Environment

Within this chapter:

Environmental stewardship

Part of the non-financial report

As a science and technology company with manufacturing operations, our activities have an impact on the environment, generating air emissions, wastewater and waste. Even the materials we utilize could adversely affect the environment if not handled properly. To mitigate these impacts, all our sites meet a strict set of environmental regulations and continually adapt their processes to new regulatory requirements. Moreover, due to the growing scarcity of natural resources, we attach great importance to using energy, water and materials efficiently.

Our approach to environmental stewardship

Minimizing negative environmental impacts and taking meaningful climate action requires a holistic approach. Our goal is to diligently monitor detrimental emissions into the air, water and soil and try to prevent them wherever possible.

How we structure our environmental stewardship practices

On October 1, 2018, Belén Garijo took over from Walter Galinat as the Executive Board member with responsibility for environmental governance, a remit that also covers climate impact mitigation, water management, waste and recycling, and plant and process safety. Our Group function Environment, Health, Safety, Security, Quality (EQ) is in charge of steering all related ecological efforts Group-wide. At our individual sites, each site director is responsible for environmental stewardship as well as occupational safety at the operational level. At larger facilities, the site directors receive day-to-day 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 hand in hand with EQ.

In 2018, our EHS organization comprised **more than 200 EHS managers** – supported at the local level by other personnel. Our Group function EQ conducts annual EHS seminars at our various sites. All new EHS managers are required to complete EHStart-up!, a three-day training course held at our global headquarters in Darmstadt that covers topics such as our Rapid Incident Report System (RIRS, see below), energy efficiency and climate impact mitigation, wastewater, occupational safety and process safety.

The EQ leadership meets with the Executive Board on a regular basis, usually once a month, to report on their environmental stewardship efforts. Every six months, EQ provides the Executive Board with a report on environmental, health and safety issues that also covers climate impact mitigation, water management, waste and recycling, and plant and process safety. The report focuses on our current progress, documenting and assessing the work EHS has accomplished. The Executive Board utilizes this brief as a source of information and as documentation to support ISO 14001 and BS OHSAS 18001 certification.

Our Executive Board is moreover responsible for approving internal guidelines such as our Environmental, Health and Safety (EHS) Policy. Internal standards are approved by the head of EQ. While standards provide an operational framework, guidelines present an overarching outline of our company's position on a specific issue.

INFO

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

Responsibilities of Group Governance and Service Unit Environment, Health, Safety, Security, Quality (EQ)

- Develop and maintain Group EG strategy
- Performance of environmental and safety audits
- Compliance audits to review adherence to standards
- Implementation of EQ management systems
- Conducting EQ improvement programs
- Consulting for investments, process development and acquisitions
- Conducting training programs

Responsibilities of local operating units with competencies at local sites:

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

Clearly defined incident reporting procedures

We have established a variety of reporting procedures (EHS Leading Rate) to review critical situations, near misses and environmental incidents as quickly as possible and take corrective action. These procedures allow us to track the respective incident, its degree of severity and all risk mitigation efforts. All incidents are logged Group-wide and reported to the Executive Board every six months.

In the event of major incidents, our **Rapid Incident Report System** (RIRS) promptly notifies the Executive Board, our EHS Group function and Group Communications. Such incidents may include fatalities, accidents with multiple casualties, or injuries and damage that occur beyond our premises, but also environmental disasters such as earthquakes or floods. Through the RIRS, we can coordinate the responses of all those involved and inform other potentially impacted sites immediately. To make the RIRS faster and more effective, we migrated to an online version of the system at the end of 2018.

Our commitment: Standards and standard operating procedures

Our approach to environmental stewardship is built on our **Group-wide EHS Policy** (Corporate Environment, Health and Safety Policy), which has been endorsed by the Executive Board. This policy is closely aligned with the stipulations of the chemical industry's Responsible Care® Global Charter, as well as with the environmental management standard ISO 14001, and emphasizes the responsibility of our leadership toward environmental stewardship, health and safety. Moreover, it addresses our suppliers, encouraging them to adopt similarly enhanced standards governing environmental sustainability and safety. In doing so, our Corporate EHS Policy complements the Responsible Sourcing Principles of our Group Procurement function.

The principles of our EHS policy are implemented through internal guidelines, standards and standard operating procedures. For instance, our Group EHS, Security and Quality Manual describes how we **organize environmental stewardship and occupational safety across the company**. In addition to this manual, we have put in place a number of other internal standards that govern environmental stewardship such as our Air Emissions Standard, Waste Management Standard and Energy Management Standard.

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

We regularly review our internal guidelines, standards and standard operating procedures. In 2018, we revised and introduced multiple standards and processes. For instance, we updated our Office and Field Service Safety Standard to increase our focus on safety in areas beyond our production facilities. We also adjusted our Occupational Hygiene Standard. In making these improvements, our aim is to better recognize and counteract health hazards in the workplace. In addition to these efforts, in 2018 we introduced the Sustainable Water Management Standard. Composed of two parts, it replaces our Water Protection Standard and details wastewater discharge control and monitoring, water use analysis and protective measures against rainwater risks such as contaminated rainwater.

