MERCK

CORPORATE RESPONSIBILITY REPORT 2019

content

Letter from the CEO

Dear Readers,

What drives you? We all have goals and values that inform our actions - this holds true for people and companies alike. At Merck, the force that drives us is our purpose: We are curious minds dedicated to human progress.

For us, acting responsibly means respecting the interests of our employees, customers, investors, and society. That is why we support the United Nations Global Compact and its principles, which cover human rights, labor standards, environmental protection, and anti-corruption. For example, in 2019 we adopted the Group-wide "Social and Labor Standards Policy", which addresses the guidelines of the International Labour Organization (ILO), emphasizes fair and respectful treatment of one other and is an effective tool against discrimination in the workplace.

In 2019, we also signed the "Women's Empowerment Principles", an initiative of UN Women and the UN Global Compact to support women.

Diversity makes us stronger, which is why we have decided to promote it. For example, we launched training courses designed to help participants identify their own unconscious biases. We want to give all brilliant ideas equal consideration, regardless of whether they are from colleagues in Darmstadt or Shanghai.

Collaboration is the foundation for a good future. We want our business activities to create shared value that is both measurable and makes a recognizable contribution to society. Therefore, as a company we support the United Nations Sustainable Development Goals, which include, for example, "Good Health and Well-being" and "Quality Education".

I firmly believe that this is a day and age in which we can find answers to many societal challenges, not least due to the rapid development of data processing, among other things. At the same time, new research approaches also raise new questions – including ethical issues. For example, to find responsible ways to deal with difficult topics, we have been relying on the Merck Bioethics Advisory Panel for a decade now.

In 2019, this international expert committee focused particularly on digital ethics. If we develop new business models based on artificial intelligence and Big Data, we need clear guidelines, for example in handling patient data. As a result of these discussions, we have established a Digital Ethics Board to address ethical issues related to data use and algorithms.

This example also shows that we want to maximize the benefits of our work – and minimize the risks. The same applies with regard to environmental impact. In the next two years, for example, we will reduce by one-fifth the amount of polystyrene packaging used for products from our Life Science business sector and increase the proportion of recyclable materials. We are currently working intensively to embed the various aspects of sustainability in the strategies of our business sectors. This includes a new climate target that we will set in 2020.

Last but not least, we at Merck want to make a positive contribution, both above and beyond our daily business. As a science and technology company, we are ideally positioned to do so. In 2019, we presented the first edition of our Future Insight Prize for visionary research. Two American scientists received a total of one million euros for their work in the fight against infectious diseases. The recent outbreak of the novel coronavirus has once again underscored the importance of pandemic prevention.

Together with the World Health Organization, we are also fighting the insidious worm disease schistosomiasis, which claims around 200,000 lives every year. We have already donated a total of more than one billion praziquantel tablets for the treatment of this disease. In addition, we are working on a new pediatric formulation of the active ingredient for very young children and seeking new ways to diagnose and treat the disease. Our long-term goal is to eliminate schistosomiasis. And we are pressing ahead with malaria prevention and the war against counterfeit medicines. Apart from our efforts to help patients, we are also advocating for the people taking care of them. As part of our worldwide "Embracing Carers" initiative, we want to raise awareness for the often overlooked needs of people helping family members requiring nursing care.

For me personally, it is highly motivating to be part of a team that makes all this and much more possible. I hope you find this report both inspiring and informative.

Sincerely,

Stefan Oschmann
Chairman of the Executive Board and CEO

strategy & Management

Within this chapter:

company profile

Part of the non-financial report

We are Merck, a vibrant science and technology company. Science is at the heart of everything we do. It drives the discoveries we make and the technologies we create. We make a positive difference in the lives of millions of people every day. In Healthcare, we discover unique ways to treat some of the most challenging diseases such as multiple sclerosis (MS) and cancer. Our Life Science experts develop tools and solutions, which are aimed at enabling scientists achieve breakthroughs even faster. And in Performance Materials, we develop science that sits inside technologies and changes the way we access and display information.

Everything we do is fueled by our belief in science and technology as a force for good. A belief that has driven our work since 1668, and will continue to inspire us to find more joyful and sustainable ways to live. We are curious minds dedicated to human progress.

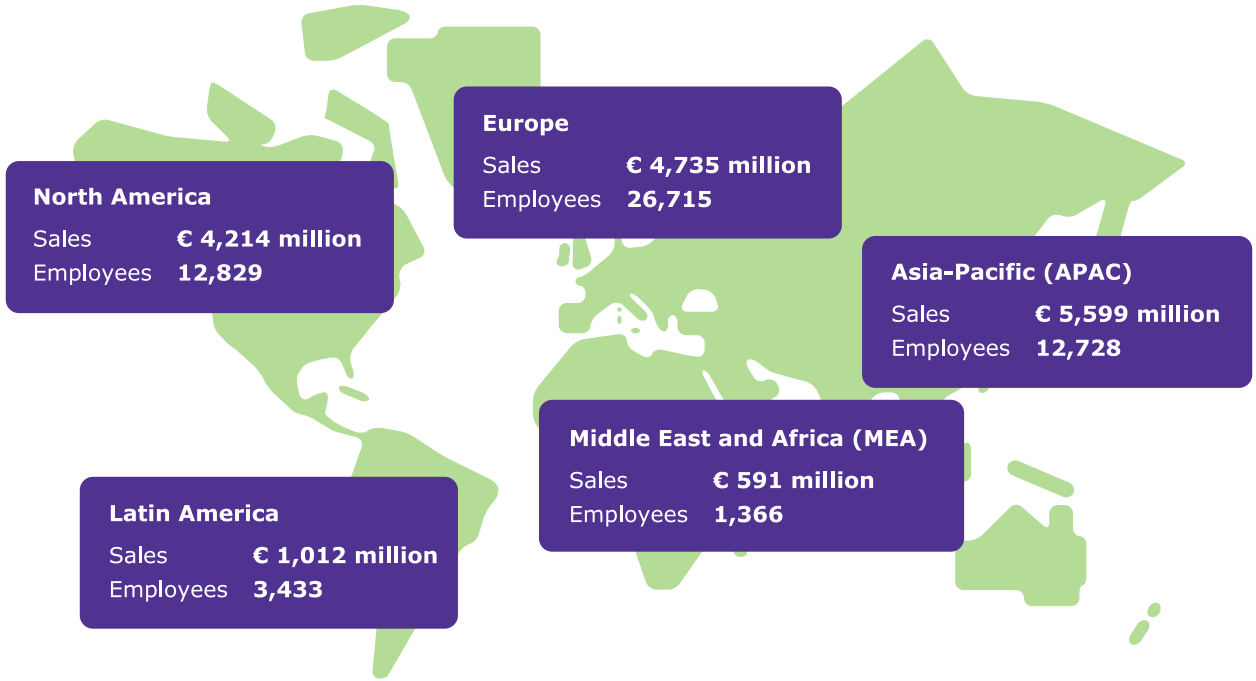
We are Merck

We hold the global rights to the Merck name and brand. The only exceptions are Canada and the United States. In these countries, we operate as EMD Serono in the biopharmaceutical business, as MilliporeSigma in the life science business, and as EMD Performance Materials in the high-tech materials business.

Apart from our three business sectors, our reporting presents the five regions: Europe, North America, Asia-Pacific (APAC), Latin America as well as Middle East and Africa (MEA). As of December 31, 2019, we had 57,071 employees worldwide, which compares with 51,749 on December 31, 2017.

In 2019, our 222 subsidiaries with employees in 66 countries generated sales of € 16.2 billion. Our 103 production sites are located across 21 countries.

Employees and sales by region – 2019



Group structure

Merck comprises three business sectors: Healthcare, Life Science, and Performance Materials. Our Healthcare business sector – the biggest among our three business sectors – comprises the two businesses Biopharma and Allergopharma.

Our Biopharma business discovers, develops, manufactures and markets innovative pharmaceutical and biological prescription drugs to treat cancer, multiple sclerosis (MS), infertility, growth disorders, and certain cardiovascular and metabolic diseases. Biopharma is the larger of our **Healthcare** businesses and operates in four franchises: Oncology, Neurology & Immunology, Fertility and General Medicine & Endocrinology. Our R&D pipeline positions us with a clear focus on becoming a global specialty innovator in oncology, immuno-oncology, and immunology including MS. Our allergy business Allergopharma is a leading company in the field of allergy immunotherapy (AIT) in Europe. For high-precision, effective allergy therapy, we offer comprehensive diagnosis solutions as a basis for individual treatment concepts. Our AIT products concentrate on causal treatment of type 1 allergies such as allergic rhinitis (for example, hay fever) and allergic asthma to meet patients' needs.

In **Life Science**, with our Research Solutions, Process Solutions, and Applied Solutions business units, we are a leading, worldwide supplier of tools, high-grade chemicals, and equipment for academic labs, biotech, and biopharmaceutical manufacturers, as well as the industrial sector. Research Solutions provides our academic customers with the chemicals and tools needed to make scientific discovery easier and faster. Process Solutions provides drug manufacturers with process development expertise and technologies, such as continuous bioprocessing. Applied Solutions offers both testing kits and services to ensure that our food is safe to eat and water is clean to drink. Our portfolio comprises more than 300,000 products, ranging from lab water systems to genome-editing tools, antibodies, and cell lines, as well as end-to-end bioprocessing systems to support the manufacturing needs of both emerging biotech and large pharma companies. For example, our ZooMAb® recombinant antibodies bring the next generation of polyclonal and monoclonal antibody technology and production to the industry, specifically engineered for greater specificity, higher consistency, and maximum stability. Another example is our BioReliance® End-to-End Solutions, a service offering for process development and manufacturing for emerging biotech companies. Additionally, our Life Science business sector has built the expertise to further develop BrightLab™, our digital ecosystem for complete lab management.

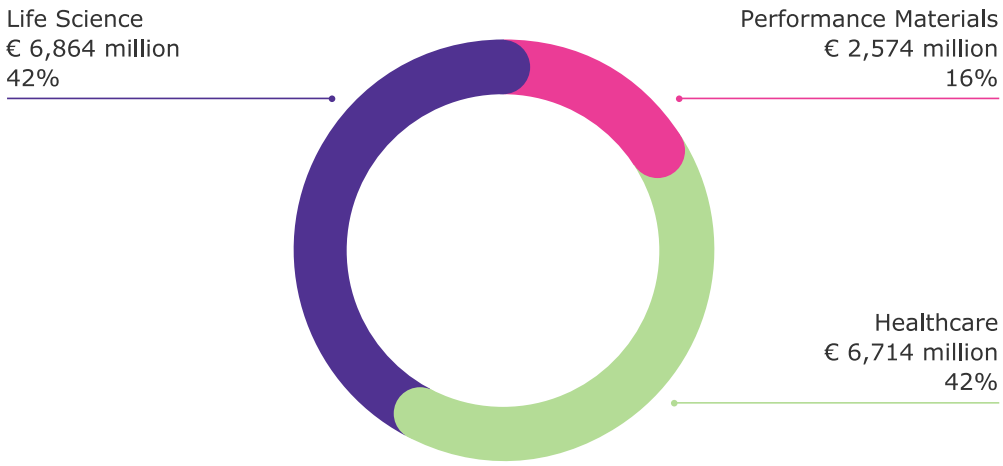
Our **Performance Materials** business sector comprises the specialty chemicals business of Merck. We offer innovative solutions especially for the electronics industry — for microchips and displays — and for surfaces of every kind. The business sector consists of three business units: Semiconductor Solutions, Display Solutions, and Surface Solutions. Comparing Performance Materials with a smartphone, Display Solutions represents the user interface, Semiconductor Solutions the intelligence, and Surface Solutions the aesthetics.

We are well on track in the execution of our five-year Bright Future transformation program announced in 2018, with which we are adapting to new market realities and customer requirements.

With the completion of the acquisition of Intermolecular on September 20, 2019, and Versum Materials on October 7, 2019, we reached two major milestones on our journey to transform Performance Materials into a strong solutions provider and leading player in the electronic materials market. Intermolecular has application-specific materials expertise and platforms for accelerated learning and experimentation with a powerful analytical infrastructure, all of which perfectly complement our portfolio. Together, we are well-positioned to deliver next-generation digital devices for a smarter, safer, and more connected world. Versum Materials is a leading global provider of innovative, high-purity process chemicals, gases, and equipment for semiconductor manufacturing. The merger should transform Merck into a leading provider of electronic materials for the semiconductor and display industries. The Intermolecular and Versum Materials businesses are being integrated into the Semiconductor Solutions business unit.

With the acquisition of Versum Materials and Intermolecular, Semiconductor Solutions is now the largest business unit within Performance Materials. It consists of two dedicated units: Semiconductor Materials and Delivery Systems & Services. Our Semiconductor Materials unit supplies products for every major step in the wafer manufacturing process, including doping, lithography, patterning, deposition, planarization, etching, and cleaning. Specialty cleaners and conductive pastes for semiconductor packaging round off the portfolio. The Delivery Systems & Services (DS&S) business enables the safe and responsible handling of gases and liquid chemicals for electronic manufacturers. It focuses on the development and deployment of safe and reliable delivery equipment. This allows our materials to be handled with the highest quality and safety standards for our customers. Our Display Solutions business unit comprises the liquid crystals, OLED (organic light-emitting diodes), photoresists, and liquid crystal windows businesses. In the Surface Solutions business unit, we provide our customers with solutions that help them to create innovative surfaces of all kinds. Our materials enable more beautiful, more resistant, and more effective products.

Net sales by business sector – 2019



Governance

Based in Darmstadt, Germany, our company operates in the legal form of a corporation with general partners (Kommanditgesellschaft auf Aktien – KGaA). The general partner E. Merck KG holds around 70% of the total capital of Merck KGaA (equity interest); the shareholders hold the remainder, which is divided into shares (share capital). Our shares have been included in the DAX® 30, the blue-chip index of the Deutsche Börse, since 2007. In September 2008, our company was added to the FTSE4Good Index, a sustainability index that assesses the social, ecological and ethical conduct of companies.

Group strategy

Throughout the past years, Merck has grown significantly through a series of strategic moves that have enabled us to develop into the vibrant science and technology company we are today. We have systematically and continuously strengthened and focused our portfolio of innovative science and technology throughout our business sectors. In Healthcare we divested our Generics business (2007) to focus on highly specialized products and acquired Serono (2007) to expand our pipeline and strengthen our business. This focused approach has continued until today with the divestments of the Biosimilars business (2017) and Consumer Health business (2018), so that we can increase our efforts on our Oncology, Immuno-oncology and Immunology franchises. Within Life Science, we have significantly transformed to become a diversified industry leader through the acquisition of Millipore (2010) and Sigma-Aldrich (2015). During the last years, Performance Materials has continued to deliver profitable growth and a significant cash contribution, and we evolved this business further into attractive science and technology areas such as semiconductor materials (Semiconductor Solutions) through the acquisition of AZ Electronic Materials (2014) as well as Intermolecular and Versum Materials (both in 2019), which also helped us further diversify our product portfolio that was strongly driven by liquid crystals. Our Group Strategy considers certain foundational elements such as, first and foremost, a risk diversification strategy that ensures that we are not over-exposed to any single customer, industry or geography. We want to be a forward-thinking company generating long- term sustainable value. We focus our efforts and activities on innovative areas to add maximum value to the future of science and technology.

You can find more information on our strategy in our Annual Report 2019.

CR strategy

Part of the non-financial report

Major global trends are fundamentally transforming societies and people's lives while also raising the bar for responsible corporate citizenship. We are tackling the major issues facing society today, including the growing global population, increasing life expectancy, resource scarcity, and climate impact mitigation. In developing and commercializing new technologies, our ambition is to generate added value for both our company and society as a whole.

Our approach: Creating shared value

As a leading science and technology company, we know that our business operations impact our environment and the people around us, which is why we have made **responsible conduct** a pillar of our company culture. This approach is also the foundation of our sustained business success. Through innovative top-quality products from our Healthcare, Life Science and Performance Materials business sectors, we help solve global challenges while also bolstering financial performance.

Our Group strategy is geared to profitable growth and thus business success, which means respecting the interests of employees, customers, investors and the community while also doing our best to mitigate ethical, economic and social risks. Our corporate responsibility (CR) strategy is derived from our Group strategy and focuses our resources on those areas where we can have the greatest impact. All our CR activities can be summed up as "good corporate citizenship", which most importantly means listening and taking action.

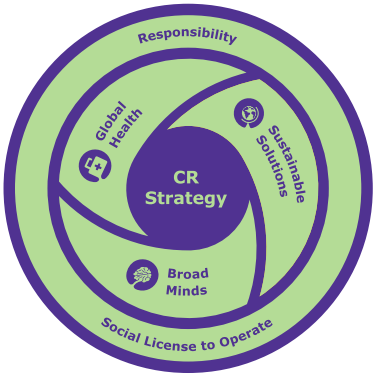
We take on responsibility for our products, the environment and our neighbors and aspire to develop products and services that can help **solve the major challenges** of our time. With safety and ethics mattering just as much to us as business success, we work to minimize the environmental impacts of our production activities, which necessitates safe manufacturing techniques, high environmental standards and strict quality management. Furthermore, we aim to strengthen our company by recruiting, developing and motivating talented employees. We want to serve as an example for ethical conduct and actively contribute to the communities we live in.

In order to stay abreast of new **global trends and challenges**, we engage in dialogues and initiatives, share lessons learned and best practices with other organizations in our industry and assess media and news coverage. This allows us to minimize risks while also leveraging new business opportunities.

In 2019, we moved forward with the realignment of our CR strategy, which had started in 2018. We are increasingly pursuing a **shared value approach** and are working to make the value we create for the company and for society measurable.

Our CR strategy builds on our ambition to be a responsible corporate citizen, ensuring our social license to operate and maintaining our competitive edge. We believe that research and technology hold the key to solving global challenges and see our role in helping to shape society. In aligning our activities with the areas where we can have the **greatest impact**, we have defined three strategic spheres of activity as the center of our CR strategy – Global Health, Sustainable Solutions and Broad Minds.

CR strategy



Global Health

We develop and manufacture medicines and smart devices that offer patients a broad array of healthcare solutions. Health awareness plays a key role in our approach to improving access to these healthcare solutions. For this reason, we regularly conduct disease awareness campaigns worldwide, drawing on a wealth of expertise from our businesses. Additionally, we collaborate with a range of partners to reach out to people in low- and middle-income countries. For example, we are engaged in the fight against schistosomiasis, a parasitic infection. Through our Global Health Institute, we are developing diagnostics, therapies and preventive solutions to address malaria as well as schistosomiasis and other neglected tropical diseases. You can find more information under "Health for all".

Sustainable Solutions

We are constantly working to improve the sustainability footprint of our products to include their use phase as well. These efforts also help our customers achieve their own sustainability goals. To this end, we have established systematic approaches for product development such as Design for Sustainability. A program of our Life Science business sector, this initiative allows us to assess the sustainability of products under development through techniques such as life cycle analyses. You can find more information under "Sustainable product design".

Broad Minds

As a science and technology company, we endeavor to excite people about science, inspire curiosity and help their creativity take flight. Our goal is to bolster the reputation of our company in the science community, especially in those areas where we have particular expertise. We not only support educational programs for schools, but also back pioneering research at institutes of higher learning. Because music and literature inspire people, we also support a number of cultural initiatives worldwide. Creativity and curiosity are the bedrock of science, culture and art and also underpin our holistic approach. You can find more information under "Broad Minds".

Corporate responsibility embedded in governance

Our CR strategy is approved by our Executive Board, which meets regularly to make decisions regarding our CR goals and reporting. Also tasked with overseeing corporate responsibility, our Group Corporate Affairs function reports to the Chairman of the Executive Board. We additionally have a CR Committee in place to steer the implementation of our CR strategy and submit recommendations regarding **CR goals** to the Executive Board. While our Executive Board Chairman bears overall responsibility for this body, it is led by the head of our Group Corporate Responsibility unit and consists of representatives from our business sectors as well as from relevant Group functions such as EQ, HR, Compliance, and Procurement.

Our CR Committee also reviews our CR strategy to ensure that it covers the issues material to our company. In doing so, we draw on regular input from our stakeholders as well as the results of materiality analyses. This committee also defines measures to enact our CR strategy and assesses the success of these efforts. In addition, it ensures that the initiatives of our business sectors, Group functions and subsidiaries align with our Group-wide CR strategy. The measures adopted by the CR Committee are implemented by our subject matter experts and by interdisciplinary project teams.

In 2019, the CR Committee met twice, focusing its attention on human rights, environmental and social standards across the supply chain, animal welfare, bioethics, and the evolution of our CR strategy and its implementation.

Understanding and improving the impacts of our operations

We do our best to mitigate the ethical, financial and legal risks of our business activities, thereby advocating for and ensuring our social license to operate. To this end, we have comprehensive structures and systems in place to ensure compliance with legal requirements, along with ethical, social and ecological standards, all of which are explained in detail in the individual sections of this report.

sustainable development goals

The United Nations Sustainable Development Goals (SDGs) are aimed at all countries and organizations across the globe. We are also helping to achieve these objectives, doing so in nearly every field in which we operate.

Our approach

The international community has defined 169 targets for the 17 SDGs in order to facilitate specific actions necessary to achieving the SDGs. As a member of global society, we see ourselves obligated to support the implementation of the SDGs.

What we are doing

Our CR efforts particularly focus on good health and well-being (SDG 3), quality education (SDG 4) and affordable and clean energy (SDG 7) (see diagram below).

But we not only help tackle global challenges within the areas of "Global Health", "Sustainable Solutions" and "Broad Minds". Our contributions towards achieving the SDGs have positive effects beyond the strategic spheres of activity established in our Corporate Responsibility strategy. Our 2019 CR Report illustrates the SDGs and targets we specifically support through our management practices and projects.

SDG 3: Good health and well-being

Ensure healthy lives and promote well-being for all at all ages.

Across the globe, two billion people lack access to medicines, with an estimated 400 million lacking access to effective and affordable essential health services. Given this reality, we are working to help rectify the situation through our Global Health Strategy. However, recognizing that we cannot solve these challenges alone, we have joined forces with strong partners to work towards creating solutions.

Target 3.3: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.

- Our approach to improving healthcare for underserved populations
- Strategy for preventing and treating infectious diseases
- Our fight against schistosomiasis
- Our fight against malaria
- Alliances for better access to health
- Access to Medicine Index ranking 2018

Target 3.B: Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all.

- Our approach to sharing and protecting intellectual property
- Collaboration on open innovation: WIPO Re:Search
- Provide a solid basis for access to healthcare
- Drugs for Neglected Diseases initiative
- Research work on novel therapies, diagnostics, technologies and prevention to combat communicable diseases
- Consortium for the development of a pediatric praziquantel formulation

SDG 4: Quality education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

We invest in high-quality education, which applies above all to the vocational and advanced training of our employees. This is how we offer an attractive environment for development and remain competitive. In addition, we foster the education of young people so as to empower them to help shape society.

Target 4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.

- Community outreach in the mica supply chain

Target 4.3: By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.

- Vocational training and dual education programs
- SPARK: igniting a passion for science in the next generation
- Continuing education for teachers and school partnerships
- Junior labs at the Technical University Darmstadt

Target 4.4: By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

- Employee learning and education
- Trainee programs and job orientation
- Vocational training and dual education programs
- Integrating refugees through training

SDG 5: Gender equality

Achieve gender equality and empower all women and girls.

Gender equality is essential to creating a diverse workforce and an inclusive company culture, which is why we do not tolerate discrimination. In addition, we promote and advance women in low- and middle-income countries through a variety of initiatives.

Target 5.1: End all forms of discrimination against all women and girls everywhere.

- Our commitment: Group-wide Social and Labor Standards Policy
- Our commitment: Industry-wide initiatives and regulations
- Taking action against discrimination

Target 5.5: Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.

- Our approach to diversity and equal opportunity
- Women in leadership roles: Requirements and targets
- Promoting women leaders and talent
- Rooting out unconscious bias
- Networks to bolster diversity
- Healthy Women, Healthy Economies initiative

SDG 6: Clean water and sanitation

Ensure availability and sustainable management of water and sanitation for all.

Sustainable water management is a key component of our environmental stewardship. In withdrawing or discharging water, we aim to impact the aquatic ecosystems near our sites as little as possible and to lower our water consumption, especially in water-stressed areas. Furthermore, we are committed to ensuring that people have access to clean, safe drinking water.

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

- Clean water for Chinese schools
- Schistosomiasis health education project

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

- Assessing our water management practices
- Avoiding antibiotic residues in wastewater

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

- Curbing water use

SDG 7: Affordable and clean energy

Ensure access to affordable, reliable, sustainable and modern energy for all.

Efficient energy management is absolutely essential to mitigating our climate impact, which is why we invest in renewable energies and endeavor to develop technologies that are more energy-efficient.

Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix.

- Buying renewable energy

Target 7.3: By 2030, double the global rate of improvement in energy efficiency.

- Development of energy efficient building solutions

SDG 8: Decent work and economic growth

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

In our Human Rights Charter, we acknowledge our responsibility to uphold and protect human rights and are constantly working to integrate human rights due diligence into our processes. Our dedication to appropriate and fair labor standards is a fundamental component of this responsibility. We expect our suppliers and service providers to comply with social standards that are primarily derived from the core labor standards of the International Labour Organization (ILO) and the United Nations Global Compact. We also maximize resource efficiency in our water and waste management practices and product development activities, in a bid to promote sustainable economic growth.

Target 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programs on sustainable consumption and production, with developed countries taking the lead.

- Our approach to waste and recycling
- Systematic waste reduction
- Advancing the circular economy
- Curbing water use
- Our sustainable packaging strategy

Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities and equal pay for work of equal value.

- Performance-based pay

Target 8.7: Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms.

- UK Modern Slavery Statement
- Our approach to human rights due diligence
- Our commitment: Guiding principles, Human Rights Charter and laws
- Our approach to making our supply chains more sustainable
- Our approach to responsibility in the mica supply chain

Target 8.8: Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.

- Our approach to human rights due diligence
- Our commitment: Guiding principles, Human Rights Charter and laws

SDG 9: Industry, innovation and infrastructure

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

We are always on the lookout for pioneering developments and trends. We develop products and technologies that enrich people's lives. New technologies and the advance of digitalization in particular enable us to create innovative products, services and business models.

Target 9.4: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

- Our approach to environmental stewardship
- Material investments in environmental impact mitigation
- Climate impact mitigation

SDG 10: Reduced inequalities

Reduce inequality within and among countries.

We leverage our expertise from our Healthcare business sector to improve access to health worldwide, particularly for people in low- and middle-income countries. Moreover, we believe that a diverse workforce makes us more innovative and successful.

Target 10.2: By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

- Our approach to diversity and equal opportunity

Target 10.A: Implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with World Trade Organization agreements.

- Shared data platform for medicine donations
- CURAFA™ Points of Care
- Low-price second brands
- Generics

SDG 11: Sustainable cities and communities

Make cities and human settlements inclusive, safe, resilient and sustainable.

We take on social responsibility. Focusing especially on those areas where we can best leverage our expertise, we primarily support health, education and cultural projects. Furthermore, we provide disaster relief and assist people in need in the countries where we operate, especially communities in the immediate vicinity of our sites.

Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

- Environmental certification according to ISO 14001:2015
- Reducing the environmental impacts of waste

SDG 12: Responsible consumption and production

Ensure sustainable consumption and production patterns.

Respect for the environment is the bedrock of our approach to sustainability. We see it as our duty to not only conserve resources in developing and manufacturing our own products, but also to help our customers make their products more sustainable and more efficient.

Target 12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

- Our approach to sustainable product design
- Green chemistry assessment tool
- Our approach to safe chemical products
- Safety analysis during product development
- Environmentally friendly solvents
- Our approach to plant and process safety
- Our approach to safe transport and storage

Target 12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

- Our approach to waste and recycling
- Systematic waste reduction
- Reducing the environmental impacts of waste
- Advancing the circular economy

Target 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

- Our CR strategy
- Annual reporting cycle

SDG 13: Climate action

Take urgent action to combat climate change and its impacts.

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 continuously working to reduce these emissions to mitigate our impact on the climate. In addition, we encourage our employees to do their part to preserve the climate.

Target 13.2: Integrate climate change measures into national policies, strategies and planning.

- Development of a new climate target
- Climate impact mitigation

Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

- Employees and climate action

SDG 14: Life below water

Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Our wastewater may contain traces of substances such as heavy metals or active pharmaceutical ingredients. For us, sustainable water management means not negatively impacting the aquatic ecosystems from which we obtain freshwater, or into which we discharge treated wastewater.

Target 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

- Wastewater continuously monitored
- Avoiding antibiotic residues in wastewater
- Alternatives to microplastics in cosmetics

SDG 15: Life on land

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss.

Unsealed surfaces represent an important habitat for plants and animals and we think it essential to seal as little surface area as possible. Furthermore, we comply with the stipulations of the Nagoya Protocol and German law that govern natural resource access and benefit sharing. Thus, we ensure that countries providing genetic resources and expertise also benefit from their use.

Target 15.6: Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.

- Responsible use of natural resources

SDG 16: Peace, justice and strong institutions

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

First and foremost, responsible entrepreneurship means complying with laws, regulations and ethics standards. For us, this is key to maintaining our reputation as an attractive employer and reliable business partner. We also expect fair and responsible conduct from our employees, suppliers and customers.

Target 16.2: End abuse, exploitation, trafficking and all forms of violence against and torture of children

- UK Modern Slavery Statement
- Our approach to human rights due diligence
- Our commitment: Guiding principles, Human Rights Charter and laws
- Our commitment: Group-wide Social and Labor Standards Policy

Target 16.5: Substantially reduce corruption and bribery in all their forms.

- Our approach to compliance
- Our approach to responsible governance

Target 16.B: Promote and enforce non-discriminatory laws and policies for sustainable development.

- Our commitment: Group-wide Social and Labor Standards Policy
- Industry initiatives and regulations for diversity and gender equality

SDG 17: Partnerships for the goals

Strengthen the means of implementation and revitalize the global partnership for sustainable development.

To reach our goals and drive sustainable development within our company and beyond, we need strong partners. We therefore collaborate with a wide array of organizations, federations, associations, and networks to tackle the challenges of today and tomorrow.

Target 17.6: Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.

- Our approach to stakeholder dialogues
- Stakeholder dialogues on health for all

Target 17.9: Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation.

- Collaboration with WHO
- Education partnership with the NALA Foundation
- Consortium for the development of a pediatric praziquantel formulation
- Partnership to develop new lead programs for antimalarials

stakeholder dialogue

Our business activities converge with the interests of many people, which is why engaging with our various stakeholders is particularly important to us. Through this dialogue, we communicate our decisions and actions transparently so as to ensure our social license to operate. We aim to unite divergent interests as far as possible as well as build and sustain trust.

Dialogue at various levels

Our key stakeholders include our employees, customers and business partners, patients, the Merck family as the majority owner of our company, shareholdersand our suppliers. We maintain continuous contact with these groups through a variety of channels, such as stakeholder surveys, issue-specific dialogues, roundtable discussions, and information forums. We also engage stakeholders through our advocacy work and industry coalitions.

Our stakeholders

Stakeholder surveys

We regularly conduct surveys among our employees and customers. We want to know which issues they consider to be of importance to our company today and tomorrow, and how they rate our performance in addressing the individual areas. We also seek to understand their expectations of us as a responsible company.

In 2019, we conducted a **Group-wide employee survey** in 22 languages. Around 47,000 employees took part, resulting in a response rate of 88%. We also conducted a survey among our Life Science customers to understand which of our material topics are most important to them.

Roundtables and informational forums

At our major sites, we conduct roundtable discussions and informational forums for local residents. Since 1994, we have been holding an annual public planning forum in Darmstadt (Germany) to discuss the development of our site with members of the city council, local authorities and the community. In 2019, the forum focused on our investments at the site, such as the new Performance Materials Research Center or the new daycare center, which will both be completed in 2020.

Issue-specific dialogues

Our business operations in Healthcare, Life Science and Performance Materials intersect the interests of various societal groups, with whom we engage via questionnaires, workshops and seminars, as well as at major conferences. Our departments organize these exchanges at the local, national and international level, depending on the topic and degree of importance. Beyond this, we are also involved in industry networks and participate in symposia. In 2019, we took part in numerous dialogues on material topics with our stakeholders. These include:

- **Bioethics:** In May 2019, we hosted a "Dialogue on Ethics of Genome Editing" for policymakers. 45 political stakeholders engaged in an open debate on the topic.
- **Human rights:** We participate in the Business & Human Rights Peer Learning Group of the German Global Compact Network. Within this group, we share lessons learned as well as successes in implementing human rights due diligence. Moreover, in 2019, we included external stakeholders such as trade unions, industry associations and representatives of potentially impacted groups in our work to update our Human Rights Charter.
- **Health for all:** In 2019, we participated in numerous events with global reach or relevance in order to participate in and advance global health discussions.

Advocacy groups and industry coalitions

We actively participate in the political process and advocate our views by engaging policy makers in a direct dialogue and by working with industry coalitions. Below are several examples of major national and international industry associations of which we are members and where we hold positions:

- German Chemical Industry Association e. V. (VCI)
- European Chemical Industry Council (Cefic)
- German Association of Research-based Pharmaceutical Manufacturers e. V. (vfa)
- International Federation of Pharmaceutical Manufacturers & Associations (IFPMA)

Examples of positions held by members of our Executive Board include:

Stefan Oschmann, Executive Board Chairman and CEO:

- European Federation of Pharmaceutical Industries and Associations (EFPIA), President (until 30 June 2019)
- German Chemical Industry Association e. V. (VCI), Member of the Executive Committee
- National Academy of Science and Engineering (acatech), Member of the Executive Committee

Udit Batra, Executive Board member and CEO Life Science:

- Greater Boston Chamber of Commerce, Member of the Board
- Massachusetts High Technology Council (MHTC), Chairman
- Massachusetts Biotechnology Council, Member of the Board
- University of Delaware, Department of Chemical Engineering, Member of the Advisory Council
- Princeton University, Department of Chemical Engineering, Member of the Advisory Council

Kai Beckmann, Executive Board member and CEO Performance Materials:

- German Federation of Chemical Employers' Associations (BAVC), President
- Fraunhofer Institute for Computer Graphics Research (IGD), Chairman of the Advisory Board
- Confederation of German Employers' Associations (BDA), Vice President

Belén Garijo, Executive Board member and CEO Healthcare:

- Pharmaceutical Research and Manufacturers of America (PhRMA), Board member

Marcus Kuhnert, Executive Board member and Chief Financial Officer:

- German Chemical Industry Association e. V. (VCI), Vice Chairman of the Hessian Chapter

Involvement in initiatives

We collaborate with an array of civic organizations, such as the Goethe-Institut and the World Environment Center (WEC). In addition, for many years we worked successfully with The Joint Conference Church and Development (GKKE) in Germany and will continue the dialogue and collaboration with a number of other church representatives and organizations. Furthermore, we are also involved in initiatives and projects that share our interpretation of responsible entrepreneurial conduct. This is why we support, for instance, the Code of Responsible Conduct for Business and are members of the Chemie³ and Responsible Care® initiatives.

Political donations

In 2019, our Executive Board approved the new Sponsorships & Memberships Policy, which stipulates how political contributions are to be handled. Pursuant to the policy, we will not transfer any value to political parties or related political organizations, initiatives serving the goals of a political party or candidates of any public office. Furthermore, we will not transfer value to support, defeat or influence the election of a representative in a public office or candidate for public office. Generally speaking, political action committees (PACs) exist in the United States through which our employees can donate money to support political candidates and organizations. Such donations are not made by or on behalf of the company. These indirect and voluntary donations are reported to the U.S. Federal Election Commission and publicly disclosed.

Materiality analysis

Part of the non-financial report

Which topics are key to our long-term, environmentally and socially responsible business success? What expectations do our stakeholders have of us? In which areas do we help create a more sustainable future? To answer these questions, in 2019 we updated the materiality analysis we conducted in 2018, thereby meeting the applicable reporting requirements of the Global Reporting Initiative (GRI) and the German CSR Directive Implementation Act.

Material issues updated and validated

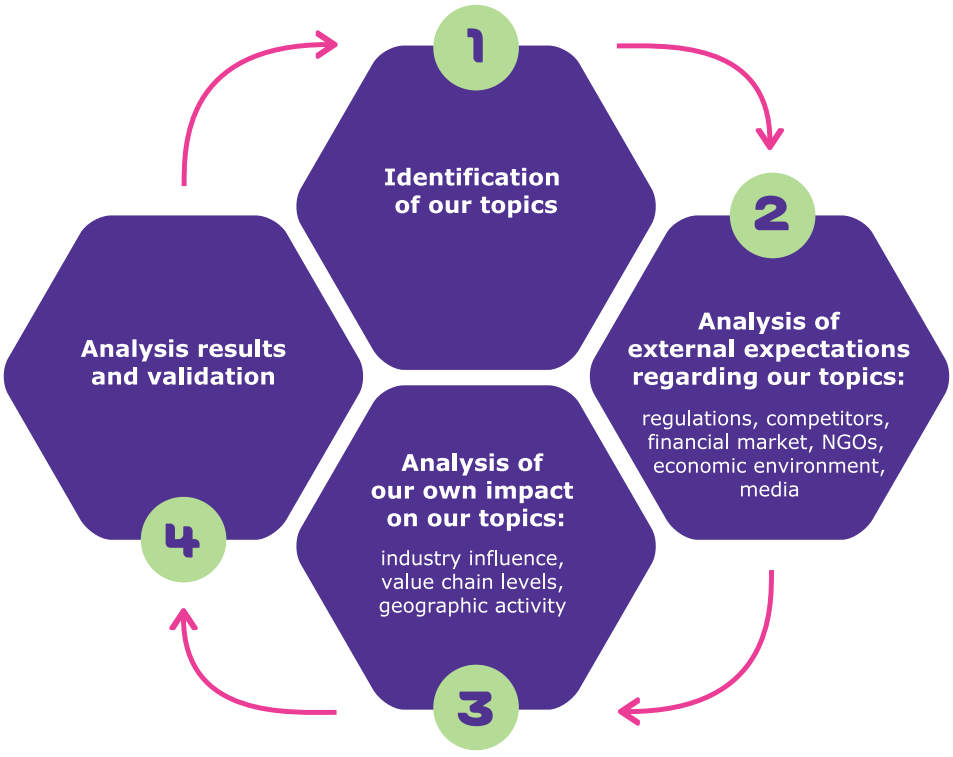
We regularly conduct a comprehensive materiality assessment to help us define key topics for our Corporate Responsibility (CR) management and for our report content.

We conducted our last comprehensive analysis in 2018, which reflected the requirements and expectations that our stakeholders place on us. In the process, we reviewed:

- Relevant regulations
- Goals and positions of our competitors
- Requirements imposed by investor ratings
- Expectations that non-governmental organizations (NGOs) have of the chemical and pharmaceutical industries
- Relevance of various CR topics to our economic environment.

Likewise, we analyzed how our industries, value chain and sites impact sustainable development. For our 2019 CR Report, we updated the existing analysis by **including the media as a further external stakeholder group**. We additionally conducted a media analysis and integrated the results into our previous approach.

Materiality process



Results of the update

The 35 topics identified as being of significance to our CR strategy and reporting did not change relative to the 2018 analysis. As a result of having incorporated a structured media analysis into the materiality process, the results changed minimally, but this impacted neither the reporting framework nor the contents.

Since our stakeholders additionally expect information and transparency regarding less significant issues, we also report on these, albeit in less detail.

Topics for the non-financial report

The German CSR Directive Implementation Act obliges us to review the **"double materiality"** of topics according to section 289c (3) of the German Commercial Code. The principle of double materiality requires companies to disclose non-financial information when the following two criteria are met. Firstly, the information is necessary to understand the company's business performance, business results and financial situation. And secondly, the information makes it possible to understand how the company's business activities affect non-financial aspects.

In 2019, we again reviewed the double materiality of the topics identified. Those that fall within the scope of this definition are marked in the materiality matrix and linked to the respective chapters in this report.

Material topics

Resource efficiency
- Waste and recycling
- Water management

Product safety and quality
- Patient safety
- Chemical product safety
- Product-related crime
- Transport and warehouse safety

Supply chain standards
- Supply chain standards

Environmental protection
- Emissions
- Plant and process safety
- Energy efficiency and renewable energies
- Greenhouse gas emissions
- Biodiversity

Health for everyone
- Prices of medicines
- Access to health
- Health awareness

Ethical conduct
- Bioethics
- Clinical studies
- Animal welfare

Sustainable products
- Sustainable products (including design, packaging and recycling)

Human rights
- Human rights

Good business practice
- Compliance
- Data protection
- Governance
- Responsible marketing
- Interactions with health systems
- Community involvement

Technology
- Digitalization
- Innovation and R&D

Attractive employer
- Health and safety
- Good leadership
- Employee engagement
- Employee development
- Attracting and retaining employees
- Diversity
- Work 4.0

Very high importance | High importance | Medium importance | Part of the non-financial report

Material issues in our value chain

The following table shows where our material issues fall within the value chain: upstream in our supply chain, in the course of activities within our own business sectors, or downstream with our customers and patients. Moreover, we listed the issues to show the breakdown of materiality by stakeholder groups.

	Upstream activities	Healthcare	Life Science	Performance	Downstream activities
Product safety and quality					
Chemical product safety		✓	✓	✓	✓
Material for:	Customers, Merck family, shareholders, government agencies, NGOs, commercial and business partners associates				
Patient safety		✓			✓
Material for:	Merck family, shareholders, government agencies, NGOs, health systems, patients				
Product-related crime		✓	✓	✓	✓
Material for:	Customers, Merck family, shareholders, federations and policy makers, government agencies, NGOs, commercial and business partners, health systems, patients				
Transport and warehouse safety	✓		✓	✓	✓
Material for:	Customers, government agencies, suppliers, commercial and business partners, communities				
Ethical conduct					
Bioethics		✓	✓		✓
Material for:	Customers, federations and policy makers, government agencies, NGOs, media, scientists				
Clinical studies	✓	✓			✓
Material for:	Merck family, shareholders, federations and policy makers, government agencies, NGOs, media, suppliers, scientists, patients				
Animal welfare	✓	✓	✓	✓	
Material for:	Government agencies, NGOs, media, suppliers, scientists				

Good business practice

Compliance	✓	✓	✓	✓	✓
Material for:	Employees, Merck family, shareholders, government agencies, NGOs, suppliers, commercial and business partners, health systems, competitors				
Responsible marketing		✓	✓	✓	✓
Material for:	Customers, federations and policy makers, media, commercial and business partners, health systems, patients				
Community involvement		✓	✓	✓	✓
Material for:	Merck family, employees, NGOs, media, communities				
Interactions with health systems		✓			✓
Material for:	Federations and policy makers, government agencies, NGOs, health systems, patients				
Governance	✓	✓	✓	✓	✓
Material for:	Employees, employee representatives, Merck family, shareholders, government agencies, suppliers, commercial and business partners, customers				
Data protection	✓	✓	✓	✓	✓
Material for:	Employees, employee representatives, suppliers, commercial and business partners, customers, patients				

Health for all

Access to health		✓	✓		✓
Material for:	NGOs, media, commercial and business partners, health systems, patients				
Prices of medicines		✓			✓
Material for:	Merck family, shareholders, NGOs, media, commercial and business partners, health systems, patients				
Health awareness		✓			✓
Material for:	NGOs, media, commercial and business partners, health systems, patients, communities, competitors				

Supply chain standards

Supply chain standards	✓	✓	✓	✓	✓
Material for:	Customers, Merck family, shareholders, federations and policy makers, NGOs, media, suppliers, competitors				

Human rights

Human rights	✓	✓	✓	✓	✓
Material for:	Customers, federations and policy makers, NGOs, media, suppliers, communities, employees				

Sustainable products

Sustainable product design			✓	✓	✓
Material for:	Customers, scientists				

Attractive employer

Diversity		✓	✓	✓	
Material for:	Employees, employee representatives, Merck family, media				
Recruiting and retaining employees		✓	✓	✓	
Material for:	Employees, employee representatives, Merck family, shareholders, competitors				
Employee development		✓	✓	✓	
Material for:	Employees, employee representatives				
Good leadership		✓	✓	✓	
Material for:	Employees, employee representatives				
Employee engagement		✓	✓	✓	
Material for:	Employees, employee representatives				
Health and safety	✓	✓	✓	✓	
Material for:	Employees, employee representatives, government agencies				
Work 4.0		✓	✓	✓	
Material for:	Employees, employee representatives				

Technology

Innovation and R&D	✓	✓	✓	✓	✓
Material for:	Customers, Merck family, shareholders, Scientists, health systems, patients				
Digitalization	✓	✓	✓	✓	✓
Material for:	Scientists, commercial and business partners, customers, patients				

Resource efficiency

Waste and recycling		✓	✓	✓	✓
Material for:	Government agencies, NGOs, communities, customers				
Water management		✓	✓	✓	✓
Material for:	Government agencies, NGOs, communities				

Environmental protection

Energy efficiency and renewable energy		✓	✓	✓	✓
Material for:	Federations and policy makers, NGOs, customers				
Greenhouse gas emissions	✓	✓	✓	✓	✓
Material for:	Customers, federations and policy makers, government agencies, NGOs, media, suppliers				
Plant and process safety		✓	✓	✓	
Material for:	Employees, shareholders, Merck family, government agencies, media				
Biodiversity		✓	✓	✓	
Material for:	Federations and policy makers, government agencies, NGOs				
Emissions		✓	✓	✓	
Material for:	Federations and policy makers, government agencies, NGOs				

Business ethics

Within this chapter:

Corporate Governance

Governance

Part of the non-financial report

For more than 350 years, responsibility has been an integral part of our corporate identity. It is one of our six company values, alongside courage, achievement, respect, integrity, and transparency. These core values guide us in our daily work, defining how we interact with our customers and business partners. We endeavor to give our best for patients and customers– and find solutions for the world of tomorrow.

