from manufacturing and handling antibiotics. The results confirmed the efficacy of our water treatment procedures: across the board, antibiotic residues were minimal and fell below local detection thresholds.

plant and process safety

Part of the non-financial report

The safety of our plants and processes is a key element of our environmental stewardship practices, allowing us to protect both our workforce and the people in the immediate vicinity of our sites. Furthermore, high-performance safety systems help minimize production errors and lower the risk of financial losses.

Our approach to plant and process safety

We seek to **minimize manufacturing process hazards** wherever possible in order to avoid workplace accidents, production outages and chemical leaks. We train our employees regularly in an effort to prevent human error and also to detect technical defects before they can cause damage.

How we organize our plant and process safety

Our Group Environment, Health, Safety, Security , Quality function (EQ) coordinates plant and process safety within our company (Environmental stewardship), with our individual sites and their EHS managers handling this at the operational level. In particular, **fire protection** is paramount to the safety of our plants and processes.

We conduct **internal EHS audits** to verify the safety of our plants and processes. While doing so, we also evaluate select suppliers based on criteria such as purchasing volumes, type of incoming raw materials and geographic location. If we identify technical or organizational deficiencies pertaining to occupational and plant safety, our vendors are obligated to rectify them. Our own sites are likewise required to correct any defects discovered during the audit, with the auditor verifying whether the specified corrective action has been taken. When it comes to our suppliers, our Procurement organization verifies that the appropriate measures have been implemented.

Integration of Versum Materials and Intermolecular

In the course of integrating Versum Materials and Intermolecular, two companies we acquired in 2019, we are reviewing their existing management structures, policies, standards, and procedures for plant and process safety and are implementing our internal Group-wide requirements if necessary. We are furthermore reviewing their current process for collecting plant and process safety-related indicators and are working to harmonize methodologies and timelines. Starting in 2020, we will be incorporating plant and process safety indicators for Versum Materials and Intermolecular into our reporting.

Our commitment: Standards and legislation

Our Group-wide EHS Plant and Process Safety standard, which sets forth the safety rules for all production plants and warehouses, encompasses the entire life cycle of a plant, from planning and construction to operation, retooling, servicing and maintenance through to closure. Before commissioning a plant, we draft a **safety concept** that is subject to continuous review and, when necessary, updated until the facility is decommissioned. This concept contains an overview of potential risks and the corresponding protective measures.

Our Group-wide EHS Spillage Control standard governs the **handling of hazardous materials** and stipulates organizational requirements to prevent toxic substances from spilling or leaking during storage and transport. In addition to this standard, our Risk Management Process guides all our sites in identifying and assessing risks and is used to devise steps to minimize them. Our Group Procedure Hazard and Operability Study defines the individuals responsible for pinpointing potential hazards during new plant construction, plant alterations or safety-relevant plant modifications as well as the manner in which these dangers should be identified and documented. In 2019, we revised our Fire Protection standard, which provides our sites with a clear framework of fire protection requirements.

The revised EU directive on the control of major accident hazards involving dangerous substances (aka Seveso III) was transposed into German law in 2017 through the amended version of the 12th German Hazardous Incident Ordinance (aka 12th BImSchV). Our processes and documents governing the **assessment and reporting of potential hazards** comply with statutory requirements. On request, members of the public may access our safety reports at any time. At our Darmstadt (Germany) site, we hold neighborhood meetings to inform people about potential hazards and protective measures in the event of a hazardous incident. Further information can be found in our Hazardous Incident Brochure, which we update every three years and send to approximately 17,000 households in the vicinity of our global headquarters. The document is also available on our website.

Keeping a close eye on safety

Our EHS **performance indicators** make it possible to measure safety and identify opportunities for improvement. We track EHS performance indicators at all our production and warehouse facilities, as well as at major research sites. In doing so, we record both accidents and near misses. We investigate each individual incident and devise appropriate countermeasures in an effort to prevent such accidents from reoccurring in the future.

Under our EHS Incident Rate (EHS IR), which also includes our Loss of Primary Containment (LoPC) indicator, we record and evaluate all major and minor incidents. Also important is the EHS Leading Rate (EHS LR), which is calculated based on an analysis of near misses and critical situations. In 2019, we specified the Occupational Illness Rate (OIR) as an additional indicator. Complementing our EHS IR indicator, which tracks spontaneous accidents, the OIR is intended to record work-related illnesses and their long-term effects.

Furthermore, we have set the goal of stabilizing our lost time injury rate (LTIR) at 1.5 Group-wide by 2020, which measures the number of accidents Group-wide resulting in at least one missed day of work per million man-hours. Our individual business sectors also define their own annual targets for EHS IR and EHS LR. EHS performance indicator reports are submitted once a month at the business sector level, with the Executive Board receiving reports on the topic every six months.

EHS Incident Rate

To document accidents and other incidents, we track the EHS Incident Rate (EHS IR), an indicator that covers the following four types of incidents:

- The number of workplace accidents involving our employees and the contractors who work at our sites
- Environmentally relevant incidents as defined by the European Chemical Industry Council (Cefic) and the German Chemical Industry Association (VCI), for example product spills
- The activation of operational safety precautions with no adverse impact on people or the environment, such as preemptive systems shutdowns
- Deviations identified during external reviews and audits

The calculation of the EHS Incident Rate includes the number of incidents and the severity of the event relative to the number of man-hours worked. **The lower the EHS Incident Rate, the safer the site** is.

3.6

Our EHS IR indicator was 3.6 in 2019, which represents a significant year-on-year decrease (2018: 5.3). In 2019, we introduced a new calculation method, which is why our EHS IR figures for 2019 and 2018 deviate from those previously reported.

In 2019, we recorded no significant incident-related spills across any of our production, research and warehouse sites Group-wide.

Training and sharing lessons learned

The safety of our plants and processes is predicated on the successful **interplay between man and machine**, which is why it is crucial for us to provide our employees with regular training. Our internal continuing education programs for site, production, engineering, and EHS managers also cover plant and process safety. Likewise, we train newly hired EHS managers in plant and process safety during their onboarding, with 25 new EHS managers completing this training in 2019.

In the interest of improving safety, it is extremely important to continuously **share best practices and lessons learned**. This approach enables all our production sites to learn from incidents at other facilities and implement preventive measures. Once a month, for instance, site directors and EHS managers participate in safety leadership calls to share new lessons learned. Additionally, our site EHS managers regularly hold sessions to discuss matters.