Material investments in environmental impact mitigation

Preventing and monitoring air, water and soil emissions involves large expenditures on the part of our company, as does proper waste disposal. Moreover, we have set aside provisions **for groundwater and soil remediation** to ensure our ability to execute all measures required. In 2018, our provisions for environmental impact mitigation totaled € 137 million, 94% of which was attributable to Merck KGaA, Darmstadt, Germany. Neither these environmental indicators nor the ones appearing later on in the report reflect data from our Consumer Health business. This is due to the fact that this business was transferred to Procter & Gamble as of December 1, 2018 and, pursuant to IFRS 5, was classified as a discontinued operation as of April 2018.

Parking lot remediation completed

In 2018, we completed our ten-year project to decontaminate a parking lot at our Gernsheim site. The scope of the **environmental remediation** required turned out to be significantly greater than originally anticipated. During the decontamination work, we removed hexachlorocyclohexane (HCH) residue from the soil under the parking lot and properly disposed of it using external incinerators.

Assessing environmental impacts and reporting violations

In general, we conduct risk-based assessments along with **internal and external audits** on all our production facilities every three years with the goal of analyzing and minimizing our environmental footprint. Conducted by EQ, these assessments serve to ensure that our requirements are being met. As needed, we use the results to define a suitable course of action. In addition, grievance mechanisms are in place to identify potential violations of our requirements. In 2018, our corporate EHS audits rated 80% of the 40 sites audited as "good" or "satisfactory". We assess 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, a facility will undergo audits less often, while significant violations can increase the frequency.

Aside from using audits to identify issues, we also encourage employees to report potential violations of our standards to our Compliance unit. All of these violations are reported to the Executive Board. In the 2018 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, which means that all production sites with more than 50 employees must implement the requirements of the certificate. Other facilities are not obligated to implement an ISO-certified environmental management system. New sites must gradually establish a corresponding **environmental management system with predefined indicators** for factors such as greenhouse gas emissions and water use, as well as obtaining ISO 14001 certification. The annual internal audit reports and management reviews carried out as part of the Group certificate afford us a better overview of how all our sites are performing.

81

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

Every year we contract a third party to perform a certification audit. In 2018 a sample of ten sites underwent and passed an ISO 14001 audit, while two facilities were newly incorporated into the Group certificate. Furthermore, we conduct internal audits to ensure compliance with our requirements.

Stakeholder dialogue

By participating in a variety of industry associations, we exchange information and ideas on environmental issues. In 2018, for instance, we took part in discussions between the German Chemical Industry Association e. V. (VCI) and German legislators on eliminating the thermal value criteria. Until the end of 2018, our company chaired the VCI plant safety working group. 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, Building, and Nuclear Safety. Since 2018, we have also been involved in a multi-stakeholder dialogue to develop the Trace Substance Strategy of the German federal government to protect aquatic ecosystems.

Furthermore, we engage residents in the vicinity of our sites in discussions on issues of local relevance.

climate action

Climate change is one of the most pressing challenges of the 21st century. Because our operations also generate greenhouse gas emissions, we endeavor to reduce these emissions to mitigate our impact on the climate, a course of action expected by our customers and stakeholders. Although stricter regulatory requirements may lead to planning and investment uncertainty, burgeoning regulations and rising energy costs are making climate impact mitigation an increasingly smart investment.

Our contribution to climate protection

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.

Across the globe, 40 of our sites account for roughly 80% of our greenhouse gas emissions, which is why we are focusing our efforts here.

Energy conservation represents a key component of our climate impact mitigation activities. By adapting and updating our technology, we are improving the **energy efficiency** of our R&D operations, our production processes and our buildings. Just as important for climate impact mitigation is the **reduction of process-related emissions**. Furthermore, we are working to lower the emissions resulting from energy generation. Where financially viable, we additionally make use of renewable energies to generate our own power.

How we structure our climate impact mitigation efforts

Our Group function Environment, Health, Safety, Security, Quality (EQ) is responsible for globally overseeing all climate impact mitigation efforts (see also Environmental stewardship), with each of our sites handling the actual implementation of the specific measures.

Our commitment: Standards and legal frameworks

Our Corporate Environment, Health and Safety (EHS) standards on energy management and emissions from coolant ensure that energy and process-related emissions are managed consistently across the Group. We audit our EHS processes at random to verify compliance with all EHS standards.

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

Our company is subject to a wide array of **national and international energy and emissions regulations** such as the German Energy Conservation Act and the German Renewable Energy Sources Act. Our activities are also governed by EU Directive 2012/27/EU, which stipulates that relevant companies must establish energy management systems and regularly audit their energy consumption. The sites subject to these requirements are responsible for implementing them and furthermore undergo audits conducted by internal or external experts.

The **revised EU Emissions Trading System** took effect in April 2018, establishing a legal framework for installations covered by this system for the fourth phase of the trading program (2021 – 2030). Going forward in phase four, we foresee having to purchase the emissions allowances that we are still largely obtaining for free during phase three (2013 – 2020).

Slight increase in energy consumption

We used 2,232 gigawatt hours of energy in 2018, versus 2,194 gigawatt hours in 2017. Our energy intensity relative to sales totaled 0.15 kWh/€ in 2018.