Our approach to responsible governance

The requirements we place on responsible governance are derived from our company values and the regulations, external initiatives and international guidelines to which we are committed. We have integrated these requirements in both our Corporate Responsibility strategy (CR strategy) and our Group-wide guidelines. These guidelines comprise **charters and principles** valid for the entire company, as well as specific standards and procedures for individual business sectors and sites.

Some examples: Our Human Rights Charter aligns with the UN Guiding Principles on Business and Human Rights. Our Group-wide Social and Labor Standards Policy reflects the labor standards of the International Labour Organisation (ILO). Our EHS-Policy (Corporate Environment, Health and Safety) forms the basis for implementing the chemical industry's Responsible Care® Global Charter within our company. Our Regulatory Affairs Governance Policy for chemical products sets out the processes and management structures for product safety.

How we live responsible governance

Based on the requirements set forth in charters, principles and policies, our internal standards give specific guidance for operational processes. These standards are constantly updated by the relevant departments and are available on our intranet. Our managers implement these standards in their respective areas of responsibility and ensure that they are adhered to. In addition, we educate and train our employees on all guidelines that apply to them.

We employ **management systems** to steer processes as well as define goals, actions and responsibilities. These systems are based on standards such as the internationally recognized quality management standard ISO 9001, good working practices (GxP) in the pharmaceutical industry, and ISO 14001 for environmental management. Our company regularly undergoes ISO 14001 and ISO 9001 certification, which is conducted by an independent auditing firm. We hold group certificates for both standards.

We support the following responsible governance initiatives:

- We have been a member of the United Nations Global Compact since 2005 and are committed to complying with its principles. Our annual progress report illustrates how we live our responsibility in our day-to-day actions.
- As a signatory to the chemical industry's Responsible Care® Global Charter, we voluntarily go above and beyond what is required by law and have adopted mandatory standards for product responsibility, environmental impact mitigation, health, and safety.
- As a member of the **Together for Sustainability** (TfS) network, we are dedicated to improving the supply chain with respect to environmental, compliance and social standards.
- We are also a member of **Initiative Chemie**[3], a collaboration between the German Chemical Industry Association (VCI), the German Employers' Federation of the Chemical Industry (BAVC), and the German Mining, Chemical and Energy Industrial Union (IG BCE). The partners of this globally unique alliance seek to make sustainability a core part of the chemical industry's guiding principles and to jointly drive the sector's position within the German economy as a key contributor to sustainable development.

compliance

Part of the non-financial report

First and foremost, responsible entrepreneurship means acting in accordance with the law, a practice commonly known as compliance. All our activities must adhere to laws, regulations and international ethical standards around the world. Compliance violations would not only result in possible legal prosecution but could also seriously compromise our reputation as an employer and as a business partner.

Our approach to compliance

Compliance is one of our primary considerations worldwide. As an international company with operations in low- and middle-income countries, we have very stringent requirements for effective compliance management. In our view, however, compliance means much more than simply adhering to regulatory provisions. We aspire to always act in accordance with the principles set forth in our company values and believe that profitable business operations should go hand-in-hand with the highest ethical standards.

How we ensure compliance

Our Group Compliance function manages the core topics of anti-corruption, healthcare compliance, antitrust, anti-money laundering, third-party due diligence, data privacy, transparency reporting, and dawn raid preparedness. To cover these core compliance topics, we have **Group-wide policies**, procedures and processes in place that ensure our business activities align with the relevant laws, regulations and international ethical standards. Other compliance related issues, including respective internal regulations and guidelines (such as Pharmacovigilance, Export and Import Controls, and Environment, Health, Safety, Security, Quality, are managed by the responsible functions.

Supported by our Group Compliance function, our Group Compliance Officer is responsible for our compliance program, which consists of the following elements:

- Risk Assessment
- Policies & Procedures
- Compliance Committee
- Training & Awareness
- Programs & Tools
- Monitoring & Reporting
- Case Management
- Continuous Improvement
- Whistleblowing hotline (our SpeakUp Line for anonymous and non-anonymous reporting of potential breaches of rules and regulations).

Our compliance program is regularly updated to reflect new requirements, such as those resulting from amendments to legislation, relevant industry codes or changes within our company.

Our Group Compliance Officer reports to the Executive Board every six months on the status of our compliance activities, possible risks and serious compliance violations. In turn, the Executive Board updates our supervisory bodies at least twice a year on key compliance issues. As part of regular reporting processes, we annually compile a comprehensive **compliance and data privacy report** for the Executive Board detailing the status of our compliance program, updates that have been made, compliance and data privacy cases and training figures. Additionally, we prepare an update at the mid-year mark to highlight current developments and the status of relevant projects and initiatives.

Our Group Compliance Officer oversees approximately 85 Compliance Officers around the world, who implement our compliance program within their respective areas of responsibility. These Compliance Officers receive guidance from our Group Compliance Programs and Support team, a centralized body that drives the design and update of our compliance program across all business sectors and Group functions and is responsible for initiating necessary measures.

Our global Transparency Operations team is responsible for incorporating current and upcoming transparency **reporting requirements in the health sector** – such as those of the European Federation of Pharmaceutical Industries and Associations (EFPIA) and the United States Physician Payments Sunshine Act.

Various Compliance Ambassador programs exist in all our regions to take the different needs and cultures throughout our Group into account. In general, the main objective of the Compliance Ambassador programs is to spread the culture of compliance across the local organizations. The ambassadors act as the primary points of contact for their own teams in compliance aspects. They are not compliance representatives and do not replace the work of the Compliance Officers. The Compliance Ambassadors aim to influence the behavior of their colleagues on a daily and permanent -basis, using different compliance-related activities specifically designed for their teams. From the Compliance Offices across the world we encourage and support the development of these programs as they are an excellent way to increase accountability and ownership of **business ethics** across our businesses and functions.

Clear chain of command for reporting violations

Reports of potential compliance violations that we receive via our SpeakUp Line are reviewed by the Compliance Investigations and Case Management team and appropriate investigative steps are initiated. Exposed cases with a certain risk profile are additionally presented to the Compliance Case Committee, which consists of senior representatives from Compliance, Corporate Security, Data Privacy, Human Resources, Internal Auditing and Legal. The committee's duties include assessing and classifying ethical issues, investigating their background and addressing these issues through appropriate measures. If, during the investigation, a root cause is identified that could lead to further **compliance violations**, it is continuously monitored and preventive or corrective actions are taken. An associated sub-committee advises on disciplinary action, if necessary.

Conflicts of interest

We take all potential conflicts of interest seriously. Employees must strictly avoid situations where their professional judgment may come into conflict with their personal interests. Also, they must disclose every potential conflict of interest to their manager and document the disclosure. Such issues are usually resolved directly between the employee and his or her manager, but can also be routed to Human Resources or other relevant functions. Furthermore, we have implemented a specific governance process that includes the Executive Board and ensures that shareholders and related parties are regularly provided with **information on potential conflicts**.

Beyond this, our processes for handling conflicts of interest are detailed in our Annual Report.

Data Privacy integrated into Group Compliance

Our Data Privacy unit is part of our Group Compliance organization. As required by law, this unit acts independently and submits **frequent data privacy updates** in addition to compiling a regular comprehensive data privacy report as a part of the compliance report. Besides a central Group Data Privacy Officer, we also have local Data Privacy Officers at various sites around the world.

Integration of Versum Materials and Intermolecular

Both Versum Materials and Intermolecular have robust compliance programs in place. We will be implementing our compliance program and the corresponding processes step-by-step until December 2020.

Our commitment: guidelines and standards

Our compliance program builds on our company values and integrates these into our compliance framework, which contains Group-wide guidelines for entrepreneurial conduct that are mandatory for all our employees:

- The Merck Code of Conduct guides our people in conducting business ethically – in accordance with our values and the law. It is available to all employees worldwide in 22 languages, both electronically and as a print brochure.
- Our Human Rights Charter supplements our Code of Conduct with globally recognized principles regarding human rights.
- Our **Anti-Corruption Policy** stipulates that all business activities must be conducted in accordance with legally applicable anti-corruption standards. All forms of bribery – whether giving or receiving – are strictly prohibited.
- Our **Pharma Code** for prescription medicines as well as underlying policies and additional guideline documents set out key principles for interactions with our partners in the health industry.
- Our Group-wide **Antitrust and Competition Law Policy** sets forth that all business activities across the Group are to be conducted in compliance with applicable competition regulations at all times. We acknowledge the importance of fair competition and expect the same of contract organizations acting on our behalf.
- Our **Compliance Reporting** and Investigation Policy includes the basic steps for an internal compliance investigation. Its purpose is to ensure an appropriate, timely and thorough response to compliance-related reports of potential misconduct relating to any kind of internal or external regulations or policies.
- Our global **Money Laundering Prevention Policy** defines and describes the internal global processes and assurance measures in place to protect our company from being misused by third parties for money laundering purposes.

We use an **online confirmation process** to send Group-wide policies to relevant managers and employees, including Group Legal and Compliance colleagues. Recipients confirm receipt of the policies and commit to adherence and appropriate implementation at the relevant sites.

Rules for the provision of healthcare items

Our company occasionally provides healthcare professionals with items of medical utility or **informational and educational materials.** We require the provision of such items to be for legitimate and lawful purposes, in accordance with our Code of Conduct as well as applicable policies, laws and codes. The rules on such provisions are laid out in our Healthcare Items Policy, which was updated in 2019 to include EMD Serono, Allergopharma and the Merck Foundation within its scope.

Requirements we place on our business partners

To be effective, compliance management must not be restricted to the boundaries of our own company. While our supplier management processes focus on vendor compliance with our standards, our **global Business Partner Risk Management** process governs interactions with sales partners, such as sales agents, distributors, dealers and wholesalers. We expect all our business partners worldwide to comply with our compliance principles. We only collaborate with partners who pledge to comply with all applicable laws, reject all forms of bribery and adhere to environmental, health and safety guidelines. Furthermore, we contractually require our business partners to demonstrate a commitment to internationally recognized **human rights and labor standards** as well as to our own compliance requirements. We also monitor adherence to these standards for existing business relationships with a certain risk-level via our established global Business Partner Risk Management process – typically every three years or ad hoc when new risks are identified.

Requirements of our business partners

We employ a global approach for responding to Code of Conduct acknowledgment requests from our business partners. The framework guiding this practice is laid out in our internal Merck Corporate Responsibility Letter, which was reviewed and updated in 2019.

Harmonizing data privacy Group-wide

Our Policy for Data Protection and Personal Data Privacy defines our standards for processing, saving, using and transmitting data. This approach allows us to achieve a **high level of protection** for the data belonging to our employees, contract partners, customers and suppliers as well as patients and participants in clinical studies. Our Group-wide understanding of data privacy is based on European legislation, which also entails the EU General Data Protection Regulation (EU GDPR). We also consider local data privacy requirements, as not all requirements at all sites are covered by EU standards.

Compliance audits

As part of operational audits, our Group Internal Auditing function regularly reviews relevant matters at our sites to determine the **effectiveness of the respective compliance guidelines**, processes and structures in place. The unit also checks for violations of our Code of Conduct and our Anti-Corruption Policy and reviews the workplace requirements set out in our Human Rights Charter.

Our audit planning aims to provide **comprehensive risk assurance** through the best possible audit coverage. Our annual audit planning process is risk-based and includes factors such as sales, employee headcount, systematic stakeholder feedback and the Corruption Perceptions Index (CPI) published by the non-governmental organization Transparency International. If an internal audit produces recommendations, Group Internal Auditing performs a systematic follow-up and monitors the implementation of the prescribed corrective actions. In 2019, we assessed 50 operations for corruption-related risks.

As of 2020, Versum Materials will be part of the annual audit plan of Group Internal Auditing. In January, a "post day 1 audit" was performed. Further audits, such as of Versum Materials Korea or Delivery Systems and Services, are also part of the **2020 Internal Audit Plan** as approved by our Executive Board.

Compliance training

We provide regular compliance classroom and online training courses on our Code of Conduct, anti-corruption, anti-trust, data privacy and healthcare compliance standards. We require employees to take these courses based on their risk indication. Some courses also apply to independent contractors and supervised workers, such as temporary staff.

In June 2019, we completed the full global roll-out of our **business sector-specific Code of Conduct e-learning program** by publishing it in 20 new languages in addition to German and English, which were already launched in 2018. The training complements our Code of Conduct brochure "What guides us," by providing practical guidance on how to act ethically in the workplace. In 2019, 50,461 employees and contractors had been trained as part of the program, which we conduct regularly for all new employees and contractors.

We regularly update our training plan and adapt it to new developments to continuously educate our employees on existing and new compliance requirements, guidelines and projects. One example is the e-learning course on our Anti-Corruption Policy, which is available in 15 languages. In total, 35,425 employees and contractors have completed this training since the introduction of the program, which is also being updated for the 2020 training cycle.

In response to the European General Data Protection Regulation (EU GDPR), we redesigned our regular Data Privacy e-learning course, rolling it out in 17 languages in late 2018. In the meantime, a total of 47,650 employees and contractors have completed this course. Additionally, Compliance Officers complement the execution of our Group-wide training plan by conducting mandatory local and business-specific e-learning courses.

SpeakUp Line for potential compliance violations

We encourage all Group employees to report potential compliance violations to their superiors, Legal, HR or other relevant departments. Worldwide, they can also use our central whistleblowing SpeakUp Line **free of charge and anonymously** to report violations in their local language by telephone or via a web-based application. Based on recommendations from the Compliance Investigation Team or the Compliance Case Committee, disciplinary actions may also be taken against employees who have committed a compliance violation, where necessary. These actions may range from a simple warning to dismissal, depending on the severity of the violation. In May 2019, the SpeakUp Line was also made available to external stakeholders. The relevant information can be found in the Compliance and Ethics section of our website, where we consolidate key compliance information such as our values, Code of Conduct, and information on transparency and data privacy for external audiences.

To continuously strengthen employees' awareness of the SpeakUp Line, we rolled out a **global SpeakUp Line communication campaign** in May 2019, using digital and internal print channels.

Both the number of reports of suspected compliance violations and the number of actual compliance cases was stable compared with the previous year. In 2019, we received 75 compliance-related reports via the SpeakUp Line and other channels that **led to investigations**. In 2019, there were 30 confirmed cases of violations of the Code of Conduct or other internal and external rules.

Risk analysis: Compliance Risk Reporting and Self-Monitoring

In 2019, the Compliance Programs and Support team launched a **redesigned compliance risk management process**. We adapted the process for risk evaluation and added a new self-monitoring component. The risk management process for compliance-related topics consists of two major core elements: Compliance Risk Reporting and Self-Monitoring.

Compliance Risk Reporting:

Compliance Risk Reporting is the process where compliance risks are evaluated. The Compliance Officer of the respective legal entity or department evaluates designated risks based on the business sector. The risk evaluation is conducted by determining a monetary impact and the extent to which the risk is likely to occur. In line with the best practice for risk evaluation, the Compliance Officers assess the **inherent risk followed by the residual risk**.

Self-Monitoring:

The new Self-Monitoring component allows us to monitor the **effectiveness of our compliance program** within a business. The respective Managing Director of the legal entity or business head of a department in scope is provided with specific risk-mitigating statements that must be attested to on an agreement scale.

Once the process is completed, the collected data will be further analyzed and specific risk and control reports will be generated. Based on the results, follow-up activities will be initiated to further enhance our Compliance Management System.

Management of business partners

We apply a risk-based approach to selecting business partners for sales activities. The greater we estimate the risk to be regarding a certain country, region or type of service, the more in-depth we examine the company before entering into a business relationship. For these risk assessments, we use the **Corruption Perceptions Index** (CPI) maintained by Transparency International and assess potential partners based on other parameters such as the nature of the intended business and sales volume. We also explore background information from various databases and information reported by the business partners themselves, for instance, on their own compliance programs.

If we encounter compliance violations, we decide whether to reject the potential business partner, terminate the existing relationship or impose conditions to mitigate identified risks. However, our partners are generally willing to adapt their structures and processes in line with our strict compliance requirements. Since launching this process in 2013, we have assessed more than 3,700 business partners. In 2019, we used this process to assess more than 300 business partners.

Ensuring data privacy and information security

We operate a data privacy management system as part of our Group Compliance function. This system is harmonized across the whole Group. Furthermore, it is necessary to protect our information systems, their contents and our communication channels against criminal activities of any kind, like e-crime and cyberattacks, including unauthorized access, information leakage and misuse of data or systems. Our Group Security and IT Security units implement organizational, process-related and technical information security countermeasures based on recognized international standards. We **harmonized our electronic and physical security measures** (e.g. access control) to bolster our ability to handle sensitive data such as trade secrets. Aside from active security monitoring, our Group Internal Auditing verifies that we are implementing and complying with our data privacy policy and data security programs.

Our data privacy management system applies the **PDCA principle** (plan, do, check, act) to ensure that data privacy policies and tools (plan), data privacy training (do), inspections and assessments (check) and incident and issue management processes (act) are all in place.

To support local Data Privacy Officers at our sites, we have introduced **standardized data privacy consulting services** that can be requested by data controllers and processors as needed. We also implemented a central IT tool to provide a single source for data privacy processes like answering data privacy questions, registering data processing activities and reporting potential data privacy incidents. We had zero sanctioned complaints or incidents

concerning breaches of customer privacy leaks, thefts or losses of customer data in 2019. In one case, a minor personal data breach was reported to the supervisory authority which was not sanctioned.

EFPIA Transparency Initiative

Members of the Transparency Initiative of the European Federation of Pharmaceutical Industries and Associations (EFPIA) are required to publish all contributions to medical professionals and organizations in the health sector, along with the names and addresses of individual recipients. Beyond this initiative, several countries have introduced legislation to further increase transparency in the pharmaceutical industry. We comply with these requirements and additional standards governing interactions with health systems and include them in our transparency reporting.

Alliance for Integrity

We are a member of the Alliance for Integrity Steering Committee. Established by the German Society for International Cooperation (GIZ), the German Global Compact Network (DGCN) and the Federation of German Industries (BDI), this initiative aims to achieve a corruption-free business world in low- and middle-income countries. Its activities focus on Latin American countries, Ghana and Asian countries, in particular India and Indonesia. The Steering Committee leads the decision-making process for developing measures in the countries, while local advisory groups oversee implementation at country level. Our company has chaired the advisory group of Ghana since 2018. Our local compliance organizations also collaborate with these groups and offer **training to small and medium-sized companies**. Beyond these efforts, we continuously assist the Alliance for Integrity through business-to-business workshops and training courses and by sharing best practices on how to develop and implement effective corruption prevention systems.

Engaging stakeholders

In 2019, we engaged stakeholders in dialogue primarily through our memberships in various associations. Among other organizations, we are members of the German Chemical Industry Association e. V. (VCI), the German Institute for Compliance (DICO), the European Federation of Pharmaceutical Industries and Associations (EFPIA), the German Association of Voluntary Self-Regulation for the Pharmaceutical Industry (FSA), the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA), the Alliance for Integrity, the German Association for Supply Chain Management, Procurement and Logistics e. V. (BME), and the International Association of Privacy Professionals (IAPP).

Responsible Marketing

Part of the non-financial report

We mainly focus our pharmaceutical business on prescription medicines. The well-being of patients is always our primary consideration when marketing such products. This is why pharmaceutical marketing is regulated by both statutory requirements worldwide as well as a variety of internal guidelines that shape our business conduct.

Our approach to responsible marketing

We strictly adhere to all regulations concerning pharmaceutical marketing. In most markets, manufacturers are only permitted to advertise prescription drugs to medical professionals such as physicians and pharmacists. These advertisements must always disclose the active ingredients, adverse effects and contraindications of the drug. Our internal guidelines governing marketing and advertising are part of our Group-wide compliance program, which requires us to always conduct business in compliance with the law and **in line with the highest ethical standards**. This is complemented by our internal guidelines and various voluntary commitments that, in many cases, exceed the applicable statutory regulations. We regularly review all our internal guidelines and revise them as required in response to any new developments.

How we conduct ethical marketing

Our Group Compliance unit is responsible for setting up internal overarching compliance policies to help ensure that our business activities adhere to the statutory regulations applicable to our sales and marketing activities. This unit is supported by other functions that provide topic-specific expertise, offer detailed guidance and report on the processes in their units that are relevant to compliance. For instance, our Global Regulatory Affairs unit has established a dedicated policy and corresponding process document on the review and approval of our promotional materials. The necessary training and communications are carried out by the units responsible for each of the respective policies. At the operational level, the relevant business and all employees involved in our sales and marketing activities must adhere to our internal policies and procedures. Our Group Internal Auditing unit regularly conducts **risk-based reviews** of these activities.

Details on how we help ensure compliance with statutory regulations worldwide can be found under Compliance.

Our commitment: Code of Conduct and industry-wide regulations

Our Group-wide Pharma Code for Conducting Pharmaceutical Business and Pharmaceutical Operations defines the relevant standards for our ethical marketing practices. It also governs our interactions with physicians, medical institutions and patient advocacy groups.

Between 2017 and 2019, we revised our Biopharma compliance policies to ensure we provide the required up-to-date compliance guidance to the business. We also extended the scope of this policy to our Healthcare business in the United States (operating under the name of EMD Serono), to Allergopharma and to the Merck Foundation. This will help enable them to effectively adhere to our compliance principles and guidance around the world while maintaining the necessary flexibility to implement **specific local policies or procedures** that additionally comply with local regulations.

Through our Principles of Review and Approval of Promotional Materials and Other External Communications, we help ensure that all promotional materials conform to our rigorous standards. All employees involved in creating promotional materials have received training on updates made to the principles and the associated standard processes.

In addition to local laws and our own standards, we comply with the codes of conduct of various industry organizations, such as the Code of Practice published by the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA). This code was revised in May 2018 and became effective on January 1, 2019. Similarly, the European Federation of Pharmaceutical Industries and Associations (EFPIA) updated its Code of Practice in 2019. We simultaneously revised our internal Items Provided to Healthcare Professionals policy to harmonize our internal guidance with IFPMA Code of Practice requirements. We are also a member of the German Association of Voluntary Self-Regulation for the Pharmaceutical Industry (FSA), which has defined its own code of conduct regarding collaboration between physicians and the pharmaceutical industry.

Reviewing marketing material Group-wide

Our aim is to review all promotional material end-to-end to ensure that it meets our standards as well as local regulations, which is why we apply a harmonized **Group-wide review and approval system**. Approximately 2,200 Healthcare employees use a centralized platform that allows us to streamline the review and approval process while also providing a better overview of global marketing data. This also helps us identify opportunities for improvement.

Addressing violations of standards and regulations

We have a number of channels for reporting wrongful marketing practices to the industry associations in which we are members. For instance, when members of the FSA or third parties suspect a violation of the FSA Code, they can file complaints directly with the respective Arbitration Board. In 2019, no significant complaints of this kind were sustained against our company worldwide.

In May 2019 we made our SpeakUp Line for anonymously reporting potential compliance violations available to

external stakeholders. If our marketing or advertising rules of conduct are breached, we have a committee in place to take immediate countermeasures. In 2019, we had no significant cases of non-compliance regarding regulations and voluntary codes.

Regular employee training

Employees who are responsible for our pharmaceutical advertising receive regular training on current guidelines. This particularly applies to individuals working in sales, marketing and drug registration. Such seminars are either conducted locally in a classroom setting or as e-learning courses.

We ask new company employees to participate in **onboarding training** on the topic of Review and Approval of Promotional Materials and Other External Communications. Additionally, employees in charge of marketing and the promotion of pharmaceutical products can also access our respective compliance guidelines via our intranet.

Direct-to-consumer advertising only in certain countries

Direct-to-consumer (DTC) advertising for prescription drugs is permitted in some countries, such as the United States, and we only pursue DTC campaigns in these areas. In these countries, we use DTC advertising to help increase people's awareness of certain diseases and the therapies that are available, thus empowering patients to **make informed decisions** about their own treatment.

Marketing chemicals

We approach the marketing of our chemical products with the deepest sense of responsibility. For instance, we only supply our chemicals to commercial customers with proven expertise and provide them with detailed information on the safe handling and use of our products. We have an extensive safety and security network in place to prevent the **misuse of dual-use products**. This network features standardized export control guidelines for these products, which are monitored by our central Export Control and Customs Regulations unit as well as by trade and export control officers at our local subsidiaries. If we suspect or are informed of misuse, we terminate our business relationship with that customer. When necessary, we work with the responsible authorities to prevent illegal use.

Interactions with health systems

Part of the non-financial report

It is essential that research institutes, healthcare professionals, patient advocacy groups and other key players in health systems have access to up-to-date information on diseases and treatments. We help facilitate this access by sponsoring independent initiatives and medical capacity advancement programs. We also support outstanding research projects, for example through our Global Grants for Innovation. Transparency is our top priority in everything we do.

Our approach to interacting with health systems

We support health systems by providing information to professional medical associations, patient advocacy groups, university clinics, and other hospitals, following **specific approval requirements** and procedures and in accordance with applicable laws and codes. In countries that have statutory or industry obligations regarding the disclosure of transfers of value to health systems, we comply with these obligations.

How we ensure transparency and compliance at an organizational level

For all interactions with healthcare stakeholders, Group Compliance establishes internal policies and related **review processes** to ensure adherence to statutory requirements and transparency obligations. Group Compliance also provides the necessary training for all applicable employees and handles the respective communications. The Global Transparency Operations team serves as a center of excellence, providing support for **transparency reporting** and our end-to-end management process for interactions with healthcare professionals, healthcare organizations, patients, caregivers, and patient advocacy groups.

Our Group Internal Auditing function monitors the local implementation of these initiatives. Before entering into a collaboration with a third party that is not a healthcare stakeholder, we also apply a selection process based on a policy and standard operating procedure. This is part of our Business Partner Risk Management compliance program, which is conducted by Group Compliance. More details can be found under Compliance.

Our commitment: Group-wide guidelines and industry standards

Our Policy on Interactions with Patients, Patient Opinion Leaders and Patient Organizations provides a comprehensive framework for our interactions with these key stakeholders. Our guideline entitled Good Practice and Process Guidance: Engagement with Patients, Patient Opinion Leaders and Patient Organizations provides additional **guidance for our interactions** with these stakeholders. It reflects our longstanding commitment to prioritizing patient well-being. Through this policy, the supplementary guideline and specific local policies, we provide a robust guidance structure to support our employees in being compliant during their interactions with patients, patient opinion leaders and patient organizations.

In 2019, we updated our Items Provided to Healthcare Professionals policy, which guides our employees in providing these key stakeholders with items such as medical or educational materials. We want to help ensure that this is done for legitimate and lawful purposes in accordance with our Code of Conduct as well as with applicable policies, laws and codes.

Transparent reporting

In 2019, we continued to publish all financial and non-financial contributions that we made to European medical professionals and organizations in the health industry. As required by the EFPIA Disclosure Code, this information includes the names of individual recipients and their addresses as well as the purpose and amount of the transfer. Before publishing, we secured all necessary informed consent forms as required by the applicable data privacy regulations.

In addition to disclosing monetary transfers of value on an individual level, we continue to **publish overall spending** on our research and development activities as required.

We also adhere to all statutory transparency requirements worldwide, such as the Transparency Code of the German Association of Voluntary Self-Regulation for the Pharmaceutical Industry (FSA). Specific national laws and requirements are implemented by our local units. We consistently adhere to the applicable data privacy legislation and endeavor to ensure the full compliance of our partners.

Relevant employees participate in mandatory e-learning courses and classroom seminars to stay up-to-date on our policies and guidelines and important changes to transfer of value reporting requirements.

Collaborating with patient advocacy groups

Patient advocacy groups support patients, family members and caregivers, providing them with information on disease management. We also made it our goal to improve patient quality of life, which is why we support the vitally important work of these organizations. We **ensure transparency** on our voluntary unsolicited donations by publishing the details of contributions to European patient organizations on our website. The report is updated annually and includes all amounts, recipients and the purpose of each transfer of value, thus fulfilling our obligation as a member of EFPIA.

Transparently promoting medical research and education

We sponsor research and medical education around the world so that we can contribute to medical advances that will benefit patients. Through our Global Grants for Innovation, in 2019 we selected two new winners for Grants of Growth Innovation (GGI) and three new winners for the Grants of Multiple Sclerosis Innovation (GMSI). A total of 104 research proposals have been selected to receive research grants through the Global Grants for Innovation program since 2009.

Through our Global Medical Education and External Relations department, we organize non-promotional Medical Education Programs, either directly or by providing grants to Third Party Medical Education Providers to fund independent medical education programs. This enables the development and delivery of advanced medical training aimed at increasing the scientific knowledge and competence of scientists, physicians, nurses, pharmacists and other healthcare professionals in order to enhance medical practice and **improve patient outcomes**. As with our other partnerships, we take an entirely ethical, transparent and responsible approach aimed at providing fair, balanced and objective content that is designed to allow the expression of diverse theories and recognized opinions.

All direct and indirect financial support aligns with the principles of the EFPIA Code of Practice. According to our internal Medical Education Funding Policy and our Programs Policy, all requests for medical education funding are channeled through an approval process that falls under our R&D and Compliance functions. This process ensures that all funds available for medical education programs are granted according to established internal guidelines and criteria, while also complying with all applicable laws and industry codes.

In 2019, we continued our partnership with the International Pharmaceutical Alliance for Continuing Medical Education (iPACME). This group of 20 professionals from 17 different companies from around the world engages in continuous discussions on improving and harmonizing **quality standards** for continuing medical education. We also contributed to updating the EFPIA Code of Practice issued by the EFPIA Medical Education Working Group.

We continue to support research and education in and for low- and middle-income countries through a series of programs, with a focus on schistosomiasis and malaria.

Healthcare-specific Code of Conduct training

In 2019, we worked on a Code of Conduct-related training curriculum on dealing with dilemmas in healthcare-specific situations. We piloted the project in China, where 21 leaders participated in a very comprehensive training course. The aim was to improve their awareness and understanding of Code of Conduct-related dilemmas in healthcare-specific situations, for example when overhearing a conversation that may or may not constitute attempted bribery. This training will be rolled out in other countries in 2020.

suppliers

supply chain standards

Our company procures many raw and packaging materials, technical products, components and services from across the world. We aim to promote supply chain stability while providing our customers with high-quality products and services. We expect our suppliers to share our ethical, social and compliance standards, as set out in our Responsible Sourcing Principles and to apply these within their own supply chains as well.

Our approach to making our supply chains more sustainable

One of the goals of our supplier management is **compliance with fundamental environmental and social standards**, alongside high-quality, reliable delivery and competitive prices. To achieve this, we have introduced relevant strategies, processes and guidelines that we are continuously improving to prevent violations of supply chain standards. Our supply chains are diverse and differ in their characteristics. While some supply chains are automated, others, especially in the service sector, are labor-intensive. Our risk-based supplier selection and management approach takes this diversity into account, which helps our sourcing employees to identify required mitigation actions with relevant suppliers and work on improvements.

The approach for our **strategic suppliers,** which account for approximately 43% of our total spend, includes the identification, monitoring and assessment of supply security risks with four main elements:

- **Supplier Risk Assessments**: to capture the overarching risks at supplier legal entity level, including multiple risk domains. In 2019, we enhanced the data scoping and quality, adding NGOs and new financial information providers to our pool of data sources.
- **Alert system:** to notify our Procurement unit when any of our suppliers faces a potential disruption.
- **Material Risk Assessments:** to capture the risks of relevant materials that make up our most significant finished products.
- **Risk Response Tracker:** to create and monitor risk mitigation activities. They will be applied after testing in 2020.

We calculate risk factors for suppliers and raw materials by multiplying risk probability and risk impact. We consider 29 risk titles such as Economic freedom, Social unrest, Unfair business practices, and Poor labor practices.

Additionally, for suppliers that are above a certain spend threshold, we have expanded our risk assessment methodology by integrating further factors such as country, industry and supplier risks as well as the impact on our business. We have also included criteria to identify supplier relationships impacted by **key sustainability risks** such as mineral sourcing or animal welfare.

In 2019, we consolidated the Risk Management approach described above and our sustainability activities into a single supply security program in order to gain a more holistic view of our supply chain. In this way, we aim to further strengthen corporate responsibility (CR) within our standard procurement process.

How we implement corporate responsibility standards in the supply chain

Group Procurement is responsible for integrating corporate responsibility (CR) requirements into the relevant stages of our sourcing and supplier management processes. It is a global organization with direct accountability and resources in procurement-relevant local subsidiaries. Our Center of Excellence for Supplier Security coordinates the relevant measures, such as updating our guidelines where necessary, examining processes and coordinating our participation in external initiatives. Sourcing employees responsible for selecting and contracting suppliers are aware and regularly updated on our **guidelines and CR requirements** through internal communications and training.

Also in 2019, our training activities (such as our Procurement Training Academy) for Group Procurement employees included sessions on sustainability.

Integration of Versum Materials and Intermolecular

The acquisition of Versum Materials and Intermolecular resulted in a change to our supplier portfolio. The procurement processes described in this report do not yet fully apply to Versum Materials and Intermolecular. We are currently reviewing their existing processes and will align them as needed.

Until the integration is complete, Versum Materials will continue to apply its existing policies and processes. Versum Materials issues a conflict mineral report pursuant to Rule 13p-1 under the Securities Exchange Act of 1934 and has a conflict minerals policy and the respective due diligence processes in place.

We are currently in the middle of developing a company-wide due diligence process for Responsible Minerals Sourcing according to OECD guidance, which will incorporate and further develop measures already implemented in our business sectors. In the second half of 2019, we established a working group with representatives from business sectors and Group functions that also includes a

representative from Versum Materials. At the end of 2019, elements of a conflict minerals management system were drafted and will be further defined in 2020.

Our commitment: Guidelines and standards

We expect all our suppliers and service providers to comply with environmental and social standards, which are primarily derived from the core labor standards of the International Labour Organization (ILO) and the UN Global Compact.

Moreover, we support the Compliance Initiative of the German Association for Supply Chain Management, Procurement and Logistics (BME) and have endorsed the BME Code of Conduct. In particular, this code sets out rules for combating corruption, antitrust violations and child labor, as well as for upholding human rights, protecting the environment and public health and promoting fair working conditions.

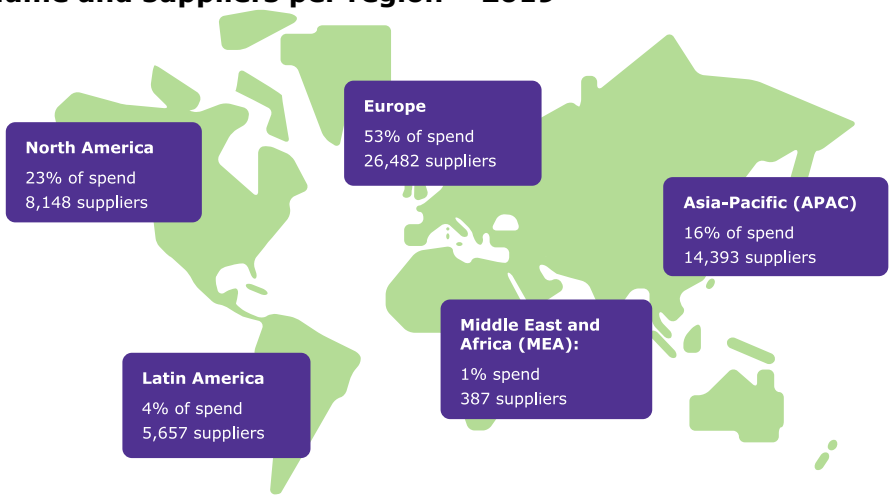
We seek to conduct our business activities in compliance with labor, social and environmental standards while also respecting human rights. Additionally, we abide by the standards set out in our Code of Conduct and our Human Rights Charter. We expect our suppliers to **comply with the labor, social and environmental standards** defined in our Responsible Sourcing Principles and to ensure that their subcontractors do likewise.

All modifications to legal frameworks are incorporated and appropriate measures are initiated where necessary. In 2019, we reviewed our Supplier Management Procedure, which came into effect at the end of 2019. We now take the suppliers' Corporate Responsibility programs into consideration when selecting key vendors and review their Corporate Responsibility progress as part of supplier performance evaluations.

Global procurement

In total, the goods and services we purchased in 2019 from **more than 55,000 suppliers** in almost 150 countries amounted to around € 7.5 billion, versus approximately € 7.4 billion in 2018, representing an increase of 2%. Of these (including R&D services), we purchased 23% from suppliers based in North America, 53% from suppliers based in Europe, 16% from suppliers based in the Asia-Pacific region, 1% from suppliers based in the Middle East and Africa, and 4% from suppliers based in Latin America.

Purchase volume and suppliers per region – 2019[1,2]



[1] For data processing reasons, 3% of our purchase volume (1,434 suppliers) is currently not assigned to any purchase region.

[2] The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

Ambassadors for more sustainable supply chains

In October 2019, the Together for Sustainability (TfS) initiative published The Sustainable Procurement Pledge on the social network LinkedIn. This platform addresses all procurement professionals, academics and students who want to become a sustainability ambassador and drive a responsible procurement agenda through personal engagement. As a member of TfS, many of our Procurement employees have already signed the pledge.

How we monitor our supply chain

A number of different approaches are used to keep track of our suppliers and ensure compliance with our standards and values. These are generally based on the risk the suppliers pose and combine the factors of country risk, industry risk and impact on business.

- Under the **Together for Sustainability** (TfS) initiative launched by companies in the chemical industry, we encourage our suppliers to be assessed either on self-reported information or via audits. We have been a member of TfS since 2014.
- In selected cases, we conduct our own CR audits on suppliers.
- Regarding our mica supply chain, we engage with a global consultancy to conduct audits and the Indian organization IGEP to conduct inspections.

In 2019, we decided to expand the scope of accepted **CR certifications and audits**. We now also accept audits conducted in line with the Pharmaceutical Supply Chain Initiative (PSCI) and in line with the Sedex Members Ethical Trade Audit (SMETA).

TfS supplier assessments and audits

Under TfS, suppliers are assessed either on information obtained during audits, or on the basis of self-reported and publicly accessible information provided by EcoVadis, an independent rating agency. EcoVadis assesses suppliers from 155 countries and 198 sectors across the four categories of **Environment, Labor and Human Rights, Ethics, and Sustainable Procurement**. The results are shared among TfS member companies in compliance with all restrictions stipulated by competition law. Strategically speaking, TfS activities focus heavily on achieving demonstrable improvements in supplier sustainability standards. In 2019, TfS changed its KPI portfolio to measure member activities with a stronger focus on progress and improvement rather than the quantity of assessments and audits.

We conducted several internal webinars and invited suppliers to join a TfS training session in Shanghai (China).

Through the TfS initiative, we have access to more than 1,600 assessments from our suppliers. In 2020, we will intensify our analysis of assessment results and implement comprehensive mitigation activities.

Conducting our own audits

We continuously conduct our own audits in select cases based on business requirements. In 2019, none of these revealed indications of violations of the right of association, the right to collective bargaining, or cases of child labor, forced labor or compulsory labor.

Local suppliers

We have no internal guidelines stipulating that preference be given to local vendors in allocating contracts and therefore do not collect this type of data. We generally procure our goods and services globally. In some cases, however, local vendors do have an advantage, as products bought locally may be less expensive due to a reduction in additional transport costs. Country-specific regulations such as import duties and licenses also help us decide whether to source our goods locally or globally. In some countries local laws require contracts to be awarded to regional suppliers.

Supplier diversity

In the United States, we have a specific supplier diversity program in place that has grown significantly. Within the Small Business Program, the spend with small businesses grew by 146% in 2019 versus 2018, with growth of 294% in small women-owned companies. We focused our efforts on different internal awareness campaigns, supplier diversity days, training seminars for our sourcing managers, and investment in tools to increase our small and diverse vendor database.

Mica supply chain

Mica is an important raw material of our effect pigments, which are used in automotive and industrial coatings and plastics, as well as in the cosmetics and food industries. We procure the majority of our mica from India, specifically the north-eastern states of Jharkhand and Bihar. This region suffers from political instability and poverty, with widespread child labor. We've taken special measures to comply with our social and environmental standards.

Our approach to responsibility in the mica supply chain

In procuring mica from northeast India, we are supporting this region by safeguarding local employment and livelihood. We only source the raw material from suppliers acting in formal working environments and monitor compliance with our standards, including our ban on child labor.

Our mica suppliers have been informed of our standards and have confirmed that they adhere to the principles of our Human Rights Charter as well as the requirements of our Responsible Sourcing Principles. **We do not tolerate child labor** and contractually prohibit our suppliers from employing children. Hence, we are driving initiatives and taking measures to improve the conditions of mica sourcing based on our high standards. We constantly review our monitoring processes and work on improving their effectiveness.

How we organize our mica supply chain

We have established direct business relationships with those suppliers who handle the mica supply chain in India. Our procurement unit is in direct contact with the suppliers to reiterate the importance we place on ethical, social and environmental standards. Whenever non-compliance with our standards is identified, we work with suppliers to ensure the appropriate implementation of corrective measures.

Our commitment: Compliance with guidelines and standards

As a signatory to the United Nations Global Compact, we are actively involved in working to abolish child labor. Our Human Rights Charter underscores this commitment. In our Responsible Sourcing Principles, we set out our expectations for our suppliers in terms of corporate responsibility and human rights, including a ban on child labor. Our Responsible Sourcing Principles also form an integral part of our supplier contracts.

Auditing our mica supply chain

We have implemented a series of oversight mechanisms through a system that monitors and audits compliance with our social and environmental standards. In addition to regular inspections by Merck employees and third parties used for this purpose, we conduct comprehensive announced audits as well as frequent, unannounced check visits in the region.

Regular audits

Environmental Resources Management (ERM), an international management consulting services company, conducts regular audits of all mines and processing plants, investigating working conditions as well as **environmental, health and safety issues**. The audit reports document any identified shortcomings in this respect and propose corrective actions. Our employees in Kolkata (India) and Darmstadt (Germany) then follow up to work on resolving any identified issues.

When shortcomings are not rectified, we take further actions up to freezing relations with the respective company or even terminating the business relationship altogether.

Unannounced inspections

Since 2013, the IGEP Foundation, a local non-government organization, has been arranging regular unannounced visits to check the working standards along the supply chain. During these visits, IGEP monitors occupational safety as well as **compliance on child labor**. In 2019, these inspections focused on the upgrade of personal protective equipment and training sessions on proper use.

Tracking system for mica sources

We use a tracking system to help ensure that the mica we purchase is derived from sources **qualified by our company**, and to monitor their productivity. Based on written records of the daily extraction quantities, we review the volumes of mica reported and supplied to the processing companies.

Community outreach in the mica supply chain

The states of Jharkhand and Bihar are among the most impoverished regions in India. Together with IGEP, we are working to improve the **living conditions of the families** in the mica mining areas. The literacy rate and the number of children who attend school are far below the Indian national average, according to a study conducted in 2016 and a report published in 2018 by the organization Terre des Hommes and the Centre for Research on Multinational Corporations.

As part of our efforts, we are funding three schools in Jharkhand run by our partner IGEP, which are attended by nearly 500 children and adolescents. All schools go up to at least sixth grade. In 2019, two schools introduced a seventh grade. Tailoring and carpentry courses are also offered. At a fourth school run by one of our mica suppliers, we provide scholarships for 200 children.

In addition to our education efforts, we are committed to improving **local access to healthcare**. To this end, we have established a health center operated by IGEP to serve the 20,000 residents in the region. Two medical professionals work at the center and also provide regular health

services to schools. This center provides an important contribution to improving the medical care of the population in the region.

Stronger together: Joint action in the mica supply chain

We are a founding member of the Responsible Mica Initiative (RMI), which was established as a multi-stakeholder group. Our company held the presidency of the organization in 2019. The initiative aims to eradicate child labor and unacceptable working conditions in the Indian mica supply chain by **joining forces across industries**. In 2019, we continued to actively support the RMI's work on its three main goals:

- **Responsible workplace standards**: In 2019, RMI held several training sessions on workplace standards for local businesses.
- **Community empowerment**: Building on the first community empowerment program in 2018, which reached 40 villages, in 2019 RMI launched a second program covering a further 40 villages. The goal is to address the root causes of child labor and to improve livelihoods within the local community.
- **Advocacy**: Through continuous advocacy work, the RMI is recognized as an important partner in drafting future policies to help ensure sustainable mica mining while eradicating the root causes of child labor.