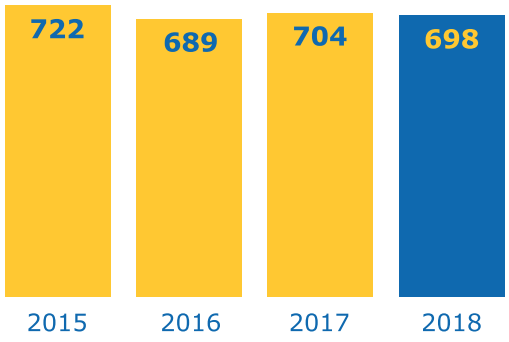
Emissions lowered despite growth

Despite growth in our operating business, we managed to reduce our **greenhouse gas emissions** by 11% relative to the 2006 baseline. We thus lowered our process-related emissions from 111,000 metric tons in 2017, to 95,000 metric tons in 2018. In 2018, we emitted 698,000 metric tons of CO_2 equivalents, versus 704,000 metric tons in 2017. Greenhouse gas emission intensity amounted to 0.047 kg of CO_2eq per euro of net sales in this period.

Between 2006 and 2018 we more than doubled our sales, which means that, relative to sales, our emissions dropped significantly.

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), the greenhouse gas emissions have been calculated based on the current corporate structure of the reporting year and retroactively adjusted for acquisitions and divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted). Because it was divested in 2018, emissions from the Consumer Health business are no longer included in these figures.

Strategic climate program

Since 2009, all our measures to **improve energy efficiency and reduce process-related greenhouse gas emissions** have been housed under our strategic Edison program. Within this framework, our Group function EQ collaborates with a working group comprising representatives from all our business sectors. Any site can propose a project to curb CO_2 emissions.

Through the more than 360 Edison projects initiated since 2012, we aim to save around 177,000 metric tons of CO_2 annually in the medium term. Since 2012, these efforts have conserved approximately 89,000 megawatt hours of energy in total, primarily from electricity.

By the end of the year, we had implemented or launched 34 of the 48 Edison projects approved for 2018. These initiatives are expected to achieve savings of around 75,000 metric tons of CO_2 in the medium term. As in previous years, we also accepted new project proposals.

In 2018, the efficiency projects underway focused on optimizing air conditioning and ventilation systems, using and optimizing electric motors, and energy generation at installations mainly located in Germany, the United States and Switzerland.

In 2017, the Executive Board approved a **roadmap** for achieving the remaining savings needed to meet our climate target, and in 2018 they made the decision to purchase more power from renewable sources in an effort to achieve this objective faster.

Investing in renewable energies

Globally, we utilize **photovoltaic plants** with a total output of approximately 2,500 kilowatts. In 2017, we installed a solar voltaic system at our site in Burlington (Massachusetts, USA). It has an installed capacity of 182 kilowatts and generated 136,000 kilowatt hours of power in 2018, reducing our emissions by roughly 37 metric tons.

Educating employees about climate impact mitigation

We encourage our employees to do their part to preserve the climate and regularly report on our **Group-wide climate action efforts** in our EHS newsletters while also providing helpful information and tips on our Intranet. Moreover, we support employees who prefer greener modes of transportation. For instance, we constantly update our leased vehicle pool with more efficient models so as to reduce the average carbon emissions of our fleet Group-wide by 30% by 2020, relative to 2013.

Subsidies for our employees

In January 2017, we lowered the CO_2 emission rate for newly registered company cars from 150 g/km to a maximum of 135 g/km. We are currently in the process of updating our vehicle emissions limits to the new requirements (test cycle). At our German subsidiaries, we offer a subsidy of € 100 towards monthly lease payments to employees who opt for a **greener car model**.

The average **emission rate of our company fleet** in Darmstadt and Gernsheim is 122 g/km, with about 15% of the fleet being electric.

In the United States, we provide our people with financial incentives to choose greener options. For instance, they receive up to US$ 1,000 in subsidies towards the construction of a private solar power unit and up to US$ 100 towards an energy audit for their home. They are also eligible for as much as US$ 3,500 towards the purchase of a hybrid or electric car. To date, we have helped 55 of our employees install solar panels and motivated 361 employees to switch to a hybrid or electric car.

Recharging facilities at our sites

Our company fleet in Darmstadt and Gernsheim includes 23 **electric vehicles** (as of December 2018) that our employees can use for business purposes, but we also want to encourage our workforce to use electric cars in their private lives. To this end, our Darmstadt headquarters offers ten charging stations in the employee parking garage that recharge electric vehicles using green electricity. Furthermore, this site has six additional charging stations and 15 charging boxes for departmental vehicles. Over the next several years, we intend to continually expand the charging infrastructure at our German and European sites. Charging is processed via a payment platform called eCharge. Employees already registered on the platform also have access to a network across Germany featuring 6,000 charging stations across 740 cities.

In 2018, we installed eight new **charging stations** in the United States and Switzerland. In the United States, we now offer 43 such stations to our employees at 11 sites nationwide. Moreover, we have ten charging stations available (as of December 2018) at our sites in France, Ireland and Switzerland.

Jobticket and carpooling

We offer our workforce in Darmstadt a "Jobticket", an annual subscription to use local public transportation whose cost we partially cover. In 2018, more than 5,800 employees made use of this option. Our people also have access to an online tool that helps them organize carpools.

Bike sharing in Germany

At our German facilities, we also encourage our people to use **eco-friendly forms of transport** through "bike4me", a program enabling them to lease a bike at special rates with payments coming out of their pre-tax income. In 2018, 161 of our employees signed up for the program.