In 2019, the RMI participated in **multiple local and global stakeholder meetings**, such as the OECD Forum on Responsible Mineral Supply Chains in Paris (France). The goal of the event was to assess and facilitate progress on minerals sourcing globally with a special focus on conflict minerals. The RMI also attended the event marking the publication of the National Commission for Protection of Child Rights (NCPCR) study on education and child welfare in the Indian mica mining regions of Bihar and Jharkhand. Also in 2019, RMI signed a Memorandum of Understanding (MoU) with the Responsible Minerals Initiative to help prevent child labor and improve working conditions in mica industry supply chains globally.

New sources of mica

Our processes undergo constant review and improvement. We are evaluating other sources for mica according to our quality, social and environmental standards both in India and in other regions. In 2019, a considerable amount of our mica was obtained from Brazil, where we have also established oversight mechanisms to monitor and audit adherence to our CR standards. Furthermore, we manufacture effect pigments based on synthetic substrates as an alternative to pigments based on natural mica.

Human rights

All nations are called upon to uphold and protect human rights and basic freedoms. As an international corporate group, we have a duty to respect human rights worldwide and to ensure that they are not compromised by our business activities. We are constantly working to integrate human rights due diligence into our processes in an effort to minimize the risk of human rights violations and to protect these rights within our sphere of influence. We will not tolerate any business activities or relationships leading to violations of human rights.

Our approach to human rights due diligence

We are committed to upholding and protecting human rights. To this end, we must first understand the **potential human rights impact** of our business activities and relationships, as well as identify the human rights due diligence measures already in place at our sites. This knowledge helps us adapt our Group-wide efforts to local circumstances and to the respective risk profiles. In this way, we can develop support programs, strategies and processes to overcome particular challenges.

Within the German Global Compact Network, we are a member of the Business & Human Rights Peer Learning Group, a working group in which we engage with other companies to share lessons learned as well as successes in implementing human rights due diligence.

How we promote respect for human rights

Ultimate responsibility for upholding human rights within our organization lies with our Executive Board, which obliges our managing directors of our subsidiaries to meet this responsibility.

Our Group Corporate Responsibility unit is responsible for coordinating all human rights due diligence processes and activities. Progress and measures are regularly discussed at CR Committee meetings, while subject matter experts within our Group functions, business sectors and local units are in charge of initiating the necessary actions.

Moreover, we established an interdisciplinary Human Rights Working Group in 2019. Its objective is to develop and conduct **joint, cross-functional actions** that will enable us to meet our responsibility to respect human rights. The group meets three to four times a year. Four meetings were held in 2019.

Our commitment: Guiding principles, charters and laws

Our Human Rights Charter aligns with the UN Guiding Principles on Business and Human Rights. It underscores our commitment to respecting human rights while also defining the relevant requirements for our company. The charter interlinks and complements all existing rules and regulations pertaining to human rights, including, for example, our Code of Conduct, our Group Environment, Health and Safety Policy, and our Charter on Access to Health in Developing Countries. In 2019, we updated our Human Rights Charter, availing ourselves of **expertise from external stakeholders** such as trade unions, industry associations and representatives of potentially impacted groups. We also adopted a Group-wide Social and Labor Standards Policy, which reflects the labor standards of the International Labour Organization (ILO). Among other topics, the policy covers forced labor, modern slavery, human trafficking, child labor, freedom of association, and collective bargaining rights. In 2019 we also initiated the update of various aspects of our Group-wide Site Security Standard, including human rights.

At the end of 2016, the German federal government adopted a national action plan for implementing the UN Guiding Principles on Business and Human Rights. We welcome this plan and are steadily working to implement it across our organization.

In the United Kingdom, the UK Modern Slavery Act requires us to report on the steps we are taking to counter forced labor and human trafficking. In 2019, we issued our third UK Modern Slavery Statement, which has been endorsed by our Executive Board and is available on our website.

Continually improving our management processes

In order to mitigate human rights risks and prevent their negative impacts, we are working to integrate human rights due diligence even more firmly into our operational processes. With these risks in mind, we are focusing on external manpower, product and service sourcing, and collaboration with contract partners. We are currently creating a **Group-wide overview** of the use of external manpower, above all in high-risk countries such as China, Vietnam and the Philippines. Based on these findings, we intend to execute risk-based measures.

Our Compliance Risk Reporting & Self-Monitoring process also covers human rights topics. In 2019, we broadened our risk assessment of human rights and modern slavery. Initial results will be available in 2020.

In 2019, we also began reviewing human rights aspects within the scope of our Site Security Risk Assessments to determine whether site security has any connection to human rights risks, initiating the appropriate actions as necessary.

In addition, in 2019 we opened our SpeakUp Line to external stakeholders. Previously it was only accessible to employees. Grievances can now also be reported via our website.

Human rights and investment decisions

When projects exceed a certain cost threshold, our Investment Committee must approve the expenditure. In its decision, the committee considers factors such as environment, health and safety. When it comes to investment projects, we are also bound by our Code of Conduct, which stipulates compliance with the principles of the UN Global Compact and therefore also with the core labor standards of the International Labour Organization (ILO), such as the prohibition of child and forced labor.

Creating awareness

In 2019, we took further steps to raise awareness of certain human rights risks.

While revising our Human Rights Charter and introducing our Social and Labor Standards Policy in 2019, we launched an e-learning course targeted to all managing directors and senior leaders reporting to the Executive Board. The course requires them to implement both of these guidelines in their areas of responsibility.

As in the previous year, the EHS StartUp! onboarding course 2019 offered in Darmstadt (Germany) for all new EHS managers addressed the topics of human rights and modern slavery.

Additionally, we ran training activities (such as Procurement Training Academy) for new Procurement employees including sessions on sustainability and human rights in 2019 and conducted webinars for our Procurement staff. Lastly, we invited Chinese suppliers to attend a TfS training session in Shanghai (China).

Our employees can find information about human rights on our intranet.

Bioethics

Part of the non-financial report

Bioethics guides us in how to use the rapidly advancing power of life science and technology responsibly and ethically to the ultimate benefit of society, humans and other living beings. However, factors such as diverse cultural backgrounds have led to heated debates on divisive bioethical topics and issues arising from the explosive progress in science. In light of this situation, we feel the need to clarify our own position on bioethical approaches.

Our approach to ethical business conduct

In our work we encounter various bioethical topics and issues, including animal testing and clinical research, stem cell use, the use of genetically modified microorganisms, and the potential impact of new genome editing techniques such as CRISPR/Cas. We are strongly committed to conducting this research in an ethical manner. **Patient well-being and benefit** is always our number one priority, both during treatment with our drugs and when our products are distributed to academic researchers and the biopharmaceutical industry. We carefully evaluate our position on controversial topics so that we can develop frameworks and make informed decisions that meet the highest ethical standards.

How we assess bioethical topics and issues

The Merck Bioethics Advisory Panel (MBAP), co-chaired by a senior executive biomedical expert from our company and the Head of our Global Health Institute, gives clear guidance on bioethical topics and issues, which steers our actions and entrepreneurial conduct. The MBAP consists of renowned international experts in the fields of **bioethics, theology, science, and law** from the United States along with countries across Europe, Asia, and Africa. The panel's composition reflects the fact that the evaluation and assessment of bioethics are strongly contingent on cultural and regional factors. The bioethical assessment of topics must be viewed holistically. The MBAP meets once yearly and also spontaneously, if required, in response to emerging urgent bioethical issues. We publish a summary of the discussions from each meeting on our internal electronic collaboration platform. Our employees can ask MBAP members for advice and are able to report concerns on ethical issues through channels such as our SpeakUp line or by reaching out to the bioethics office.

Our dedicated guidance panels for genome editing and stem cell matters operate under the overarching MBAP. These panels are responsible for the operational implementation of our stance and are empowered to make decisions about specific questions on individual projects. Formed in 2011, the Stem Cell Research Oversight Committee (SCROC) performs tasks such as verifying all internal research proposals that employ **human stem cells** and ensuring compliance with our ethical guidelines and any legal requirements. This also includes collaboration with external partners.

In 2019, we additionally established the Digital Ethics Board (DEB) as a sub-committee of the MBAP. Its purpose is to guide our new digital business models with a strong focus on health. One member of the DEB will join the MBAP as a digital expert.

Our commitment: Identifying topics and issues early on

As a global company, it is crucial for us to promptly identify and address new developments concerning bioethical topics and issues in order to define our own stance. Although we align all our business activities with international and national legislation, many bioethical discussions raise questions that far exceed the current scope of legislators, which is why we also seek the advice of external experts.

The birth of the first babies from genome-edited embryos in China significantly disrupted the realm of bioethics in 2019. This breach of law, ethics and academic self-regulation led to marked global criticism. Subsequent discussions emphasized the need for profound bioethical debate and meaningful governance of genome-editing research in the human germline. Statements and positions were issued by the National Academy of Sciences, the Royal Society and the German Ethics Council. This furthermore led to the creation of the World Health Organization (WHO) expert advisory committee on Developing Global Standards for Governance and Oversight of Human Genome Editing. Regulation in this research field is expected to emerge in the following years.

Merck Bioethics Advisory Panel (MBAP) discussions

From November 2018 to March 2019, we held internal workshops on **Artificial Intelligence (AI)** ethics to create a baseline on all Advanced Machine Learning (AML) and AI projects at our company and to identify potential (bio-)ethical issues resulting from these projects. In particular, we produced eight guiding ethical aspects to evaluate projects that might be ethically problematic. This improves our ability to develop new technologies responsibly and address potential ethical issues arising from the usage of AI early on. Currently, no ethical questions or problem statements have arisen from our ongoing and planned AML and AI projects.

As a result of these workshops and of new digital health business models that we are developing, the MBAP addressed the topic of digital ethics in 2019. Since these business models involve enabling access to and exchange of patient data, core guidance and foundational ethics must be established in order to gain stakeholders' trust, which is critical for their success. Another major topic discussed by the panel was our genome editing principle.

Other topics included new developments in the Stem Cell Research Oversight Committee and the Global Health Institute.

The Merck Bioethics Advisory Panel (MBAP) members

Merck discusses with external international experts to give guidance on bioethical topics and issues

Prof. Yimtubezinash Woldeamanuel Mulate
Microbiology
Addis Ababa University
Board member and Secretary of Pan-African Bioethics Initiative

Prof. Jochen Taupitz
Medical law, bioethics
Former Vice-Chair German Ethics Council

Prof. Nikolaus Knoepffler
Philosophy, Theology, Ethics
University Jena

Prof. Christoph Rehmann-Sutter
Philosophy, Ethics, Biology
University Lübeck
Former Chair Swiss National Advisory Commission on Biomedical Ethics

Prof. Jeremy Sugarman
Bioethics, Medicine
Johns Hopkins University

Prof. Jeanne Loring
Molecuar Biology, Stem Cells
Formerly Scripps Research Institute La Jolla (Advisor)

Prof. Daniel Fu-Chang Tsai
Bioethics, Medicine
National Taiwan University

Digital Ethics Board

As a result of the MBAP discussions on digital ethics in 2019, we decided to create the Digital Ethics Board (DEB) to deal with all **ethical questions resulting from our Digital (Health) Businesses**, especially from the intended joint venture Syntropy (with Palantir). The DEB is designed as a sub-board of the MBAP, and its chair will join the MBAP as a digital expert. The DEB will consist of world-leading experts in digital health business models as well as experts in ethics and medicine. The first step will be to develop a Digital Code of Ethics to address questions and scenarios that may arise from our new Digital Businesses. The DEB will play a pivotal role in ensuring that we develop new technologies responsibly and address potential ethical issues arising from the usage of digital health technologies early on. We strive to be the "ethical digital health company", adhering to the highest ethical standards in crucial areas such as patient data handling.

Biotechnology and genetic engineering

We utilize genetically modified organisms (GMOs) in our research and development work and have been manufacturing biotech products using GMOs since the 1980s. Without this technology, the **major medical advances** of past years would not have been possible.

Our most important research hubs for medical biotechnology are Darmstadt (Germany), Boston (Massachusetts, USA), Beijing (China), and Tokyo (Japan). Major biotech production sites are located in Martillac (France), Aubonne (Switzerland) and Corsier-sur-Vevey (Switzerland), which is one of the largest biopharmaceutical production sites in Europe.

Across our Group, we manufacture our biotech products in accordance with the highest standards, and all our biotech activities are subject to strict statutory regulations worldwide. Compliance with these regulations is monitored by our **biological safety officers**. We continuously track regulatory changes that relate to biotech products and adapt our processes accordingly, thus ensuring we adhere to all statutory requirements.

Using genome-editing techniques

We are a leading supplier of technologies such as CRISPR/Cas9, which can be used to target and modify specific genes, a process known as **genome editing**. CRISPR/Cas9 opens up new possibilities in genetic engineering research that could bring about major advances in the treatment of serious diseases or in "green genetic engineering", which is the use of genome editing techniques in plant cultivation. Statutes in different countries allow for a varying degree of latitude in applying this technique.

Our Genome Editing Technology Principle provides a mandatory ethical and operational framework for our employees, setting clear operational boundaries for us both as a supplier of custom targeted nucleases and genetically modified cell lines, and as a user of genome editing technologies for scientific research. This principle includes background information on the topic and explains our stance on genome editing.

Following the critical debate surrounding the announcement that a Chinese researcher's work had led to the birth of the first babies from genome-edited embryos, global discussions emphasized the need for profound bioethical debate and meaningful governance of genome-editing research in the human germline. The topic was presented in detail by the Taiwanese member of the MBAP, and potential regulatory consequences were discussed by the panel, including the implications for our company as a provider and user of this technology. Our Principle on Genome Editing, published in 2017, addresses the subject of human germline editing, taking a strict stance against it.

Bioethical views on germline editing (GE) have been evolving for years in academic and societal discussions. Once the safety profile of the use of GE on embryos has been made fully accessible through clinical studies, and once the benefits significantly outweigh the risks, there may be cases where the use of GE on embryos could be ethically acceptable. Even the German Ethics Council took a similar position. One example of this cystic fibrosis, a monogenetic disease.

Considering the progress in genome editing and evolving ethical views, such as the German Ethics Council's perspective, the MBAP agreed that we needed to update our Genome Editing Principle. Sections on background information, the wording on germline genome editing, and the section on artificial gametes subsequently underwent minor revisions. Our statement on human germline editing is as follows:

> "Merck does not support the use of genome editing in human embryos and clinical applications of germline interventions in humans in accordance with the German Embryo Protection Act. Merck recognizes that there may be value of responsibly conducted related research."

Stem cell research

We currently neither participate in clinical programs that utilize human embryonic stem cells or cloned **human cells** for the treatment of diseases, nor do we pursue such approaches ourselves. We do, however, use human embryonic stem cells in our research and offer our customers several select stem cell lines. Thus, our Stem Cell Principle ensures compliance with our ethical approach. All projects are reviewed and approved by the SCROC before any stem cells are used for research purposes. We only use cell lines approved by the United States National Institute of Health (NIH) and allowed under the German Embryo Protection Act and the German Stem Cell Law.

In 2019, the SCROC started developing a new Informed Consent Form for the use of induced pluripotent stem cells (iPSCs). iPSCs are identical to embryonic cells and can generate any type of cell in the human body. They are used in many research projects, but, in most cases, do not require specific approval by the SCROC. The SCROC also decided to support the generation of organoids derived from adult stem cells under the precondition that stem cells derived from fetal tissue should be avoided.

To date, we have not supported research aimed at producing artificial gametes. Any support on our part would have to comply with the German Embryo Protection Act and our Fertility Principle.

The topic of producing artificial gametes will be revisited by the SCROC in order to follow up on ongoing developments.

Fertility research

We develop treatments for infertility and seek to improve the success rate of in vitro fertilization, so we are frequently confronted with various related **bioethical issues**. Our legislative point of reference for these issues is the German Embryo Protection Act, and we are guided by our Fertility Principle, which was developed based on input from the MBAP.

Biosampling and biobanking

Biological samples obtained from patients within clinical studies are indispensable to the development of new precision treatments and advanced diagnostic methods. We handle these samples in a responsible and ethical manner, in compliance with all regulatory requirements and according to the consent given by patients for the use of their samples. This may include the permission to use biospecimens for **further medical research** beyond the clinical study through an optional consent. Since 2017, we have had standard operating procedures and a policy in place that define our principles and processes for human biosample management during and after clinical studies.

Biological samples, including tissue and body fluids, are stored in biorepositories together with the corresponding encrypted patient and specimen data.

Clinical studies

We discover and develop innovative medicines that meet patient needs. In doing so, we adhere to all relevant statutory and regulatory requirements, as well as scientific and ethical standards. For clinical studies, these standards particularly include the Declaration of Helsinki, in which the World Medical Association formulated ethical principles for medical **research involving human subjects**, and the Good Clinical Practice (GCP) of the International Council for Harmonisation (ICH). More details can be found under Clinical studies.

Off-label use

We **endeavor to drive scientific and medical progress**, often doing so in close collaboration with medical professionals. We regularly receive inquiries about the off-label use of our products, such as indications for which the drug was not originally approved. While each medicine is authorized for specific indications, cases do arise in which a physician wishes to prescribe a drug to treat a disease for which it is not approved. Such applications can benefit patients. However, to use a drug in this way, solid evidence must exist showing that it can be effective and safe in the treatment of the specific disease.

Our principles for disseminating information regarding the off-label use of our products are set out in corresponding policies that apply Group-wide. In 2018, we included a statement regarding requests on off-label use in the new compliance policy concerning interactions with patients. We only market our medicines within the scope of the drug's marketing approval; we never share information on off-label use for commercial ends but provide such information to healthcare professionals for medical purposes only and only upon direct, unsolicited request. The information must be backed by scientific evidence and factually balanced. Our employees are not permitted to make any sort of treatment recommendations for individual patients.

Parliamentary discussion on genome-editing

In May 2019, we hosted a Dialogue on Ethics of Genome Editing for German policymakers in the form of a parliamentary breakfast discussion. It was attended by 45 political stakeholders, including elected state officials, members of the German federal parliament, and other high-profile German politicians. Participants engaged in an open debate on the ethics of genome-editing one day after the publication of the German Ethics Council's new position paper on germ cell genome-editing.

Panel discussion on ethical implications of new technologies in the health sector

In November 2019, in collaboration with the Brussels Representation of the State of Hesse, we hosted a panel discussion (representing academia, the European Parliament and Commission, and our company) on ethical implications of new technologies in the health sector, addressing ethical questions on both digital health and genome editing technology. It was attended by 100 European political stakeholders, including elected officials, Members of the European Parliament (including a vice president), representatives from various governmental and non-governmental organizations, and representatives from the pharmaceutical and biotech industries, all of whom engaged in an open debate with the panelists.

At both events, the Merck Bioethics Advisory Panel's recent work had a significant impact on the respective discussions, which in turn generated valuable input for the continuation of the debate.

clinical studies

Part of the non-financial report

Our company develops medicines that help people with serious diseases. Before obtaining regulatory approval, we conduct clinical studies with patients and, if necessary, also with healthy volunteers to investigate the safety and efficacy of these products. These studies generally run for several years. Before they begin, extensive preclinical testing must be performed to demonstrate that the drug poses no unacceptable risks. This typically includes procedures such as animal studies.

Our approach to safe and transparent clinical studies

We conduct high-caliber clinical research that always complies with applicable laws and regulations. When performing clinical studies, we adhere to the **highest ethical and scientific standards** worldwide.

We only conduct clinical studies to investigate issues that are relevant to patients, healthcare professionals or society, and only when the medicines being tested show significant therapeutic promise and have a **positive benefit-risk ratio**. In addition, a sound, established scientific methodology must be available to investigate these scientific or medical questions. We only enroll the number of participants required to answer each of the questions.

Protecting the safety, wellbeing, dignity and rights of the patients and healthy volunteers participating in our clinical studies is of utmost importance to us. We do not intentionally expose study subjects to undue risk or irreversible harm. **Personal data privacy** is also very important to us, and we maintain a strong focus on data protection and confidentiality, in compliancewith statutory regulations.

Clinical studies in low-and middle-income countries

We conduct all our clinical studies in accordance with local laws and regulations and we adhere to all relevant international scientific and ethical standards, irrespective of the region or country. We are intentionally expanding our medicinal product development to more diverse markets in order to address pressing healthcare needs in low-and middle-income countries, and support the development of their healthcare systems.

When performing clinical studies in low-and middle-income countries, where there is usually a lower level of healthcare and limited healthcare infrastructure, furthermore the following applies:

- We only do so in an environment in which the principles of Good Clinical Practice can be upheld.
- We only investigate diseases and innovative medicines that are relevant to the local population.
- We only conduct clinical studies in countries where we expect that the drug being tested will be submitted for marketing authorization and made available to patients after we have proven its efficacy and safety.
- We assure that no subject enrolling in a clinical study is discriminated against on the basis of ethnic origin, gender or socio-economic status.

How we govern clinical studies

Pharmaceutical development and the related governance process are the responsibility of our Head of Global Research and Development, who co-chairs the Development Decision Group (DDG) with the Global Head of Innovative Medicine Franchises. **Decision-makers from all relevant functional areas sit** on this biopharmaceutical committee, helping to ensure a cross-functional approach to the governance of drug development.

Under the umbrella of the DDG, two further committees oversee our clinical studies. The Integrated Clinical Study Committee (ICSC) is responsible for the studies performed by the company in pharmaceuticals that are under clinical development, while the Global Medical Decision Board (GMDB) is responsible for our own studies with approved medicines, as well as for all studies performed by independent investigators and supported by us (so-called investigator-sponsored studies). Both bodies consist of medical-scientific **experts and executives with long-standing experience** in clinical research. The ICSC is also supported by our Therapeutic Area Review Boards, which conduct thorough scientific assessments of new study concepts. Our development and study teams present clinical study concepts to the appropriate committee. Each committee meets regularly to conduct a comprehensive review of the proposed concepts and ascertains that our studies are scientifically sound, have a legitimate scientific

purpose and are performed according to the latest standards and best practices.

Before administering a new drug to human subjects, there must be sufficient evidence that it offers a potential **therapeutic benefit**, is sufficiently safe for use in humans and has a positive benefit-risk profile. We only take the critical step of a first-in-human clinical trial after diligently conducting extensive preclinical testing. The decision resides with a separate committee, the Human Exposure Group chaired by our Global Chief Medical Officer.

We continuously analyze potential **risks for study participants** before and during the course of our clinical studies. Our Medical Safety and Ethics Board (MSEB) oversees the safety of subjects participating in our clinical studies and, as necessary, reviews the benefit-risk profiles of investigational drugs. You can find further information on the MSEB under Patient safety.

Issues may be submitted to the relevant committees by product teams or other committees (as defined in relevant SOPs or committee charters). If individual employees wish to seek advice or report concerns on ethical questions, they can contact the chairperson or a permanent member of a committee directly.

Our commitment: International guidelines and agreements

Our Human Subjects Research and Development Policy provides the framework for conducting clinical studies and helps ensure that we adhere to all applicable **legal, ethical and scientific standards**. In addition to the relevant national laws and regulations, these standards also include:

- The Good Clinical Practice (GCP) guidelines of the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH)
- The Declaration of Helsinki, published by the World Medical Association
- The Belmont Report by the U.S. Office for Human Research Protections
- Good Pharmacovigilance/Laboratory/Manufacturing/Distribution Practices (GVP/GLP/GMP/GDP)
- The International Ethical Guidelines for Health-related Research Involving Humans, published by the Council for International Organizations of Medical Sciences (CIOMS)
- The Joint Position on the Disclosure of Clinical Trial Information via Clinical Trial Registries and Databases and the Joint Position on the Publication of Clinical Trial Results in the Scientific Literature, published by the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA) the European Federation of Pharmaceutical Industries and Associations (EFPIA), the Japan Pharmaceutical Manufacturers Association (JPMA), and the Pharmaceutical Research and Manufacturers of America (PhRMA)
- The Principles for Responsible Clinical Trial Data Sharing, published by EFPIA and PhRMA, and the IFPMA Principles for Responsible Clinical Trial Data Sharing

Regular supervision of clinical studies

Our clinical study procedures are regularly inspected by health authorities to ensure compliance with the applicable laws and guidelines. We also conduct our own **quality assurance audits**. These are planned by the Research and Development Quality function, based on a quality risk assessment approach to identify areas for internal and external auditing. In both cases, we respond immediately to any issues found by defining and implementing corrective and preventive actions to improve our processes accordingly.

Conducting clinical studies responsibly

Prior to enrolling subjects, every clinical trial must first be assessed and approved by a qualified **independent ethics committee**. Furthermore, all regulatory authorizations required in the respective country must be obtained. In accordance with Good Clinical Practice guidelines (ICH-GCP), all study participants must give their explicit informed consent before enrolling in a clinical study. Participants are fully informed about all aspects of the clinical trial in a language that they understand. This includes the potential risks and benefits from participating in the study. All participants are given ample time and opportunity to inquire about details before deciding whether to participate. All questions are answered by the clinical investigator or another qualified healthcare professional familiar with the study. As far as possible, non-interventional (observational) studies are also assessed by an ethics committee.

Every study follows precisely defined procedures to ensure that it is conducted to the **highest quality standards** in line with good working practices for the development and manufacture of drugs (GxP), the ethical principles of the Declaration of Helsinki and other international guidelines and regulations. In 2019, once again, there were no significant issues which had any impact on patient rights, patient safety or data integrity of a study raised by third parties or regulatory agencies.

We continuously collect and communicate **safety data for our investigational drugs** and promptly provide clinical investigators with important new findings relevant to the safety of the study participants. In this way, we help to ensure the safe use of our pharmaceuticals. Potential adverse effects and risks are taken into consideration in an effort to evaluate the benefit-risk ratio of our products and manage any risk. Product information, including the Investigator's Brochure and Information for study participants, is updated accordingly. More information is available under Patient safety.

Conducting clinical trials in vulnerable populations

The implementation of clinical studies in vulnerable populations, such as children or people with mental disabilities, requires **special attention and care** in order to comply with the highest ethical and scientific standards. The well-being of the individual is our highest priority. For this reason, we only conduct studies with participants from vulnerable population groups if scientifically justified and if there is no other way to achieve conclusive results. When performing such studies, especially when informing study participants and obtaining their consent, we comply strictly with all statutory regulations.

Under our leadership and in collaboration with a consortium of partners, the Pediatric Praziquantel Program has conducted clinical trials with vulnerable populations in low- and middle-income countries. The program aims to develop, register and provide access to a **pediatric formulation** of praziquantel for treating schistosomiasis in children younger than six years of age. Due to the lack of clinical data as well as a suitable pediatric formulation of praziquantel, this age group currently goes untreated. Following the successful completion of Phase I bioavailability studies with healthy adults in South Africa and the swill-and-spit taste study in children aged six to eleven in Tanzania, Phase II was concluded in November 2018 in Ivory Coast. The results confirmed the validity of lozenges (orodispersible formulation) as dosage form to be pursued to registration. The pivotal Phase III trial, which is being conducted in Kenya and in Ivory Coast, started in September 2019.

The clinical program was designed in line with the recommendations of the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA) for pediatric development. It was planned and is being implemented in close cooperation with regulatory authorities and a panel of international experts, including clinicians from endemic countries. Further details can be found under "Health for all".

Teaming up to get results

To provide a broad, in-depth basis for the development of new medicines, we frequently conduct clinical studies in collaboration with external **partners in academia and industry**, as well as with medical-scientific advisory boards, service providers and vendors. We expect all our partners to abide by the same set of high standards when conducting clinical research. This especially applies to contract research organizations (CROs) performing studies on our behalf.

In our collaboration with CROs, we follow established processes of selection, approval, contracting and monitoring defined in comprehensive manuals. We expect their services to comply with the highest quality level including roles and responsibilities as specified in detailed quality agreements. Vendors are audited regularly based upon a risk assessment approach. This is to ensure that they comply with all applicable regulations, guidelines and the requirements defined in the aforementioned manuals and agreements. The same applies to study centers (for example, hospitals) involved in our clinical studies. In 2019, these audits again reveal no indications of systematic or significant non-compliance with the standards mentioned above. One individual critical observation was raised with respect to computerized systems. The root cause was identified and addressed with relevant corrective and preventive actions.

We are a member of TransCelerate, a consortium of 20 pharmaceutical companies seeking to drive the e**fficient, effective and high-quality delivery of new medicines.** In this context, we are currently leading an initiative related to decentralized (virtual) clinical trials.

Close dialogue with patients and advocacy groups

We want to ensure the voice and **needs of patients and their caregivers** are adequately taken into consideration when developing and conducting clinical studies. We, therefore, established the Patient Advisory Boards (PAB) as one of our crucial communication channels. Our PAB Charter describes how to involve patient advocacy groups in our clinical research process. During Advisory Board meetings, patients, caregivers and representatives from patient advocacy groups are invited to share their experience and perspectives related to clinical trials. We use this opportunity to discuss multiple aspects of the drug development process, including but not limited to, protocol design, educational materials, technology and innovative approaches to clinical trials. Our Global Clinical Operations (GCO) unit values and leverages such information in multiple ways, with a clear focus on prioritizing patient centricity in everything we do. In 2019, we made further strides towards delivering this ambition by executing the first PAB in Asia.

Furthermore, we are involved with multiple organizations that focus on this relevant aspect of **patient centricity in clinical studies**. In the United States, we are an active member of the Clinical Trials Transformation Initiative (CTTI), which focuses on quality and efficiency in clinical trials. In Europe, we are involved in the European Patients' Academy on Therapeutic Innovation (EUPATI), a public-private partnership within the Innovative Medicines Initiative (IMI). We extended our participation, which initially ran from 2012 to 2017, until the end of 2019. EUPATI is a pan-European project led by the European Patients' Forum (EPF). It features partners from patient advocacy groups, universities and not-for-profit organizations, along with a number of pharmaceutical companies.

Responsible data sharing

We support professional circles in advancing **medical and scientific knowledge**, thereby allowing for informed healthcare decisions for the benefit of patients. Upon request, we provide qualified researchers with study protocols, anonymized patient data, study data, and clinical study reports. We share data and information in a manner that is consistent with the joint Principles for Responsible Clinical Trial Data Sharing of the EFPIA and PhRMA:

- Safeguarding the privacy of patients
- Respecting the integrity of national regulatory systems
- Maintaining incentives for investment in biomedical research

In 2019, we did not receive any substantiated complaints from patients, participants or regulatory bodies concerning breaches of privacy in the context of our clinical studies.

Disclosure of clinical studies and publication of results

We are obliged to disclose findings from our clinical studies, which we do publicly in a complete, accurate, balanced, transparent and timely manner, as laid out in our Clinical Trial Disclosure Policy. Our clinical study designs and results are made public in the international ClinicalTrials.gov database run by the U.S. National Institutes of Health (NIH), which can also be accessed via the World Health Organization's International Clinical Trials Registry Platform (ICTRP). Furthermore, in accordance with EU regulations, we publish results from our clinical studies in the EU Drug Regulating Authorities Clinical Trials (EudraCT) database, which is run by the European Medicines Agency (EMA). If required by local laws and regulations, we publish study results on other publicly accessible platforms. In 2019, we provided participants of 11 studies with Lay Patient Summaries of clinical study results, which explain the results in plain language. Since November 2019, we have been providing clinical study report synopses and Lay Patient Summaries on our clinical trials website.

We publish results from our clinical studies in **medical journals** in line with applicable laws and industry codes. In this way, we adhere in particular to the current version of the Good Publication Practice (GPP3) and follow the recommendations of the International Committee of Medical Journal Editors (ICMJE). Our Medical Publications Policy ensures compliance with all relevant standards and we use defined standard procedures for scientific publications on our products.

Immuno-oncology: Major clinical research milestones

Immuno-oncology investigates the extent to which the body's immune system can be activated or boosted to mount an immune response against cancer cells. As part of our strategic alliance with the U.S. pharmaceutical company Pfizer, we are developing Bavencio® (avelumab), an investigational anti-PD-L1 antibody that we initially discovered and developed as a potential treatment for different tumors. Under this collaboration, in 2015 we launched JAVELIN, our comprehensive international clinical study program in which we investigate the potential therapeutic benefit of avelumab in multiple tumor types. By the end of 2019, more than 12,200 patients had participated in this program.

By the end of 2019, avelumab had gained marketing authorization in 50 countries, including the EU member states, Japan and the United States, for the treatment of **patients with metastatic Merkel cell carcinoma (mMCC)**, a rare and aggressive form of skin cancer. Furthermore, avelumab was granted regulatory approval in three countries for the treatment of patients with locally advanced or metastatic urothelial carcinoma (UC) following platinum-containing chemotherapy. UC is a malignant tumor of the urothelium lining the urinary tract.

In addition, avelumab, in combination with axitinib, gained FDA approval and European Commission authorization in 2019 for treating patients with advanced renal cell carcinoma. Meanwhile, avelumab continues to be evaluated in several ongoing registrational Phase III studies across different tumor types, including lung and head and neck cancers, as well as the first-line therapy of urothelial carcinoma.

In 2019, we entered into a **global alliance** with the company GlaxoSmithKline to co-develop and co-commercialize Bintrafusp alfa, a bifunctional fusion protein for immunotherapy. Currently in clinical development, including pivotal studies, it could be used to treat multiple difficult-to-treat cancers.

Enabling early access to new medicines

Not all patients have the opportunity to take part in a clinical study and so must wait for a new pharmaceutical product to be approved. Through our **Early Access Program**, we can, under specific circumstances, enable patients to gain early access to new, potentially life-saving medicines. The offer is aimed at people with serious conditions who have already received all available therapies without success. It allows them to be treated with medicines that have already been clinically tested but have not yet been approved. Furthermore, we offer patients who participated in one of our clinical studies post-study access to the investigational product, provided that certain conditions are met. Here, too, we meet stringent statutory, ethical and scientific standards. By performing a thorough assessment of all available data, we ensure that the potential benefits outweigh the potential risks for patients. We published position papers on Early Access and Post-Study Access on our website.

Supporting independent human subject research

In addition to conducting our own clinical research programs and studies, we also support studies proposed by independent investigators, so-called investigator-sponsored studies (ISS). Our ISS Principles, published on our website in 2018, define an ISS as "an unsolicited request for funding and/or supply of an investigational or marketed product by a third-party investigator/institution that initiates and conducts an independent scientific investigation as the regulatory sponsor". By granting **financial or material support** for independent human subject research, we seek to stimulate the advancement of clinical and medical knowledge and patient care in our therapeutic areas of interest, and to support the safe and effective use of our products. We give priority to research that is innovative and has the potential to address specific unmet medical or scientific needs. Our principles, framework and standards for granting support for ISS and for our collaboration with independent investigators are specified in our ISS Principle and our corresponding policy and standard operating procedure.

Coming to terms with the past

In the 1950s and 1960s, pharmaceutical companies in Germany supplied their drugs to various institutions for clinical trials conducted typically by university clinics or general practitioners, but in certain cases, also in children's care homes. Since 2015, we have been giving researchers access to the files in our historical archives at our global headquarters in Darmstadt (Germany) and supporting them in the comprehensive historical research of this topic. We maintain **full transparency**. When their work is completed, their findings can be used for the final assessment of this complex topic.

animal welfare

From both an ethical and scientific perspective, animal studies for medical purposes and chemical safety are indispensable and furthermore mandated by law. We comply with strict animal welfare standards that meet and frequently exceed applicable laws. Moreover, we oblige our suppliers, contract research organizations and other partners to meet our high expectations with respect to animal welfare.

Our approach to animal welfare

Animal studies enable us to test both the safety of our medicinal and chemical products, and the efficacy of our pharmaceuticals. We conduct animal studies within our Healthcare business sector as part of the official drug approval process, for chemical safety (REACH) and for biological quality control. Animal welfare is also of importance to the Life Science business sector, where laboratory animals are kept, for instance, for the generation of antibodies. Our subsidiary BioReliance conducts animal studies within the scope of contract research work for third parties.

Our Group-wide Policy on the Use, Care and Welfare of Laboratory Animals sets forth our commitment to consistently uphold the highest ethical standards regarding the housing, care and feeding of laboratory animals. When conducting animal studies, we pursue well established methods that ensure high-quality results. We strive to replace animal studies with alternative methods wherever possible and permissible by law. We, therefore, subscribe to the internationally recognized **3Rs for animal-based research**:

- Reduction – using the minimum number of animals required
- Refinement – minimizing distress or discomfort before, during and after testing
- Replacement – replacing animal studies with non-animal systems

With our internal 3Rs Award, we recognize best practice and further strengthen our commitment to apply and actively promote the 3Rs in our animal studies.

We also promote the 3Rs outside our company. Under the International Consortium for Innovation and Quality in Pharmaceutical Development (IQ Consortium), for instance, we joined forces with other pharmaceutical companies to introduce the Global 3Rs Awards Program. In partnership with the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC International), the IQ Consortium recognizes **innovative contributions** to the 3Rs of animal studies to advance ethical science in academia and industry.

How we ensure animal welfare

Through our Corporate Animal Science and Welfare unit, we endeavor to create uniform high-quality animal welfare standards. To ensure adherence to these standards, we initiate **animal welfare audits** within both our company and our partners. Our animal science and welfare officers and experts regularly interact through our global laboratory animal science network, sharing best practices and lessons learned. This supports the animal welfare units at our sites as well as all projects and processes related to animal science and welfare.

Our Group Animal Welfare Council is made up of representatives from all our business sectors and meets twice a year. The council discusses relevant developments, advises the Chief Animal Welfare Officer and makes decisions regarding our Animal Welfare Strategy.

If employees identify an issue regarding animal welfare, they can report it directly to the **Chief Animal Welfare Officer** or via our SpeakUp Line.

All our animal sites are subject to national regulations. In order to assess the quality of animal husbandry practices and ensure compliance with our standards as well as all statutory requirements, we appoint **animal welfare officers** and establish **animal welfare councils** across our Group, even where not required by law.

Work with committees and associations

As part of our efforts to improve animal welfare, we are involved in several organizations such as the European Federation of Pharmaceutical Industries and Associations (EFPIA), the German Association of Research-based Pharmaceutical Companies (vfa) and Interpharma, a federation of research-based pharmaceutical companies in Switzerland. As a member of Interpharma, we have joined a continuous dialogue with Swiss Animal Protection to identify common interests and find synergies regarding the 3Rs.

Our Chief Animal Welfare Officer is a member of various committees and takes an active role in order to advocate our position on animal welfare. Moreover, he represents EFPIA on the AAALAC International Board of Delegates. In 2019, he was appointed Vice Chair Elect to the Board of Directors of AAALAC International, entailing a four-year commitment (2021 Vice Chair, 2022 Chair, and 2023 Immediate Past Chair). He is also a member of the German Federal Animal Welfare Commission. Our animal welfare officers are members of the National Committee pursuant to section 15 of the German Animal Welfare Act, the German professional veterinary commission for laboratory animals and the German federal professional veterinary commission for animal welfare, for example.

Our commitment: Group-wide methodology and standards

Through our Group-wide Policy on the Use, Care and Welfare of Laboratory Animals, we have expressed our commitment to global animal welfare principles and the highest possible ethical standards in animal studies. The policy further sets out principles on the housing, care and feeding of laboratory animals. We strive to provide our animals with the **best quality of life possible** and consistently seek ways to make improvements. This ethos applies equally to the contracted animal study services we offer third parties such as contract research organizations, academia or partnerships and to those services we contract from these third parties. In addition to our policy, our Group-wide Animal Science and Welfare manual describes the requirements for implementing, maintaining and improving animal welfare practices. Moreover, our standard entitled Housing and Husbandry Practices for Common Laboratory Animals also applies to our external partners. Our Vendor Qualification Standard describes our criteria for evaluating the quality of animal welfare practices in our suppliers and partners.

Legal requirements

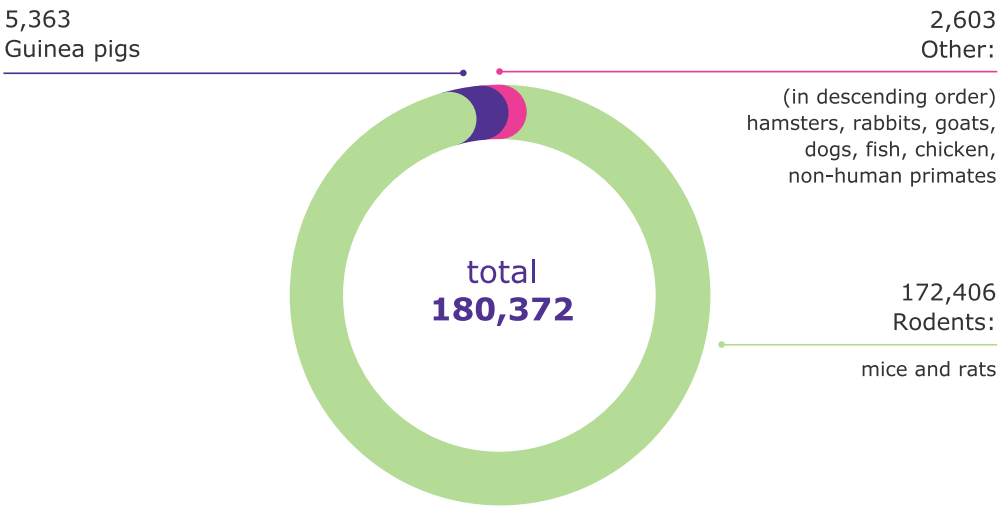
Animal testing is only permitted if there are no recognized alternative methods available. In many fields, however, animal studies are indispensable and legally mandated by ICH guidelines or REACH, which place priority on the **safety of humans**. Laws and regulations govern all aspects of animal testing, such as the housing conditions of laboratory animals, the conduct and approval of studies and the reliability and expertise of all involved individuals.

Number of laboratory animals used for medical study purposes

In 2019, 180,372 animals were used at our company. This represents an increase of 8% compared to 2018. This is attributable mainly to the Life Science business sector, specifically the subsidiary BioReliance. This increase is directly related to government-required safety testing of the compounds of our customers, in particular the testing and determination of clinical toxicological safety profiles.

The majority (96%) of the laboratory animals we use are rodents (mice or rats). In addition, around 10,240 animals were used by contract research organizations (CROs) on our behalf and in collaboration with academia, which represents a decrease of 5% compared to 2018. Regulatory agencies sometimes require the safety of investigational drugs to be investigated in non-rodent species. This allows researchers to identify potential adverse effects with the necessary accuracy and include them in the risk assessment of a substance.

Animal types



Auditing our research facilities

We perform regular audits on our animal testing facilities to ensure adherence to our animal welfare standards. In 2019, three internal audits (sites in Israel and Scotland) and one authority visit in Darmstadt were conducted. Where necessary, we initiated the relevant corrective measures. No critical shortcomings were identified during these audits.

We strive to adhere to the highest international animal welfare standards. All our Healthcare laboratory animal facilities and one of our Life Science laboratory animal facilities in the United States were accredited to the standards of AAALAC International.

Collaborating with partners and suppliers

We perform the majority (95%) of animal studies ourselves and procure the animals required from specialized breeders. Sometimes, however, we also hire contract research organizations (CROs) to conduct animal studies on our behalf. Furthermore, we work with academic institutions. Whenever collaborating with such organizations, we expect them to share our high standards, as set out in our Use, Care and Welfare of Laboratory Animals Policy and in the Group standard entitled Animal Welfare CRO, CMO and Supplier Qualification.

Regularly auditing our partners

We verify compliance with our animal welfare policy and standards through a risk-based qualification procedure together with regular audits of our animal breeders and contract research organizations. As part of our collaboration with Interpharma, we worked with other member companies to develop a **cross-company audit concept**. The results are shared among Interpharma member companies and treated confidentially. Based on the audit results, it is up to the discretion of each company whether or not to collaborate with the respective suppliers. In 2019, the association conducted three audits in Germany, France and the United Kingdom, respectively. We, ourselves, conducted one audit at a CRO in Israel.

In October 2019, one of our CROs in Germany conducting animal studies was accused of having violated our animal welfare and legal animal protection regulations. Following a comprehensive internal investigation, we decided not to commission any further animal studies from this CRO. The last study activities ended in December 2019. If this legally required study had been terminated earlier, it would have had to be repeated elsewhere with other animals. To protect the animals and minimize any potentially harmful impacts, our experts oversaw the completion of the study. Through our rigorous and diligent on-site supervision at the laboratory we could ensure full compliance with all applicable animal protection standards and statutory regulations.

In consultation with the authorities, we work with recognized animal welfare organizations to find appropriate accommodation for the remaining laboratory animals. You can find more information in our NEWS section online (only in German).

Comprehensive employee training

We regularly train all employees who work with laboratory animals. This way we want to ensure that animal studies are conducted according to the latest scientific standards and that animals receive the best care possible. We held training sessions in Darmstadt (Germany), and at several U.S. sites. The training covered topics such as roles and responsibilities of Institutional Animal Care and Use Committees (IACUCs) and clinical care of animals. The nature and scope of the training courses are based on national, international and local legislative requirements.

Our employees also regularly participate in external continuing education programs, such as accredited laboratory animal science courses offered by the Federation of European Laboratory Animal Science Associations (FELASA), the American Association for Laboratory Animal Science (AALAS), the Society of Laboratory Animal Science, the Laboratory Animal Science Association (LASA) and the Interessengemeinschaft Tierpfleger (Community of Animal Technicians).

How we implement the 3Rs

We implement the 3Rs by way of various measures – both within our own company and as part of industry associations. In 2019, for example, we established the use of less invasive imaging technologies (magnetic resonance imaging and ultrasound) for longitudinal and individual investigations in preclinical studies in rodents.

We also put in place an innovative group housing concept for rabbits and rats at one of our sites. By keeping animals together in groups, they are generally healthier and less stressed. Wherever possible, we adopt out our animals and employ a special re-homing program using recognized animal welfare organizations that specialize in laboratory animals.

Further, our scientists continuously develop alternative methods for animal studies and received numerous accolades for their efforts.

In 2019, we invited once again to apply for our Merck 3Rs Award. The internal award honors employees who provide innovative ways of implementing the 3Rs principle for animal-based research.

We actively support the development of **alternative testing methods** and their official recognition at an international level. There is serious need for action here because animal studies can only be truly reduced if a new methodology is internationally accepted. Without this global recognition, both, animal studies and alternative testing have to be conducted in parallel when developing pharmaceuticals intended for worldwide distribution.

To help improve this situation, we support the European Partnership for Alternative Approaches to Animal Testing (EPAA). This collaboration between the European Commission, European trade associations and companies from various industry sectors seeks to pool knowledge and resources to accelerate the development of alternative approaches to animal use in regulatory studies. Through our membership in the German Association of Research-based Pharmaceutical Companies (vfa), we also support the German set Foundation, which is dedicated to finding and developing new alternatives in animal experimenting and seeks to **reduce and replace animal testing**. To achieve this objective, the foundation funds projects that conduct research into alternative methods. Our Chief Animal Welfare Officer is currently Vice Chair of the set Foundation Board of Trustees.

products

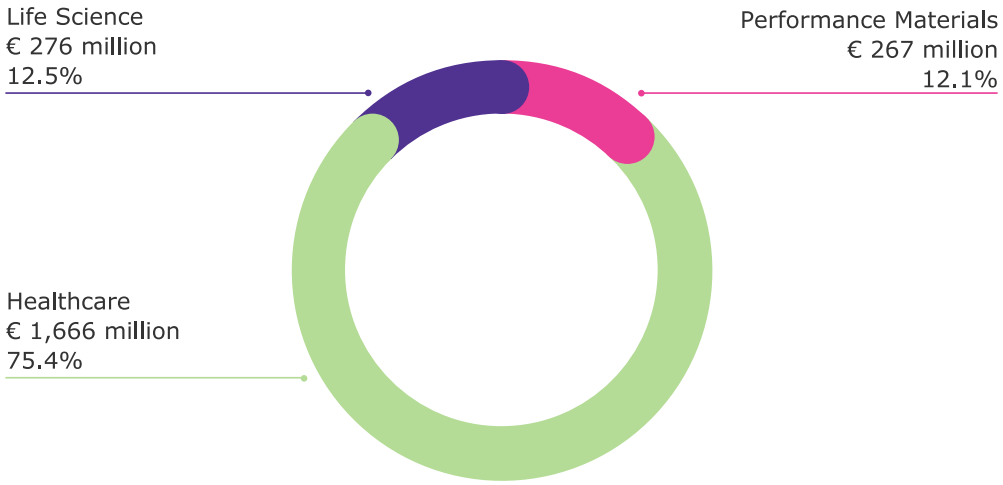
Within this chapter:

innovation and digitalization

Part of the non-financial report

We develop products and technologies that enrich people's lives. To this end, we are constantly on the lookout for groundbreaking developments and trends. Research and development (R&D) and innovation are the cornerstones of our success. In 2019, we spent € 2.3 billion on R&D, corresponding to 14% of our net sales. New technologies, and the advance of digitalization in particular, enable us to create innovative technologies, products, services and pioneering business models. Digitalization also decreases the time-to-market for new ideas, which creates opportunities we intend to leverage.

Research and development costs by business sector[1] – 2019



1) Not presented: Research and development costs of € 59 million allocated to Corporate and Other.

Our approach to innovation

Our Healthcare, Life Science and Performance Materials business sectors use established strategies to drive new product developments for the benefit of patients and our customers. The diversity of these business sectors provides us with a breadth of technologies and depth of market knowledge, giving us a competitive advantage in developing new products.

At the same time we aim to create new businesses between and beyond our business sectors and the current scope of our activities. When deciding where to focus our activities, we analyze current megatrends to determine the innovation fields in which we see potential for new business. We endeavor to identify innovation projects that transcend our current portfolio and develop them from the initial idea all the way to market launch. This can only succeed if our business sectors work closely together and if we are open to external momentum. Our **end-to-end innovation process** seeks to achieve exactly that. In the process of integrating Versum Materials and Intermolecular, which we acquired in 2019, we are reviewing the existing innovation process, making adjustments as necessary.

We also create and **foster innovation ecosystems** in order to bolster our overall innovative power in several areas. We incubate viable technology companies through our Accelerator programs in Europe and China. Furthermore, we partner with key universities on several development programs, focusing on the fields detailed below.

INFO

OUR THREE INNOVATION FIELDS TO DRIVE INNOVATION BETWEEN AND BEYOND

Bio-sensing and interfaces

Focusing on the interface between the biological and digital world, the goal of this field is to utilize data analytics tools to enable faster and more accurate (remote) monitoring and medical treatments in numerous areas.

Clean meat

This field concentrates on the biotechnology required to produce real meat grown in vitro. This is expected to enable the production of animal protein that is healthier, more ethical and environmentally sustainable.

Liquid biopsy technologies

This area focuses on non-invasive alternatives to traditional tissue-based diagnostics, such as liquid biopsy, thereby reshaping methods of detecting and managing various diseases.

We drive promising projects as quickly as possible from the brainstorming and idea generation stage to an incubation and growth phase, where we provide project teams with a suitable environment to develop their business models and scale up their ideas. Projects are monitored in a lean process in which they prove their commercial relevance at different gates. All activities are **supported by experts** in business model design, business development, market research, and agile methodologies. The objective is for the new products or services to make a measurable contribution to our business success once they have been launched.

Our approach to driving digital innovation

A major focus of our innovation efforts is digitalization, and we leverage related opportunities to boost our business performance. We are therefore increasingly forming new **strategic partnerships** with organizations offering different perspectives. We expect to see progress in:

- **Research and development:** Digital technologies enable us to access and analyze large volumes of data rapidly, thereby accelerating our research and development activities. This is particularly the case in our Healthcare business sector, where we are working to advance the development of new drugs to provide patients with faster access to effective medicines.
- **Supply chain management:** Digital technologies help us to better manage our supply chain. Centrally collating all data gives us access to crucial real-time data. This enables us to predict supply bottlenecks around the world and respond promptly to make sure medicines reach their destination when needed.
- **Production:** We set up the infrastructure to capture data throughout all stages of our production processes and apply advanced data science methods to optimize our manufacturing methodologies. To improve the efficiency and reliability of our production processes, we leverage in-silico methods, which means that we simulate molecule properties or chemical reactions on a computer.
- **Digital product innovations:** Digitalization enables us to broaden our existing product portfolio to include offerings such as new digital services. We also promote health awareness and improve disease awareness and patient treatment through innovative e-health offerings such as our Diabetes Online Risk Assessment (DORA).
- **Interactions with customers:** Thanks to modern data collection and analysis methods, we can make more efficient use of customer-relevant data. This information allows us to adapt our products and services where necessary.

You can find more information on research and development in our 2019 Annual Report.

How we drive innovation

The organizational setup of our research and development (R&D) activities reflects the overall structure of our company. All three of our business sectors operate independent R&D units, which pursue their own individual innovation strategies.

Our Group Strategy and Transformation function facilitates innovation between our individual business sectors and beyond our current business scope. It oversees an **end-to-end process** that ranges from setting the innovation direction through project ideation, incubation and growth to establishing long-term new businesses for our company.

Projects of this kind are developed through our Innovation Center at our global headquarters in Darmstadt (Germany), our China Innovation Hub and our Silicon Valley Innovation Hub.

In addition to identifying innovation fields at a global level, we have also introduced a China Innovation Hub, which is mainly centered on AI-enabled health solutions. In this **innovation field focused on China**, we are exploring new AI-based technologies, products and services that could impact the medical or healthcare industry across the value chain by, for example, increasing efficiency, saving costs or improving customer experience.

Many potential partners for innovation projects are based in Silicon Valley (United States). Through our Silicon Valley Innovation Hub in Menlo Park, California, we aim to uncover new technological opportunities and establish partnerships and projects within our three innovation fields.

Our Innovation Committee (IC) oversees the implementation of innovation projects both between and beyond our business sectors. It is tasked with reviewing the progress of ongoing efforts and with ensuring that the decision-making process for selecting innovation projects is both transparent and consistent. The committee consists of leaders from our Group functions and our three business

sectors. For projects requiring larger-scale investments, the IC consults our Executive Board.

Leveraging data science capabilities

We employ a Global Data Science Team of around 30 data scientists to leverage the significant potential in **advanced analytics and machine learning**. For example, this team works with external and internal data to provide insights to sales teams in Life Science, uses image recognition techniques to support the work of clinicians and researchers in our Healthcare business sector, and assists in the research and innovation process in Performance Materials. The team is part of our Digital Organization, which focuses on providing significant business value by challenging conventional scientific methods and implementing technology to create faster processes.

Investing in promising ideas

M Ventures is our strategic corporate venture capital arm. It invests in innovative technologies and transformational ideas with the potential to significantly impact our core business areas. With a € 300 million fund, M Ventures has a focus on **early-stage investing and start-up companies**, including the creation of spin-offs to leverage our science and technology base. M Ventures takes an active role in its portfolio companies and has a mandate to invest in the areas of Healthcare, Life Sciences, Performance Materials, and New Businesses.

Our commitment: Protecting innovative ideas

We are committed to ensuring the confidentiality of sensitive information, particularly of intellectual property in digitalization projects, and to protecting our innovative ideas. Our Policy for Personal Data Protection and Personal Data Privacy defines the standards that govern how we process, save, use and transfer data. You can find more information on data protection under Compliance.

Our Innovation Center: Growing ideas into business

Located in Darmstadt (Germany), our Innovation Center offers our employees and external partners an optimal environment to **cultivate their ideas** and scale them up to viable new businesses. We provide the infrastructure needed to advance cutting-edge projects, along with state-of-the-art methods and tools.

The Innovation Center team holds regular events, workshops, seminars and webinars. Through these channels, we introduce our employees to creative methods that help generate innovative ideas. In 2019, our Innovation Center received several awards and accolades for its unique concept of driving innovation.

Igniting and nourishing internal ideas

We seek to maximize the innovative power within our company, giving our employees around the world the opportunity to present their ideas via diverse channels. Our **Innospire** initiative encourages employees to submit ideas for new products, services and business models. Through a multi-stage process, we develop the best suggestions into business plans. In 2019, employees submitted a total of 406 project ideas related to either our three innovation fields or our freestyle category. After assessing their viability, we will announce the most promising projects in May 2020.

Our **Innovator Academy** strives to unlock the innovation potential of idea givers, internal project teams and members of think tanks and start-ups. It provides a wide range of development programs and methodologies, along with online and classroom training courses. We also offer webinars, introducing employees to Innovation Center topics and content through practical examples.

Project example: Mapping the technology and knowledge landscapes of companies

The R&D world in large global organizations is very complex and highly dispersed over many sites, countries and sectors. Finding the right expert or the capabilities needed to start or run projects can therefore become a cumbersome exercise. In addition, building the most efficient R&D strategy for an enterprise requires a comprehensive overview of the available technology platform portfolio.

We have created a **digital solution** to map the entire technology and knowledge landscape within our company – across sites, sectors and countries. This makes the information created by every knowledge node across the organization instantly available to R&D managers, experts, technology scouts and strategists across the business. A next step is to commercialize this software, making it available to other companies.

Opportunities for university students

In June 2019, we launched the Merck Innovation Summer School, a three-month intrapreneurship program giving students a unique opportunity to learn about intrapreneurship, meaning innovation in a corporate environment. The students were to grow a seed idea **into a pitchable innovation concept**. They were tasked with exploring our innovation fields and proposing ideas for potential new innovation projects in the Innovation Center. Our expert jury selected two promising ideas, and we offered the winning teams seed funding to further shape their ideas into an initial business plan at our Innovation Center.

Silicon Valley Innovation Hub: Looking for the food revolution

The Silicon Valley Innovation Hub has a strong focus on our Clean Meat innovation field. Besides other initiatives, we began sponsoring the Alternative Meats X-Lab at the University of California, Berkeley (USA) in 2019, to help entrepreneurs and researchers investigate the **next generation of foods**. The sponsorship offers an opportunity to engage with a prolific research community within the Clean Meat industry that is interested in ideation, problem-solving and driving the research agenda.

We also partnered with the Institute for the Future (IFTF), a not-for-profit think tank based in Palo Alto (California, USA). This relationship will give us access to recent research on the **future of food** and allow us to collaborate with one of the most highly regarded and successful think tanks in the world on topics within our innovation fields.

China Innovation Hub: Strengthening our innovation footprint

Our China Innovation Hub has locations in Shanghai and Guangdong, which were inaugurated in October and November 2019, respectively. Their role is to use a **nationwide innovation network** to scout, incubate and invest in innovative opportunities in healthcare, life science, performance materials, and related fields between and beyond our existing businesses.

In addition, we launched a **China-specific program** for the Merck Accelerator via the China Innovation Hub. Six start-ups completed their three-month acceleration journey, with half of them forging partnerships in business sector and innovation fields of our subsidiary in China.

Synergizing external ideas: Start-ups and cross-industry collaboration

Numerous start-ups around the world are working on new technologies and innovative business models. The **Merck Accelerator** supports select enterprises in their development through programs at our global headquarters and in China. This helps us gain insights into innovative start-ups, which supports our efforts to identify emerging market trends early on. Our primary goal is to link these start-up companies with our innovation projects or our business sectors for future collaboration. In 2019, we accepted ten start-ups into the Accelerator at our Darmstadt headquarters. Following the end of this three-month program, we initiated collaborations with 30% of the participating start-ups. We are in discussions with another 60% on potential partnerships.

We accepted a total of 18 start-ups from more than 610 applications for the next Accelerator intake at both our global headquarters and in China.

Accelerating innovation

In 2019, we extended our Merck Accelerator Satellite program, making it also available in the United Kingdom. In Africa, it is now run through a public-private partnership with Make-IT in Africa, a tech entrepreneurship initiative initiated by the German Gesellschaft für Internationale Zusammenarbeit (GIZ) in Kenya, Nigeria, South Africa, and Tunisia. This enables us to **connect with African entrepreneurs** and identify cutting-edge start-ups for our Accelerator program.

Through this African satellite program, we aim to **contribute to UN Sustainable Development Goal 3**, "Ensure healthy lives and promote well-being for all at all ages", by identifying innovative African start-ups and offering them partnership and support to help them scale up. We focus on areas close to our business and innovation fields such as bio-sensing and interfaces and liquid biopsy technologies.

In June 2019, we opened the H. Spectrum & Merck Innovation Lab in Taiwan – an incubator that aims to support start-ups in **generating patient-centric solutions**. We selected four start-ups to participate in the program, working under pre-defined innovation topics: Liquid biopsy, Bio-sensing and interfaces, Patient journey, and Right drug to right patient. The select start-ups gain access to expertise and networks while we engage with new ideas that help drive innovation for technology-based healthcare solutions.

Rewarding inclusive innovation

For the second time, we hosted the European final of the Inclusive Innovation Challenge in Darmstadt (Germany) in October 2019, acting as the exclusive European partner. The competition was initiated by the Massachusetts Institute of Technology (MIT) Initiative on the Digital Economy and aims to **accelerate technology-driven solutions** that enable greater economic opportunities for medium- and low-income earners. Organizations and companies from around the world can take part with technological solutions that shape the future of work. The challenge awards over US$ 1 million in prize money. We invited the expert judges involved in selecting the winners to take part in an advisory board on the topic of digitalization and the future of work at our company.

Fruitful strategic partnership

Through our strategic partnership with Palantir Technologies, a company based in California (United States), we are able to use their data analysis capabilities to improve and accelerate the development, commercialization and delivery of new medicines. The access to Palantir technology enabled us to create tools that help to improve patient retention, increase the efficiency of sales representatives and aid in strategic targeting to deliver effectively on our product launches. We can also integrate and analyze large amounts of data to **improve our operational excellence**.

Syntropy is a joint venture formed by our company and Palantir Technologies. The partnership aims to give scientists and research centers **access to a technology platform** that integrates and centralizes various organizations' data. Advances in medical research over decades have created a wealth of knowledge about diseases and how to treat them. This includes biomedical data. A substantial amount of this data is inaccessible to the scientists and clinicians who need it to advance their research. Syntropy will create a network that drives discovery and improves human lives.

Promoting visionary research

In 2018, on the occasion of our 350th anniversary, our company launched the Future Insight Prize to honor and promote groundbreaking scientific and technological innovations that stand to **benefit humanity** in the fields of health, nutrition and energy. We presented the award for the first time in 2019 and offered a € 1 million research grant to the winners: U.S.-based scientists Pardis Sabeti and James Crowe. Pardis Sabeti from the Broad Institute was recognized for identifying innovative genetic technologies used in the detection and therapy of infectious diseases. James Crowe from Vanderbilt University Medical Center received the prize for uncovering the mechanisms necessary for creating therapeutics and vaccines. Their research may enable the development of a "pandemic protector" technology that would help protect people worldwide from pandemic viral diseases.

At the 2020 Curious Future Insight Conference, we will award the next Future Insight Prize in the Multidrug Resistance category.

sustainable products

sustainable product design

Respect for the environment is at the heart of sustainable conduct. We see it as our duty to not only conserve resources when developing our own products, but to also help our customers increase the sustainability of their products. Our Life Science business sector develops solutions to make research and biotech production simpler, faster and more efficient, while our Performance Materials business sector focuses on solutions for the electronics market, for example semiconductor or display materials.

Our approach to sustainable product design

Our individual business sectors take different approaches to sustainable product design. In our Life Science business sector, we aim to reduce the impact of our products on health and the environment. This applies to **the entire life cycle**, from manufacture and use to disposal. At the same time, we seek to make our products more efficient and user-friendly. We ask ourselves right at the start of product development how to best reconcile these requirements.

Our Performance Materials business sector develops and produces numerous intelligent materials that help our customers manufacture high-tech products. Many of these materials allow people to save energy in their everyday lives. The avoidance of hazardous materials is a principle that is embedded in the product development process.

How we include sustainability in product design

The Life Science business sector works across its three business units to drive product-related sustainability. This includes our Design for Sustainability (DfS) program for eco-friendlier life science products as well as DOZN™, a web-based tool for assessing greener alternatives.

Our Performance Materials business sector has its own CR Committee. It comprises representatives from all Performance Materials business units and other relevant internal units.

The responsibilities described here also apply to product packaging and recycling.

Integration of Versum Materials and Intermolecular

In October 2019, Merck acquired the two companies Versum Materials and Intermolecular, broadening the Performance Materials product portfolio in the semiconductor solutions field.

In the course of the integration process, we evaluate their activities and then include them in our reporting as of 2020.

Our commitment: Chemicals and product policies

In order to meet the product safety regulations relevant to our company, our Regulatory Affairs Group Policy details **Group-wide processes** for managing and implementing product safety, including the necessary management structures.

Our processes for sustainable product design

Within our Life Science business sector, a strategic platform founded on a transparency-based, **data-driven approach** helps our experts to drive sustainability improvement during the development of products and packaging. Our Design for Sustainability (DfS) program, a comprehensive approach to increase the sustainability of our products, focuses on three areas:

- Our **DfS: Development** pillar focuses on embedding sustainability at the beginning of the R&D process.
- Our **DfS: Consultancy** pillar focuses on working with our customers to solve specific sustainability and/or green chemistry challenges they face.
- Our **DfS: Reengineer** pillar focuses on our established portfolio of products and on looking at how we can improve the environmental footprint of these products through application of the 12 Principles of Green Chemistry in our process. We then use our proprietary web-based tool DOZN™ to assess the improvements. We have now extended the tool to our customers to aid them in assessing their own products and processes.

Within our Performance Materials business sector, our raw materials for the cosmetics industry meet the high standards of the EU Cosmetics Regulation and are produced in line with Good Manufacturing Practices for Cosmetic Ingredients (EFfCI GMP).

Sustainable product design in the Life Science business sector

Through our DfS program, we have developed a comprehensive approach to increasing the sustainability of Life Science products. The "DfS: Development" program provides our product developers with a **range of tools** that enable them to analyze the impact of a product regarding materials used, energy and emissions, waste, water, packaging, usability and innovation. We have developed sustainability criteria that can be used to rank a product's performance in each of these areas. When developing a new product, our aim is to improve on as many of these criteria scores as possible.

To understand the potential environmental impacts throughout the product life cycle, we conduct streamlined product life cycle analyses. The findings from these analyses inform our efforts to improve our products and are incorporated into subsequent development stages. Experts from R&D, Product Management, Quality, Procurement and other departments collaborate along every step of the process. By the end of 2019, 32% of such product development projects had met three or more product sustainability criteria.

In 2019, we successfully developed further our DfS program in order to better account for environmental impacts during the product development process and to improve our **communication of sustainability attributes** to our customers. We developed new elements of the program, including a scoring system and we initiated a pilot phase during which we test and optimize these elements prior to global implementation.

We also continued to run a product development pilot project with the goal of encouraging our suppliers to participate in the Together for Sustainability (TfS) industry initiative. Ten of our suppliers of consumables took part in the project. More than 85% of product manufacturing costs are attributable to them.

Green chemistry assessment tool

Through our "DfS: Reengineer" initiative, our Life Science researchers are developing innovative solutions in line with the 12 Principles of Green Chemistry developed by chemists Paul T. Anastas and John C. Warner. These aim to make research **as environmentally compatible as possible** and to minimize negative impacts on human health.

Our proprietary web-based tool DOZN™ enables us to assess sustainable alternatives for various chemicals and to provide transparency to our customers. DOZN™ provides a **framework for rating our products** in the three stewardship categories "Improved resource use", "Increased energy efficiency" and "Reduced human and environmental hazards." The system calculates scores on each substance based on a range of data that includes the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as well as Material Safety Data Sheet information. To date, we have used this matrix to assess and improve more than 45 products.

In 2019, we introduced a new customer-facing version of DOZN™ 2.0. It allows customers to compare products and/or processes in a secure environment while utilizing the power of our system. DOZN™ 2.0 brings new possibilities of sustainable product design to our customers to make more **environmentally friendly choices** in their development processes.

More than 830 greener alternatives to conventional products have been made available to date across our platform of solutions.

Responsible use of natural resources

We are committed to implementing the **Nagoya Protocol**, an international supplementary agreement to the UN Convention on Biological Diversity (CBD), which has been transposed into EU law and was implemented in German law on July 1, 2016. We support the general principles set forth in the CBD, and especially the third objective: the fair and equitable sharing of benefits arising from the utilization of genetic resources and traditional knowledge, in accordance with the Nagoya Protocol's terms and conditions. A key element is access and benefit sharing, which ensures that countries providing genetic resources and knowledge also benefit from their use. The Nagoya Protocol plays a key role in our product development efforts and we apply the agreement's requirements when using genetic resources originating in countries covered by the protocol.

In 2019, we adopted a Group-wide standard entitled Access to Genetic Resources. Its objective is to define **requirements, roles and responsibilities** in order to ensure compliance with the Nagoya Protocol under applicable legislation. We carried out comprehensive trainings on the standard across relevant units.

Where appropriate, we ensure that genetic resources and traditional knowledge are obtained with the prior informed consent of the relevant Nagoya Protocol member state. Their use is governed by **mutually agreed terms**. If applicable, for example when introducing a new product on the market, we disclose appropriate due diligence declarations and keep all associated records as required by relevant legislation.

Each business sector defines specific procedures to help ensure that the requirements set out in the Group-wide standard are met.

Tracking material use

We primarily use chemical and pharmaceutical raw materials for our manufacturing operations, in addition to operating supplies and packaging materials such as folding boxes, glass bottles and ampules. We utilized 434 kilotons of material in 2019 (2018: 488 kilotons). We only record the weight of the materials that are directly used in our pharmaceuticals and chemicals.

Wide range of solutions

Our Life Science portfolio comprises a broad array of products, with different properties that are taken into consideration when applying our DfS approach. The following examples illustrate the results.

Greener solvents

Our greener, bio-based solvents utilize non-food, **renewable resources**, making them more environmentally friendly. Our solvent Cyrene™ is derived from waste cellulose and is used as a more sustainable alternative to substances such as NMP and DMF, which are classified as toxic to reproduction. Through Cyrene™ and other greener solvents, we are helping our customers to make their production processes safer and more environmentally sustainable. Cyrene™ was named "Environmental Product of the Year" at the Environmental Leader Awards 2019.

We expanded our greener solvent portfolio by launching another solvent, Dimethyl Isosorbide, in 2019, with further solvents to be launched until 2022.

Eco-friendly lab water use

Our Milli-Q® IQ 7000 lab water purification and monitoring system uses mercury-free UV oxidation lamps and has a hibernation mode to save energy while still preserving system water quality. Compared to previous versions, we reduced the size of the system by 25% and the size of the purification cartridges it is equipped with by 33%. These measures helped to cut down on the amount of plastic used, on packaging and transportation as well as on waste levels.

Less plastic in cell culture creation

The amount of plastic waste generated by creating cell cultures is high, due to the need for single use, sterile products. We estimate that globally, between all providers of filters, approximately seven million units are used each year just for sterile filtration. This does not include flasks, pipettes and other plastic used. This plastic is a biohazardous waste and cannot be easily recycled.

Under our Design for Sustainability approach, we created a greener version of our current Stericup sterile filtration system, thereby reducing the amount of plastic entering the laboratory and waste stream.

The new Stericup E was designed so that customers can connect the bottle containing the sample to be filtered directly to the Stericup E filtration unit, avoiding the use of a plastic funnel. Depending on the product version, the new Stericup E design can **reduce the amount of plastic** used by up to 48%. This also reduces the amount and size of plastic and corrugated packaging by up to 73%. The unit of sale is then lighter and smaller, which leads to a reduction of CO_2 emissions during transportation. Storing the product at our distribution centers and at customers' sites requires less space and reduces the volume and cost of waste disposal (including biohazardous waste) for our customers. This new design leads to a reduction of the global warming potential of the product of up to 46% from design to end of life.

Optimizing the ethylene oxide sterilization process

Some of our products are sterilized with ethylene oxide (EO). In 2019, we successfully completed our three-year project to improve the efficiency and reduce the environmental impacts of the EO sterilization process for products manufactured at our Life Science site in Molsheim (France). This encompassed 25 of our product families. A multidisciplinary team successfully developed and implemented the new process in line with the ISO 11135 standard on the sterilization of healthcare products. The new process allows us to sterilize different products in the same cycle, resulting in an optimized truck fill rate for transportation from our site to the sterilization partner. The number of trips has thus been reduced by half, enabling us to reduce our emissions by 200 metric tons of CO_2eq annually.

Current product examples from the Performance Materials business sector

Our Performance Materials products help boost sustainability in a variety of ways:

Colloidal silica

Over the past decade, our semiconductor customers have transitioned to using more environmentally sustainable materials in their chip manufacturing, while simultaneously delivering advanced computer chips at lower costs. We have responded to this challenge by developing **next-generation products** using a minimum of 30% less colloidal silica to save process costs for our customers, while also reducing our freight, packaging and processing costs. We successfully launched a next-generation product that meets these technical and commercial targets. We can therefore reduce the need for ocean containers by approximately 180 units annually. We also optimized the production process, reducing process water consumption by over 14 million gallons (53 million liters) compared to our standard product. The availability of this product in concentrated form means that our customers can also save costs on waste treatment and reduce the number of plastic drums used.

As a result of the acquisition of Versum Materials, we obtained a significantly sized CMP business, in which we aim to explore options for applying the approach outlined above.

NMP-free removers

The production process for semiconductor devices requires numerous cleaning steps to remove the organic material used to pattern the circuit design. These cleaning methods require complex solvent chemistries that selectively remove organic material without damaging the sensitive electronic components. However, the most effective solvents pose a significant environmental hazard. NMP, a mainstream solvent common in wafer cleaning processes, is highly toxic and, in 2020, will be classified as a restricted chemical under the European Union's REACH regulation. We are continuously working on developing **new cleaning chemistries** and already launched new products in 2019. As a result, not only more sustainable solvents, but also more efficient solvents are utilized by our customers. By designing custom solvent systems for our customers' cleaning applications, hazardous chemistries can be avoided and the volume of material used is reduced, as is waste.

Switchable windows

Windows that can be darkened in a matter of seconds are now a reality, thanks to our liquid crystal window (LCW) technology. These darkened windows regulate the heat generated by direct sunlight. The LC material was commercialized under our licrivision® and eyrise® brands. New estimates based on planned customer projects show that this technology can lower the energy consumed by building climate control systems and lighting by up to 10%, thereby replacing conventional shading.

Life cycle approach to benefit our customers

At the manufacturing plants where our effect pigments are produced, we focus on saving energy and reducing CO_2 emissions. This is especially relevant for customers who want to reduce their upstream supply chain CO_2 footprint. In 2019, we achieved a 11% overall CO_2 reduction for plants producing pigments for our Surface Solutions portfolio compared with 2018.

Shifting to more natural-based cosmetics

Consumers are increasingly scrutinizing brands and companies for environmental and social aspects. Responding to this trend and the ever-growing popularity of natural cosmetics, we are working closely with our customers in the cosmetics industry to find solutions for more natural-based cosmetics. The resulting cosmetic formulations comply with strict criteria and, by the end of 2019, 73 of our cosmetic pigments and active ingredients had been certified to Ecocert's COSMOS standard for organic and natural cosmetics. We have also obtained **halal certificates** for over 50% of this product portfolio, including broad parts of the pigments portfolio, our Eusolex T and UV-Titan product ranges. Our aim is to develop more natural-based raw materials for use in cosmetics in the future.

Alternatives to microplastics in cosmetics

Functional fillers play a crucial role when it comes to the look, feel and quality of cosmetics. For example, beauty products containing effective functional fillers are easier to apply, wear well and help mask imperfections or skin discolorations.

Microplastics are often used in cosmetics and functional fillers. However, they are highly resistant to environmental biodegradation, fragment into ever smaller pieces and do not dissolve in water. Wastewater treatment plants are able to filter out only 90% of microplastics.

We offer effective and scientifically proven alternatives to microplastics. Our RonaFlair® portfolio of functional fillers offers environmentally friendly mineral ingredients that deliver a variety of cosmetic properties.

packaging and recycling

Packaging protects our products from external influences and helps to ensure that they reach the customer undamaged. Packaging must remain intact across the entire product life cycle. We are working to reduce the amount of material we use as well as to increasingly utilize eco-friendly materials. We also help our customers to take a more sustainable approach to disposing or recycling our products and packaging.

Our sustainable packaging strategy

We aim to deliver our products in packaging that is safe and easy for customers to handle. We also try to make it as sustainable as possible. With more than 300,000 products in our Life Science portfolio – ranging from biochemicals to lab chemicals and from filter materials and systems to instruments – we face a variety of challenges when it comes to packaging. We strive to improve the sustainability of this packaging to help both us and our customers reduce its environmental impact. In 2019, we therefore officially launched SMASH Packaging, a sustainable packaging strategy for Life Science. The strategy is built on three pillars: optimizing resources, using more sustainable materials and designing for a **circular economy**. We have set four goals that support these pillars.

- **Shrink**: reduce amount of packaging
- **Secure**: achieve zero deforestation
- **Switch**: improve plastic sustainability
- **Save**: maximize recycling

We have also defined targets for the years up to 2022 relating to these goals. The targets address the development of new product packaging and the improvement of existing product and distribution packaging.

New product packaging is where we can make the biggest impact. Our approach consists of implementing **new standards and guidelines** development teams can apply to create more sustainable packaging. In the future, we will assess the sustainability characteristics of new product packaging based on our Design for Sustainability scorecard that is being redesigned.

Making packaging more sustainable

A large proportion of our packaging consists of fiber derived from wood. We work continuously to increase the amount of recycled material and the proportion of corrugated cardboard boxes certified to the standards governing **sustainable forestry**, including the Sustainable Forestry Initiative (SFI), the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification Schemes (PEFC). We want to reach our zero deforestation goal by ensuring that none of our wood and fiber-based packaging materials contribute to deforestation. In this connection, we conducted a survey in 2019 to better understand the practices of our suppliers and the characteristics of our packaging and to identify opportunities for improvement. We collected information from our strategic direct suppliers who represent 80% of our fiber-based packaging materials spending. Overall, by volume, 75% of corrugated packaging supplied by these companies is certified by at least one of the three sustainable forestry standards or are made of recycled material.

Cellulose as an alternative to polystyrene foam

In the past, we used expanded polystyrene (EPS) molded foam to secure glass reagent bottles and prevent them from breaking during transport. While EPS, also known as Styrofoam®, is an excellent cushioning material, it is manufactured from non-renewable petrochemicals and difficult to recycle. By contrast, molded pulp components can be easily recycled with other paper materials and **compacted together** for storage and transport. We are replacing EPS wherever possible with molded components made of cellulose and recycled paper pulp.

We use molded pulp inserts to pack a variety of liter bottle configurations in shipping boxes, thereby replacing around three million EPS parts per year. We are currently conducting safety tests on new pulp designs for shipping other bottles of various sizes. Overall, we used approximately 1,000 metric tons of molded pulp packaging material in 2019.

More sustainable bulk packaging solution

We seek **eco-friendly alternatives** to ship our products safely, which is why we are partnering with a biotech company to jointly develop a more sustainable bulk packaging design for the transport of our Millistak+® Pod Disposable Depth Filters. A life cycle assessment showed that we achieved a 24% reduction of corrugated cardboard used, which translates to a 17% decrease in greenhouse gas (GHG) emissions throughout the life cycle of the packaging materials. This translated to a total of around 4 tons of corrugated cardboard that was saved in 2019. Moreover, our customers require 70% less time to process our products and their packaging.

More cardboard instead of plastic

Solvents are usually supplied in plastic bottles. We use Titripac® because it offers a more eco-friendly alternative. The cardboard carton and plastic liner with an integrated withdrawal tap have made the packaging **more recyclable** and reduced its weight by more than 50%. As a result, the greenhouse gas emissions arising across the entire product life cycle are 61% lower compared to plastic bottles. Since the withdrawal tap protects the product against contamination, contents can be used to the very last drop. This helps reduce chemical waste.

Reusing EPS boxes

Many of our Life Science products need to be kept cool during shipping and are therefore packed in special EPS

boxes. To **mitigate waste**, we offer our customers in the United States the option of returning these boxes to us. If they are still fully functional, we reuse them. In 2019, this amounted to more than 11,500 boxes that were reused at least once, representing around 4% of the shipments leaving the three distribution centers where this type of packaging is being used.

Sustainable membrane packaging for cut disc filters

In 2019, we launched a redesigned membrane box packaging. All customers who order cut disc filters now receive their order in the new packaging design.

The new membrane box packaging is manufactured using 22% less plastic than the previous design. Moreover, it replaces polystyrene with polypropylene that has a 43% lower global warming potential in its production phase than polystyrene. Other environmental impact enhancements include the elimination of foam inserts and local sourcing of materials, resulting in less transportation and fewer emissions. This new design also **reduces GHG emissions** by 200 metric tons per year across the entire product life cycle. A life cycle assessment conducted on this new packaging design features the following sustainability improvements over the previous design:

- 22% reduction in weight of product packaging
- 33% reduction in GHG emissions
- 27% reduction in non-renewable energy.

Introducing recyclable plant-based coolers

In the past, we used insulated containers made of expanded polystyrene (EPS) for the shipment of our temperature-controlled products. While EPS offers good insulation and cushioning properties, it is a petroleum-based material that takes hundreds of years to decompose. As the options for recycling EPS are limited, it is generally incinerated or landfilled. It can also cause environmental pollution, notably when it enters the marine environment. We have set ourselves the target to **reduce the use of EPS by 20% by 2022**. This target is part of our SMASH Packaging strategy.

In 2019, we investigated several technical solutions in order to find an **alternative cooler** that would meet our standards for effective cold chain transportation with a lower environmental footprint than an EPS cooler.

In early 2020, we started implementing this new cooler at one of our distribution centers in the United States. We use it for our products that are shipped with dry ice at a temperature of 2°C to 8°C. We plan to progressively deploy these new coolers in our main distribution centers in North America.

Reducing the amount of packing material used in distribution

Packing or padding material is used to safely store and transport products to our customers. We want to **increase its sustainability characteristics** as part of our SMASH Packaging initiative. In 2019, our distribution teams in Germany and India conducted projects to optimize the use of packing materials for the shipment of our products.

In our distribution center located in Darmstadt (Germany), we reduced the grammage of kraft paper used as packing material from 100g/m^2 to 80g/m^2. This initiative allows us to save 14 tons of paper annually, while maintaining the **same level of performance** in protecting our products.

In our Jigani (India) distribution center, we replaced plastic air pillows with shredded corrugated cardboard for packing. We also implemented a corrugated box shredder. Thanks to this machine, we are able to **reuse the inbound corrugated packaging waste** as shredded corrugate for packing, avoiding the additional purchase of packing material.

Our recycling program

In cooperation with a waste management company based in Massachusetts (USA), we employ a comprehensive recycling program for our Life Science customers in the United States. Product waste from their research labs and biopharmaceutical manufacturing operations is collected, sanitized and **recycled into plastic panels**. This material can be used in many industries, such as construction, landscaping, transportation and marine construction. The program includes our Biopharma Recycling and Ech2o Collection recycling programs.

We continue to expand this program throughout the United States and are exploring options in other regions such as Europe and Asia. The program now serves 12 major biopharma manufacturing customers. Since launching the program in 2015, we have recycled 4,167 metric tons of waste generated from the use of our products, including 1,466 metric tons in 2019 alone.

Health for all

Global strategy

Two billion people across the globe do not have adequate access to health. We are striving to make health solutions affordable, raise awareness of diseases and help people learn how to manage them. We work with committed partners to tackle this complex challenge by researching innovative solutions, developing new approaches and improving existing programs to help people at the point of care.

Our approach to improving healthcare for underserved populations

Our aim is to create a healthier future for all: for individuals, communities and countries. We want to use innovation in science and technology to help improve the health of underserved populations in low- and middle-income countries. To achieve this, we leverage our expertise from all business sectors and collaborate closely with a wide range of partners. We also participate in industry-wide initiatives to develop new approaches.

Our **Global Health strategy** is designed to overcome access barriers for underserved populations and communities in low- and middle-income countries in an economically viable and sustainable manner, thereby creating shared value. For us, this means developing business models that increase the value and competitiveness of our company while solving unmet health needs and strengthening health systems. This leads to a win-win solution for our company and society as a whole.

We follow three core operating principles:

- **Developing innovative solutions:** We take a leading role in the elimination of schistosomiasis, and we create new integrated drug, diagnostics, technology and vector control solutions for schistosomiasis, malaria and other infectious diseases.
- **Engaging with cross-sector partners:** We participate in multi-stakeholder global health platforms to help achieve the UN Sustainable Development Goals. We define partnerships for research and development programs, utilize access alliances and create locally-based opportunities, where possible.
- **Creating business opportunities via a shared value approach:** We help to sustainably improve the health of underserved populations by utilizing our portfolio from across all three of our business sectors.

Using focus programs to address our priority areas, we want to be instrumental in the elimination of schistosomiasis while fighting malaria and other infectious diseases. Furthermore, we help build local capacity across the value chain and position our company as a leading and reliable partner.

Our global access to healthcare strategy rests on four major pillars that guide our access activities:

- **Availability**: We research, develop and refine health solutions that address unmet needs, tailoring them to local environments. For example, we are committed to delivering on our R&D portfolio of projects by developing and providing access to innovative health solutions that help tackle infectious diseases.
- **Affordability**: We seek to provide assistance to those who are unable to pay for the health solutions they need, for example through our patient access programs. This also includes addressing challenges regarding pricing and intellectual property. Furthermore, we are working on innovative access paths for health solutions to fight NTDs. For instance, we aim to ensure the future affordability of our new pediatric drug to treat schistosomiasis.
- **Awareness**: By empowering medical professionals, communities and patients to make informed decisions, we help raise awareness for diseases and therapies through efforts such as our global awareness campaigns.
- **Accessibility**: We promote initiatives that control the cost of goods during product development and production and allow for localized health solutions. We also strive to strengthen our supply chains to help ensure that medicines reach the people who need them quickly and safely, as demonstrated by our NTDeliver project.

How we are improving access to healthcare

Our Global Health unit coordinates the implementation of our strategy for global access to healthcare. Multiple teams work on ways to investigate and reduce the barriers that prevent underserved populations from receiving adequate healthcare.

This unit is also responsible for Group-wide initiatives, programs and sponsorships relating to global health topics. Our experts collaborate closely with the Healthcare, Life Science and Performance Materials business sectors to leverage their strengths and competencies effectively.

Our Merck Global Health Institute develops and implements a portfolio of projects for transformative treatments, diagnostics, technologies, and preventive measures against infectious diseases. The institute also seeks to provide **research and development capabilities** by engaging in activities to help strengthen health systems in low- and middle-income countries. It operates as a social business enterprise to deliver innovations for the most vulnerable members of society, namely women and children in low- and middle-income communities.

Our Access to Health unit investigates the factors that prevent underserved populations from receiving healthcare and coordinates with multiple partners to identify and develop solutions.

The Merck Schistosomiasis Elimination Program leads our efforts to eliminate schistosomiasis in close collaboration with several external partners.

Our commitment: Providing a solid basis for access to healthcare

To demonstrate our commitment to expanding access to healthcare, we publish a dedicated Access to Health Charter on our website. We updated the charter substantially in 2019 to reflect our strategy and approach in response to the latest developments in global health and access. This charter sets out guidelines on the following:

- Our approach (updated in 2019)
- Pharmaceutical product donations (updated in 2019)
- Fake medicines
- R&D for infectious diseases (updated in 2019)
- Pharmaceutical product pricing
- Intellectual property rights (updated in 2019)

Every two years, the Access to Medicine Foundation publishes the Access to Medicine Index. It benchmarks 20 of the world's largest research-based pharmaceutical companies on activities and initiatives that experts consider most relevant for access to medicine, ranging from donations made and patents registered to capacity building. We use the ranking to inform and, in certain cases, guide our access to health strategy and approach. In 2018, we were ranked in **fourth place**, retaining our previous position. This was in recognition of our company's integrated strategy on access to medicine, our efforts to address the needs of unserved and underserved populations across the entire value chain and our commitment to creating shared value.

We continue to endorse the London Declaration on Neglected Tropical Diseases, through which participating companies, governments and private organizations promise to help control and ultimately eliminate the top ten most prevalent infections. We are particularly engaged in the fight against schistosomiasis.

Partnering to build research capacity and clinical skills

Following our integrated approach to fighting infectious diseases, we have continued implementing a series of research programs on malaria and schistosomiasis. These programs mainly took place in Africa and involved post-doctoral and PhD fellows and local scientists. We also developed a training course for laboratory experts.

By acting as a host organization for the European and Developing Countries Clinical Trials Partnership (EDCTP) Fellowship Scheme, we are helping to **empower African research fellows** and enhance their clinical trial practices and management skills.

Engaging stakeholders

Partnerships and dialogue are vital to improving access to healthcare, and we aim for stakeholder dialogues with a relevant and scalable, far-reaching impact. Our partners include multinational organizations, government agencies and NGOs, as well as academic institutions, health industry associations, companies, and independent global health experts.

Alliances for better access to health

We are a member of the Business for Social Responsibility (BSR) initiative and endorse the BSR Guiding Principles on Access to Healthcare, which provide a framework for us to refine and enhance our Global Health efforts.

Together with 21 other leading pharmaceutical companies, we host the global Access Accelerated initiative, which seeks to improve both the treatment and prevention of non-communicable diseases in low- and middle-income countries. We also joined forces with advocacy groups such as the Swiss Malaria Group, which aims to positively influence access paths.