Furthermore, our employees can also use the Deutsche Bahn Call a Bike service throughout Germany and borrow a bike free of charge for the first half hour. Deutsche Bahn, the German national rail company, has set up further rental stations all around our sites in Darmstadt, and in 2018 we sponsored 100 bikes in the city.

Switching to sea freight

In an effort to lower greenhouse gas emissions resulting from the transport of our products, we **utilize sea rather than air freight** whenever possible. However, this is only an option for products that survive protracted transport times undamaged, and we cannot allow the quality of customer service to suffer due to lengthy transport. The raw material mica, for instance, is transported primarily by ship.

Transparency regarding CO_2 emissions and energy consumption

The organization CDP (formerly the Carbon Disclosure Project) assesses the ways in which companies are working to minimize the risks and consequences of climate change, along with their success and strategy for doing so. The rating scale used ranges from A to D-, with A being the top score. In 2018, we received a C (B in 2017). The lower rating is attributable to several factors, including our failure to make progress on our ambitious emissions target in the reference period.

Since 2008, we have been reporting in detail on our climate impact mitigation efforts as stipulated by the CDP. We track our greenhouse gas emissions in line with the Greenhouse Gas (GHG) Protocol, an internationally recognized standard, reporting on Scopes 1 and 2 as well as parts of Scope 3. Regarding Scope 3 emissions, we only track emissions from business trips and employee commuting, from waste management, and from the manufacture and transport of fuel. Besides these emissions, we also measure energy consumption at our sites. However, this does not include energy use outside our field of activity such as raw materials production, as we do not have sufficient data available to perform these complex calculations.

waste and recycling

Waste contains valuable raw materials that can be reused in the production stream. However, it can also pose risks to the environment, so we consider it fundamental to both prevent and recycle as much of our waste as possible.

Our approach to waste and recycling

We work to both limit the loss of raw materials and minimize the environmental impacts of our waste disposal processes. To this end, we have set the goal of reducing the ecological impact of our waste by 5% by 2025 (relative to the 2016 baseline).

We generally try to prevent waste, for instance by developing new production processes or optimizing existing ones. Since this is not always feasible, whenever possible we endeavor to reuse the accrued waste to produce materials or generate energy. Through our Waste Scoring System and its objectives, we are supporting the circular economy. By employing measures such as waste separation, for instance, we ensure that **raw materials are recycled**, and that 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 requirements, taking 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. Each of our vendors must prove that they have **properly discarded our waste**, and we perform random audits to verify their compliance with our disposal standards, especially when it comes to hazardous substances.

How we organize our waste management and recycling activities

Our Group function Environment, Health, Safety, Security, Quality (EQ) bears overall responsibility for our waste management and recycling activities, while our EHS managers are in charge of implementing our guidelines and requirements at our individual sites (see Environmental stewardship). In 2018, we established both a Group-wide and a U.S.-based **Waste Expert Network Group** aimed at fostering interactions and promoting best practice sharing on waste management. In addition, these groups of experts are responsible for further integrating waste scoring into our company practices.

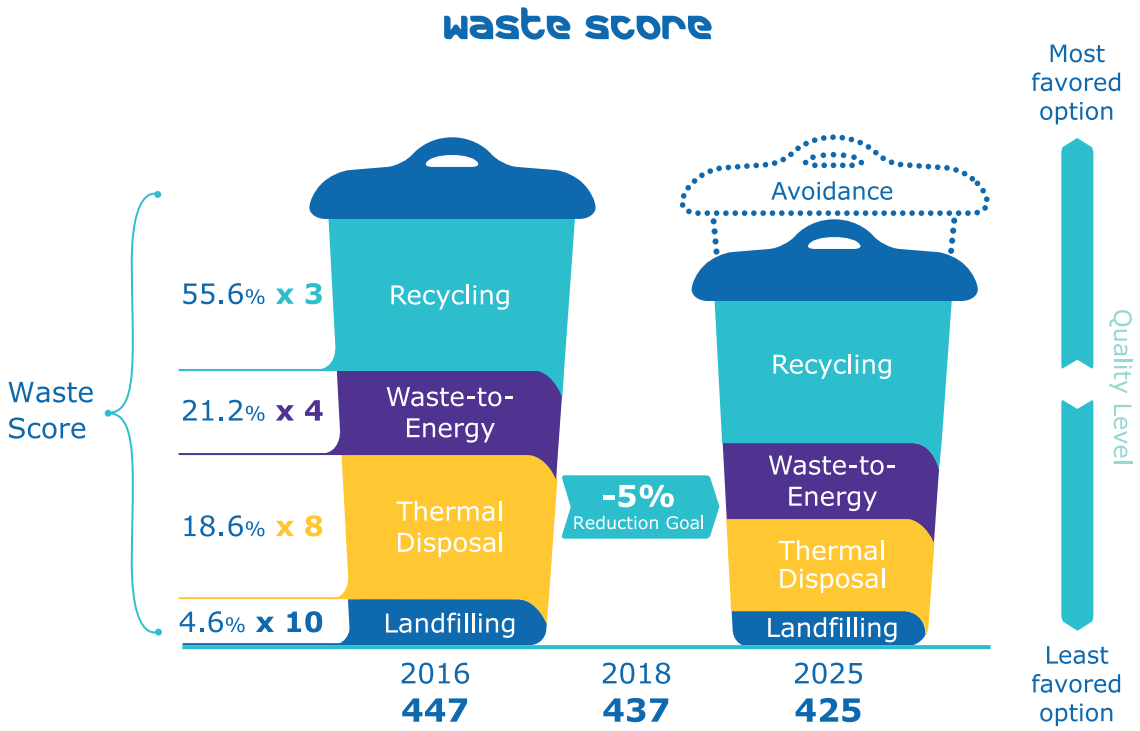
Waste management is part of our Group-wide ISO 14001-certified environmental management system. As well as undergoing external certification, we also conduct internal EHS audits to review our waste management practices. Moreover, in an effort to ensure Group-wide compliance with our environmental standards,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