The Merck Access Dialogue Series is a multi-stakeholder platform for sharing information and **exchanging best practices** on broadening access to healthcare. We harness the ideas shared through the series to inform and drive our access strategy, plan of action and engagements. In this way, we create transparent, insightful and critical dialogue on how we and our partners can best use our respective capacities, experience, expertise, and competencies to sustainably address access barriers. In 2019, we hosted an event on supply chains and delivery where we met with internal and external experts to share information and discuss our company's engagement.

Discussions at a global level

We take part in many events with a global reach or relevance in order to participate in and advance global health discussions. We engage with major stakeholders in a dialogue on infectious diseases and deepen collaborations with the scientific community through publications and by taking on leading roles at international scientific conferences and events.

In 2019, we participated in multiple events and initiatives, some of which are listed below:

- Conference on Tropical Medicine and Global Health in Munich (Germany), April
- World and Merck Malaria Day, April
- 72nd World Health Assembly in Geneva (Switzerland), including the side event "Leaving no one behind: from philanthropy to sustainable health solutions. How can local manufacturing be part of an integrated approach to tackling NTDs and advancing Universal Health Coverage?", May
- 7th International Conference on P.Vivax Research in Paris (France), June
- High-level meeting between CEO Healthcare (Merck Executive Board member) and the Director-General of the World Health Organization (WHO), July
- 74th Session of the UN General Assembly in New York (USA), September
- Merck Access Dialogue Series: Supply Chain & Delivery, September
- COR-NTD on Female Genital Schistosomiasis in Liverpool (UK), September
- 11th European Congress on Tropical Medicine and International Health in Liverpool (UK), September
- Annual NTD NGO Network Meeting in Liverpool (UK), September
- WHO-WIPO-WTO Trilateral Symposium on "Cutting-Edge Health Technologies: Opportunities and Challenges", October
- Joint UNICEF, UNFPA and WHO meeting with manufacturers and suppliers in Copenhagen (Denmark), December

Focus programs

Neglected tropical diseases occur almost exclusively in impoverished populations in low- and middle-income countries. Barely known in industrialized nations, they attract little public attention and research funding. One example is schistosomiasis. Our aim is to help take urgent action to prevent and control this neglected disease as well as more familiar infections such as malaria.

Strategy for preventing and treating infectious diseases

Working hand in hand with our external partners, we seek to improve the health of underserved populations in low- and middle-income countries through our science and technology innovation. Our strategy is to develop and provide medicines, improve diagnosis, counter disease transmission, increase disease control, expand access to healthcare, and strengthen local health systems.

Our priority areas are eliminating schistosomiasis, developing health solutions for malaria and infectious diseases, expanding access to healthcare by strengthening health systems, and promoting capacity building along the value chain.

Our fight against schistosomiasis

Schistosomiasis, a tropical worm disease also known as bilharzia, is one of the most prevalent parasitic infections in Africa, placing a significant burden on public health and the local economy. The disease affects almost 240 million people worldwide, with more than 90% of cases occurring in sub-Saharan Africa. School-aged children are particularly vulnerable to infection. An estimated **200,000 people** die every year from the long-term effects of schistosomiasis, such as liver and kidney infections, bladder cancer and anemia.

Our ultimate aim in all our schistosomiasis-related work is to eliminate the disease. To help achieve this goal, we adopted an integrated schistosomiasis strategy in early 2019 that we are implementing in close collaboration with multiple partners worldwide. The new approach focuses on five areas:

- **Supplying medicine:** We donate up to 250 million tablets of praziquantel per year to WHO. Nearly 50 years after its invention, praziquantel still remains the standard of care for the effective treatment of schistosomiasis around the world.
- **Researching new solutions:** We are collaborating with research institutions and through public and private sector partnerships to develop a new formulation of praziquantel for children under the age of six and identify diagnostics and vector control approaches.
- **Working with partners:** Collaborating with partner organizations through the Global Schistosomiasis Alliance (GSA), we are accelerating the progress towards schistosomiasis control and elimination.
- **Improving water, sanitation and hygiene:** We support WASH projects to prevent transmission of the disease through the development of infrastructure.
- **Education and behavior change:** We invest in education and behavior change projects and participate in health education initiatives that raise awareness of the causes and dangers of schistosomiasis and teach people how to prevent it.

Our fight against malaria

According to World Health Organization (WHO) estimates, nearly half of the world's population is at risk of contracting malaria. More than **200 million cases of malaria** and over 400,000 related deaths are recorded every year, with 70% in children under five years of age. Around 90 different countries are affected by the disease, with approximately 90% of deaths occurring in Africa.

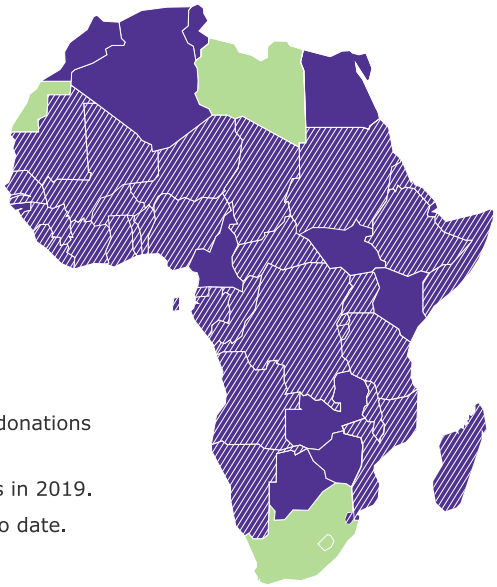
There is an urgent need for new products to overcome the problem of increasing drug resistance and to achieve our goal of complete elimination. Through our One Merck for Malaria program, we are helping to deliver integrated and sustainable health solutions entailing treatments, diagnostics and prevention methods to fight malaria in endemic countries.

Schistosomiasis: Over one billion tablets donated

As part of our longstanding partnership with WHO, we have renewed our commitment to make annual donations of praziquantel tablets for distribution in 47 endemic African countries to treat school-aged children. In 2019, we donated approximately **233 million tablets** for distribution in 35 countries, 32 of which in Africa. Also, we maintained our commitment by ensuring that we have sufficient production capacity to manufacture up to 250 million tablets a year. The latest numbers from WHO show that in 2017, 72% of all school-aged children in need of treatment in sub-Saharan Africa were treated.

Countries that have received donations of praziquantel tablets

Since 2007, we have donated over **1 billion** tablets of praziquantel, which is enough to treat around 400 million school-aged children.



- African countries that have been receiving tablet donations from us since 2007*.
- African countries to which we also donated tablets in 2019.
- Countries that have received no donated tablets to date.

* Launch of our Praziquantel Donation Program.

Schistosomiasis health education project

Through our joint health education project with the NALA Foundation, we are investing nearly € 300,000 over a three-year period. Since the end of 2017, we have reached 250,000 people in southwestern Ethiopia, almost half of whom are school-aged children. The education programs will help promote long-term behavioral change in the drive to **eliminate schistosomiasis** and other neglected tropical diseases.

In 2019, we expanded the project to two further districts in Ethiopia and reached around 188,000 people, almost 40% of whom were school-aged children. To deepen our understanding of the knowledge, attitudes and practices of primary school children with respect to **safe water, sanitation and hygiene,** we conducted a survey that revealed that 58% of the children taking part had never heard of parasites that can infect the intestines. This prompted us to create a series of educational training sessions.

Thanks to our financial support, our on-the-ground partners were able to conduct training sessions in schools and among local communities, with the majority of the schools setting up hand-washing stations. Clean water and latrines are now available in these stations throughout the school year. Teachers also reported major improvements in students' personal hygiene and general levels of cleanliness in the participating schools.

Central platform in the battle against schistosomiasis

The Global Schistosomiasis Alliance (GSA) is a coordinated, multi-sectoral effort to combat the complex disease schistosomiasis. In 2019, the GSA recruited additional international stakeholders as new members and contributed to WHO's consultations ahead of the new NTD Roadmap expected to be passed by the World Health Assembly in 2020. The GSA took part in various projects aimed at driving local efforts to combat schistosomiasis as well as organizing several conferences and key meetings. The alliance is also helping to promote and support an **international action plan** to progress schistosomiasis control and ultimately eliminate the disease. The GSA continues with its efforts to raise awareness through coordinated campaigns.

Partners in schistosomiasis research

Over time, we have developed a portfolio of R&D projects on schistosomiasis. These include a new pediatric formulation of praziquantel to treat children under the age of six, identifying new drugs to prevent and treat schistosomiasis, developing innovative and highly sensitive **schistosomiasis diagnostic methods,** and defining approaches for vector control.

Praziquantel is an effective and well-tolerated drug, but it does not work in all developmental stages of the parasite. We continue to collaborate on research activities with many partners in developed and low- to middle-income countries. This work aims to discover new, long-lasting compounds to **treat juvenile forms** of the parasite, thereby improving efficacy and preventing reinfections. In 2019, we obtained promising assets from Salvensis and the London School of Hygiene & Tropical Medicine to identify potential new candidates for preventing infection and curing patients affected by schistosomiasis.

The need for more sensitive diagnostics is crucial in the fight against schistosomiasis. Since 2017, we have been collaborating with the Australian Institute of Tropical Health and Medicine at James Cook University in Townsville (Queensland, Australia) and with the Baylor College of Medicine in Houston (Texas, USA) on researching new biomarkers in order to develop diagnostic tools for schistosomiasis. The program achieved the preliminary identity of new schistosomiasis biomarkers for novel diagnostics.

As of early 2019, we also initiated our collaboration with the Foundation of Innovative New Diagnostics (FIND) and the Bill and Melinda Gates Foundation to develop a sensitive

rapid diagnostic test (RDT) to improve mapping and case detection for schistosomiasis.

Beyond these efforts, we continued to explore technologies that control transmission factors through basic research activities, for example the elimination of the infectivity of snails through gene editing, or through access-to-water programs in Senegal. In 2019, we implemented initiatives to address female genital schistosomiasis (FGS), a major challenge to women's health in Africa, and its impact on HIV/AIDS. In particular, we began supporting a trial to **optimize therapeutic treatment for women** suffering from FGS in Madagascar and conducted advocacy initiatives through workshops and training sessions.

Consortium for the development of a pediatric praziquantel formulation

If left untreated at a preschool age, schistosomiasis can have long-term effects on children such as anemia, stunted growth and impaired learning. It can seriously affect their lives and potentially cause chronic diseases, including bladder cancer or genital schistosomiasis. We are working with the Pediatric Praziquantel Consortium, which includes both public and private sector representatives, to develop and provide access to a pediatric formulation of praziquantel to children under the age of six.

Following initial Phase I studies and a taste evaluation, we completed the Phase II study in Ivory Coast in 2018. It assessed the efficacy and safety of two different formulations of orodispersible tablets (ODT) in schistosomiasis-infected children under the age of six. The results indicated that both formulations are well tolerated and helped us to identify the optimal formulation and dose to pursue until we can register the drug.

In 2018, two new partners joined the Pediatric Praziquantel Consortium: the Kenya Medical Research Institute (KEMRI) and the Université Félix Houphouët-Boigny in Ivory Coast. Both play important roles in implementing the Phase III trial that started at the Homa Bay clinical center in Kenya in September 2019. This pivotal trial is designed to evaluate the efficacy and safety of the new **child-friendly praziquantel ODT formulation** in children three months to six years of age who are infected with schistosomes. The trial is being conducted in Kenya and Ivory Coast, and is co-funded by the consortium, the European & Developing Countries Clinical Trials Partnership (EDCTP) and the Global Health Innovative Technology (GHIT) Fund. The study represents the last step of the clinical development program, which, should it produce a positive outcome, will allow the clinical data package needed for registration to be completed. We expect the product to be available to the first endemic countries in Africa in 2022. Together with international key stakeholders, we are working on designing an innovative access path to ensure future affordability, availability and adoption of the new medicine.

Malaria: Enabling the treatment of children

As part of our One Merck for Malaria program, we are developing a new innovative drug (M5717) for the treatment of malaria in children. In 2019, we assessed the safety of the compound and gathered data to support clinical proof of principle by conducting a Phase I/Ib study in healthy volunteers in Australia. The program is progressing towards the next phase, where we will explore opportunities to develop the compound in combination with another anti-malarial compound to potentially serve as a single-dose treatment to cure or prevent malaria.

Developing new lead programs for antimalarials

In 2019, our strategic collaboration with the University of Cape Town in South Africa and the Medicines for Malaria Venture continued its screening activities with the aim of identifying new therapeutic solutions for malaria and building research capacity in and for Africa. Co-funded by the German Federal Ministry of Education and Research, this program continues to leverage our proprietary chemical library of nearly 100,000 compounds to identify new lead programs for the treatment of malaria. It targets liver-stage forms of the parasite and focuses on long-lasting compounds to **improve post-treatment prophylaxis**. Together with our partners, we have identified a promising chemical series to help declare potential lead candidates for drug discovery and development activities.

Through a collaboration with the Instituto de Biologia Experimental e Tecnologica (iBET) and the Instituto de Medicina Molecular (IMM) in Portugal, we made progress in developing a new cell model of liver-stage malaria infection. This new cell model could serve as a screening tool for novel anti-malaria drugs. The results have been published in peer-reviewed scientific journals.

Preventing and controlling malaria transmission

To help prevent the spread of malaria, we are working to improve access to insect repellent as a vector control method. Through internal and external collaborations, we are working towards demonstrating the efficacy of IR3535® against malaria in Africa. IR3535® is used in insect repellents for complementary prevention of vector-borne diseases such as dengue and Zika fever, Chikungunya and Lyme disease. The repellent is safe for all age groups, including children, pregnant women and nursing mothers.

We are partnering with the Infanta Malaria Prevention Foundation to support the Ghana Health Service's National Malaria Control Program by exploring potential IR3535®-based solutions for malaria prevention in vulnerable communities. In 2019, we helped to broaden the scope of this initiative through an **integrated, country-level approach**, working with an established network of partners in Ghana. Through these efforts, we aim to improve health worker capacity to detect malaria cases through microscopy and continue our work to deploy IR3535® as a malaria preventive method for women and babies. Furthermore, we will increase our knowledge of the prevalence of asymptomatic patients suffering from malaria via an innovative pan-African network that maps the pathogenic parasite *P. vivax*.

Technologies to combat antimicrobial resistance

We have implemented new collaborative programs to assess the degree of resistance of identified bacterial pathogens. We have also focused our efforts on the development of new technological platforms to accelerate the assessment of infection types and test the validity of drugs. Since 2018, we have been partnering with Boston University to test, validate and optimize a new user-friendly technology to identify and quantify the active pharmaceutical ingredients of medicines sold in hospitals, health centers and pharmacies. This helps us in detecting fake medicines.

open innovation sharing

We consider it our duty and responsibility to share core technological advances to improve global access to healthcare. However, this level of transparency requires a solid, transparent and reliable legal framework that protects the intellectual property rights of pharmaceutical companies and enforces patents in order to provide the opportunity to balance the initial investment in research and development.

Our approach to sharing and protecting intellectual property

The approach that we and other pharmaceutical companies take to our intellectual property impacts access to healthcare. We often refrain from filing or enforcing patents in low- and middle-income countries. In markets where we do register product patents, we are transparent and committed to sharing data to the greatest possible extent and to improving public access to clinical study data. We report on the patent status of our products via a publicly accessible database. Furthermore, we support voluntary licensing agreements of all kinds, including non-exclusive voluntary licenses, legally binding non-assertion covenants and clauses that aim to widen access to health. Moreover, we support the concept of patent pools, but believe that these should be structured in such a way that they improve access to medicines, prevent anti-competitive behavior and overcome geographic limitations. We consider joining patent pools when they are relevant to our portfolio and meet all our efficacy, quality and safety requirements.

The responsible treatment of intellectual property does not pose a barrier to health, but rather guarantees **safety and high quality** for patients worldwide. Nearly all medicines that address the highest burden of disease in low- and middle-income countries are not protected by patents. Studies found that between 90% and 95% of the WHO Model List of Essential Medicines are off-patent. We provide 46 essential medicines and products, 27 of which are on the WHO Model List of Essential Medicines and 29 of which are considered to be first-line treatments.

We provide access to patent information through our Access to Health initiatives and partnerships. In some cases, we even give access to parts of our chemical compound libraries. This is true for open innovation research projects and collaborative research programs that develop novel R&D platforms in search of new active substances.

How we organize access to and control of our intellectual property

The Merck Open Innovation initiative is a collaborative and cross-functional effort led by our Access to Health and Patents Healthcare units. It aims to **mitigate affordability issues** by sharing our intellectual property, thus accelerating early discovery in diseases with high unmet needs where we do not have expertise. We hope to foster the discovery of new generations of health solutions that will tackle the needs of the most vulnerable populations, with a primary focus on neglected tropical diseases (NTDs).

Our Open Innovation Committee provides technical expertise, strategic guidance and decision-making regarding our open innovation strategy, activities and collaborations. Co-chaired by the heads of our Access to Health subunit and the globally acting Patents Healthcare unit, the Open Innovation Committee is part of our Open Innovation Initiative.

Our commitment: Supporting transparent and reliable frameworks

We support TRIPS, an international agreement administered by the World Trade Organization (WTO) that addresses trade-related aspects of intellectual property rights, along with TRIPS addenda such as the Special Declaration on the TRIPS Agreement and Public Health (also known as the 2001 DOHA Declaration). This extends the deadline for low- and middle-income countries to apply TRIPS provisions to pharmaceutical patents until 2033.

Initiative improves access to patent information

We are a founding member of the Patent Information Initiative for Medicines (Pat-INFORMED), which was established by 20 leading research-based biopharmaceutical companies. Pat-INFORMED acts as a global gateway to medicine patent information, offering tools and resources that help determine the existence of patents relevant to products sought by national and international drug procurement agencies. This transparency should make it easier for drug procurement agencies to access a basic body of patent information needed for implementing **disease management strategies** and other activities that address public health needs. Pat-INFORMED features patent information for small-molecule drugs within cardiovascular, diabetes, hepatitis C, HIV, oncology and respiratory therapy areas and any products on the WHO Model List of Essential Medicines that are not within these therapy areas. The initiative is backed by the World Intellectual Property Organization (WIPO) and the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA).

Pat-INFORMED currently houses information on over 14,000 individual patents for 600 patent families and 169 INNs, unique names that are globally recognized and used to identify pharmaceutical substances or active pharmaceutical ingredients of medicines that cover a wide range of conditions.

Open innovation collaboration through WIPO Re:Search

We continue to take part in the WIPO Re:Search public-private partnership, whose mission is to accelerate the discovery and development of medicines, vaccines and diagnostics. This initiative aims to create **new solutions** for people affected by neglected tropical diseases, malaria and tuberculosis by making intellectual property and knowledge available to the global health research community. Our latest collaboration under the WIPO Re:Search platform is with the University of Yaoundé I in Cameroon (Africa) to combat the infectious disease known as Buruli ulcer. Furthermore, we are working on extending our collaboration with the University of California San Diego (United States) to find potential cures for onchocerciasis, leishmaniasis, Chagas disease and African sleeping sickness.

Drugs for Neglected Diseases initiative

In partnership with the Drugs for Neglected Diseases initiative (DNDi), we are involved in the Drug Discovery Booster project for neglected tropical diseases, pursuing an open innovation approach through which the participating companies can simultaneously search for new treatments for leishmaniasis and Chagas disease. We are joined in this project by seven other companies: AbbVie, Astellas, AstraZeneca, Celgene, Eisai, Shionogi, and Takeda).

pharmaceutical supply chain

In many parts of the world, medicines are not always available where and when they are urgently needed. We want patients in low- and middle-income countries to have fast, safe and affordable access to our products and believe this can be accomplished through efficient supply chain management and by utilizing local manufacturing.

Our approach to local supply chain solutions

During product development and manufacturing, we favor approaches that enable us to control the cost of goods and allow for local manufacturing and supply chains that help to strengthen the local economy. We apply this model in our work with the Pediatric Praziquantel Consortium, for instance.

We partner with pharmaceutical companies and other supply chain stakeholders to help strengthen supply chains in low- and middle-income countries and to guarantee the targeted supply of medicines. We manufacture some of our products directly in the regions where they are needed in order to **build local capacity**, increase service quality and flexibility through reduced travel times and distances, and to achieve cost savings that can be passed on to the consumer.

Our pharmaceutical supply chains are organized efficiently to ensure that our products reach the right place in the right condition and quantity, at an affordable price and on time. **Modern supply chain solutions** that include real-time monitoring allow us to track our inventories and current deliveries as well as to predict expected demand for medicines.

How we organize our supply chains

Our Global Planning unit is responsible for our efficient medicine supply chains and is part of Biopharma Supply Network Operations within our Healthcare business sector. Global Planning collaborates with our Global Health unit and markets supply chain representatives for efficient demand management. It also consults experts from other business sectors as needed.

Our commitment: High quality standards for pharmaceutical production

All our pharmaceutical production plants operate to the same high standard of quality worldwide. This ensures full compliance with Good Manufacturing Practice (GMP) and Good Distribution Practice (GDP) for us and our contract manufacturers.

Our Right First Time (RFT) concept aims to reduce the number of temperature excursions that occur during transportation worldwide. We also encourage shipping sites and receiving units to work with freight forwarders and carriers to improve their processes.

Our **uniform quality assurance system** helps to ensure that our quality standards are universally respected. It comprises training courses, quality control monitoring and technologies tailored to each site. The results of all audits conducted by health authorities are published Group-wide, allowing the respective units to share lessons learned and to benefit from the improvements made by others.

Through our Virtual Plant Teams, we support our contract manufacturers in complying with quality standards. We assign a production expert to our external partners in Africa, Asia and Latin America to act as a virtual site leader and to provide guidance.

Leveraging technological possibilities for efficient market access

Accurate business forecasts are the foundation of efficient supply chain management. We use harmonized biopharmaceutical business planning processes across our Group, including a special software platform that enables us to plan centrally for specific demands for medicines. The data generated by the software platform is provided to the regional affiliates so that they can add their market intelligence. The received forecast is then used to manufacture and deliver medicines according to demand, which allows us to prevent local inventories from running out or expiring.

We employ a software-based solution that provides **continuous access** to our e-shop for our customers in northwestern Africa, enabling them to quickly and easily order medicines approved by the respective regulatory authorities. The system makes demand more transparent while reducing lead times and miscommunication. Both systems combined enable us to react more quickly to local demands than ever before, even in low- and middle-income markets.

In 2019, we extended the integrated business planning process and platform to other functions within the Healthcare business sector. In this way, we can further improve our understanding of market demand across all our functions, helping to ensure that supply is better balanced with demand.

We also deployed our innovative global production planning tool to the manufacturing sites in Darmstadt (Germany), Mollet (Spain) and Semoy (France). The tool takes the sites' capacity constraints into account when generating production orders. As a result, we are better able to match the distribution plan with feasible production orders and can provide a much better visibility of the supply to markets.

Working with partners to achieve more

Our collaborations and partnerships are founded on the Group-wide exchange of centrally stored information, which allows us to organize shared supply chains in a more efficient manner.

Shared data platform for medicine donations

NTDeliver is our digital information tool for improving transparency in medicine donation supply chains created through public-private partnerships. Deliveries sent by companies running donation programs are clearly displayed – from purchase orders made by the World Health Organization (WHO) through to delivery to the first warehouse in the destination country. The tool improves the coordination of our efforts and provides WHO, local experts and our company with a more **transparent overview** of the in-country inventories. We added new features to the tool in 2019, such as an alarm that informs key stakeholders about upcoming expiry dates of medicines that may still be in their inventory.

In Kenya, where schistosomiasis poses a significant challenge to school-aged children, we are collaborating with approximately 12,000 teachers across the country to support a deworming program designed to help prevent and treat instances of schistosomiasis among children. We deploy our NTDeliver tool to monitor the volumes of **medicines reaching schools**, particularly those of last-mile deliveries to remote, rural locations in Kenya. In addition to tracking the efficiency of schistosomiasis medicine supply chains, we are stepping up our monitoring to understand the positive impact of these supply chains on children's lives. For instance, we track the number of children treated. In 2019, we further improved this tool and firmly established it as an essential part of the program. Building on this experience, we are reviewing the best way to retrieve unused medicines from the field and store them centrally for upcoming deworming campaigns. We are also considering how best to expand the use of this tool to other countries.

Further partnerships

We are a founding member of the Accessibility Platform, which meets to discuss local supply chains during our Access Dialogues. Spearheaded by the private sector, the platform seeks to raise awareness of the importance of improving supply chain efficiency when expanding access to healthcare worldwide. In particular, it aims to increase the **sharing of knowledge** and information through open, multi-stakeholder dialogue and to identify opportunities for collective action. We also share best practices with other companies and partners on efficient, secure end-to-end supply chains.

Access Delivery Mentorship

As part of our work to innovate and strengthen health systems, we are working on a **supply chain capacity-building** and mentorship program in Tanzania, with the aim of helping to build a strong and resilient private sector distribution network. We are doing this in collaboration with Business for Health Solutions (BHS) and Bahari, one of Tanzania's largest medical and health supplies distributors. We have successfully launched and implemented the first pilot program, which brings together our supply chain experts and our partners' procurement teams to better manage stocks of medicines, thus preventing facilities from running out in times of need.

Promoting local production

In India and Indonesia, we manufacture drugs for diabetes, cardiovascular conditions and diseases of the lower respiratory tract. These capacity-building efforts support local economies and allow us to supply medicines more rapidly and affordably to these and neighboring countries, such as Sri Lanka and Myanmar. We also serve local markets in China and Russia through local production, for example via contract manufacturing organizations (CMOs).

CURAFA™ Points of Care

We aim to address inequalities regarding primary healthcare access in emerging economies and to enable accessibility, availability, awareness, and affordability of primary healthcare in order to fulfill our vision of primary healthcare for everyone, everywhere.

Five facilities within the CURAFA™ initiative are operational in underserved, low-income communities in the outskirts of Nairobi, Kenya. They serve as points of care for **integrated primary healthcare services**. Each facility is run by local pharmacists and nurses who provide pharmaceutical and clinical services, medicines, digital health solutions, health education, insurance, and financing solutions to their communities. These teams are supported by modern facilities that include Wi-Fi access and cell-phone charging stations, tablet computers, televisions, and refrigerators for cold chain medicines that are solar powered. In 2019, the five sites collectively served over 2,000 patients every month. We implemented a patient management platform and acquired a telemedicine solution in 2019 to improve patient outcomes.

The overarching objective is to further develop the primary healthcare service model, resulting in a sustainable business model. The first achievements towards scale-up were the development of a franchising manual and the CURAFA™ replication request by the Guinean Ministry of Health and Public Hygiene.

In recognition of this work, we received a grant from the UK Department for International Development (DFID).

Fight against falsified medicines

According to a WHO report, more than 10% of all medicines in developing and emerging countries are counterfeit or substandard, a situation that creates a major health risk. For more than 20 years, the Global Pharma Health Fund (GPHF), a non-profit initiative funded by our company, has been fighting falsified and substandard medicines with its unique portable, compact laboratory, the GPHF Minilab™.

The GPHF Minilab™ fits into a tropics-resistant flight case and can detect falsified medicines rapidly and cost-effectively. Largely used in Africa and Asia, and cited by WHO as one of the most important tools for detecting substandard and falsified medicines, it enables scientists and clinical staff to verify the content of some **100 active pharmaceutical ingredients** for authenticity. The GPHF develops the Minilab's method inventory, supplies the portable laboratories at cost and provides training on how to use them. In 2019, the GPHF consolidated all 100 test methods within a single manual in English, with translations into French and Spanish due to become available in 2020.

More than **850 Minilabs** are currently in use. In 2019, 21 Minilabs were supplied. 15 were given to the Philippines and the others to Bangladesh, the Democratic Republic of the Congo, India and Mongolia.

In November 2019, we engaged in discussions on the topic of detecting falsified medicines. At the National Consciousness Week Against Counterfeit Medicines (NCWACM) in the Philippines we discussed challenges and solutions for the fight against counterfeit drugs with local regulatory representatives and government officials. We presented our collaboration with Boston University on the development of a new user-friendly tool to assess the validity of drugs.

Prices of Medicines

Part of the non-financial report

In OECD countries, prescription drug costs accounted for between 6% and 29% of total healthcare spending in 2017. However, advances in the research and development of innovative medicines are significantly transforming the healthcare landscape, allowing chronic diseases – the greatest cost drivers – to be treated more effectively and affordably.

Our approach to pricing medicines

We want to help ensure that all patients have access to the most effective medicines for their needs, which is why we are working to prevent cost from becoming a barrier to treatment. We are committed to **flexible and fair pricing** – both within and across countries. We therefore adapt our prices based on local market access, taking into account factors such as health system capacity and financial standing, geographic circumstances and existing infrastructure, statutory requirements, unmet medical needs and socioeconomic aspects, such as the patients' ability to pay. This approach involves working closely with governments and other stakeholders. In addition to these considerations, we continuously monitor dynamic healthcare environments and markets, pricing and reimbursement systems and legal and regulatory guidelines, adjusting our prices as necessary.

We review our prices on an annual basis to ensure they meet patient access needs. We use a consistent, **data-driven approach** to monitor our local pricing. We also make our products affordable to patients in certain countries by participating in government tenders, establishing low-price secondary brands or branded generics and by operating patient access programs.

Moreover, we support risk-sharing agreements and are working to improve data efficiency in health systems, in order to achieve an optimal distribution of funds and resources.

Setting medicine prices

Our Global Pricing and Market Access unit sets market launch prices in coordination with the respective franchises. The team reports directly to a member of our Healthcare Executive Committee. Our individual subsidiaries are responsible for managing prices and continually adapting them to local conditions.

Our commitment: Medicine price guidelines and principles

The affordability of our health solutions is part of our broader patient value proposition, which includes increasing accessibility, availability and awareness. Our medicine pricing adheres to the stipulations of our overarching Access to Health Charter and is defined in detail by our Pricing of Medicines guideline. Additionally, our Patient Access Programs Policy sets out standards for offering medicines at reduced prices.

Customer-centric contracting models

We are dedicated to advancing value-based healthcare through pricing and contracting mechanisms that fully comply with all local laws. In collaboration with payers, such as health insurance companies, we developed various product- and market-specific reimbursement and contracting models. These help to provide patients with prompt **access to our innovations**. For instance, in the United Kingdom and Ireland, we entered into a risk-sharing agreement that provides immediate access to Mavenclad® for patients with multiple sclerosis (MS). Under this agreement, the National Health Service only has to reimburse medication costs for patients who respond to the drug. If treatment has to be switched from Mavenclad® to another product, a partial rebate is paid to the National Health Service. Around 1,300 patients in the United Kingdom and around 250 patients in Ireland had been reimbursed for the cost of the drug under this program as of end of 2019. Since October 2018, we have been using a similar pay-for-performance contract for Mavenclad® together with GWQ ServicePlus AG, a network of around 60 health insurers with 11 million patients in Germany.

We have also established contracting models for our oncology drug Erbitux®, our MS drug Rebif® and our growth hormone Saizen®, to make it easier for patients to access these medicines. Similarly, we have capped per-patient costs and formed risk-sharing agreements in certain countries.

Pricing schemes to serve low-income patients

We work in close partnership with governments and other stakeholders on innovative, differential medicine pricing schemes and we supply products at reduced prices to certain countries in Africa, Asia, Latin America, and the Middle East. In India, for instance, we cooperate with public sector representatives, such as Bharat Heavy Electricals Limited (BHEL) and the Oil and Natural Gas Corporation (ONGC), to offer **discounted prices** for certain general medicine and endocrinology products to patients with a limited ability to pay.

Moreover, we regularly participate in government tenders for products that are used in public hospitals serving low-income patients. Many of these tenders take place in low to middle-income countries.

Low-price second brands

For some of our existing brands, we have created low-price second brands, particularly in countries with a large percentage of patients with very low incomes. In Brazil, for instance, 11 of our products are available in a lower-priced format. We have also established low-price second brands in countries including Mexico, the Philippines, Poland, and South Africa.

Generics

Together with our partners, we offer branded generics particularly in low- to middle-income countries. This helps meet the urgent need for affordable, high-quality medicines required to treat endemic diseases. In doing so, we help to ensure better access to consistently high-quality medicines at lower prices. To date, we have launched four branded generics in the Philippines and three in Angola. We also launched a branded generic product in Brazil and Mexico.

Patient access programs

Worldwide, we operate patient access programs that allow us to offer certain products at more affordable prices in several countries. Examples include efforts to expand access in China to Erbitux®, our oncology medicine used for instance in the treatment of colorectal cancer. Geared primarily toward low-income patients who receive the drug free of charge, our Erbitux® donations have benefited around 12,900 patients in China since October 2012. The program ended when Erbitux® was added to China's national healthcare reimbursement catalog, which now gives patients **immediate access** to the product.

We run similar assistance programs in other countries such as India, where we also offer a patient access program for Erbitux®, providing treatment cycles for free under certain conditions. Around 2,300 patients participate in the initiative each year. In nations such as China and Peru, we offer a free-of-charge biomarker screening that determines whether Erbitux® would be a suitable treatment. In China, around 40,800 patients have benefited from this program since 2014.

In addition to our oncology initiatives, we offer access programs for our drugs Rebif®, Gonal-f® and Saizen®. In China, for instance, we operate the Gonal-f Baby Fund, an access program that provides financial assistance for fertility treatments to low-income couples having difficulty conceiving.

Health awareness

Many people suffer from certain conditions but do not realize it. This results in individuals either not receiving treatment or not receiving it in time, although effective medicines and therapies are available. To try and prevent this occurrence, we conduct global campaigns that raise awareness and improve knowledge of diseases, their symptoms and treatment options. Ultimately, healthcare professionals and patients can only make informed decisions if they have proper knowledge and the right information.

Our approach to raising health awareness

Awareness plays a key role in our approach to improving access to healthcare. We seek to empower communities, medical professionals and patients with appropriate tools, information and skills so that they can make **high-quality, informed decisions** on prevention, diagnosis, treatment, care, and disease management.

We often join forces with committed partners to conduct educational campaigns for prevention, early diagnosis and awareness. This also helps build the capacities of medical professionals working in the fields of research, technology and healthcare.

How we build health awareness

The strategic direction and output of all awareness activities are aligned with our respective businesses. Our diverse business units plan and implement our awareness projects either on a global level or through their local offices, with projects organized according to the **specific needs of the local community**. The offices are also responsible for local mobilization during our global campaigns.

Our commitment: access to health through awareness

Our strategy for addressing access to healthcare incorporates the topic of awareness and is laid out in our Access to Health Charter, which we revised in 2019. Our awareness campaigns are also subject to the respective marketing principles set out in guidelines such as our "Pharma Code for Conducting Pharmaceutical Business and Pharmaceutical Operations." In addition, our campaigns are governed by internal policies and guidance for reviewing our interactions with health systems and by the review processes for communication materials as well as further global, regional and local rules and regulations.

Global awareness campaigns

We regularly conduct campaigns to raise awareness of various diseases across the globe, often in collaboration with patient advocacy groups. We focus on diseases that align with **our core competencies**, expertise and experience along the health value chain. These are, in particular, cancer (specifically colorectal as well as head and neck cancer), thyroid disorders, diabetes and multiple sclerosis.

Awareness and knowledge transfer for thyroid disorders

Throughout 2019, we continued our work to raise awareness of thyroid disorders. At the global level, we supported the International Thyroid Awareness Week in May 2019 for the 11th consecutive year. This annual awareness campaign, which we founded together with the Thyroid Federation International (TFI), aims to highlight some of the **lesser-known aspects** of thyroid disorders.

We hosted numerous events during the week, including events specifically targeted at healthcare professionals. The campaign reached people in many different countries via the events as well as press coverage and social media. We also introduced the world's first-ever series of thyroid emojis or "thyrojis", tapping into a popular trend of the 21st century with a series of customized emojis representing the many faces of thyroid disorders.

Awareness campaigns for head and neck cancer

In 2019, we supported two key head and neck cancer awareness events: World Head and Neck Cancer Day (WHNCD) on July 27 and the European Head and Neck Cancer Awareness Week from September 16-20. Activities focused on aligning with the UK-based patient advocacy group The Swallows to create an emotive video on the **journey of a patient** and his carer, tying in with the existing Embracing Carers initiative. The September campaign built on the campaign in July, continuing to work with The Swallows and featuring video footage of the same patient, focusing on the transition from treatment to survivorship.

World Cancer Day

On February 4, we again marked World Cancer Day, an annual initiative led by the Union for International Cancer Control (UICC). Building on the UICC's theme "I Am and I Will", we created a compelling campaign to communicate our ongoing drive to transform cancer care. Our campaign, "I Am. I Will #TransformCancerCare." focused on how personal contributions make a collective impact on the evolution of oncology care. It was supported by 250 images from 13 countries generating over 33,000 impressions on social media.

Colorectal Cancer Awareness Month

In 2019, we stepped up our efforts to raise awareness of colorectal cancer (CRC). We worked closely with DiCE, a representative body for digestive cancer patients in Europe, to redefine the CRC Awareness Month campaign. We pooled resources, extending the collective reach of the campaign far beyond what would have been possible individually. We maintained a consistent, unifying theme throughout the campaign, encouraging our employees and external audiences to take part. In addition, we developed a suite of materials to maximize CRC Awareness Month activities,

including a video on the CRC screening journey and an infographic banner on the importance of such screenings.

Cancer Immunotherapy Month

June 2019 marked the seventh annual Cancer Immunotherapy Month, which aims to raise awareness of the **life-saving potential** of immunotherapies. On June 14, supporters were encouraged by leading cancer groups to wear white to promote a future without cancer and to promote their activities in social media via #WearWhiteDay. White represents the immune system's white blood cells (lymphocytes) that fight cancer. It also symbolizes the laboratory coats worn by the scientists and clinicians working to find a cure for cancer and it represents the color of all cancer awareness ribbons combined, which is significant as immunotherapy has the potential to treat all types of cancer.

World Multiple Sclerosis Day

We participated in the annual World Multiple Sclerosis Day on May 30, 2019. This year's official theme was #MyInvisibleMS, focusing on all the invisible symptoms of the disease. A total of 37 Group companies participated in this MS International Federation (MSIF) initiative by showcasing their activities in support of the MS community under the umbrella of our #MSInsideOut campaign.

As part of our World MS Day activities, we created the My Invisible MS art gallery. It was based on pieces of art created by people living with MS who illustrated their invisible MS symptoms. We displayed the art gallery in 17 different countries around the world.

We remain focused on bringing our commitment to fight MS to life in a meaningful way, addressing patients' evolving needs and improving the lives of carers. We also recognize the **valuable impact** that community and grassroots initiatives have in contributing to this effort. As a result, we are working on an initiative through which these groups can apply for a grant to supplement work specifically aimed at improving the provision of support to carers.

World Malaria Day

Since 2015, our company has been championing World Malaria Day, which takes place every year on April 25. We conduct campaigns that raise awareness of the disease. In 2019, we marked the event with our partners in Ghana and conducted an internal awareness campaign to showcase our engagement in the **fight against malaria**. In particular, the campaign highlighted the One Merck for Malaria program as our company-wide approach towards the control and elimination of the disease. This program leverages competencies from all of our business sectors to deliver integrated and transformative health solutions, such as new diagnostics, therapies and preventive methods, together with approaches that strengthen local health systems in low- and middle-income countries.

More information on the One Merck for Malaria program can be found in the Focus Programs chapter.

World Health Day

On April 7, 2019, we celebrated World Health Day as an opportunity to communicate about the importance of equity in quality health services for individuals, economies and society. The campaign, promoted by the World Health Organization (WHO), highlighted the need for universal health coverage to ensure that all people can obtain the care they need, when they need it.

Since the spread of infectious diseases remains a major global health threat, the World Health Day is an occasion for us to confirm our engagement in combating schistosomiasis and malaria through science and technology innovations.

World Diabetes Day

For World Diabetes Day 2019, on November 14, we launched a campaign that echoed the International Diabetes Federation's (IDF) theme, namely– "The Family and Diabetes". The campaign was an extension of the previous year's World Diabetes Day campaign "See it. Slow it. Stop it.", which aimed to identify risk factors among people who are likely to develop type 2 diabetes.

The campaign focused on sharing the message that having a supportive family contributes significantly to people's ability to lead a healthier lifestyle and fight type 2 diabetes.

Our company remains steadfast in its commitment to its partnership with the IDF, working on a range of educational activities that seek to raise awareness of prediabetes and type 2 diabetes management and prevention.

Fertility Awareness Week

European Fertility week provided an opportunity for our company to increase awareness of in vitro fertilization and the patient journey. We created a platform for an open dialogue around the **reality of fertility**. This helped people living with infertility in Europe to be heard. The platform was supported by our global social media campaign "We are in it together", which comprised opinion pieces by our senior management and an employee emphasizing the need for collaboration to support female fertility.

At the same time, we launched various country initiatives. For instance, in France we had a #Testyourfertility social media campaign, focusing on prevention and creating awareness of infertility issues among 18- to 24-year-olds.

Healthy Women, Healthy Economies initiative

To help empower women to overcome the challenges of communicable and non-communicable diseases and to rise to their economic potential, we are committed to the "Healthy Women, Healthy Economies" initiative. Under the auspices of the Asia-Pacific Economic Cooperation (APEC), we collaborate with representatives of several governments through this public-private partnership, which seeks to identify and implement policies that advance women's health and well-being to support their economic participation.

In July 2019, we partnered with the "March of Dimes" initiative in a three-year collaboration, launching "Healthy Babies, Healthy Business", a program that supports health benefits for mothers and promotes family-friendly work environments.

Embracing Carers initiative

Embracing Carers is a global initiative that we lead in collaboration with prominent caregiving organizations around the world. Embracing Carers is designed to increase awareness, action and discussion around the often-overlooked needs of caregivers. We believe that the topic of caregiving is one of the most under-addressed public health issues of our time, with caregivers receiving little recognition and support despite providing vital services for others. We raise awareness of the issues faced by caregivers, prompt stakeholders to show deeper engagement, establish **global best practices** and advocacy resources and endorse the improved integration of carer support into the spectrum of care.

In 2019, Embracing Carers worked to transform awareness into action by launching a global "Time Counts" campaign, which encouraged people to find large or small ways to help a caregiver in their lives and pledge that time. Embracing Carers also provides support to more than 30 patient and carer groups globally, enabling them to create initiatives dedicated to behavioral change and peer-to-peer support programs to improve caregivers' lives.

product safety and quality

chemical product safety

Part of the non-financial report

Since many of our chemicals are classified as hazardous substances and mixtures, we must ensure that they pose no risk to people or the environment. We therefore comply with all relevant national and international regulatory requirements, laws and guidelines, an approach that is crucial to our business success. At the same time, we aim to meet the expectations that stakeholders such as customers and employees have of a comprehensive hazard management program.

Our approach to safe chemical products

Product safety is one of our top priorities. Starting at the development stage, we investigate the potential adverse impacts chemical substances may have. Along the entire value chain of our chemicals – **during import, manufacture and commercialization** – we fulfill all regulatory requirements, often even exceeding them. We publish extensive information on the safe handling of our products (see merckmillipore.com and merckgroup.com) on our websites.

How we ensure chemical product safety

Our Healthcare, Life Science and Performance Materials business sectors each have their own organizational structures in place to provide support and guidance on product safety. The employees responsible for product safety from all three units work in close collaboration with each other as well as with our Group-wide governance function Corporate Regulatory Affairs Chemicals (EQ-R) to ensure the safety of our products. Their tasks include registering chemicals, classifying hazardous substances and communicating risks by means of safety data sheets and labels.

Our Group Product Safety Committee (GPSC) monitors regulatory requirements worldwide to check for relevant changes, initiating the measures needed to integrate new requirements into our processes and reviewing their progress.

EQ-R ensures that our company complies with all regulatory requirements Group-wide. Because it is not subject to any operational commitments and reports directly to the head of our Group Environment, Health, Safety, Security, Quality function, EQ-R operates independently of our business sectors. Any necessary corrective or preventive actions are the responsibility of each business sector. EQ-R furthermore supports individual units in implementing and harmonizing efficient processes.

Integrating Versum Materials and Intermolecular

In the process of integrating Versum Materials and Intermolecular, we are verifying whether their product safety practices comply with the applicable regulatory requirements as well as our internal standards, adapting the underlying processes as needed.

Our commitment: Legal requirements and Group-wide guidelines

Through Group-wide guidelines, we guarantee continual compliance with national and international regulations and have also endorsed general voluntary commitments of the chemical industry, such as the Responsible Care® Global Charter.

Our Regulatory Affairs Governance Policy details our Group-wide processes for managing and **implementing product safety** and sets out the necessary management structures. To meet the product safety regulations relevant to our company, in 2019 we revised our Regulatory Affairs Governance Policy to more clearly define the roles, rights, powers, and responsibilities within our Group.

The legal requirements applicable to our operations include the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and its implementation in regional and national legislation (such as the CLP regulation in the European Union and HazCom in the United States). Our Group Label Standard provides a consistent framework for labeling products according to GHS requirements. In addition to these, we also comply with the EU chemicals regulation REACH, the amended U.S. Toxic Substances Control Act (TSCA), and the amended German Federal Banned Chemicals Ordinance (ChemVerbotsV).

No significant incidents of non-compliance with regulations or voluntary standards involving chemical product labeling were reported in 2019.

REACH registration

In 2018, upon completing the third registration phase of the EU chemicals regulation REACH, we committed ourselves to the following actions: We shall continuously review our own registration dossiers to verify quality and keep the information up-to-date, improving the dossiers as needed. In 2019, we developed and implemented the processes necessary to accomplishing this.

ICCA Product Safety Summaries

By mid-2019, we had made product safety summaries available on the website of the International Council of Chemical Associations (ICCA). Effective October 1, 2019, the website had been taken down by the ICCA because information on chemical substances is available on other web portals. We provide information on the safe handling and use of our chemicals on the websites of our Life Science and Performance Materials business sectors.

Safety analysis during product development

We believe that product safety starts with development. By conducting **hazard**, **exposure and risk assessments**, we work to ensure that our chemicals can be safely used later on. As stipulated by law, we analyze all products in terms of their impact on human health and the environment, complying with the relevant regulatory requirements. Before launching a new product, we evaluate all pertinent hazardous substance data and classify the product according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), along with locally applicable regulations such as CLP in Europe. In conducting these safety assessments, the employees in our Life Science and Performance Materials business sectors receive advice and guidance from their respective Regulatory Affairs unit.

Our approach to nanotechnology

Nanotechnology is a highly innovative field of development that researches and uses structures 50,000 times thinner than a human hair. This technology opens up many opportunities for our Group. In our Life Science and Performance Materials business sectors, we utilize nanomaterials to develop products with new functions and properties that can help **make resource and energy consumption more efficient**, for example. In our Healthcare business sector, we explore the use of nanomaterials in medical therapies.

Despite their promise, the unique structure of nanoparticles may harbor risks, which we assess in line with legal requirements such as REACH. Our Group-wide Policy for Use and Handling of Nanomaterials underpins our approach to this technology. In the manufacture and processing of our products, we adhere to all legal requirements along with standards such as those of the German Federal Institute for Occupational Safety and Health (BAuA), as well as the German Chemical Industry Association (VCI). We furthermore provide our customers with safety data sheets containing information on the proper handling of nanomaterials during transport, processing, storage, and disposal.

In principle, we only utilize this new technology with the greatest care, abiding by the **precautionary principle** and taking nanomaterial safety very seriously. In doing so, we observe Group-wide requirements for safety, environmental stewardship and health impact mitigation, and leverage our existing processes and systems to ensure product safety.

Sharing nanotech knowledge

Beyond our internal safety efforts, we regularly engage other companies, associations and regulatory agencies in a dialogue on the **opportunities and risks of nanotechnology**. We take part in committees and working groups, including the Nano Panel of VCI's Technology and Environment committee, as well as Responsible Production and Use of Nanomaterials, a joint technology working group of the Society for Chemical Engineering and Biotechnology (DECHEMA) and the VCI. Within the VCI, we furthermore review the latest scientific literature in order to stay abreast of new advances in nanotechnology.

Product safety information

As part of our efforts to communicate the potential dangers of our products, we provide our customers with in-depth informational material on all our chemicals. These brochures contain instructions on **proper use and handling** to prevent them from posing a danger to people and the environment.

We provide all chemicals classified as hazardous with **safety data sheets**. These contain information on the physicochemical, toxicological and ecotoxicological properties of the agent and reflect the relevant regulatory requirements of the countries in which they are published. We therefore produce country-specific safety data sheets in 44 languages for our Performance Materials business sector and in 37 languages for our Life Science business sector. We also provide safety data sheets for the non-hazardous materials and finished medicinal products manufactured by our Healthcare business sector. Since all these documents must be kept up-to-date and consistent, we have automated and standardized the majority of our Group-wide hazard communication processes within our business sectors.

In 2019, we updated 12 million safety data sheets for our Life Science business sector.

26 M.

safety data sheets in total are made available to our customers.

We offer an app that enables our Life Science customers to access the latest product safety information. Covering the whole life cycle of the product along its entire supply chain, the information is available worldwide in the respective national language and takes country-specific regulations into account. To access it, customers only need to scan the product's barcode or enter it manually.

Informing and educating customers

In 2019, we ran the Docs Online project within our Life Science business sector, which allowed us to verify that customer documents such as CoAs (Certificates of Analysis), CoOs (Certificate of Origin) and safety data sheets are up-to-date and available on the Sigma-Aldrich website, which has belonged to Merck since 2015. Additionally, it is now **easier to locate the documents**. For individual special product groups, we contact our customers directly if needed, for instance when legal requirements change. Through our ScIDeEx® program, our customers can check whether they can use a chemical safely within the boundaries of the EU REACH exposure scenarios.

patient safety

Part of the non-financial report

The safety of patients who are treated with our medicines is our absolute priority. Our pharmaceutical products need to be effective in treating the respective disease, while also posing as little risk as possible to patients. That is why we consistently monitor risks and any adverse effects that may arise and take the necessary actions to minimize them.

Our approach to ensuring patient safety

Through rigorous benefit-risk management, we help to ensure that the benefits of our drugs always outweigh the risks for patients. Every new medicine passes a series of precisely defined development stages. Before any drug is given to humans, we conduct extensive preclinical testing both in vitro and in vivo . Through toxicological testing, we determine whether an active pharmaceutical ingredient is toxic to living organisms and, if so, at what dosage. This also helps us determine the dose that humans can safely tolerate. Only when this is complete do we perform clinical studies to investigate the safety and efficacy of the drug when used in humans. During clinical development, we diligently use all collected data to continuously evaluate the drug's **benefit-risk profile**. If we consider the drug's benefit-risk profile to be positive, we then submit an application for marketing authorization to the regulatory authorities.

Continual monitoring

Once a drug is launched, the number of patients being treated with it increases significantly. In certain circumstances, rare adverse and potentially serious effects that go undetected during clinical development may occur, which is why we continuously monitor and manage the positive benefit-risk profiles after market launch. Pharmacovigilance includes the process of monitoring a drug on an ongoing basis to detect and assess signals as part of signal management activities. The aim is to track any adverse effects in an effort to take appropriate action to minimize and communicate the risks in a transparent way. We always provide physicians and patients with the **latest information on the safety** of all our marketed drugs. The above applies to the entire life cycle of a product, ranging from development, market launch and commercialization to expiration of the marketing authorization.

Capabilities that we have developed and strengthened in this area include:

- Advanced benefit-risk management
- Big data analytics (using real-world data)
- Advanced signal detection technology
- Pilot processes in patient-centric adverse effects collection

Based on the conditions of regulatory approval, we regularly develop and publish **educational materials for patients and healthcare providers** to communicate any known and potential risks and ways to minimize them for newly approved products (such as Bavencio® and Mavenclad®). We assess the effectiveness of these materials in close collaboration with our Benefit-Risk Action Team. If required, we adjust the content of the materials and their distribution, and describe the results from the effectiveness analysis in our periodic safety reports and risk management plans, which we submit to relevant health authorities for evaluation.

How we monitor patient safety

Our Global Patient Safety unit is responsible for pharmacovigilance. It continually collects **current safety data** from a wide variety of sources across the globe, including clinical studies, early-access programs, spontaneous reports on adverse effects , patient support programs and articles published in medical and scientific journals.

Our experts help to make sure all information on the risks and adverse effects of our medicines is properly documented, tracked and reported to the respective health authorities in accordance with regulatory requirements. The Global Patient Safety unit analyzes all data and reassesses the benefit-risk profile based on these data, where required. We, then, inform regulatory authorities, physicians and patients about new risks, additional risk mitigation measures and potential changes **in the benefit-risk balance**.

Our Global Patient Safety unit became part of our Global Development function at the end of 2018, enabling us to better integrate **sound knowledge of patient safety** into early decision-making, in particular through the advent of predictive safety. Our expertise, in close collaboration with Chemical & Preclinical Safety, Translational Medicine and other functions, will help ensure the seamless assessment of benefit-risk profiles throughout the product life cycle to deliver therapies that are truly differentiated and provide transformational value to patients. We restructured the Medical Safety function in 2019. It is now therapeutically aligned as a holistic end-to-end function, including a unified Safety Scientist group and a new function known as Medical Operations and Analytics. Investigational and marketed drugs were previously managed through two separate functions within Global Patient Safety. Overall, this newly consolidated department will help us to focus on scientific data and medical safety. Acknowledging the importance and magnitude of our journey, we launched a Transformation Office. To establish a robust and streamlined end-to-end process for Individual Case Safety Report (ICSR) management, the Medical Assessment group was integrated into the Safety Operations group. Thus, one team is now accountable for the entire ICSR process.

Our **Merck Healthcare Quality** (HCQ) unit processes quality complaints relating to our products. When quality defects may have an impact on patient safety or lead to adverse effects, Global Patient Safety gets involved.

Our Medical Safety and Ethics Board

Our Medical Safety and Ethics Board (MSEB) oversees the safety and benefit-risk assessments of our drugs throughout clinical development and commercialization. It endorses appropriate **measures to minimize risk**, such as package leaflet updates. This board is chaired by our Chief Medical Officer (CMO) and consists of experienced physicians, scientists and experts from our company. Throughout a drug's entire life cycle, the MSEB reviews and assesses important medical safety risks and benefit-risk issues, and reviews ethical issues, as appropriate.

Within the Global Patient Safety unit, the Benefit Risk Action Team is responsible for signal management, benefit-risk assessment, risk management and all topics regarding product safety and the benefit-risk profile of our medicinal products. Recommendations from the Benefit Risk Action Team are endorsed by the Pharmacovigilance Advisory Board (PVAB), also chaired by Global Patient Safety unit.

Our commitment: Guidelines and statutory requirements

We follow international guidance and standard procedures, such as the International Conference for Harmonization (ICH) guidelines and the Good Pharmacovigilance Practices (GVP) established by the European Medicines Agency (EMA) and national health authorities. In addition, we adhere to all statutory pharmacovigilance regulations in those countries where we market our products, and we continuously work to incorporate all required changes in our Group-wide standards and processes. We began harmonizing the **processing of personal data** according to new European legislation on data privacy (General Data Protection Regulation) in 2018 and continued this effort globally in 2019.

Collecting information and checking processes

In 2017, the EMA implemented a new process to monitor the safety of medicines in EudraVigilance: This provides marketing authorization holders with access to data on suspected adverse effects and requires them to monitor the EudraVigilance data for safety signals and to report these to health authorities. In response to these new requirements and to the new data transmission format stipulated by ICH guideline E2B (R3), we upgraded our **Global Safety Database** to ensure the technical capabilities needed to support the coordinated exchange of individual case safety reports. In 2019, we started safety reporting in line with the enhanced E2B(R3) standard in China, Europe and Japan.

In 2019, we assessed new **country-specific regulatory requirements** and implemented necessary changes in order to meet them. Examples include new benefit-risk assessment and safety signal notification requirements in Canada, Denmark, Serbia, and the United States, and requirements for local pharmacovigilance responsible persons in Botswana, Kazakhstan and Kenya. Other examples include: the EU Falsified Medicines Directive (FMD, 2011/62/EU), the MHRA Guidance on the Regulation of Medicines, Medical Devices and Clinical Trials, and regulatory changes in African countries with – among others – respect to clinical trial guidelines. We also compiled comments on drafted guidelines and provided them to health authorities, for example on "ICH – Draft Guidance E8(R1) General Considerations for Clinical Studies" and "ICH – Draft Guidance E19 Optimization of Safety Data Collection."

Monitoring drug safety

Regulatory authorities conduct periodic inspections to verify that we comply both with statutory requirements and with our own internal standards for drug safety. In Germany, these are handled on behalf of the European Medicines Agency (EMA) by the German Federal Institute for Drugs and Medical Devices (BfArM) and the Paul Ehrlich Institute (PEI), the German Federal Institute for Vaccines and Biomedicines. We follow up on the findings of health authority inspections and take the necessary actions to ensure the proper functioning of our pharmacovigilance system. In 2019, three **pharmacovigilance inspections** were conducted (France, Germany and Serbia).

Furthermore, we perform audits to ensure that all our **units and subsidiaries involved in pharmacovigilance consistently** meet all requirements across the globe. In 2019, we conducted a total of 29 pharmacovigilance audits and found no significant deviations in our pharmacovigilance system from these requirements. We also audit vendors and licensing partners involved in pharmacovigilance, which helps us hone our pharmacovigilance processes so that they surpass statutory requirements.

In line with our goal to enhance patient safety, we implemented a patient-friendly interface in the mobile app agReporter. With this app, not only field nurses and our sales representatives, but also non-medically trained users can **report any side effects** or adverse events arising from the use of our products. This places patient feedback at the core of our efforts to consistently collect data on adverse effects. In 2019, we implemented further changes to the app to improve data quality for the adverse events reported. We also made the app available in a total of 14 languages, with an Arabic version currently in preparation.

Innovative signal detection

Through our tool for signal detection, called Empirica, we analyze and manage large amounts of global data, such as scientific studies and news about adverse effects. This helps us to comply with regulatory timelines for safety signals and other safety-related factors and will ensure that all signal data, documentation and decisions are captured in one place. It also allows easy access to and analysis of our data as well as cross-functional collaboration between the Global Patient Safety unit and other internal and external stakeholders. We use a key performance indicator (KPI) to track whether all signals, validated and not validated, detected from external or internal sources are managed and completed within the timeline defined by standard operating procedure, which is 60 days from the date of detection. The KPI shows that the implementation of Empirica **improved**

the tracking of all safety. Using diverse statistical tools and leveraging all available safety data from our internal and external databases also helped to improve our signal detection rate.

Up-to-date labeling and product information

Our product information explains to physicians and patients how to properly use the respective drug and allows for an informed decision on the treatment. In accordance with statutory regulations, the **package leaflet** contains all relevant information such as indication(s) and ingredients, as well as dosage, storage, mode of action, instructions for use, warnings, precautions and possible adverse effects. Should the medicine contain ingredients that could impact the environment, the package leaflet may also contain information on the proper disposal of the product.

We review and update all product information documents such as package leaflets, ensuring that our medicinal products contain the latest information on safety, efficacy and pharmaceutical formulation, as appropriate. In accordance with statutory requirements, all modifications to the leaflets are submitted to the respective regulatory authorities for approval. In 2019, there were no incidents of non-compliance with statutory regulations concerning labeling of drugs or pharmaceutical products.

Internal and external training

All employees involved in the safety and quality of pharmaceutical products take part in training in line with our global training standards. We verify compliance with these requirements by producing training compliance reports and by performing regular audits.

Our training is delivered via a global-learning platform. All of the approximately 24,000 biopharma employees receive **basic pharmacovigilance training** once a year that covers the procedure for reporting adverse effects from our products. Other training courses keep employees up to date on their professional expertise as well as internal standard operating procedures and other relevant requirements. This helps to ensure adherence to Good Pharmacovigilance Practice (GVP) requirements.

Sharing expertise with other countries

We endeavor to transfer our drug safety expertise around the world, especially into countries where health workers need to build their pharmacovigilance expertise. In 2019, we continued the **pharmacovigilance workshops** for medical school students in Guatemala, as reporting adverse effects is often not sufficiently covered by the curricula there.

We also assist Latin American health authorities in **implementing electronic reporting processes** for adverse effects. We support the implementation of electronic reporting in Argentina, El Salvador and Peru. Health authorities in Brazil, Mexico and Tunisia are also moving towards adopting this technology.

Additionally, we conducted pharmacovigilance training and shared pharmacovigilance expertise in the Eurasian Economic Union (EAEU). As members of the pharmacovigilance working group within the Association of International Pharmaceutical Manufacturers (AIPM), we shared our expertise through conferences, provided training and seminars in the industry, presented to university school students and professors and liaised with the health authority in Russia.

The Medical Dictionary for Regulatory Activities (MedDRA) is a clinically validated medical terminology system used by health authorities and the industry worldwide. Following the release of the new MedDRA version 22.0, the MedDRA Maintenance and Support Services Organization (MSSO) presented the Russian version of MedDRA. We also collaborated with health authorities in Brazil and China to contribute to the creation of local language versions of MedDRA.

In Russia, we implemented a **new adverse effects database** for the health authority in September 2019. Information for marketing authorization holders is currently being developed in collaboration with the national industry association and health authorities.

In 2019, we also formulated a new strategy to increase the contribution made by our Access to Health Initiative (A2H) to pharmacovigilance. **Improving access to high-quality health solutions** for underserved populations and communities in low- and middle-income countries is the key objective of A2H Initiative. A key aspect of this new strategy is fostering pharmacovigilance initiatives in safety data-sharing with health authorities and building pharmacovigilance capacity with reputable partners in underserved countries in a sustainable way.

To this end, we selected low- and middle-income countries from the UN Human Development Index (HDI) and included these in our project scope. The primary focus in 2019 was on encouraging universities and ministries of education in these countries to establish **pharmacovigilance curricula** in schools of medicine, pharmacy and nursing, and to support health authorities in adopting pharmacovigilance systems through industry associations or partnerships.

Furthermore, for the selected countries we appointed Merck ambassadors per region to systematically collect and report information on pharmacovigilance initiatives and activities in each region. The analysis of preliminary information already demonstrated that we actively contributed to the preparation of the Brazil health authority's new pharmacovigilance regulations and the creation of a Brazilian-Portuguese MedDRA. In Russia, we began a **joint educational initiative** with the Sechenov University, which took place between October and December 2019, targeting students in their fourth year at the School of Pharmacy. The topic of pharmacovigilance was also covered in this training course.

Through the A2H initiative, we also promoted patient centricity in low- and middle-income countries through a **pharmacovigilance awareness video** that we developed and distributed. For example, this included presentations at a Tunisian pharmacovigilance congress, information on company-sponsored disease awareness websites in India, pharmacovigilance workshops for medical school students in Guatemala and over 2,300 pharmacists in China. We plan to expand this approach to other countries.

Stakeholder dialogues in 2019

Lecture for pharmacy students of Peoples' Friendship University of Russia

Being members of the pharmacovigilance working group of the Association of International Pharmaceutical Manufacturers (AIPM), both, the Eurasian Economic Union (EAEU) Qualified Person for Pharmacovigilance (QPPV) and the Local Patient Safety Officer (LPSO) in Russia took part in projects to increase pharmacovigilance (PV) awareness among local and international industry, healthcare professionals and university students. They presented PV-relevant topics at professional conferences and educational events. In April 2019, representatives of our company held a lecture for pharmacy students at the People's Friendship University of Russia. In this way, we increased the students' knowledge on PV and raised awareness of its importance.

Boosting patient-centricity in North Africa

At the Tunisian pharmacovigilance congress in April 2019, we presented a **video on educating patients** about adverse drug reactions. Reaching more than 200 participants and speakers from Algeria, Europe, Morocco and Tunisia, our #AdverseEventAwareness video built confidence among our partners and stakeholders, and enhanced patient centricity and pharmacovigilance awareness. The initiative was met with approval from Tunisian and Moroccan health authority representatives, who proposed collaborating to assess opportunities for further development.

Towards a digital pharmacovigilance partnership in Tunisia

To ensure the smooth implementation of **accurate, electronic reporting on pharmacovigilance** in Tunisia by using the ICH E2B system, we liaised with the Tunisian Pharmacovigilance Department. In this way, we helped to ensure the system complemented the Tunisian pharmacovigilance center's existing connection to the World Health Organization database for safer use of medicines, called Vigibase. The Tunisian Pharmacovigilance Department tested the system and plans to make it mandatory for all pharmaceutical companies involved in electronic reporting.

product-related crime

Part of the non-financial report

According to the World Health Organization (WHO), a considerable proportion of the medicines in developing countries are illegal, counterfeit or substandard. In industrialized nations, however, such products are also becoming increasingly available on the market through unlicensed Internet pharmacies and dubious online platforms, posing a risk to public health. Moreover, chemical products can also be used for illegal purposes such as the manufacture of illicit drugs.

Our approach to product-related crime

Our company develops and manufactures products of the highest quality. In order to protect both customers and patients, we secure our products against counterfeiting and are resolutely committed to fighting product-related crime by, for instance, collaborating with health, regulatory and law enforcement agencies at the **regional, national and international level**. In taking preventive action, we cooperate with industry representatives, Interpol and the World Customs Organization. Our guidelines, standards and processes apply to all our business sectors and markets worldwide.

How we define product-related crime

1. Counterfeit products: In line with the relevant WHO standard, we define a counterfeit product as "a product that is deliberately and fraudulently produced and/or mislabeled with respect to its identity and/or source to make it appear to be a genuine product."

This includes products

- with incorrect active ingredients or concentrations thereof
- without any active ingredients
- with dangerous impurities
- with modified/altered packaging and/or incorrect brand names
- with an authentic active ingredient, but not one produced under GxP conditions
- that have expired
- that were diverted from the legal supply chain

2. Illegal diversion of products: This term refers to the diversion of either pharmaceuticals or chemical substances from within the legitimate supply chain either to sell or export them through illegal channels to produce narcotics, weapons or explosives, or to use them for other illegitimate purposes.

3. Misappropriation of products: This refers to theft from production sites and warehouses, or while in transit.

How we are tackling product-related crime

Our Group Corporate Security function coordinates all our anti-counterfeiting activities, all of which are overseen by the Chief Security Officer and the head of Environment, Health, Safety, Security, Quality (EQ). Furthermore, all our sites have a product crime officer who is responsible for investigating potential cases of counterfeiting, acting as the interface between local regulatory and law enforcement authorities, national associations, our Group functions, and our sites. In 2019, conference calls with all product crime officers were held every two weeks to discuss strategic matters along with local issues and suspected cases of criminal activity.

Integration of Versum Materials and Intermolecular

As part of integrating Versum Materials and Intermolecular into our organization, we are examining the structures and processes in place to prevent and prosecute product-related crime, making changes as needed.

Group-wide anti-counterfeiting network

Our Anti-Counterfeiting Operational Network (MACON) is responsible for **globally monitoring and executing all anti-counterfeiting measures** for our products. Along with coordinating prevention and the development of security systems, this organization is also responsible for investigations. Comprising experts from various units such as Legal/Trademarks, Product Security, Export Control, Supply Chain, Patient Safety, and Quality Assurance, this network is coordinated by our Corporate Security unit.

To investigate suspected cases, MACON collaborates with the competent law enforcement agencies and regulatory authorities. In 2019, MACON investigated and pursued numerous incidents that primarily involved **counterfeits within the legitimate and illegitimate supply chains** as well as theft and illegal diversion.

Our commitment: Group-wide guidelines and standards

Our guideline entitled "Crime Relating to Products of the Merck Group" describes our goals and strategies for combating product-related crime. The Group-wide Product Crime Investigation standard sets out **mandatory requirements** and defines the procedures we follow within the Group. Moreover, it ensures that cases are processed efficiently and creates a clear legal framework for dealing with illicit products.

Enhanced monitoring and reporting systems

We analyze and document all counterfeit product incidents using a Group-wide reporting system. This approach provides us with a **complete picture of the security situation**, enabling us to identify possible links between different cases and effectively tackle them. Introduced in 2018, our standard operating procedure entitled Data and Documentation Quality Management details the corresponding process, making the risks more transparent and the processes more efficient.

Tracking system for chemical substances

We monitor chemicals that could be misused to produce illegal weapons, explosives or narcotics, tracking them through an **internal system** that flags suspicious orders or orders of sensitive products. These are only released once we have confirmed the existence of a (verified) end-user declaration.

In addition to fulfilling the duties stipulated by **statutory provisions on export control**, we also report suspicious orders, inquiries and requests to the competent authorities. Through these efforts, we are honoring a voluntary commitment of the German Chemical Industry Association (VCI) and meeting the terms of the Guideline for Operators published by the European Commission. In 2019, we reported 1,519 orders placed for relevant substances, which represents 1.8% of the overall order volume. In addition, we received six inquiries from the authorities regarding specific suspected cases that we helped to resolve.

We evaluate the effectiveness of our measures based on the number of reported, investigated and solved cases, as well as their severity.

Supporting customers and patients

To protect patients, the identity and authenticity of pharmaceuticals must be verifiable. We ensure this by rigorously implementing the requirements of the EU Falsified Medicines Directive. In February 2019, we started applying a **unique serial number** to the packaging of all the prescription medicines we commercialize in the European Union (Track and Trace). We also use this system in Colombia, Russia, the United States, Turkey Egypt, and other parts of the Middle East. In the coming years, we intend to roll out this system in all African countries as well as the rest of the Middle East. Plans are in place to implement it in Malaysia and Indonesia as well.

In addition, we also pursue our own initiatives:

- We apply the Security M label to some of our products, enabling users to **easily verify authenticity**. We take a risk-based approach to identifying the products to be labeled in this manner.
- In our **Mobile Anti-Counterfeiting System (MAS)** project in Nigeria, we are working closely with one of our suppliers on a text message-based identification system. Patients scratch off a barcode that is printed on the product packaging then text this code to a number that has been specifically set up for this purpose. They immediately receive a response telling them whether their code is authentic.
- We sponsor the non-profit Global Pharma Health Fund (GPHF), which supplies the **GPHF-Minilab®**, a compact laboratory used mainly in low- and middle-income countries to test the quality of 90 different active ingredients quickly and inexpensively. You can find more information on this project under Pharmaceutical supply chain.
- We offer our customers in the pharmaceutical industry **Candurin® pearl effect pigments** with unique color properties. When used to coat tablets and capsules, these pigments make it more difficult to create counterfeit copies.

Industry-wide exchange

In an effort to fight product-related crime, we actively participate in various associations and **industry-wide initiatives**. For instance, we work in very close partnership with the Pharmaceutical Security Institute (PSI), a non-profit organization dedicated to protecting public health. It both promotes the exchange of information on counterfeit products and helps the authorities to implement sanctions against the counterfeiters. You can find more information on our efforts under Stakeholder dialogue.

Raising awareness of product-related crime

We aim to raise awareness of product-related crime among our business partners and employees, educating and training our employees Group-wide on the subject.

All staff involved in security, such as product crime officers, participate in **appropriate training programs** aimed at building their capacities and promoting best-practice sharing. We are continuously evolving these programs and adapting them to new trends. In 2019, for instance, we held 35 training courses for our product crime officers covering incident reporting, case management, and cooperation with the authorities.

Security audits for contract manufacturers and distributors

We regularly check whether our distributors and contract manufacturers are complying with GMP and GDP (Good Manufacturing Practice/Good Distribution Practice). These audits are based on the EMA ICH Q10 pharmaceutical quality assurance standard. They also allow us to ascertain the extent to which our **security requirements** are being met by contract manufacturers and distributors. In addition, we conduct special security audits if a concrete need is identified. We also perform these audits as standard practice when we certify external service providers for our Security M label. This applies to both pharmaceutical contract manufacturers as well as companies that print packaging. Defects that we deem as critical must be rectified either before we enter into a contract, or a detailed corrective action plan must be submitted for our approval. In 2019, we conducted this type of security audit in Russia, which found two critical, eight significant and two minor defects. Corporate Security is monitoring the implementation of the necessary corrective actions. As soon as these have been completed, we can start the planned business endeavors.

Transport and warehouse safety

Part of the non-financial report

We transport and store numerous products and materials around the world, including commercial chemicals and pharmaceuticals, raw materials, intermediates, and waste, as well as technical materials and packaging, all of which could pose a hazard to health and the environment if handled incorrectly.

Our approach to safe transport and storage

It is our aim for all our shipments to reach our customers and sites safely, undamaged and with the required safety information. Several of the materials we store and transport are classified as hazardous. The storage of such hazardous goods and the transport thereof – whether by road, rail, plane, or ship – are governed by regulations applicable worldwide. To minimize risks to people and the environment, we apply **strict safety regulations across the Group** that of course also comply with applicable legislation. We conduct regular reviews to ensure that our own warehouses as well as those of third parties comply with these regulations. In addition, we train our employees accordingly.

How we achieve transport and warehouse safety

The overriding responsibility for transport and warehouse safety lies with our Group Environment, Health, Safety, Security, Quality (EQ) function (see Environmental stewardship), which defines the standards and guidelines applicable Group-wide. In addition, our individual sites are subject to various national and international regulations governing environmental stewardship and public safety, which **local site directors are responsible** for complying with.

Each of our sites around the world has an EHS manager and a **dangerous goods manager**, a position that equates to the Dangerous Goods Safety Advisor required by EU regulations. Both advise the site director on the safe storage and transport of hazardous goods while also monitoring compliance with statutory requirements and our own internal standards.

Our EHS managers are also responsible for **monitoring our contract warehouses**. Before signing a contract with a third-party warehouse operator, we assess whether they properly adhere to national and international storage and transport regulations and whether they are able to meet our additional requirements. We summarize the findings from this audit in an EHS report.

Integrating Versum Materials and Intermolecular

In the process of integrating Versum Materials and Intermolecular, which we acquired in 2019, we are reviewing their existing structures and processes for transport and warehouse safety, making adjustments as necessary.

Our commitment: Internal standards and international rules

Our **Group-wide safety concepts and standards** govern the safe storage of hazardous substances. Our Warehouse Safety standard, for instance, sets out measures to prevent materials from leaking or igniting and requires us to specify the dangers posed by any stored substance. Moreover, special safety rules apply to all warehouse employees.

Contract warehouses must also adhere to our high safety requirements. Before we sign a contract, providers must submit a statement detailing how they plan to meet our stringent safety standards. We also perform audits to ensure compliance from both our own warehouses as well as third-party facilities, utilizing a standardized checklist of the key requirements to help us assess potential contract warehouse risks. Furthermore, our Group standard Warehouse Requirements for Third-party Warehouses defines specific **structural and organizational requirements** for such facilities.

In Germany, the Technical Rules for Hazardous Substances (TRGS 510 "Storage of hazardous substances in non-stationary containers") govern the **storage of packaged hazardous materials** and apply across all our warehouse and distribution centers worldwide. An updated version of the TRGS is due to take effect sometime in 2020, and we are currently working with the Committee on Hazardous Substances (AGS) to revise these rules. Moreover, all our existing sites comply with applicable requirements of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). As part of the integration process, we are examining whether the sites of the recently acquired companies Versum Materials and Intermolecular are GHS-compliant.

Our Group Transport Safety standard defines the **safety levels for our facilities** and is based on the United Nations Recommendations on the Transport of Dangerous Goods. This is especially important for sites in those countries with no local regulations covering the transport of hazardous materials.

All standards are reviewed as necessary, at a minimum every three years, and updated to reflect current requirements. When needed, we support our site directors in implementing relevant changes at the local level.

Enhancing transport and warehouse safety

In addition to the inspections conducted by our EHS and dangerous goods managers, we regularly perform Group **risk-based audits** to ensure that our sites comply with warehouse and transport safety regulations. We generally conduct these every four years, performing them more

frequently at sites that pose a potentially higher risk. If major shortcomings are identified, we re-audit the respective site the following year. Conversely, we may decide to extend the period between audits at facilities where, based on the findings from previous audits, we deem the potential risk to be low. Our EHS managers are also responsible for monitoring contract warehouses.

In 2019, we audited nine of our warehouse facilities for compliance with our Warehouse Safety and Transport Safety standards. All audit observations were assessed to pinpoint the areas where we can improve. For instance, we subsequently **revised our criteria for recycling shipping cartons** in order to reuse as many original shipping boxes as many times as possible at our distribution centers. In 2019, we also audited four third-party warehouses and drew up the necessary corrective action plans. Beyond this, we started analyzing our current audit processes for contract warehouses at the end of the year.

We report transportation incidents and accidents in accordance with the Recommendations on the Transport of Dangerous Goods – Model Regulations (UN Orange Book, section 7.1.9) in conjunction with the criteria of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR, section 1.8.5). There was one reportable incident during 2019.

Employee training and best practice sharing

Our employees undergo regular training in line with their tasks and responsibilities, which is conducted by either their respective supervisor or our EHS and dangerous goods managers. Topics include internal standards and procedures, changes to international requirements, and proper incident management, and many of the subjects have ready-made training materials available that can be modified to reflect the circumstances of the respective site or country. All truck drivers employed by our company hold a dangerous goods driver's license, provided that this qualification exists locally. In Germany, our truck drivers are subject to the requirements of the German Professional Driver Qualification Act (BKrFQG) and must therefore complete additional training on transporting hazardous goods and securing cargo.

Across the globe, we conduct around **1,000 internal and external seminars on transport and warehouse safety every year**. The e-learning program we developed for hazardous material transport and storage is mandatory for logistics, EHS and dangerous goods managers. It currently features eight courses that are mandatory for the assigned participants.

Our dangerous goods managers hold regular conference calls to share their experiences and discuss current changes. All new EHS managers must complete EHStart-up! a three-day orientation seminar on environmental stewardship, safety and safe logistics. In 2019, 26 EHS managers took part in this training in Darmstadt.

Ensuring proper transport

We primarily use logistics companies to deliver our products to customers. In Germany, we transport the majority of our hazardous waste ourselves. Furthermore, we participate in the **Transport Accident Reporting and Emergency Response System** (TUIS) operated by the German Chemical Industry Association (VCI). Within this system, we exchange expertise and best practices on chemical transport with experts from other chemical companies and also provide hands-on assistance in the event of a chemical transportation accident. Our site fire departments in Darmstadt and Gernsheim collaborated with the fire departments in the region to develop the TUIS Messkonzept Südhessen. When a transportation or warehouse accident occurs, this standardized assessment system for southern Hesse allows us to quickly determine whether and how fast hazardous substances are spilling and spreading. In emergencies, our fire departments also provide on-site assistance using their specialized equipment.

Making transport vehicles safer

The safe transportation of dangerous goods requires safe vehicles, another factor our company takes very seriously. In Germany, for instance, we have been constantly evolving our **SafeServer truck body technology**. Under this design, the aluminum panels integrated into the side walls of the truck render the walls extremely stable. In 2019, 18 of our trucks had already been equipped with this technology.

Employees

Within this chapter:

good leadership

Part of the non-financial report

Good leaders are key to the success of not only our employees, but also our company. Because they provide our talent with the right framework to unleash their potential and generate new ideas, we highly value the continuing education and development of our managers. Within our company, many teams collaborate across sites and national borders, with global collaboration playing a crucial role in the professional training and growth of our leaders.

Our approach to good leadership

Our **strategic competency model** describes the core competencies that underpin the conduct of our employees at all levels of the hierarchy (see diagram).

Our competency model

In our day-to-day work, these core competencies play an important role in our success. This model provides the foundation for all development activities within our human resources work. Employees and supervisors discuss specific growth and development needs, as well as the progress they have made to date.

Our competency model is of course also applicable to our leaders. By setting an example, they play a key role in embedding the competency model across our organization. In addition, the model defines the leadership culture through which we intend to grow our business. Building on this framework, in 2018 we defined six leadership behaviors that summarize the way we expect our leaders to act.

By participating in our employee surveys, our employees can also assess the quality of the leadership within the company.

How we facilitate good leadership

We expect our leaders to be attuned to the needs of their diverse teams and therefore provide them with various tools and extensive data. At the same time, they can access transparent feedback through specially developed tools in order to track the impact of their decisions. We work with external providers to train our leaders on approaches to good leadership that are backed by science and well-established within the business world.

How we structure our human resources management

Human Resources (HR) is responsible for advising all business sectors and Group functions within our organization. We also have three Centers of Excellence in place to respond to the needs of our employees, organization and company culture: Talent, Development & Recruiting; Compensation & Benefits; and Engagement & Inclusion. In early 2020, these HR units were consolidated into Innovation HR. Across all our sites, HR employees from Market HR and Sector HR work hand-in-hand with leaders from the various units to develop attractive compensation models and benefits, along with strategies to engage our employees even more strongly. In the process, they adhere to Group-wide HR guidelines and requirements, which is verified by internal audits that are performed every two to three years. As part of the integration of Versum Materials and Intermolecular, which we acquired in 2019, we will be reviewing these HR guidelines and requirements, making adjustments as necessary.

Belén Garijo is the Executive Board member responsible for Group Human Resources. Our Chief HR Officer, in charge of the various HR activities, HR experts and HR business partners, reports directly to her. Our Merck Business Services unit oversees the operational tasks of human resources work, such as drafting contracts and payroll accounting. Marcus Kuhnert, Executive Board member and Chief Financial Officer, is responsible for this unit.

Our commitment: Leadership behaviors

Building on our business strategy, competency model and company values, in 2018 the Executive Board defined six leadership behaviors that describe the way we expect our leaders to act. We also analyzed the best practices of other companies and benchmarked our approach to leadership against market standards.

Management and talent programs for leaders

In recent years, we have initiated three different programs to enhance the **skills of our people managers**:

- The Managerial Foundation Program imparts the basics of leadership, such as communication techniques, leadership styles, conflict management, motivation, and emotional intelligence.
- The Advanced Management Program covers topics such as change management, self-reflection and resilience.
- Our Global Leadership program focuses on the competencies needed to ensure successful international collaboration.

In 2019, the Managerial Foundation and Advanced Management programs were offered at several of our sites worldwide, while the Global Leadership program was held in China, Germany and the United States.

For 20 years, we have been partnering with top international universities to offer the **Merck University** program. Over a period of roughly one year, senior leaders take classes on management techniques and strategic business development, with 480 senior leaders having participated to date.

Another initiative we have been offering our up-and-coming leaders since the 1990s is our International Management Program, where participants work on an interdisciplinary project over a period of eight months. After completion, they present the results of their efforts to the Executive Board. In 2019, 25 of our employees took part in such a project.

In addition to these various programs, we partner with universities across the globe to enable our employees to obtain qualifications such as an Executive MBA.

For local leaders in **emerging markets** such as China and the Middle East, we offer our own Growth Markets Management Program (GMMP), which covers business administration topics and company-specific content.

In 2019, we also conducted a Group-wide awareness campaign to educate our leaders on our new leadership behaviors.

New program for experts

In early 2019, we rolled out our new Expert Foundation Program, which teaches participants the fundamentals of their role as experts in interdisciplinary project groups.

Leveraging potential in growth markets

In 2019, nine employees successfully completed Afrika kommt!, a one-year program offered by the German Society for International Cooperation (GIZ) that **trains young experts and leaders from sub-Saharan Africa**. In supporting this initiative, we are helping to build a pool of regional partners to encourage economic cooperation between Germany and Africa. 17 former scholarship recipients now work for us in an array of specialist and leadership positions, some of them in various African countries and others in Darmstadt. We chose 17 new candidates for the eighth intake of Afrika kommt!; they started their new positions within the Group in November 2019.

Leveraging the opportunities of digitalization

The digital transformation has long since reached the world of work. New, agile approaches to work and artificial intelligence (AI) are increasingly gaining ground, a shift we are actively supporting within our company. Since 2017, for instance, we have been partnering with TU Darmstadt to research an intelligent humanoid robot . We want to learn how people react to intelligent robots and AI in the workplace and where these would be best deployed. Our aim is to prepare our leaders and employees for the **introduction of AI** within their working environment. The study is also intended to help make new technologies tangible, thereby paving the way for early acceptance.

Using the big data applications developed by our People Analytics HR unit, leaders obtain rapid, specific answers to HR-related questions. Besides consolidating conventional master data, this software also collects information on compensation, performance and potential, along with information on succession and human resources planning. By interlinking the data, this software can help leaders recognize trends early on. They thus have access to an extensive trove of data they can utilize within the bounds of data privacy.

In 2018, a Group-wide HR innovation campaign also gave rise to an initiative entitled "Ad@m", which features a chatbot . Accessible to HR business partners and leaders, this software provides support for HR-related issues, among others. Going forward, the chatbot will be taking over standardized tasks so that leaders and HR business partners have more time for other matters.

career at Merck

Part of the non-financial report

Globally, our employees drive advances in science and technology. We encourage every one of them to pursue the career path that aligns with their individual ambitions, skills and talents. To sustain our success, we endeavor to attract talent who will bring courage, creativity and curiosity to our company.

Our approach to attracting and retaining talent

We believe that curiosity can make great things happen. We therefore seek to provide an environment that gives our employees **scope for creativity** and ignites their passion to innovate. Our employer brand communicates this mindset to the outside world. Through our motto "Bring Your Curiosity to Life", we show applicants, whether potential apprentices or university graduates, what they can expect when they join our company. To this end, in Germany we cooperate with regional target universities, student initiatives and associations. In addition, we regularly organize events in order to give students an insight into our company. We also take part in job fairs in Germany and abroad. University graduates can apply for a position with our company directly or complete one of our trainee programs. In addition to recruiting talented students, we also provide financial assistance. For instance, we collaborate with the German Academic Scholarship Foundation (Studienstiftung des deutschen Volkes) and support the scholarships granted by Deutschlandstipendium, a scholarship program of the German federal government.

In addition to our recruiting efforts, the **vocational and advanced training** of our employees also plays an essential role for us. We support their personal and professional development in line with their strengths, ambitions and competencies, thereby laying the groundwork for an enriching and challenging career with our company. We endeavor to find qualified employees at an early stage in their career and systematically advance them.

Apart from dual education programs, we consider vocational training a key way to meet the **current and future need for qualified professionals**. As competition for young talent grows, job and occupation security are crucial, which is why we continuously invest in new technologies and integrate these into our vocational training programs. If, after completing their apprenticeship, our employees wish to continue studying while working, we will cover up to 75% of the costs and grant them special leave.

How we organize recruiting, vocational training and advanced training

Human Resources (HR) supports and advises all business sectors and Group functions within our organization. Our Talent, Development & Recruiting center of expertise develops strategies to advance our employees, organization and company culture. More information on the structure of HR can be found under "Good leadership".

Our **HR4You digital platform**, which can be accessed by all employees, helps us to globally harmonize our HR processes. For instance, the platform allows them to initiate and steer the Performance and Potential Management Process themselves, to apply for vacation or to access their pay slips.

Our commitment: Employee development guideline

Our People Development & Learning Policy provides a Group-wide framework within which employees can manage their professional growth. It defines requirements for our development opportunities, roles and responsibilities. The corresponding processes are described in our People Development & Learning Standards.

Providing feedback and supporting development

We regularly provide our employees with performance feedback. The **Performance and Potential Management Process** ensures that, in addition to this regular feedback, a meeting is held once a year to evaluate their overall performance. This process is applicable to all employees Group-wide in Role 2 or higher, and additionally to all non-exempt staff employed by either Merck KGaA or any other subsidiary based in Germany.

Our managers and their subordinates agree on individual annual objectives, define the framework and specify the desired development direction for the year. The annual bonus depends on individual performance and objective achievement. Additionally, the bonus calculation also reflects the company's overall performance, which we determine using various company key indicators.

Once the development direction is defined, our managers and their staff create a **detailed development plan** that reflects each employee's core tasks and the company's current strategic priorities. When drafting the development plan, all employees have access to the Development Advisor. Building on the Merck competencies and Merck leadership behaviors, this digital tool provides a selection of development opportunities that employees can tailor to their own needs. Every employee can thus create their development plan quickly and easily via HR4You.

They can additionally collect feedback from selected colleagues and external partners on their personal development. This **360-degree feedback** helps to identify personal strengths and advancement opportunities. Moreover, our people have access to a real-time feedback tool that can be accessed via their PC or smartphone, making it even easier to give and receive feedback. Intended to help promote a cross-hierarchical feedback culture, this tool has been used since its rollout by approximately 24,700 employees, who provided feedback around 43,300 times. We are continuously updating the tool to make it more user-friendly.

98%

of our employees took part in the Performance and Potential Management Process in 2019. 75% of them setting up an approved development plan.

Employee learning and education

Our Group-wide advanced training and continuing education program ensures that our employees develop the skills and abilities needed to help us realize our company strategy. We constantly adapt our offers to meet the current learning needs of our employees and the strategic priorities of our company. As part of their individual development plan, our employees can use our learning management system to register for seminars and e-learning courses. In 2019, we additionally launched the method of **"Working Out Loud"** Group-wide – a self-guided learning method that aims to foster collaboration within the company.

In 2019, more than 11,200 employees took part in our classroom training courses worldwide. These courses are flexible, meaning that while the core curriculum is uniform Group-wide, there is still room for site-specific modifications. In addition, around 2,500 employees registered for Group-wide e-learning courses, and approximately 430 completed language training online.

Performance-based pay

We reward the performance of our employees so as to maintain a competitive edge in attracting qualified professionals, which necessitates commensurate compensation. Within our Group, compensation is based on the requirements of each position as well as each employee's respective performance. In addition to competitive pay, we offer attractive fringe and social benefits. Our benefits4me package consists of three pillars, namely company-funded benefits including our company pension plan, health and well-being offerings, and services, for instance bicycle or IT hardware leasing offers. To meet the multifaceted needs of our workforce, we offer a **variety of benefit packages worldwide.**

To ensure a **competitive remuneration structure**, we regularly review our compensation policy based on data analyses and benchmarks. In doing so, we take internal factors and market requirements equally into account. Before adapting our remuneration structure, we consult with key stakeholders such as employee representatives. The pay structures within our company are based on defined criteria such as job requirements and performance. We do not make any distinctions based on gender.