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 moreover stipulates that all facilities document their waste by type and quantity, reporting this data to EQ. In 2018, we revised this standard to further reinforce the requirements for achieving our waste disposal targets.

Award for our Waste Scoring System

At 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 account for these impacts in our waste reduction efforts, in 2016 we created a Waste Scoring System that allows us to compare the amount of waste our individual sites are producing and monitor our various waste streams. Under this system, the volume of waste is assigned to one of five categories according to how it is discarded (see diagram) and then multiplied by a factor that increases based on the disposal method's environmental impact. The sum of the scores of each category provides the total Waste Score of our company.



All sites are expected to do their part to reduce waste. The Waste Score excludes construction and demolition debris, along with waste from water treatment plants, because such waste inherently has clearly defined disposal methods that can rarely be circumvented.

In 2018, we were awarded **third place for our Waste Scoring System in the regional Responsible Care competition**. Organized by the German Chemical Industry Association (VCI), this year's competition centered around "Our contribution to the UN Sustainable Development Goals".

Clear target for reducing the environmental impacts of waste

In 2017, we calculated our Group-wide Waste Score for 2016. Taking this as a basis, in 2017 the Executive Board adopted the goal of reducing the environmental impact of our waste by 5% by 2025. To achieve this objective, we constantly examine our production processes and disposal methods to identify potential areas for improvement. In 2018, we furthermore established two Waste Expert Network Groups that meet regularly to discuss best practices, thus facilitating Group-wide exchange among our sites. In addition, these expert groups are responsible for integrating waste scoring into our company practices.

Relative to 2017, the amount of waste we produced in 2018 decreased slightly, coming to 247 metric kilotons. Construction and demolition debris continue to account for the majority of our total waste – 31% in 2018, and 36% in 2017. In particular large quantities of such waste material was generated by the remodeling of our global headquarters in Darmstadt, a process we completed in 2018.

Preventing waste: Sharing instead of discarding

In April 2018 we launched the online platform called "Troc" at our site in Corsier-sur-Vevey (Switzerland). Using this platform, departments can procure consumables, devices and products that other departments were planning to throw away. By involving all our employees at the site in this project, we are also raising awareness on waste minimization.

Preventing waste: Reducing filter waste

In 2015, we switched our multi-step filter process for photoresists to a single-step process, thus decreasing filter waste by 50%-70%. Since 2017, this process has become standard at all our facilities involved in photoresist filtering.

Reycling: From production waste to valuable compost

At our site in Molsheim (France), since 2017 we have been making a concerted effort to achieve our waste disposal target by composting all solid media waste from production activities instead of incinerating it. This method involves filling biodegradable bags with the solid media waste and shipping them to a local composting facility, where the waste is mixed with vegetable and green waste. Once turned into compost, it is used by municipalities and individuals. This method is set to reduce the amount of incinerated waste by 80 metric tons annually.

Recycling the solvent methanol

At our site in Darmstadt, we have initiated various processes to prevent waste and recycle materials. In 2018, for instance, a solvent recycling process enabled us to recycle 211 metric tons of methanol, which is generated in the manufacture of excipients for cosmetic products and the amino acid glycine.

water management

Worldwide, the number of areas suffering from water scarcity is on the rise, yet our various facilities are dependent on a regular supply of water. At the same time, legislation governing water conservation is growing increasingly stringent. Our wastewater may contain traces of substances such as heavy metals or pharmaceutical active ingredients, which makes sustainable water management a key focus of our environmental stewardship.

Our approach to sustainable water management

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

To bolster sustainable water management practices, we use an assessment tool from the European Chemical Industry Council (Cefic) to evaluate water management practices and progress at our facilities. Based on this assessment, our sites draft a list of steps that need to be taken and implement them gradually. This often brings best practices to light which are then shared throughout the company.

In addition, we have set ourselves the goal of **reducing our water consumption at sites in water stressed areas by 10% by 2020**. To lay the groundwork for this undertaking, we are systematically analyzing our water 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 instruments help us determine, for instance, whether a site is located in a water-stressed area, i.e. those regions where the demand for water exceeds the amount available.

However, we also encourage efficient water management at facilities in areas of low or moderate water stress, which is why we are expanding our best practice sharing platform for sustainable water management. This tool provides examples of successful measures and enables our EHS officers to share ideas and lessons learned.

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 **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 the greatest potential for impacting local aquatic ecosystems.

How we organize our water management activities

Our Group function Environment, Health, Safety, Security, Quality (EQ) (see also Environmental stewardship) bears overall responsibility for water management. At our individual sites, our engineers work closely with our Environment, Health and Safety (EHS) managers to implement water conservation and wastewater treatment measures.