Sparking young people's interest in our company

We employ trainees in units such as Inhouse Consulting, Finance, Production, Marketing, Sales, Procurement, Human Resources, as well as Research and Development. Additional functions can be added as required.

Our GOGlobal program **enables university graduates to join our company as a trainee**. Within 24 months, these entry-level employees get to know various departments and functions while also gaining international work experience. Centered on China, Germany and the United States, the program offers insight into various units and includes international assignments, individual continuing education, mentoring, and coaching. In 2019, we employed a total of 106 trainees.

To cultivate **young academic talent**, we also offer internships in all departments to university students. Interns who perform exceptionally well are enrolled in our talent-retention program. Besides these programs, we also offer university students jobs as working students and the opportunity to complete their bachelor's, master's or doctoral thesis while working at our company. In addition, we regularly invite university students to various events, where we present the different occupational areas within our Group and ways to join the company. In 2019, we further expanded our efforts to cultivate young talent by increasing both the number of participants in our talent retention program as well as the number of Deutschlandstipendium scholarship recipients we sponsor.

Vocational training and dual education programs

In 2019, 589 people were enrolled in vocational training programs at our sites in Germany, with 182 starting an apprenticeship at our company. In total, we offer apprenticeships across 25 occupations, primarily in production, laboratory work and office administration. Furthermore, we enable young adults to pursue a dual education program in the fields of business administration, business IT, process engineering (chemical engineering), and mechanical engineering. Apprentices in the Laboratory group begin their training as chemistry or biology lab technicians and, subject to suitability, may receive the opportunity to start a dual education program after six months. Since 2014, we have been offering permanent employment contracts to all **apprentices and graduates of dual education programs** in occupations for which we have long-term demand. In 2019, the hiring rate for graduates of these programs – taking voluntary terminations into account – was 90%.

Special vocational training opportunities

In Darmstadt, our "Start in die Ausbildung" program helps young people who have a high school diploma but searched for an apprenticeship for at least one year without success. We offer them the opportunity to complete an 11-month program with our company, **gaining insight into the world of work and improving their qualifications** for an apprenticeship. In 2019, 20 participants aged 16-25 started this program. Since its launch in 2006, 246 young people have taken part; 120 of them have successfully completed an apprenticeship, while 45 are still in a vocational training program.

We also have a similar offer for **refugees**. In 2019, the "Integrating refugees through training" program again prepared ten young people for vocational training, thereby opening the door to the German labor market. The program comprises language, technical, cultural, and career-related training. In 2019, we hired two of the participants from the 2018 program as apprentices and placed six others in apprenticeships with other companies. Two participants are now pursuing further studies at schools or universities.

Leveraging the opportunities of digitalization

The digital transformation is increasingly shaping our vocational and continuing education programs. IT skills are becoming increasingly important while digital media are paving new paths for learning. This is why we are increasingly integrating 3D printing, **Big Data and Artificial Intelligence** into our curricula. Moreover, we are testing out novel learning and innovation methods such as Scrum and Design Thinking. To learn how to operate plants and machinery, our apprentices also utilize virtual reality environments. Initially, they practice operating the systems using a virtual reality display before applying and furthering their new skills in the actual operating environment.

Fairness and dialogue

Part of the non-financial report

As a science and technology company, we are always searching for new solutions as we work to constantly develop and evolve further. Motivated, curious employees are crucial to our success, which is why we actively engage them in our efforts to advance our company. In this context, honest feedback from every individual helps us pinpoint the areas where we can and must do better.

Our approach to employee engagement

We seek to understand the needs of the people who work for us and therefore regularly conduct **employee surveys**, both Group-wide and within select countries, individual business sectors or specific projects. These surveys help to facilitate communication between managers and employees and also show us areas where we can improve. Moreover, such surveys are paramount to our company culture, which values dialogue and employee input.

In 2019, we rolled out a new Social and Labor Standards Policy that further bolsters the foundation for fair and open interactions with our employees.

How we engage our employees

The Engagement and Inclusion unit within our HR organization is responsible for employee engagement, diversity and inclusion, and also develops and manages our employee surveys.

We include **local employee representatives** in our company's decision-making processes, doing so regularly and extensively. Within Germany, 14 of our subsidiaries have employee representation, while 26 of our subsidiaries across eight other European nations have employee representative bodies (Austria, Belgium, France, Ireland, Italy, the Netherlands, Spain, and Switzerland). Collective agreements apply to 66% of all employees of Merck KGaA, Darmstadt, Germany. Local works councils as well as a Group works council represent our employees, discussing topics such as compensation, working hours and organizational realignments. The Senior Executives Committee advocates for the interests of our top leaders, while the Euroforum represents our employees at the European level. Focusing on the economic situation, employment rates and significant changes within our Group, this body covers all EU countries as well as Switzerland and Norway, although not all countries have their own delegate.

Our commitment: Group-wide Social and Labor Standards Policy

We are dedicated to upholding the appropriate and **fair labor and social standards** that are stipulated in our Human Rights Charter, which complements our own Code of Conduct with a set of global human rights principles. These include the fundamental conventions of the International Labour Organization (ILO), which cover freedom of association and collective bargaining, forced labor, child labor, anti-discrimination, equal opportunity, equal pay, working hours, occupational health and safety, and the prevention of abuse and harassment. In 2019, in consultation with renowned external human rights experts, we used a benchmark analysis as the basis for drafting and implementing a Group-wide guideline governing adherence to ILO labor standards. This new Social and Labor Standards Policy puts into practice the social and labor requirements of our Human Rights Charter and our Code of Conduct, emphasizing fair and respectful interactions. In addition, it makes clear that we do not tolerate any form of discrimination, physical or verbal harassment, or intolerance in the workplace. We conduct internal audits to ensure that our local subsidiaries comply with these principles.

Understanding our employees

To better gauge our performance both within our company and relative to our competitors, we conduct Group-wide employee surveys every year. In this way, we ensure a **regular exchange between our employees, managers and leaders**. The 2019 employee engagement survey revealed that 74% of our employees feel engaged at work. In 2019, we fundamentally changed the survey methodology, which means this year's results cannot be compared with those of previous years. Approximately 47,000 employees (88%) took part.

In addition, we moved forward with our Science Network project in 2019. Due to the broad positioning of our company, we do not have a central research and development organization that unites **expertise across our businesses**. However, our Science Network is advancing the formation of a science community within our company in a bid to drive internal collaboration and accelerate the exchange of innovative ideas. One component of this initiative is the Continuous Performance Dialogues, which engage 1,300 employees and their supervisors in a discourse to align performance and potential appraisals with research and development needs.

Encouraging and rewarding ideas

Our company has a long tradition of rewarding ideas. In 1853, we were the first industrial company in the world to contractually stipulate **bonuses for successful employee suggestions for improvement**, and approximately 60 years ago we laid out bylaws stipulating principles and rules for our ideation efforts. Our idea management program seeks to inspire our employees to think creatively and encourage them to contribute to the continuous improvement of our procedures and processes. We reward all ideas that are successfully implemented by offering employees a bonus based on how much the suggestion enhances our processes or cuts down our costs.

In 2019, our employees submitted approximately 1,570 suggestions for improvement via our **Germany-wide ideation program**. These ideas are expected to yield around € 2.4 million in cost savings in the first year. As a reward for their proposals, our employees received around € 370,000 in bonuses.

Besides these incentives, we annually present **awards in recognition of outstanding ideas**, teamwork and projects. In 2019, the Executive Board presented four teams consisting in total of 37 employees with awards in the categories of Performance, People, and Technology, along with a special CEO Award. Projects were submitted Group-wide by 111 teams from various countries, Group functions and business sectors.

Keeping employees informed and encouraging dialogue

We keep our employees up to date and **encourage exchange through a number of formats** tailored to specific target groups. Examples include our international intranet EVA or our international employee magazine "pro", which is published in seven languages and is available in a digital format as well as an app. Since the end of 2018, the magazine has also been featuring podcasts on important company topics. "pro" has a readership covering more than 90% of our approximately 57,000 employees worldwide in their local language. Several subsidiaries also publish local editions, for example in Germany, Korea, Mexico, and Russia. Newsletters issued by individual business sectors also help keep employees informed.

EVA is our global intranet for all countries and business sectors. Ranking as one of the most important internal communication media – second only to e-mail – it receives approximately 2 million hits per month. A software permits the automatic translation of news into 22 languages and thus facilitates comprehension worldwide.

Diversity

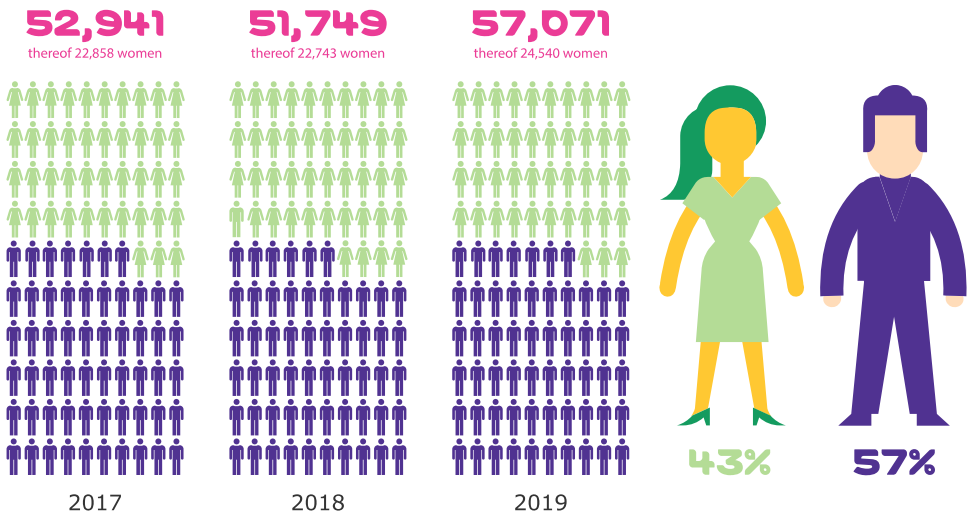
Part of the non-financial report

Our employees work together closely, irrespective of gender and gender identity, color, religion or creed, age, disability, national origin, ancestry, citizenship, family or marital status, military or veteran status, genetic information or sexual orientation. They all bring their professional backgrounds, life experience and perspectives to the table. We firmly believe that a diverse workforce and an appreciative corporate culture are essential to our ability to innovate and to our business success.

Our approach to diversity and equal opportunity

We are committed to creating an **inclusive culture** that reflects our values and enables employees to unleash their potential. Our goal is to further expand the diversity of our workforce and offer all our people equal opportunities for advancement.

Our employee numbers[1]



[1)] Each figure represents one percentage point for the respective gender.

In 2019, we continued to implement our **diversity strategy** with its defined two special areas of focus. We continue to promote women in leadership positions, and improve opportunities for talented employees from Asia while promoting a deeper understanding of this growth market. We also continue to pursue the other goals of our strategy: cultivating an international work environment, taking action against all forms of discrimination, creating teams with a balanced age structure, and building a diverse base of educational backgrounds and experience.

The strategic competencies that guide our employees and leaders in their tasks are set out in a **Competency Model**, a fundamental element of HR processes such as recruitment, feedback and training for people managers and leaders. Building on this model, in 2019 we defined six leadership behaviors and also started to sensitize our people Group-wide to unconscious bias. We help leaders to recognize these thought patterns in their daily interactions and decision-making processes, to reconsider them and to make a lasting change to their behavior.

Women in leadership roles

21% in
senior management

34% in
middle management

At the end of 2019, women occupied 33% of leadership roles Group-wide, which means that we exceeded our 2021 target of maintaining a 30% representation of women in these positions. In 2019, we developed goals and measures to achieve a more balanced gender structure in different hierarchical levels of our business sectors. With **more women participating in leadership programs** today, they are also increasingly being considered as candidates when filling leadership positions. Our flexible working models and our seminars on unconscious bias are helping to increase the proportion of women in the company.

How we are making diversity a pillar of the company

Our Chief Diversity Officer is responsible for steering the diversity strategy. She reports directly to Belén Garijo, the Executive Board member whose responsibilities include Group Human Resources. The **Diversity Council**, which consists of executives from all our business sectors and select Group functions, redefined its mandate in 2019:

- The members of the Diversity Council are visible advocates of our Diversity & Inclusion agenda and actively support the Executive Board and the managing directors of our subsidiaries.
- The members propose strategic goals, initiate measures and ensure within their respective units that line managers meet their responsibilities.
- The members exchange information, discuss the latest challenges and share best practices.
- The members are accessible to all employees.
- As leaders of our company, the members are role models within their units.

Group Human Resources (HR) analyzes existing requirements and is implementing a number of programs and processes in order to anchor diversity within the company

Our commitment: Industry-wide initiatives and regulations

In 2019, we introduced our Social and Labor Standards Policy, which clearly indicates that we **do not tolerate any form of discrimination**, physical or verbal harassment, or intolerance.

To underscore our commitment to equality, fairness, inclusion and tolerance at the workplace, we additionally participate in industry-wide initiatives.

- In 2019, we signed the Women's Empowerment Principles, an initiative of UN Women and the UN Global Compact to promote gender equality and women's empowerment in the workplace.
- In addition, we endorsed the Business Coalition for the Equality Act, a group of leading U.S. employers that support the Equality Act.
- In 2017, we adopted the new Inclusion Action Plan of the German Mining, Chemical and Energy Industrial Union (IG BCE), which defines concrete measures to create a more inclusive workforce for employees with disabilities. In endorsing this plan, we are meeting the requirements of the United Nations Convention on the Rights of Persons with Disabilities.
- In 2015, we signed the IG BCE Equal Opportunity Charter, thereby promising to do everything in our power to achieve gender equality within the company.
- In 2013, we endorsed the German industry-wide "Charta der Vielfalt" (Diversity Charter).

Meeting statutory requirements

The German Law for the Equal Participation of Women and Men in Leadership Positions in the Public and Private Sector has been in effect in Germany since 2015. Owing to our legal form as a KGaA (corporation with general partners), this law also applies in part to us. Detailed information can be found on our website.

Consisting of 37.5% women (six out of 16 members), our Supervisory Board already meets the stipulations of German legislation on the gender quota. Owing to our legal form as a KGaA (corporation with general partners), we are not required to set targets for our Executive Board. For the two management levels below the Executive Board of Merck KGaA, however, the Executive Board set the following targets in 2016:

- 21% women on the first management level of Merck KGaA below the Executive Board
- 26% women on the second management level below the Executive Board

The deadline set for reaching these targets is December 31, 2021.

Rooting out unconscious bias

We want to promote a stronger **sense of diversity and inclusion** among our employees. This also includes learning how unconscious bias influences us in daily working life. In 2019, we raised employee awareness of the topic at occasions such as International Women's Day and our own Diversity Days. We launched a new, Group-wide training course on the topic, which is also part of our management education programs. Approximately 3,160 employees completed the course in 2019. They learned how to recognize the unconscious biases and stereotypes they harbor themselves and how to prevent unintended, unfair treatment. The training is also available as an e-learning course.

In 2019, we also set up the Job Analyzer, a digital tool for filling vacant positions globally. It helps us maintain **gender neutrality when communicating** with applicants while minimizing unconscious bias in the recruiting process. The Job Analyzer is currently available in English, with plans for localized versions for the United Kingdom and Canada. German and French versions are also scheduled for completion in 2020.

Promoting women leaders and talent

We support our business units in their efforts to increase the proportion of women in leadership roles. For example, two business sectors already have **sponsoring programs** in place. This offers women the possibility of having an experienced leader as a sponsor who supports and advises them.

Furthermore, we hosted a variety of events on the topic in 2019:

- Approximately 3,450 employees took part in Diversity Days – an event series dedicated to the topic of inclusion.
- On the occasion of 2019 International Women's Day, the Healthcare business sector organized an event in Darmstadt (Germany). More than 200 participants from all business sectors and Group functions attended. The aim of the event was to sensitize participants to unconscious bias and respectful working environment.

On the occasion of the 2019 International Women's Day, in the United States we again sponsored the Big Sisters initiative, a mentoring program for young women from underprivileged communities.

In Italy, we offer an internship program specifically for women with MS because on average, women develop multiple sclerosis (MS) twice as often as men.

Networks to bolster diversity

Creating an inclusive work environment and fostering a culture of mutual respect are two prominent priorities of our Diversity Strategy. That is why we purposefully support various **employee networks**. Apart from our internal women's network in various countries, these include networks that further the interests of the LGBTQI community, Afro-American employees and international staff. Moreover, employee networks pursuing similar goals began working more closely together and several expanded internationally in 2019. Above and beyond this, we want to help them establish leadership structures and set goals for themselves.

- Our **women's networks** are creating a working environment that values qualified women and helps them to advance.
- In 2019, our **Rainbow Network** for homosexual, bisexual, transsexual, and intersex employees again supported Christopher Street Day in Frankfurt and Darmstadt (both in Germany). We were one of the main official corporate sponsors of the event in Darmstadt. In 2019, two further company Rainbow networks were formed in Switzerland and Brazil, with employees in Geneva (Switzerland) and São Paulo (Brazil) taking part in Pride parades in 2019. The Rainbow Network has also been active in the United States and Canada since 2016. In the run-up to Christopher Street Day, we organized pre-Pride events at 11 of our sites in the United States and ran further activities to mark Pride month.
- Our U.S.-based **Black Leadership Network** is dedicated to advancing and developing African-American employees, offering advanced training and continuing education programs, tailored career planning and networking opportunities. In addition, 2019 saw the establishment of the "Leaders of Color" network in North America. Consequently, the Black Leadership Network will temporarily discontinue its activities, working instead to support the multifaceted and integrative approach of the new network.
- In our **Carer Network**, we bring together employees from across the globe who provide nursing care assistance for family members. As a platform for exchange, this network helps its members to better cope with personal and professional circumstances while caring for sick or aging family members. To raise awareness for the often overlooked needs of carers, the network also supports the general mission "Embracing Carers".

Tapping into external networks

For ten years now, our company has been a corporate partner of the Healthcare Businesswomen's Association (HBA), a global organization committed to furthering the advancement and **impact of women in the healthcare industry** – almost exclusively through volunteers. We support female employees who wish to volunteer for the HBA. In 2019, more than ten of our employees were active in Germany, Europe and the United States. Two of them were members of the Europe Regional Council, with one serving as Regional Chair Europe. We are represented on both the global and the European advisory boards. In addition, we sponsor events organized by the HBA and give our female employees free access to events and conferences. In 2019, the HBA recognized one of our initiatives dedicated to the promotion of women in leadership positions.

Taking action against discrimination

As stipulated in our Code of Conduct and in our Social and Labor Standards Policy introduced in 2019, we do not tolerate any form of discrimination within our company. If employees feel discriminated against, harassed or not tolerated, they can **report the issue via various channels**. Their first point of contact is either their supervisor or one of the two Group functions Human Resources (HR) or Compliance. Alternatively, employees throughout the Group can call our SpeakUp Line anonymously. Group Compliance is responsible for investigating alleged cases. As a member of our Group Compliance Case Committee, our Group HR function coordinates cases relating to HR. Details on alleged cases can be found under Compliance.

Good ranking in diversity and equality indices

We ranked fourth – among three other companies, reaching 80 out of 100 possible points in 2019 in the DAX 30 LGBT+ Diversity Index of the Uhlala Group.

At the beginning of 2020, the American Human Rights Campaign Foundation rated our LGBTQ activities throughout 2019. We scored 90% out of 100% in the "Corporate Equality Index" (CEI) which measured the equality and inclusion of our LGBTQ employees.

These rankings show us on the one hand that we are on the right track when it comes to successfully living diversity and an inclusive work environment. On the other hand, they help us to address potential deficits.

Successfully integrating international employees

Our company is becoming increasingly international. We currently employ people from a total of 139 nations, 22% of whom are German citizens. Our leadership (Role 4+) includes representatives of 73 nationalities. In 2019, 64% of leadership positions were held by non-German employees. As of the end of 2019, 9% of our workforce worked outside their home countries.

To best facilitate this international collaboration, we offer **intercultural training** for all employees along with suitable digital tools. For instance, our Cultural Navigator helps prepare our staff for international projects and business trips abroad. To help employees transferred abroad to adjust more quickly, we offer language training and international networks. For instance, more than 700 expatriate employees are members of the International Community, which meets regularly in Darmstadt.

Our business language is English. To ensure that all employees understand our communications, we also provide a great deal of information in the respective local languages of our employees.

Rising to the challenges of demographic change

Another issue we are tackling is demographic change. We expect the average age of our workforce to continue to rise in the coming years. In Germany, we are responding to this trend with various initiatives including our workplace Health Management program. For example, we use BELS, our workplace ergonomic assessment tool, to design work spaces that help employees to maintain their physical performance and remain healthy. The tool takes the demographic development in account by evaluating various age-related stress factors, which in turn enables us to adapt our workplaces to suit the **needs of older individuals**. Moreover, we also offer innovative shift models and a prevention program for shift workers.

work-life balance

Part of the non-financial report

We know that priorities in life can shift. That is why we are considerate of such changes, offering our employees a range of options such as flexible working models, working hour accounts for early retirement or the possibility to take an extended leave of absence. We also attach great importance to family matters and support employees through generous parental leave, childcare and assistance in finding nursing care for family members.

Our approach to ensuring a good work-life balance

We realize how important work-life balance is for a productive and motivated workforce, which is why we seek to offer our employees the best possible working conditions. This includes both occupational illness and pension benefits as well as flexible working models. In many countries, our employees can already flexibly set their own working hours and location, making use of **more than 30 different part-time working models**. In Germany and the United States, where around 45% of our workforce is based, we offer parental leave conditions that exceed the respective minimum statutory requirements.

How we strengthen work-life balance

Human Resources (HR), which supports and advises all business sectors and Group functions within our company, develops measures for a healthy work-life balance.

During individual consultation sessions, experts assist our employees with retirement planning matters, for instance company pension benefits or long-term accounts. Representatives from the German Pension Insurance also visit our premises regularly to discuss statutory pension matters with employees.

You can find more information on the topic of illness benefits under "Health and safety".

Our commitment: Group guidelines and local regulations

In 2019, we introduced our new Social and Labor Standards Policy. It harmonizes certain labor standards Group-wide, for instance on working hours and parental leave options, and reflects the conventions of the International Labour Organization (ILO).

At the end of 2018, our Executive Board adopted a Group-wide guideline on flexible work arrangements that aims to create even greater working time and location flexibility in the 12 countries where 75% of our employees work. In the second phase, we plan to roll out the guideline to further countries in 2020 and 2021. Apart from these 12 countries with the highest headcounts, we are simultaneously working on local provisions for Colombia, Ecuador, Guatemala, and Korea and are launching these as part of our "mywork@Merck" program.

Flexible working models

Our employees can choose between various flexible working models. Our "mywork@Merck" program, for instance, is available to employees at our Darmstadt and Gernsheim sites (both in Germany), along with many other facilities across Asia, Australia and Europe. In agreement with their teams and supervisors, employees can freely choose their working hours and location. Together with their respective supervisors, the teams can decide for themselves when and how often fixed physical presence in the office is necessary for all members. Working hours are no longer recorded or monitored. This approach aims to strengthen the **culture of performance and trust** within the company. It is open to both exempt and non-exempt employees provided that their positions are suitable. In the coming years, we plan to roll out mywork@Merck globally following its successful establishment in Germany and Japan in 2013 and 2017, respectively. The model is currently being launched in Brazil, China, Colombia, Ecuador, France, Guatemala, Italy, Korea, Mexico, Spain, Switzerland, the United Kingdom, and the United States. At the end of 2019, a total of 5,990 employees in Germany were enrolled in this program. In 2019, 5% of our employees worked part-time, 17% of whom were men.

Supporting mothers and fathers

We want to make it easier for our employees to return to work after parental leave, which is why we offer a program for parents in Darmstadt and Gernsheim (both in Germany). In 2019, a total of 95 employees signed up for this program, which gives mothers and fathers on parental leave the chance to interact while also helping them stay in touch with the company. In addition, they can make use of various **training and networking opportunities**. We established a similar program in the United States.

Moreover, we offer female employees within our Life Science and Healthcare business sectors in the United States eight weeks of paid maternity leave, and in 2019, we introduced five weeks of paid paternal or adoption leave for employees in all three business sectors. By contrast, the statutory minimum requirement only provides for 12 weeks of unpaid parental leave per year. In the case of an adoption, we also reimburse up to US$ 5,000 in adoption fees.

At our sites in Germany (around 25% of our workforce), 792 employees were on parental leave in 2019, 40% of whom were men. In other key countries, we grant additional

support benefits that **exceed the legal requirements**, such as paid parental leave for employees in Brazil. In India, too, we offer five days of paid paternity leave even though it is not legally required.

In offering these benefits, we do not differentiate between full- and part-time staff or employees with fixed-term contracts. The latter may apply for parental leave until the end of their employment contract, with their employment continuing as agreed until the contract ends.

Childcare and support

For more than 50 years, a **daycare center for children** aged one to twelve has been located at our global headquarters in Darmstadt. This facility is funded by the Merck family (Merck'scher Kindertagesstätten-Verein e. V.) and offers 150 places in the crèche, nursery school and school aftercare program. It is open year-round, Monday to Friday from 6:30 a.m. until 7:00 p.m. The groundbreaking ceremony for the new daycare center building took place in 2019. The current building will make room for a new one, which is scheduled for completion in early 2021. This will more than double the capacity of the daycare center from 60 to over 130 nursery school places and add 60 new crèche places.

In Darmstadt we furthermore offer an **emergency childcare service** to cover situations when regular childcare becomes unavailable. During school breaks in the German federal state of Hesse, we host a number of vacation camps focused on sports, art, research, and nature for up to 350 children. In addition, we offer the possibility of in-home care for acutely ill children. For up to two days a year, parents throughout Germany can engage the services of a trained educator free of charge to look after their children at home. For the children of our employees in Gernsheim, five places are available at a public daycare center.

Our facility in Mumbai, our main site in India, also has a **daycare center** for the children of our employees. In the United States, parents can visit www.care.com to find external childcare. Furthermore, in the United States we offer up to ten days of provisional childcare, as well as discounted daycare center places and home childcare.

Saving for retirement through a long-term account

We enable our employees in Germany to reduce their working hours before retirement or to retire earlier by drawing on a **long-term account**. For instance, they can deposit salary components or comp days into the account. On top of this, our company provides subsidies to encourage the use of these long-term accounts. Employees can then utilize the accrued balance to stop working up to three years before regular retirement, or to reduce their working hours by 50% for up to six years. In 2019, over 9,500 employees made use of this option.

Taking a sabbatical

Generally, all employees of Merck KGaA, Merck Healthcare KGaA and Merck Real Estate GmbH in Germany (20% of our workforce) can apply for a **sabbatical**, which gives them up to one year off from work. At the end of 2019, 66 people were on sabbatical. For personal emergencies in which an employee needs an immediate leave of absence, we additionally offer an emergency sabbatical of up to three months' duration.

Assistance with family nursing and elder care

We offer **special seminars and family care services** to employees in Darmstadt (Germany) who are providing nursing care for family members. Moreover, through our "family leave" model, we offer employees throughout Germany the possibility to take a short- or long-term leave of absence, either part-time or full-time. In line with the German Family Leave Act and the German Home Care Leave Act, we are thus enabling employees to organize and provide nursing care for their family members.

In addition, we offer our employees in Germany family care seminars on a range of topics several times a year. In 2019, these addressed reconciling family nursing care with work obligations, financial and legal issues pertaining to family requiring nursing care, and geriatric dementia and depression. An external partner provides advice on all nursing care matters and supports employees in their **search for suitable options**. In Darmstadt, our company health insurance fund also connects people with nursing care staff, and, in the United States, our employees can use the website care.com to locate nursing care services. Additionally, telephone counseling services are offered at our sites in the 12 countries with the highest number of employees.

Our international Embracing Carers™ initiative aims to raise awareness of the needs of family caregivers while also offering them concrete assistance. More information on the program can be found under "Health awareness".

Health and safety

Part of the non-financial report

When it comes to the health and safety of our employees, we take our responsibility very seriously, doing everything we possibly can to safeguard them against both accidents and work-related illnesses. By focusing on stress prevention, nutrition and exercise, we help our employees avoid acute or chronic health problems through preventive measures that are easy to integrate into their daily work routine.

Our approach to preventing accidents and promoting health

We seek to promote the health of our employees and maintain their ability to perform over the long term, which necessitates a safe workplace. One of our Group-wide objectives is therefore to step up our **safety culture**, with our goal for 2020 being to keep our lost time injury rate (LTIR) under 1.5. At all our sites, we conduct hazard assessments even before a new plant is commissioned to minimize or eliminate any potential safety risks to our employees. Existing facilities are supposed to undergo a review every five years, which is the responsibility of the local EHS managers. Random checks are performed to ensure that the reviews are conducted at the stipulated intervals. Furthermore, we have the risk situation reassessed after any changes are made to a plant. Moreover, we are working to make workplace health management a greater part of our company and leadership culture.

Over the last two years, we have developed a **key performance indicator management system** to review the efficacy of our Health Management practices. 2018 was the first time we included questions regarding employee health in our worldwide, anonymous Employee Engagement survey. In the long run, we intend to use the input to calculate our Healthiness Index, which should reflect the general state of health of our workforce. We currently have the initial results from the areas of health and work-life balance, which are being utilized to devise suitable measures to boost the health of our employees and help them better reconcile their personal and professional lives.

We align our health initiatives with the needs of our workforce. In 2019, we defined our objectives for the next several years, creating a roadmap that will focus on shift work, mental stress, demographic change, and the analysis of key disease occurrence information in order to take the appropriate actions. We regularly evaluate the success of our efforts. In 2019, for instance, we analyzed the results of our Weight Watchers At Work for Shift Workers program along with the expanded deployment of our mobile gym buses. The results of our company health insurance fund's health report have been available since mid-2019, and we are using these to advise our leadership on the health situation in their respective units. This report is published every two years.

To make mental health an integral part of our organization, we furthermore founded an interdisciplinary Mental Health Team in 2019, which is tasked with creating and ensuring a work environment that puts our employees at ease and safeguards them as far as possible from mental stress. Serving as strategic partners and experts, the Mental Health Team offers our workforce interdisciplinary support from a single source.

How we manage occupational health and safety

Our Environment, Health and Safety (EHS) management system is the responsibility of our Group Environment, Health, Safety, Security, Quality (EQ) function, which reports to Executive Board member Belén Garijo. EQ sets objectives, globally oversees initiatives, and conducts internal EHS audits, while local EHS managers ensure that each individual site complies with occupational safety laws and regulations. All new EHS managers are required to complete EHStart-up!, a three-day orientation held at our global headquarters in Darmstadt. This seminar covers topics such as occupational health and safety as well as our BeSafe! safety culture program.

We collect workplace accident data from our sites on a monthly basis. Every facility is required to immediately report relevant accidents to EQ, where the cases are investigated and assessed. If necessary, we implement additional safety measures at our sites. This procedure is an integral practice at all of our production facilities around the world. In addition, our German sites in Darmstadt and Gernsheim have an occupational safety committee in place that meets four times a year and makes decisions on current EHS issues.

We involve our employees at the organizational level in occupational health and safety efforts, for instance during joint inspections or in the selection of personal protective gear. This approach is crucial because our people best understand the actual work situation and what is needed. We take this input and develop further ways to improve occupational health and safety. If employees are worried about their health or safety, they are encouraged to use our global SpeakUp Line and are also allowed to temporarily step back from their work until the issue has been resolved.

At our Darmstadt and Gernsheim sites, our Health Management unit helps weave health awareness into our company culture. The appropriate strategy, individual focal areas and steps required are developed by an interdisciplinary steering committee consisting of various senior leaders such as the head of Occupational Health & Safety, the chairman of the Works Council, the head of Health Management, and the production heads of our business sectors. Meeting six times a year, the committee discusses topics such as workplace health fundamentals, good leadership and tailored health programs.

Across our sites worldwide, our EHS managers help organize and evolve EHS practices. In Tokyo (Japan), for instance, we have implemented special anti-stress programs to promote employee mental health. In Taiwan, an array of exercise programs has been organized under the banner of "Enrich your health deposit". Our site in Gillingham (United Kingdom) has a program in place that encourages its employees to ride their bike to work and do something positive for their health. In supporting these efforts, we seek to promote and maintain the physical and mental well-being of our workforce.

On top of their usual tasks, some of our production employees at our sites in Darmstadt and Gernsheim are also responsible for health matters. After completing a training course, these health partners act as a liaison between our employees and Health Management, providing a channel through which employees can voice their ideas and suggestions for workplace health management practices. Since our production employees have shown great appreciation for the dedication of these first health partners, we have decided to start introducing this practice in other departments as well. In 2019, we added health partners to three administrative units and two laboratory units. As of the end of 2019, there were a total of 66 health partners at the Darmstadt and Gernsheim sites.

Our Health Management unit asks all participants to submit anonymous opinions and suggestions for each of the measures implemented, which help shape the evolution and growth of these initiatives.

Integration of Versum Materials and Intermolecular

In the course of integrating the companies Versum Materials and Intermolecular, we are examining their existing management structures, policies, standards, and processes for occupational health and safety. Where necessary, we are implementing our internal Group-wide principles. We are furthermore reviewing their current process for tracking occupational health and safety performance indicators and are working to harmonize methodologies and timelines. Starting in 2020, we will be incorporating occupational health and safety indicators for Versum Materials and Intermolecular into our reporting.

Our commitment: Policies and works agreements

Our approach to occupational health and safety is detailed in our Group Environment, Health and Safety (EHS) Policy. This is an integral part of our EHS management system, which undergoes an external OHSAS 18001 audit every year.

Our Group Health Policy defines how we ensure workplace safety for our employees while also promoting their health and well-being. This document details our **Group-wide approach to safety and health management** as well as our comprehensive behavioral modification program to prevent workplace accidents and occupational diseases. One component of the policy is our Global Wellbeing and Health Promotion Framework, which describes the differing requirements in a wide array of countries. Our individual sites are responsible for performing local workplace risk assessments and hazard analyses. In 2019, we implemented our internal Group Procedure Lab Safety standard, which describes the measures to be taken to safeguard the health of lab employees and to minimize the environmental burden of lab operations. Moreover, in 2019 we revised our EHS Compliance for Contractor Management standard, thereby integrating our contractors into our occupational health and safety efforts, in line with the latest findings and in compliance with our Group-wide regulations.

At most of our sites in Germany, we work in partnership with employee representatives to draft comprehensive **works agreements** on occupational health and safety. Introduced in 2017, for instance, our Occupational Integration Management works agreement governs the procedure for employees who have been on extended sick leave. Occupational Integration Management applies to all our sites in Germany. This works agreement is designed to retain an employee's position while also helping to prevent adverse health impacts after the respective employee returns to work.

Safety certification renewed

Our occupational health and safety management system is currently **OHSAS 18001 certified at 31 of our sites**. At 30 of these sites, 100% of employees are covered by a certified occupational safety management system. At our global headquarters in Darmstadt, the OHSAS 18001 occupational health and safety standard applies to around 70% of employees; the occupational health and safety of the remaining 30% of Darmstadt employees, who do not work in operating units, is safeguarded by the Merck Management System. The certification process helps us pinpoint weak areas, identify opportunities for improvement and take suitable measures. Other sites are also required to apply this standard.

We are preparing to transition to **ISO 45001**, which is replacing OHSAS 18001, a process that should be complete by 2020 along with the ISO 9001 and ISO 14001 recertification.

Accident rates

The **lost time injury rate** (LTIR) is the indicator used to assess the success of our safety efforts. This figure is a global measure of the number of accidents resulting in at least one day of missed work per one million man-hours. We track the LTIR for both employees and temporary staff. Having achieved the target we set in 2010 for a 2.5 LTIR, in 2015 we set a new ambitious goal of permanently lowering this figure to 1.5 by 2020. After all, we believe that nothing is worth an accident. In 2019, our LTIR was 1.5. The majority of incidents resulting in lost time were slips, trips and falls, along with contusions and lacerations from the operation of machinery and equipment. In 2019, we recorded no fatal accidents.

Generally, our sites are not endangered by hazards that could potentially cause severe injuries or have serious health consequences. This is because as a rule, before starting any activity worldwide, we perform a hazard assessment. In conducting this analysis, we identify hazards and have them eliminated before commencing a project or commissioning a plant. If this is not possible, we put measures in place to minimize the potential impacts as far as possible.

Clear rules of conduct

Experience shows that most workplace accidents can be prevented by proper conduct. Through our **BeSafe! safety culture initiative**, we are raising employee awareness of the dangers in the workplace and providing them with appropriate safety behavior rules. All relevant production and warehouse sites have now been incorporated into the program. In 2020, the remaining administrative and research & development facilities will be integrated into the program in the course of upcoming EHS audits.

In 2019, we conducted **awareness campaigns** at various sites as part of our BeSafe! program in a bid to further bolster our safety culture. For instance, we increased employee awareness by means of a safety video that forms part of our BeSafe! training and is also available on our intranet. In 2019, we created Italian, Korean and Portuguese versions of the video in an effort to reach more of our employees in their local language, bringing the total up to nine languages. In addition, several subsidiaries again held safety competitions. Furthermore, we conducted two refresher courses on key content from our BeSafe! program, as well as occupational safety training in many countries in accordance with the statutory requirements and specific risks of each country.

Our Health Management unit

At our Darmstadt and Gernsheim sites, our Health Management unit conducts an array of campaigns and programs to promote the health of our workforce. These activities are based on health indicators derived from sources such as the health report issued by our company health insurance fund, evaluations from our Site Medical Center and, since 2018, our employee survey. We utilize the findings in the creation of **prevention programs tailored to specific target groups or facilities**. Moreover, our Health Management unit offers specific health initiatives such as mindfulness courses and workplace ergonomics consultation. Along these lines, we have a standard procedure in place for continuously assessing the working conditions and environment, making state-of-the-art updates wherever needed. If other sites express interest, our Health Management unit will advise on potential improvements or health programs. When requested, we also provide local consultation and run campaigns by means of an internal service contract.

Our employees have access to a health catalog detailing our Health Management services in both English and German that contains information on ergonomics, nutrition, stress, and mental health issues.

Fit@Merck fitness program

Throughout Germany, we offer our employees services such as our Fit@Merck program, which provides them with a subsidy of up to € 195 per year towards **gym memberships and physical fitness classes**. In Darmstadt and Gernsheim, we furthermore run a company sports program that currently features 28 different activities such as tennis, volleyball, strength training, triathlon, yoga, and bouldering.

Special ergonomics programs

In an effort to improve our workplace, we regularly assess the ergonomics of individual workstations, implementing appropriate measures as required. Our workers also receive **training on occupational ergonomics** tailored to specific areas, whether manufacturing, office work or the laboratory. Moreover, we offer people at many sites the option of participating in special ergonomics training such as the Industrial Athlete Program in the United States, which helps employees improve their physical and general well-being.

Training in mobile gyms

In 2019, we expanded our Training Island project, which centers around **mobile gyms** located in renovated buses. With access to state-of-the-art equipment and professional trainers, participants can work out close to their office twice a week for 12 minutes. The program was designed in particular to prevent musculoskeletal disorders and to motivate employees to exercise. In addition to working out, participants can also access individual consultation on topics such as food and nutrition, while start and end screenings make personal successes visible. In 2019, 920 employees made use of this opportunity.

Weight Watchers At Work for Shift Employees

From April to July 2019, 21 Life Science and Performance Materials shift workers in Darmstadt and Gernsheim had the opportunity to take part in the Weight Watchers At Work for Shift Employees program. Weight Watchers designed this new approach in partnership with our Health Management unit and has not yet conducted the program at any other company. Aimed at employees with a body mass index (BMI) equal to or greater than 25, which is considered overweight, a Weight Watchers coach provided in-depth instruction on making **healthy nutritional choices and leading a more active lifestyle**. The course focused particularly on living and coping with shift work, with the schedule planned around the participants' shifts. On average, workers lost seven kilograms during the program.

Examinations and support for our employees

Our Physical Ability Test and Health Preservation process allows us to ensure that all employees meet the health requirements for their particular tasks. Due to new statutory requirements, our Site Medical Center is working with our Legal department and the Works Council to develop a new physical aptitude examination.

Our Travel Health & Medical Advisory Service assists employees who spend a lot of time abroad on company business, providing them with recommendations on necessary vaccinations and advice on hygiene risks.

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 Merck Group EHS, Security and Quality Manual 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.

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

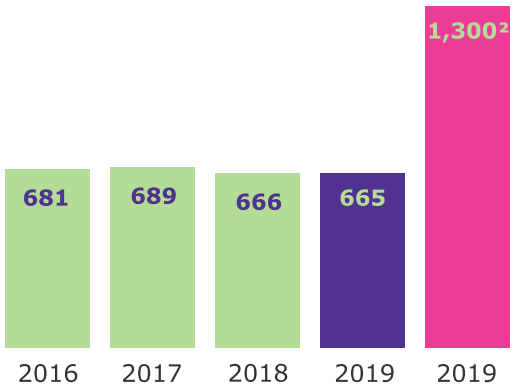
Despite growth in our operating business, we managed to **reduce our greenhouse gas emissions** by 15% relative to the 2006 baseline. Our process-related emissions slightly rose from 90,000 metric tons in 2018, to 93,000 metric tons in 2019. In the reporting year, we emitted 665,000 metric tons of CO_2 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 Merck Waste Score, 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 Merck 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

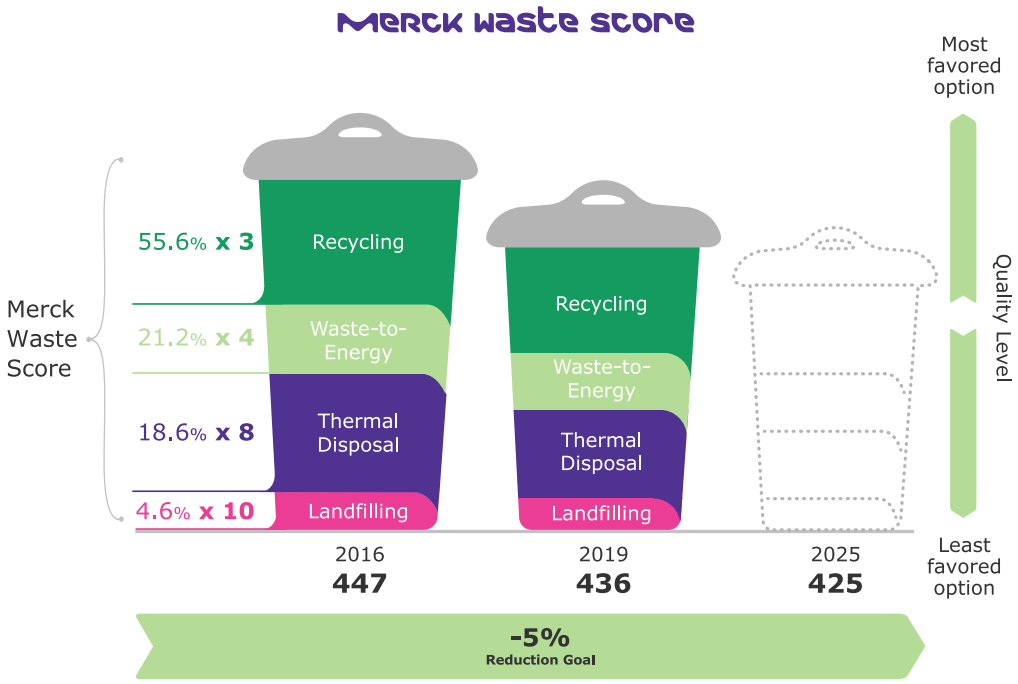
In the course of integrating Versum Materials and Intermolecular, two companies we acquired in 2019, we are reviewing their existing management structures, policies, standards, and processes for waste management and recycling, and implementing our internal Group-wide requirements if necessary. We are 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 the Merck 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 Merck Waste Score. 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. The Merck 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

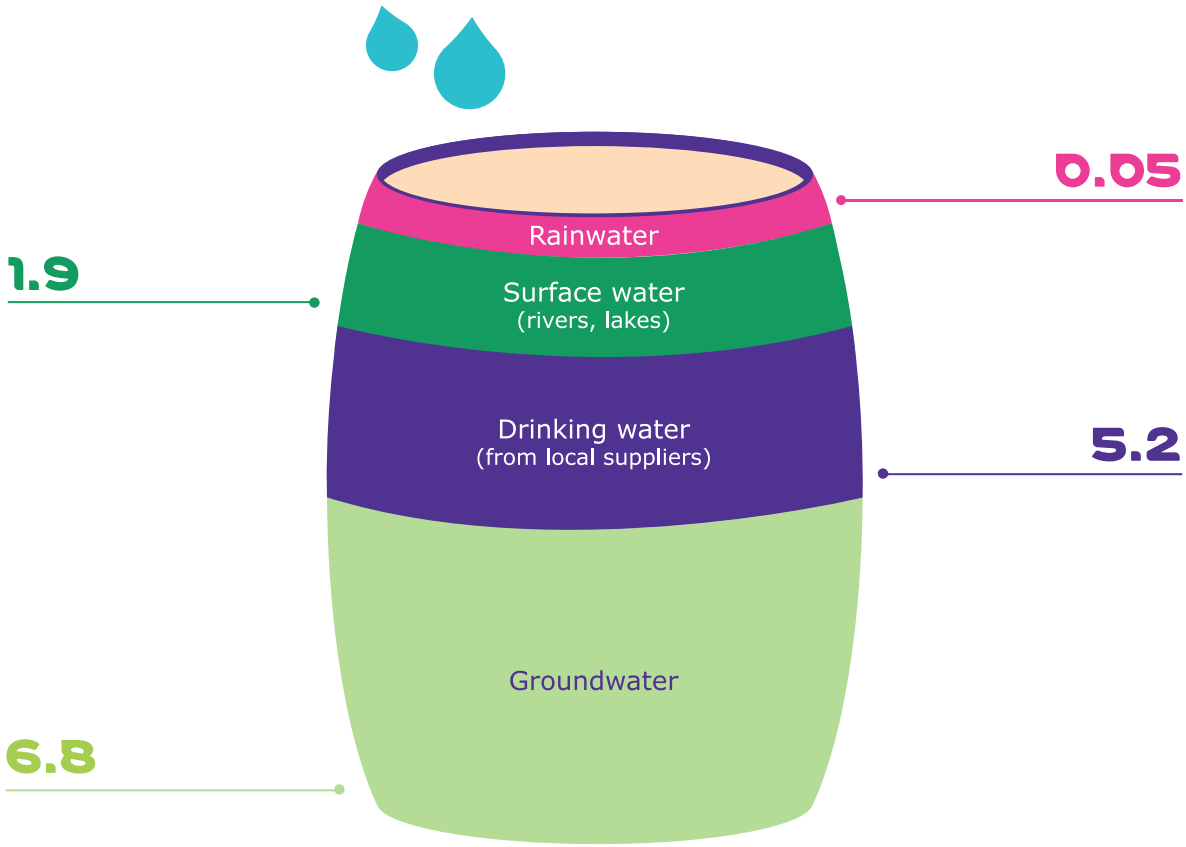
Our Group-wide "Sustainable Water Management Part 1 – Wastewater" and "Sustainable Water Management Part 2 – Water use and stormwater protection" standards detail the way we integrate **modern mechanisms of sustainable water management** into our management system. Both are based on the commitments we 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.

community

Within this chapter:

community involvement

We take on social responsibility, especially in those areas where we can leverage our expertise. Our aim is to support health, education and cultural projects and assist people in need in the countries where we operate, especially in the immediate vicinity of our sites.