Our commitment: Standards and guidelines

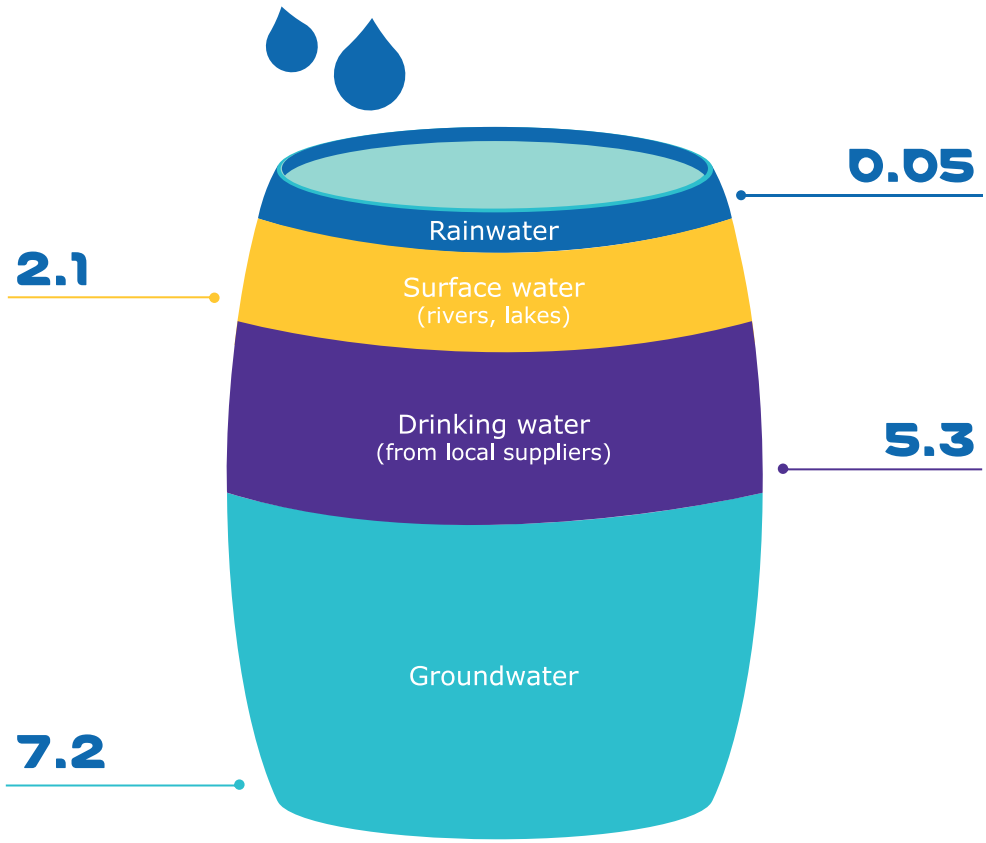
In 2018, we replaced our EHS "Water Protection" standard with two new Group-wide EHS standards: "Sustainable Water Management Part 1 – Waste water" and "Sustainable Water Management Part 2 – Water use and stormwater protection". These two new standards detail the way we are integrating **modern mechanisms of sustainable water management** into our management system. Both are based on the commitments we have made under the global Responsible Care® initiative. Guided by the "Waste water" standard, over the next several years our company will be rolling out a method of assessing our wastewater discharge into the ecosystem. The "Water use and stormwater protection" standard sets out Group-wide requirements for the responsible stewardship of water as a resource. It moreover establishes a way for us to manage the risks that arise from direct or indirect water abstraction. The standard even covers risks such as contaminated rainwater and flooding. Through internal audits, we verify compliance with our standards. All our sites are required to measure and assess the risks and impacts of the hazardous substances in their wastewater. They are moreover committed to handling water responsibly and to analyzing water abstraction and rainwater risks.

In addition to these measures, we are optimizing our production and purification processes to minimize the amount of pharmaceutical active ingredient residue in our wastewater. What's more, all our pharmaceutical manufacturing facilities have wastewater treatment plants and regularly assess the composition of their wastewater.

Water from our own sources

For the most part, we draw our process water from our own wells and drinking water from local suppliers and never do anything to 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) 2018[1]



[1] Excludes Consumer Health

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 in a once-through cooling system. For certain applications, we treat production wastewater and reuse it. In 2018, we reused a total of 24.4 million cubic meters of water.

New standards and comprehensive analyses

To reach our water management targets, in 2018 we introduced two new standards – "Sustainable Water Management Part 1 – Waste water" and "Sustainable Water Management Part 2 – Water use and stormwater protection".

We enforce the **Flagship Self-Assessment** of the European Chemical Industry Council (Cefic) and utilized it to survey our sites' water management practices in 2016 and 2017. In 2018, we evaluated this data and started assessing the environmental impacts arising from our discharged water. We constantly analyze the findings from these assessments to take specific steps at individual sites as needed.

Curbing water use

We seek to minimize our impact on the water situation at our sites. In 2018, we consumed 14,7 million cubic meters of water in total, with 883,213 cubic meters originating in water-scarce areas. Sites in areas of high water stress must **transparently report their water use** and identify the process steps that require a particularly high volume of water. In response to this information, we execute measures to help our individual facilities lower their water consumption.

This approach applies to our manufacturing sites in Mexico City (Mexico), Mollet del Vallès (Spain), Kankakee (Illinois, USA), and Norwood (Ohio, USA), which consume more than 30,000 cubic meters of water per year. At these sites, we aim to achieve a 10% reduction in annual water use by 2020, relative to 2014. The same goes for our facilities in Savannah (Georgia, USA), Hsinchu and Taoyuan (both in Taiwan), which are at increased risk due to local groundwater conditions or seasonal water scarcity. By the end of 2018, we had curbed our water use in water-stressed areas by approximately 10.8%. In 2018, our site in Savannah (Georgia, USA), for instance, cut water use by 3% by optimizing the pigment washing process in the local pressure drum filters. Our facility in Mollet (Spain) installed a filter system that prospectively will reduce local water use by 3% thanks to improved water circulation.

Grading of our water management practices

In addition to reporting on our climate action efforts, since 2016 we have also been reporting water-related data to the CDP (formerly 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 2018, we were awarded a "B-" for our water management practices (2017: B).

Water protection measures in India

We also implement measures to minimize our adverse impacts at sites not located in water-scarce regions. Our manufacturing facilities in India, for instance, abide by a zero-discharge policy that requires used water to first be treated before being drained back into the soil. Furthermore, we collect rainwater at our Bangalore site and let it seep back into the soil as well, thereby helping stop the water table from sinking further.

Our wastewater

In 2018, we generated 13.6 million cubic meters of wastewater, consisting of around 9.7 million cubic meters of freshwater wich we directly discharged into surface waters, and 3.9 million cubic meters of other water, wich afterwards was treated by external treatment plants or discharged through other disposal methods. Approximately 50% of our total wastewater was discharged by four sites. Our Gernsheim site in Germany discharges its purified wastewater into the Rhine, our Savannah (Georgia, USA) facility into the Savannah River and our Onahama site in Japan into the Pacific Ocean. The wastewater generated at our Darmstadt site is purified in our treatment plants before being fed into Schwarzbach-Ried Creek, a tributary of the Rhine River. In 2018, we discharged a volume of water representing approximately 4% of the average annual discharge of Schwarzbach-Ried Creek. We constantly work to meet the increasingly stringent **quality regulations set forth by law**, coordinating our efforts with the respective authorities.

Continuously monitoring wastewater

The two sustainable water management standards we introduced in 2018 also cover the topic of wastewater. We are in the process of implementing a method that will lay the groundwork for a **comprehensive wastewater assessment**. Our individual sites are responsible for identifying the corresponding areas of improvement and must also comply with the respective requirements imposed by local authorities.

Antibiotic residues in wastewater

We process antibiotic active ingredients on a small scale. 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. As a follow-up, we inspected the wastewater pretreatment facility at our site in Mollet (Spain). The analysis revealed that on site, antibiotic residues are below the detection limit, meaning that the wastewater has a high degree of purification.

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 efforts. This approach allows us to protect both our workforce and the people in the vicinity of our sites. Furthermore, high-performance safety systems help minimize production errors, which in turn lowers the risk of financial losses.

Our approach to plant and process safety

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

How we organize our plant and process safety

Our Group function Environment, Health, Safety, Security, Quality (EQ) oversees plant and process safety within our company (Environmental stewardship), while at the operational level this responsibility falls to our individual sites and their EHS managers. **Fire protection** is paramount to the safety of our plants and processes.

We conduct **internal EHS audits** to review the safety of our plants and processes. During this process we also evaluate selected 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, as are our own facilities, with the auditor verifying whether the specified corrective actions have been taken.

Our commitment: Standards and legislation

All our sites are subject to the same requirements for plant and process safety as set forth by our Group-wide EHS Plant and Process Safety standard, which describes the safety rules for all production plants and warehouses. This document encompasses the entire life cycle of a plant from cradle to grave. 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 measures 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. As needed, this process can be used to develop and implement measures to minimize such risks. Since 2016, the Group Procedure Hazard and Operability Study has clearly defined the individuals responsible for pinpointing potential hazards during a project as well as the manner in which hazards should be identified and documented.

The 2012 EU directive on the control of major accident hazards involving dangerous substances (aka Seveso III) was transposed into German law at the end of 2016 and entered into force on January 14, 2017. Numerous amendments to this directive have affected regulations such as the German Hazardous Incident Ordinance (aka 12th BImSchV). In response to these amendments, in 2017 we updated the existing processes and documents on the **assessment and communication of potential hazards** posed by our production plants and warehouses. On request, members of the public may access our revised safety documentation at any time. We furthermore fulfill our obligation to keep the public informed through forums such as neighborhood meetings, where residents learn about the potential hazards of industrial accidents, common accident scenarios, and the measures needed to prevent or mitigate their consequences. Further information is contained in our Hazardous Incident Brochure, which we update on a three-year basis and send to approximately 17,000 households in the vicinity of our Darmstadt site. The brochure 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 such as Billerica (Massachusetts, USA) and Chilworth (United Kingdom). In doing so, we record both accidents and near misses. We investigate each individual incident before devising appropriate countermeasures in an effort to prevent such accidents from repeating themselves in the future.

When it comes to performance indicators, we attach particular importance to the EHS Incident Rate (EHS IR) for recording and evaluating all minor and major incidents, along with the associated Loss of Primary Containment (LoPC) indicator. Also important is the EHS Leading Rate (EHS LR), which is calculated based on an analysis of near misses and critical situations.

In 2018, the European Chemical Industry Council (Cefic) and the International Council of Chemical Associations (ICCA) jointly resolved to tighten the **reporting thresholds** of incidents such as near misses. We expect that this will result in more incidents being reported going forward.

In collaboration with our individual business sectors, we have defined specific targets for our EHS performance indicators. The Executive Board receives semi-annual reports detailing the progress of these indicators.

EHS Incident Rate

Since 2013 we have been tracking the EHS Incident Rate, an indicator that synthesizes the following four categories of data:

- 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 instance 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.

3.1

was our EHS IR in 2018, which represents a slight decrease compared to the previous year's result (2017: 3.4).

In 2018, we recorded no significant incident-related spills across all production, research and warehouse sites.

Risk Management Process

Our Risk Management Process guides all our sites in identifying and assessing risks. As part of this process, for instance, we conducted a comprehensive audit of our Performance Materials site in Suzhou (China) following its acquisition in 2014. We subsequently took steps to address the shortcomings identified in the audit, all of which we successfully completed in the course of 2018.

Training and sharing lessons learned

The safety of our plants and processes is predicated on the **successful interaction between man and machine**, which is why it is crucial for us to educate our employees and provide them with regular training. Our internal continuing education programs for site, production, engineering, and EHS officers also cover plant and process safety. Likewise, we also train newly hired EHS managers in plant and process safety during their onboarding. In 2018, 23 new employees completed the onboarding process.

In the interest of improving safety, it is extremely important to **share best practices and lessons learned**, an approach that enables all our production sites to learn from incidents at other facilities and thereby implement preventive measures. Once a month, for instance, site directors and EHS managers participate in safety leadership calls to share new lessons learned. Additionally, regular discussion rounds are held by the EHS managers at our sites.

Biodiversity

The increasing loss of biodiversity is a global challenge that impacts our company as well. After all, we depend on ecosystems for natural resources such as raw materials. Prime examples include red algae (Polysiphonia elongata), whose cytoplasm is used in our cosmetic active RonaCare® RenouMer, and the seeds of the common poppy (Papaver rhoeas), whose extracts can be found in our cosmetic active RonaCare® Poppy SE. We therefore have a vested interest in preserving and promoting biodiversity.

Our holistic approach to preserving biodiversity

Across all our sites, we consider the ecosystems in our immediate vicinity with the goal of minimizing our direct impacts. With these considerations in mind, our wide array of **environmental sustainability efforts** such as water management and climate action help conserve biodiversity.

Our own 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 public sources such as neighbors and non-governmental organizations (NGOs).

How we preserve biodiversity at our sites

Our efforts to protect biodiversity are organized by our Group function Environment, Health, Safety, Security, Quality (EQ) (Environmental stewardship). In designing new sites and plants, we always include our Environment, Health and Safety (EHS) unit, which is responsible for reviewing the ecological aspects of a project. EHS is on hand to assist all sites with support and advice, and furthermore performs detailed environmental impact assessments for large-scale projects.

Our commitment: Standards and agreements

Substances that compromise biodiversity should not end up in the environment, which is why we design and operate our plants in accordance with our Group-wide safety and environmental requirements. For instance, our Corporate Environment, Health and Safety (EHS) standards define the way we manage waste and wastewater treatment as well as how we ensure plant safety. To minimize our impact on the environment, we furthermore adhere to internal standards governing air emissions, water protection and energy management.

The Nagoya Protocol is an international supplementary agreement to the UN Convention on Biological Diversity (CBD), which was transposed into German law in 2015. The aims of the CBD include the **conservation of biodiversity** and the sustainable use of its components. Within our company, for instance, the Nagoya Protocol plays a key role in our product development efforts, and we always apply the agreement's requirements when using genetic resources originating in countries covered by the protocol.

Nagoya Protocol and access and benefit sharing

We are highly vested in implementing the Nagoya Protocol. A key part of this agreement is access and benefit sharing, which ensures that countries providing genetic resources – generally developing nations – also benefit from their use. In 2018, we developed processes aimed at systematically assessing instances of access and benefit sharing and dealing with them according to common standards. In addition to these efforts, we implemented further requirements of the Nagoya Protocol, establishing a Group-wide standard that details our **approach to genetic resources** originating in countries covered by this agreement.

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 ending up in the ecosystem. We are working to increase the **percentage of unsealed surfaces** insofar as safety requirements permit.

Our Darmstadt site is a prime example of our commitment to preserving biodiversity. We conduct regular assessments of our facilities there to evaluate the site's nature conservation efforts, using the results to help develop an action plan for improving the surrounding ecosystem for plants and animals. For instance, we have created places of refuge for insects and reptiles, and around 30% of the premises (0.4 square kilometers) have now been greened. Ecologically friendly spaces are not a new idea for us, having developed a green open space concept for our Darmstadt site as early as 1995. Moreover, we have worked with the City of Darmstadt to draft a planning guideline that stipulates the ecological optimization of our site's green areas. In addition, **we survey the environment around potential construction sites** to assess the respective flora and fauna situation there.