Our approach to community involvement

Worldwide, we are deeply committed to supporting the communities in which our sites are located. In selecting social projects, we choose initiatives that align with our strategic spheres of activity, namely Global Health, Broad Minds and Sustainable Solutions. Beyond efforts that empower people, we also provide disaster relief when emergencies arise.

We are particularly determined to facilitate access to health for people worldwide. To do so, we take a multi-pronged approach that includes a wide array of health projects aimed at strengthening communities. In pursuing these activities, we apply our competencies, knowledge and experience in the health industry.

We view scientific education as a key component of culture – and vice versa. Education can help us understand culture, while culture can also **build a bridge to education**; it can stimulate curiosity, nurture creativity and even inspire scientific discovery. We therefore sponsor cultural initiatives and support a number of educational projects aimed at cultivating the next generation of scientists. As part of these efforts, we deploy our expertise to encourage and inspire curious young people who share our passion for science and technology.

Our activities are intended to have a sustainable effect on the community. We work with reliable partners to support many long-term projects, enabling us to strengthen our relationship with our stakeholders and to reinforce our social license to operate.

How we structure community support

The Group Corporate Affairs function monitors our Group-wide community outreach and coordinates some of our activities, including the Praziquantel Donation Program, the Global Pharma Health Fund (GPHF) and the Deutsche Philharmonie Merck. Beyond these Group-wide efforts, our business sectors also run their own projects such as the educational program SPARK, while several of our health initiatives in low- and middle-income countries operate under the auspices of the Merck Foundation. Most of our regional activities are planned locally and executed independently by our subsidiaries, which choose for themselves the spheres of activity from our Corporate Responsibility strategy they wish to support.

The Merck family has also long been committed to philanthropic work, consolidating its activities under the umbrella of the Merck Family Foundation and the "Merck'sche Gesellschaft für Kunst und Wissenschaft e. V.". The Merck Family Foundation supports social projects internationally, focusing on health and education, furthering citizens' initiatives, development cooperation, and intercultural understanding. In addition, the foundation cooperates with government and scientific institutions as well as non-governmental organizations. It gives priority to advancing projects that our employees are privately involved in. The "Merck'sche Gesellschaft für Kunst und Wissenschaft e. V." is a philanthropic organization that promotes artistic and scientific projects related to either the Rhine-Main region, the city or district of Darmstadt (Germany), or to the business sectors of Merck KGaA. For instance, the organization awards doctoral and postdoctoral grants and fellowships to leading researchers in the fields of chemistry and pharmacy.

Our commitment: The principles of our community involvement

We align our projects with our Group Policy on Contributions to Society, which defines what community outreach means to our company and the objectives we wish to pursue. This policy gives our business sectors and subsidiaries abroad a framework for structuring their respective activities themselves. Moreover, it sets out roles and responsibilities, emphasizing that our activities should have a **sustainable, positive effect on the community**. With this in mind, we focus our efforts on long-term projects. In 2019, we revised this Group policy so as to more closely align projects with our strategic spheres of activity.

We also rolled out and communicated our new Corporate Volunteering Guideline. Applicable Group-wide, it aims to encourage our people to get involved in supporting the community. We grant our employees up to two days of paid leave per year to take part in volunteer activities either run or supported by our company.

Our Good Deeds

Our **community outreach activities** are collectively referred to as "Our Good Deeds" and include volunteer initiatives as well as monetary and product donations. In January 2020, our employees were again asked to select their favorite projects from 2019. The projects with the most votes were distinguished with an "Our Good Deeds Award" and also received financial support.

In 2019, we spent around € 46 million on community involvement, which also includes community outreach spending by Versum Materials and Intermolecular (as of the beginning of October 2019). However, it does not include contributions from the Merck Foundation, nor initiatives that primarily serve to market our products.

Our community involvement – 2019

Examples of good deeds

In 2019, our employees again participated in **numerous philanthropic projects**, most of which were conducted locally.

In October 2019, our Healthcare team in the Netherlands organized an "Impact Day". In cooperation with a local partner, the team of 30 employees chose to spend the day with residents from a care center for the elderly. During the event, they enjoyed social activities with residents, going for a walk together and accompanying those with mobility challenges.

In Thailand, our employees organized an internal charity bazaar for the second time, selling items such as homemade food and drinks. The money raised was donated to a local organization that works to improve educational opportunities for children.

In Poland, our employees took part in a campaign by the local Red Cross, collecting school supplies and donating them to children from socioeconomically disadvantaged families.

In France, employees collected winter clothing, which they distributed along with hygiene articles to homeless people. Employees also ran a toy drive to bring Christmas cheer to children from disadvantaged families.

To mark the integration of Versum Materials and Intermolecular, our Performance Materials employees took part in an initiative designed to raise the business sector's level of community engagement. Various activities, for instance an online quiz, were held to allow every employee to impact the funding amount. A total of € 100,000 will now be used to support charitable projects around the world that employees have proposed themselves.

Further projects can be found under "Broad Minds" and "Global Health".

Global Health

We use our expertise to support health initiatives around the world. We particularly focus on promoting local healthcare infrastructure, providing basic and advanced training for health workers as well as educating people on health issues.

Our commitment: the principles of our community involvement

We align our health activities with our Group Policy on Contributions to Society, which was revised in 2019. More information is available under "Community involvement".

In addition, health initiatives are also governed by our Healthcare business sector's policies and our " Access to Health Charter" , which was updated at the end of 2018. We calculate the value of our pharmaceutical donations according to the World Health Organization (WHO) guidelines for medicine donations.

Educational initiatives for healthcare professionals

We are dedicated to improving medical care around the world. Every year, our Global Medical Education and External Relations unit initiates and supports a multitude of **educational initiatives for healthcare professionals**. This includes funding educational programs through independent third-party providers as well as leading the development of scientifically and clinically relevant programs. In this way, we advance the knowledge of healthcare professionals, sensitize for clinical disease patterns and encourage familiarization with progressing medical treatment methods, all of which ultimately benefits patients.

In 2019, we supported more than 87 Continuing Medical Education (CME) programs offered by 22 independent medical education providers and designed 17 new Merck Medical Education Programs. More than 100,000 healthcare professionals participated via e-learning platforms and in-person courses.

The educational initiatives we launch through our Global Health Institute help to **strengthen local health systems**. Our efforts mainly focus on collaborations with academia and R&D institutions in Africa to initiate and implement research programs with focus on schistosomiasis and malaria. We continued these initiatives in 2019. These include, for example, our research collaboration for drug discovery in Cape Town (South Africa) and our Master program at the Makerere University (Uganda) to assess resistance of identified bacterial pathogens and to support the development of an infection control program.

In addition, we support the Ghana Health Service's National Malaria Control program with microscopy stations and by offering training for health workers to improve **malaria and co-infection diagnosis**. PhD students and young academic researchers are involved in our research program to study the epidemiology of the malaria parasite.

As part of our collaboration with the European & Developing Countries Clinical Trials Partnership (EDCTP), we offer a fellowship program to **train African senior researchers** on clinical management and clinical study practices.

Health education in India: Fighting anemia together

In India, more than 50% of all women suffer from anemia. In 2019, as part of our Healthy Women, Healthy Economies initiative, we continued our support of the Swasth Nari Sashakt Parivar (healthy woman, healthy family) program.

As part of this initiative, we continued to provide funding for the non-profit organization Doctors For You. By the end of 2019, the organization had reached nearly 4,800 women in Mumbai aged between 18 and 35, testing them for anemia and offering **nutritional counseling and medical treatment** for those with low hemoglobin. Unique to this initiative, Doctors For You not only treats anemia, but also provides vocational skills development courses to the women undergoing treatment.

Within the scope of the Swasth Nari Sashakt Parivar program, we introduced a new project on hypothyroidism education for women. Launched in the Raigad district of Maharashtra, the project primarily aims to reach out to women in the 18-55 age group, facilitating screening for hypothyroidism, creating awareness and providing both education on preventive measures and information on diagnostic facilities for treatment.

Heightening disease awareness in Brazil

Since rare forms of cancer are often detected too late and pose a serious health threat, we want to drive the conversation on these diseases and raise awareness of early diagnosis and treatment.

To heighten awareness of colorectal cancer, we presented our **giant intestines exhibition** in March 2019 in São Paolo (Brazil). Featuring an inflatable model of the organ large enough for visitors to walk through, the exhibition provided audiovisual information on the human intestines, with more than 1,000 people attending. We also provided educational videos and speeches given by health professionals.

In partnership with the Brazilian Association of the Personal Hygiene, Perfumery and Cosmetics Industry, we conducted events for patients and caregivers at two hospitals to provide information on colorectal cancer and care during treatment. These included workshops provided by our medical team and a lecture on the importance of skin care during cancer treatment.

Building on our success in 2018, we organized a roadshow in Brazil in 2019 featuring a multiple sclerosis (MS) mini-simulator and additional interactive information. More

than 500 visitors had the opportunity to take a virtual journey through the brain of a patient to better understand neurodegenerative disease and the challenges patients face in everyday life. In addition, Merck in Brazil supported the art exhibition "My invisible MS" at the Museum of Image and Sound in São Paulo. The exhibition featured artworks created by patients around the world, depicting the invisible symptoms of MS. Brazil was one of 16 countries that hosted this unique collection of artwork.

Further educational health projects can be found under "Health awareness".

Improving access to healthcare in Madagascar

We take part in the AR-MADA initiative, which provides sustainable healthcare for underserved populations in remote, rural areas of Madagascar where access to healthcare is very limited or non-existent. At least six times a year, volunteer doctors travel to different remote areas of the island to **distribute medicines free of charge**, provide expertise and help with local workforce capacity-building. Since its inception in 1999, the project has reached almost 360,000 underserved patients. We sponsor the initiative and provide strategic support.

INFO

IMPROVING ACCESS TO HEALTHCARE THROUGH THE MERCK FOUNDATION

The Merck Foundation is a non-profit organization that aims to improve the health and well-being of people and advance their lives through science and technology – especially in low- and middle-income countries as well as underserved regions. Its efforts are primarily focused on improving access to innovative healthcare solutions in underserved communities, building healthcare and scientific research capacity and empowering people in STEM subjects, with a special focus on women and young people.

To find out more about the Merck Foundation's programs and impact, please visit www.merck-foundation.com.

Broad Minds

Building on a long-standing tradition within our company, the promotion of scientific education and culture is a core element of our commitment to society. It enables us to promote characteristics that are very valuable to us as a high-tech company, namely creativity, enthusiasm for new discoveries, curiosity, and the courage to transcend boundaries. To tap into these key drivers, we sponsor educational and cultural initiatives at many of our sites, grant scholarships and further learning in specific subjects.

Our commitment: The principles of our community involvement

When it comes to supporting creativity and inspiration within our communities, we align our efforts with our Group Policy on Contributions to Society, which was revised in 2019. More information is available under "Community involvement".

Advancing educational initiatives worldwide

In a quest to spark the interest of young people in science, we hold competitions, recognize special achievements and offer opportunities for hands-on learning.

For example, we support and hold a **variety of STEM competitions** in Germany. As the host of the competition in the German federal state of Hesse, we have been supporting the "Jugend forscht" competition for more than 35 years. In 2019, 72 young researchers took part. In addition, we support the "Internationale Biologie-Olympiade Hessen", the "Internationale Chemie-Olympiade Hessen und Thüringen", the "Chemie – die stimmt!" competition, the one-week "Erfinderlabor" as well as the German-wide "Tag der Mathematik" with 100 school students from the Darmstadt region. Apart from helping out with funding, we assist by hosting the competitions, offering site tours and allowing the competition participants to conduct research in the junior labs we support at the Technical University of Darmstadt (Germany).

Recognizing and promoting special accomplishments

In 2019, we granted awards to the three **best high school students in STEM subjects** at each of 25 schools in the Rhine-Main region. Together with the journal "Chemie in unserer Zeit", we also awarded the annual "Julius Adolph Stöckhardt Prize" for the first time in 2019. This annual prize recognizes dedicated chemistry teachers who present chemistry curricula in an especially engaging manner, thereby spurring interest in chemistry classes.

Junior Labs at the Technical University Darmstadt

We regularly invite young people to our Junior Labs, which we operate together with the Technical University of Darmstadt, to discover the **joy of experimentation**. Linking classroom lessons with the latest topics and state-of-the-art research methods, the initiative encompasses different focus areas. In the course of 2019, approximately 2,500 school students worked on research experiments here. In addition, we operate the "livfe BioLab", where around 1,500 pupils conducted biology experiments under professional guidance in 2019.

Continuing education for teachers and expanding school partnerships

As part of our school sponsorship program, we helped approximately 50 schools in Darmstadt (Germany) and the vicinity thereof to conduct experiment-based science projects in 2019.

We also support teachers by offering **professional development courses** and suggesting teaching techniques. In 2019, we again hosted a science conference attended by more than 100 teachers from the region.

Building on long-standing school partnerships in Germany, we are now also putting our experience to use worldwide. By focusing on training for teachers, we can help them to design exciting lessons that will **spark their students' curiosity in science**.

In 2019, we focused on continuing our project in Kenya, where we are applying a simple educational concept for children ("Finding out with Fred"), which combines scientific education with imaginative stories. In order to develop the curricula for the lessons, we work with partner organizations, who help us to adapt the experiments to **local circumstances**. All the experimental designs in the individual teaching blocks are possible with inexpensive materials that are easy to obtain locally. We are partnering with the Kenya Chemical Society here.

SPARK: igniting a passion for science in the next generation

As part of our global volunteer program SPARK, employees from our Life Science business can dedicate their time and expertise to assist schoolchildren in hands-on learning. The goal is to ignite a passion for science and inspire them to consider a Science, Technology, Engineering or Mathematics (STEM)-related career. SPARK activities include our Curiosity Labs™ program, which engages students through dynamic, interactive lessons. In 2019, the program reached more than 8,000 students from around the world. We also offer tours of our production sites, career panel events and more. In addition to providing materials for **interactive lessons**, we collaborate closely with education experts around the world to ensure that SPARK aligns with specific local requirements and that it complements existing curricula.

In 2019, as part of SPARK, our Life Science business ran its third year-long Curiosity Cube™ tour across North America. Consisting of a shipping container retrofitted into a mobile science lab, the Curiosity Cube™ provides a learning environment that immerses visitors of all ages in specific science topics through **hands-on experiments and state-of-the-art technology**. Supporting the daily work of teachers by offering tools and resources that many schools lack, the tour focuses on schools with underprivileged students, which account for 94% of the facilities visited.

The hands-on science experiments offered in 2019 focused on the periodic table of elements. The students learned about elements in nature, technology and the human body. The 2019 Curiosity Cube™ was equipped with digital microscopes, 3D printers and virtual reality gear. In total, the Curiosity Cube™ traveled 48,000 kilometers across North America in 2019 and engaged students in 99 communities. Following the visit, 92% of students **improved their understanding of life science terminology**.

Throughout 2019, over 2,300 of our employees volunteered more than 19,400 hours via the overall SPARK Global Volunteer Program that also includes the Curiosity Cube™, **engaging over 66,500 students worldwide**.

Partnering with Seeding Labs

In 2019, we further increased our support of Seeding Labs, a non-governmental organization that provides scientists in low- and middle-income countries with laboratory equipment, training and opportunities to collaborate with other experts in their field. To date, we have enabled the organization to equip 76 universities in 36 low- and middle-income countries with 265 metric tons of used but **fully functioning laboratory equipment**, providing access to the global scientific community and helping to accelerate scientific research. The goal is to expand the access to vital resources and help the global scientific community advance scientific research.

We are the exclusive sponsor of the new online platform hosted by Seeding Labs, TeleScience. It features educational videos and training sessions led by our Life Science employees, who share techniques and tips on a wide range of science topics. TeleScience developed 18 videos and has been visited by more than 2,300 users from 117 countries since its launch in 2018.

Pioneering hands-on learning

We have been engaged in a signature partnership with Technorama since 2017. Located in Switzerland, this organization is the third largest science center in Europe and a pioneer of practical, self-directed learning. To date, 76 of our employees have participated in six newly developed science experiments for over 1,000 visitors through events called **Technorama Days**. Through our partnership, over 3,000 teachers have benefited from enhanced advisory and training services. We also helped to convert wet laboratories into larger, state-of-the-art spaces, giving more than 100,000 visitors per year hands-on chemistry experiences. We have developed ten unique workshop themes for these laboratories and held 500 workshops.

Clean water for China

Our partnership program with the One Foundation charity fund aims to provide safe drinking water to schools in China, where over 40 million students across 114,000 rural schools lack access to such. We donate one Chinese renminbi (approximately US$ 0.14) a day on behalf of each of our employees in China. The money is used to **supply rural schools** with safe drinking water. In addition to making a personal contribution to this project, in 2019 24 employees volunteered 16 hours each, raising awareness on topics such as safe water, sanitation and electricity and organizing small scientific experiments for the schoolchildren.

Music and literature as ambassadors

Our symphony orchestra

The Deutsche Philharmonie Merck is a professional symphony orchestra established back in 1966. It is an integral part of cultural life in Darmstadt (Germany) and the local region and regularly tours internationally, performing in Moscow (Russia), in April 2019.

It is important to us to spark an **interest in music** early on. Children aged four and older enjoy the traditional cushion concerts. In our annual orchestra workshops, talented young musicians work with our professional orchestra musicians to develop sophisticated concert programs. Around 60 young aspiring musicians participated in 2019.

The Deutsche Philharmonie Merck gave its 31st charity concert in January 2019, raising a total of € 50,000. Via the "Echo hilft!" initiative, the proceeds went to help five community projects in the Darmstadt area.

~21,000

people attended the concerts given by our symphony orchestra in 2019.

Literary awards for bridge builders

Like music, literature is an important mediator between cultures. That is why we grant five literary prizes around the world, some annually, others every two years. These comprise the Johann Heinrich Merck Award for Literary Critique and Essay in Germany (since 1964), the Premio Letterario Merck in Italy (since 2003), the Merck Kakehashi Literature Prize in Japan (since 2014), the Merck-Tagore Award in India (since 2012) as well as the Merck Translation Award in Russia (since 2016). We thus mainly recognize those authors who build bridges between cultures, as well as between literature and science. Worth € 20,000, the 2019 Johann Heinrich Merck Award for Literary Critique and Essay went to Austrian literary scholar and critic Daniela Strigl. In 2019, the Merck-Tagore Award worth around € 6,000 went to Bahamian professor Kris Manjapra.

facts & figures

Within this chapter:

report profile

Part of the non-financial report

The global community is facing major challenges. We too are deeply engaged in tackling the social, economic and ecological issues of our time, which include a variety of developments. Digital innovation is opening up new avenues for social and technological development; advances in artificial intelligence and genetic engineering are giving rise to new ethical questions, and climate change is forcing us to fundamentally transform our mindset and consider new approaches.

In addressing these trends, we are continuing a long tradition of corporate responsibility, which is also reflected in our reporting practices. We have been detailing our efforts to meet our obligations to society since 1993. This initially took the form of environmental reports, but then in 2003 evolved into a full Corporate Responsibility (CR) Report released every two years. In 2016, we started publishing our CR Report on an annual basis.

In our 11th CR Report, we elaborate on our ambition to create shared value for both our company and society as a whole.

With transparency as a key goal, we aim to extensively inform our stakeholders of our activities and successes, along with the challenges we face. Our 2019 Corporate Responsibility Report meets the regulatory requirements for a combined separate non-financial report. The index to the non-financial report provides an overview of the relevant content.

This CR report also documents the progress we have made in implementing the principles of the United Nations Global Compact (Communication on Progress).

Reporting framework

This CR report covers fiscal 2019 and pertains to our entire Group including our subsidiaries in 66 countries. Any deviations from this reporting framework are indicated on a case-by-case basis.

Acquisitions of Intermolecular and Versum Materials

The closing of the acquisition of Intermolecular, Inc. on September 20, 2019 and Versum Materials, Inc. on October 7, 2019 marked two major milestones in the transformation journey of our Performance Materials business sector. Together, we are optimally positioned to enable next-generation digital devices for a smart, safe and connected world. The business combination is expected to make us a leading electronic materials player focused on the semiconductor and display industries. Intermolecular and Versum Materials will strengthen our Performance Materials business sector and become part of the Semiconductor Solutions business unit, one of the three Performance Materials business units alongside Display Solutions and Surface Solutions.

We are still in the process of consolidating the approaches, goals, results, and measures for the primary non-financial topics identified through our materiality analysis and expect this to be entirely completed by 2021. The sections of the non-financial report in which these acquisitions play a significant role reflect the December 2019 status of the consolidation.

Data collection and consolidation systems

In general, the 2019 CR Report provides non-financial indicators that represent the entire Group, including the recently acquired companies Intermolecular and Versum Materials. The majority of the figures we publish reflect the status as of December 31, 2019. We explicitly state when the information provided deviates from these parameters.

Since 2005, we have been using a Group-wide electronic data collection system to collect environmental and occupational health and safety data, which are tracked locally at our individual sites and approved following review. To maximize the quality of these data, we support the sites in optimizing their collection processes and their corresponding quality assurance measures. Moreover, our Group Environment, Health, Safety, Security, Quality (EQ) function takes measures such as internal EHS audits to review both the processes and the data provided.

We compile environmental performance indicators from all our production sites Group-wide, as well as those warehouse, research and administrative facilities that are relevant in terms of their environmental footprint. The scope of consolidation therefore covers all Group sites that have relevant impacts on the environment, with the exception of the newly acquired Versum Materials sites, which will be incorporated into our data collection process as of 2020 where pertinent.

All employee master data are continually updated in an SAP database. Some employee data are only disclosed for select sites or countries, which is accordingly indicated in the respective text passages.

We use community data management software to track data pertaining to our community outreach activities.

Determining report content

We align the content of our CR Report with the internationally recognized guidelines of the Global Reporting Initiative (GRI) and the principles of completeness and materiality, as well as input from our stakeholders. This report has been prepared in accordance with the "GRI Standards: Comprehensive Option". Furthermore, we have taken into consideration the requirements of the capital market for assessing companies' sustainability performance.

In 2018, we performed a comprehensive materiality assessment to determine the CR topics of relevance to our Group, which we then updated in 2019. Experts from our business sectors and relevant Group functions reviewed the findings and validated them. Moreover, as stipulated by section 289c (2, 3) of the German Commercial Code (HGB), we checked the issues validated in 2018 for "double materiality". We have derived the content of this CR report from the results of the materiality assessment, which can be found together with the materiality matrix under Materiality analysis.

Our Executive Board has reviewed and approved this report. The content of the non-financial report has also been reviewed by the Supervisory Board in accordance with section 111 (2) of the German Stock Corporation Act (AktG).

External audit

KPMG AG Wirtschaftsprüfungsgesellschaft has audited the annual financial statements and management report of our company for the fiscal year spanning January 1 to December 31, 2019 and has issued an unqualified opinion.

Additionally, after undergoing a limited assurance, our company received an independent assurance statement for the present CR Report as well as for the non-financial report.

The additional content provided on both the company's websites as well as external web pages that is linked in this report does not form part of the information assured by KPMG.

Point of contact:

We welcome your feedback and are happy to answer any questions.

Merck KGaA
Corporate Affairs
Group Corporate Responsibility

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Germany

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The previous CR report was published in April 2019. Our next CR report is scheduled for publication in April 2021.

indicators

economics

Net sales, operating result (EBIT) and research and development costs, by business sector[1]

€ million	Healthcare	Life Science	Performance Materials	Group
2018[2]				
Net sales	6,246	6,185	2,406	**14,836**
Operating result (EBIT)	731	1,036	508	**1,727**
R&D costs[3]	1,687[4]	251[4]	242	**2,227**[4]
2019				
Net sales	6,714	6,864	2,574	**16,152**
Operating result (EBIT)	1,149	1,280	307	**2,120**
R&D costs[3]	1,666	276	267	**2,268**

1 As a non-operating segment, Corporate and Other is not shown here as a separate item, but rather under Segment Reporting in our 2019 Annual Report.

2 Figures comprise the continuing operations of the Merck Group excluding the Consumer Health business, which was divested on December 1, 2018.

3 Part of the non-financial report

4 Previous year's figures have been adjusted, see in our 2019 Annual Report Note (45) "Effects from new accounting standards and other presentation changes" in the Notes to the Consolidated Financial Statements.

business ethics

Part of the non-financial report

Internal audits on corruption and Human Rights Charter

	2016	2017	2018[1]	2019 Merck Group[2]	2019 thereof Merck KGaA[3]
Number of audits relating to corruption	55	50	54	50	25
% of audits relating to corruption	68	65	69	65	32
Number of audits relating to the workplace requirements of our Human Rights Charter	47	45	46	46	23

1 Consumer Health business has been out of Internal Auditing scope since September 2017.

2 The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

3 Includes global audits which are conducted at the headquarters in Darmstadt and/or the management of the audited function is reporting into KGaA.

In 2019, during 46 of our audits conducted in 22 countries, we reviewed workplace parameters as per our Human Rights Charter. No violations were identified.

Reported compliance violations

	2016	2017	2018	2019 Merck Group[1]	2019 thereof Merck KGaA
Total number of reported compliance violations					
Number of reported compliance incidents	36	39	72	75	5
Number of confirmed cases	12	14	19	30	1
Confirmed cases by category					
Violation of the Merck Human Rights Charter	2	0	0	0	0
Bribery and corruption	2	1	1	0	0
Violation of the Merck Pharmaceutical Guidelines	4	2	2	9	0
Violation of Data Privacy and Confidentiality Guidelines	0	2	3	3	0
Manipulation of business documents	2	1	0	0	0
Violation of cartel laws and fair competition rules	0	0	1	0	0
Infringements in the areas of finance, accounting and banking	0	0	0	0	0
Theft and fraudulent actions against Merck	1	1	5	8	0
Other violations of the Merck Compliance Principles for the relations with business partners	1	2	1	4	1
Other violations of Merck values, internal guidelines or legal requirements	0	5	6	6	0

1 The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

Compliance training

	2016[1]	2017[1]	2018[1]	2019 Merck Group[2,3]	2019 thereof Merck KGaA[3]
Total number of persons trained on anti-corruption guidelines[4]	**29,764**	**17,044**	**11,404**	**36,109**	**5,535**
Total number of employees trained on anti-corruption guidelines	**25,889**	**13,345**	**11,155**	**35,673**	**5,517**
% of employees trained on anti-corruption	51	25	22	63	65
by employee category					
Number of Role 2+ employees trained on anti-corruption	14,379	7,080	9,257	26,890	3,943
% of Role 2+ employees trained on anti-corruption	84	27	36	96	100
% of employees below Role 2 trained on anti-corruption	34	23	7	30	35
by region (%)					
Europe	54	18	19	71	65
North America	57	46	36	59	not applicable
Asia-Pacific (APAC)	38	25	16	47	not applicable
Latin America	52	19	12	62	not applicable
Middle East and Africa (MEA)	66	29	18	80	not applicable

1 In 2016, 2017 and 2018 the job grading system had not yet been implemented for employees of all Sigma-Aldrich legal entities in Germany, or for employees of Allergopharma. In the facts and figures, these employees are included under "employees below Role 2".

2 In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma. In the figures, employees whose positions have not been assessed have been allocated to "employees below Role 2".

3 As of 2019, we changed our reporting method. Previously, our reports covered the active workforce who has been trained on a specific subject during a particular year. From 2019 onwards, we report on the active, trained workforce in the company, regardless of whether their training has already taken place prior to the reporting year. The possibility of trend forecasts for year-to-year comparisons is therefore limited.

4 Includes contractors, external supervised workers (e.g. temps) and contract partners working on-site who were trained on anti-corruption guidelines (2019: 436).

The (employee) target audience for a specific training is related to the risk level associated with employee positions and Role levels. Target audiences therefore may not include all Group employees and also may vary from training to training.

In order to address the special responsibility held by management personnel, and staff with HR responsibility, trainings on anti-corruption guidelines for these employees are in focus. This applies to all employees rated Role 2+.

Our compliance and anti-corruption principles are communicated to all our business partners, who undergo a Business Partner Risk Management (BPRM) process.

Legal actions

	2016	2017	2018[1]	2019 Merck Group	2019 thereof Merck KGaA
Total number[2] of legal actions pending or completed (for anti-competitive behavior, violations of anti-trust or violations of monopoly legislation)	**2**	**3**	**3**	**3**	**2**
pending	2	3	3	3	2
completed	0	0	0	0	0

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

2 As published in the annual reports, the herein listed total number of legal actions refers to the significant legal risks as per the company's definition. The significance of legal risks is based on potential negative effects on projected financial objectives as well as on the probability of occurrence.

For further information please see our annual reports:
Annual Report 2016, pages 135-136 and pages 228-229, No. 26
Annual Report 2017, pages 148-150 and pages 252-253, No. 27
Annual Report 2018, pages 146-148 and pages 247-251, No. 26
Annual Report 2019, pages 120-122 and pages 243-245, No. 26

Customer privacy[1]

	2016	2017[2]	2018	2019[3,4]
Total number of substantiated complaints received from outside parties	0	0	0	0
Total number of complaints from regulatory bodies	0	0	0	1
Total number of identified leaks, thefts, or losses of customer data	1	0	1	1

1 These data only reflect incidents classified as significant.

2 Includes Sigma-Aldrich as of 2017.

3 Since 2019, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

4 The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

Employees

Part of the non-financial report

Total number of employees

As of Dec. 31	2016	2017	2018	2019 Merck Group	2019 thereof Merck KGaA[1]
Total number of employees	**50,414**	**52,941**	**51,749**	**57,071**	**8,474**
Men	28,848	30,083	29,006	32,531	5,755
Women	21,566	22,858	22,743	24,540	2,719

1 Owing to the hive-down of Merck Healthcare KGaA as of April 1, 2019, effective 2019 the figures only include Merck KGaA.

Number of employees by hierarchical level

As of Dec. 31	2016[1]	2017[1]	2018[1]	2019 Merck Group[2]	2019 thereof Merck KGaA
Total employees	**50,414**	**52,941**	**51,749**	**57,071**	**8,474**
Senior management (Role 6+)	181	197	193	190	74
Middle management (Role 4 & 5)	2,685	2,927	3,095	3,352	730
Low management (Role 3)	8,139	8,904	9,019	9,499	1,943
Other employees (below Role 3)	39,409	40,913	39,442	44,030	5,727
% of women (total)	**43**	**43**	**44**	**43**	**32**
thereof in senior management (Role 6+)	25	30	36	39	14
thereof in middle management (Role 4 & 5)	805	917	1,025	1,146	199
thereof in low management (Role 3)	3,361	3,714	3,795	4,029	665
thereof other employees (below Role 3)	17,375	18,197	17,888	19,326	1,841
% of men (total)	**57**	**57**	**56**	**57**	**68**
thereof in senior management (Role 6+)	156	167	157	151	60
thereof in middle management (Role 4 & 5)	1,880	2,010	2,070	2,206	531
thereof in low management (Role 3)	4,778	5,190	5,224	5,470	1,278
thereof other employees (below Role 3)	22,034	22,716	21,554	24,704	3,886
by age group **Up to 29 years old (%)**	**15**	**15**	**15**	**15**	**14**
thereof in senior management (Role 6+)	0	0	0	0	0
thereof in middle management (Role 4 & 5)	7	3	5	8	1
thereof in low management (Role 3)	183	194	211	190	65
thereof other employees (below Role 3)	7,229	7,479	7,279	8,362	1,142
30 to 49 years old (%)	**62**	**62**	**61**	**60**	**51**
thereof in senior management (Role 6+)	76	72	69	69	29
thereof in middle management (Role 4 & 5)	1,670	1,782	1,829	1,933	446
thereof in low management (Role 3)	5,784	6,308	6,206	6,516	1,237
thereof other employees (below Role 3)	23,996	24,733	23,536	25,859	2,643
50 years or older (%)	**23**	**23**	**24**	**25**	**34**
thereof in senior management (Role 6+)	105	125	124	121	45
thereof in middle management (Role 4 & 5)	1,008	1,142	1,261	1,411	283
thereof in low management (Role 3)	2,172	2,402	2,602	2,793	641
thereof other employees (below Role 3)	8,184	8,701	8,627	9,809	1,942

1 In 2016, 2017 and 2018 the job grading system had not yet been implemented for employees of all Sigma-Aldrich legal entities in Germany, or for employees of Allergopharma. In the facts and figures, these employees are included under "other employees (below Role 3)".

2 In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma. In the figures, employees whose positions have not been assessed have been allocated to "other employees (below Role 3)".

Average number of employees by functional area[1]

	2016	2017	2018[2]	2019[3]
Group	**50,439**	**52,053**	**53,809**	**53,645**
thereof women	**21,136**	**22,353**	**23,388**	**23,503**
Production	14,829	15,571	16,240	16,455
thereof women	4,698	5,059	5,359	5,529
Logistics/Supply Chain[4]	3,955	3,729	4,014	4,109
thereof women	1,459	1,442	1,569	1,626
Marketing and Sales/Commercials[4]	14,887	15,115	15,479	13,970
thereof women	6,401	6,609	6,981	6,608
Administration	8,190	9,286	9,864	10,342
thereof women	4,421	4,798	5,067	5,194
Research and Development	6,249	6,789	7,245	7,561
thereof women	3,274	3,591	3,871	4,053
Infrastructure and Other	2,329	1,564	966	1,208
thereof women	883	854	541	493

1 The average employee headcount is calculated by adding up all employees at the end of each of the last 13 months, and dividing this total by 13.

2 The average employee headcount for fiscal 2018 incorporates the Consumer Health employees on a pro rata basis up until the end of November 2018 due to the divestment of the Consumer Health business as of December 1, 2018.

3 To calculate the average number of employees in fiscal 2019, the employee headcount of Versum Materials has been included on a pro rata basis as of October 2019 owing to the acquisition. They are allocated to the functional area "Infrastructure and Other".

4 In conjunction with the new job architecture implemented in 2017, some functional areas have been renamed and reorganized. Due to the new structure from 2017 on, it will only be possible to deliver a limited trend forecast in a year-on-year comparison.

Number of employees by region

As of Dec. 31	2016	2017	2018	2019 Merck Group	2019 thereof Merck KGaA
Total	**50,414**	**52,941**	**51,749**	**57,071**	**8,474**
Europe	**24,438**	**25,980**	**25,792**	**26,715**	**8,474**
Women	10,884	11,627	11,464	11,909	**2,719**
Women (%)	45	45	44	45	32
Number of employees with temporary contracts	1,031	1,279	1,209	1,137	254
% of employees with temporary contracts	4	5	5	4	3
North America	**10,037**	**10,520**	**10,978**	**12,829**	**0**
Women	4,308	4,518	4,742	5,285	not applicable
Women (%)	43	43	43	41	not applicable
Number of employees with temporary contracts	122	138	148	158[1]	not applicable
% of employees with temporary contracts	1	1	1	1[1]	not applicable
Asia-Pacific (APAC)	**10,754**	**11,294**	**10,486**	**12,728**	**0**
Women	3,981	4,298	4,348	5,049	not applicable
Women (%)	37	38	41	40	not applicable
Number of employees with temporary contracts	2,231	2,603	2,846	3,263[1]	not applicable
% of employees with temporary contracts	21	23	27	26[1]	not applicable
Latin America	**4,140**	**4,050**	**3,340**	**3,433**	**0**
Women	1,910	1,896	1,648	1,690	not applicable
Women (%)	46	47	49	49	not applicable
Number of employees with temporary contracts	40	40	62	55	not applicable
% of employees with temporary contracts	1	1	2	2	not applicable
Middle East and Africa (MEA)	**1,045**	**1,097**	**1,153**	**1,366**	**0**
Women	483	519	541	607	not applicable
Women (%)	46	47	47	44	not applicable
Number of employees with temporary contracts	153	172	189	182	not applicable
% of employees with temporary contracts	15	16	16	13	not applicable

1 Employees whose contract type had not yet been recorded in our database by December 31, 2019 were divided up proportionally between the categories "Employees with permanent contracts" and "Employees with temporary contracts".

External contractors are currently not logged in our employee data system, nor are there any plans to integrate them.

Employees by business sector

As of Dec. 31	2016	2017	2018	2019
Healthcare employees	**18,837**	**19,795**	**17,456**	**18,136**
thereof women	9,090	9,656	8,884	9,232
thereof women (%)	48	49	51	51
Life Science employees	**19,178**	**19,607**	**20,667**	**21,934**
thereof women	7,928	8,276	8,837	9,487
thereof women (%)	41	42	43	43
Performance Materials employees	**5,469**	**5,529**	**5,278**	**7,329**
thereof women	1,427	1,455	1,411	1,712
thereof women (%)	26	26	27	23

Employees by contract type

As of Dec. 31	2016	2017	2018	2019
Total employees	**50,414**	**52,941**	**51,749**	**57,071**
Number of employees with permanent contracts	46,837	48,709	47,295	52,276[1]
% of employees with permanent contracts	93	92	91	92[1]
thereof women	19,741	20,741	20,545	22,237[1]
thereof women (%)	42	43	43	43[1]
Number of employees with temporary contracts	3,577	4,232	4,454	4,795[1]
% of employees with temporary contracts	7	8	9	8[1]
thereof women	1,744	2,117	2,198	2,303[1]
thereof women (%)	49	50	49	48[1]
full-time employees	48,056	50,498	49,273	**54,265**
% full-time	95	95	95	95
thereof women	19,457	20,677	20,577	22,208
thereof women (%)	40	41	42	41
part-time employees	2,358	2,443	2,476	**2,806**
% part-time	5	5	5	5
thereof women	2,109	2,181	2,166	2,332
thereof women (%)	89	89	87	83

1 Employees whose contract type had not yet been recorded in our database by December 31, 2019 were divided up proportionally between the categories "employees with permanent contracts" and "employees with temporary contracts".

New employees

As of Dec. 31	2016	2017	2018	2019 Merck Group[1]	2019 thereof Merck KGaA
Total number of new employee hires	**7,085**	**7,285**	**7,129**	**7,924**	**454**
by age group					
up to 29 years old	2,930	2,940	2,967	3,432	260
30 to 49 years old	3,736	3,848	3,728	4,055	180
50 or older	419	497	434	437	14
by gender					
Women	3,388	3,412	3,401	3,622	158
Men	3,697	3,873	3,728	4,302	296
by region					
Europe	2,689	3,058	2,560	2,529	454
North America	1,348	1,603	1,524	1,733	0
Asia-Pacific (APAC)	2,201	1,955	2,222	2,729	0
Latin America	636	497	583	578	0
Middle East and Africa (MEA)	211	172	240	355	0
Rate of new employee hires[2] (%)	**14**	**14**	**14**	**14**	**5**
by age group[3]					
up to 29 years old	41	40	42	43	57
30 to 49 years old	53	53	52	51	40
50 or older	6	7	6	6	3
by gender[3]					
Women	48	47	48	46	35
Men	52	53	52	54	65
by region[3]					
Europe	38	42	36	32	100
North America	19	22	21	22	not applicable
Asia-Pacific (APAC)	31	27	31	34	not applicable
Latin America	9	7	8	7	not applicable
Middle East and Africa (MEA)	3	2	3	5	not applicable

1 These figures exclude the approximately 2,400 Versum Materials and Intermolecular employees who are not classified as new hires because they joined Merck as part of the acquisitions.

2 Formula for calculating the rate of new employee hires: Total number of new employee hires divided by number of employees at the end of the fiscal year.

3 Formula for calculating the rate of new employee hires by age/gender/region: New employee hires of the focus group divided by the total number of new employee hires.

Staff turnover[1,2]

	2016	2017	2018[3]	2019 Merck Group	2019 thereof Merck KGaA
Total turnover rate	**12.07**	**9.05**	**9.09**	**9.07**	**1.97**
Turnover rate by gender					
Men	12.87	8.75	9.03	8.69	2.09
Women	10.96	9.46	9.18	9.54	1.75
Turnover rate by age group					
Up to 29 years old	19.20	13.66	14.24	13.13	2.94
30 to 49 years old	11.37	8.38	8.53	8.90	1.92
50 or older	9.19	7.87	7.39	7.03	1.65
Turnover rate by region					
Europe	6.23	6.22	5.73	5.72	1.97
North America	11.50	11.02	9.90	11.02	not applicable
Asia-Pacific (APAC)	22.37	12.53	14.51	13.18	not applicable
Latin America	18.85	13.74	15.41	13.47	not applicable
Middle East and Africa (MEA)	10.8	11.22	9.77	12.14	not applicable
Total number of leavers	**6,087**	**4,710**	**4,613**	**4,863**	**183**
by gender					
Men	3,771	2,596	2,578	2,621	128
Women	2,316	2,114	2,035	2,242	55
by age group					
Up to 29 years old	1,464	1,058	1,061	1,042	39
30 to 49 years old	3,589	2,713	2,649	2,898	93
50 or older	1,034	939	903	923	51
by region					
Europe	1,490	1,488	1,457	1,500	183
North America	1,132	1,143	1,064	1,264	0
Asia-Pacific (APAC)	2,543	1,387	1,468	1,484	0
Latin America	814	570	522	459	0
Middle East and Africa (MEA)	108	122	102	156	0

1 The table contains unadjusted turnover rates. The rate excludes employees who depart due to parental leave or a long-term illness, as well as employees who are transitioning to the non-working phase of partial retirement.

2 Employee headcount is calculated as follows: Total number of leavers from the past 12 months divided by the average employee headcount multiplied by 100.

3 Since 2018, the figures exclude the Consumer Health business, which was divested on December 1, 2018.

In 2019, the average length of service for employees Group-wide was 9.5 years (2018: 10 years), with 16.3 years (2018: 14.9 years) for Merck KGaA employees.

Work-related accidents[1]

	2016	2017	2018	2019 Merck Group[2]	2019 thereof Merck KGaA
Lost Time Injury Rate (LTIR = work-place accidents resulting in missed days of work per one million man-hours)	**1.3**	**1.5**	**1.2**[3]	**1.5**	**3.3**
by region					
Europe	2.2	2.4	1.8[3]	2.7	3.3
North America	1.1	1.0	1.1	0.9	not applicable
Asia-Pacific (APAC)	0.4	0.3	0.3	0.2	not applicable
Latin America	0.4	1.3	1.5	1.7	not applicable
Middle East and Africa (MEA)	1.6	0.0	0.7	0.0	not applicable
Number of deaths	**0**	**0**	**0**	**0**	**0**
by region					
Europe	0	0	0	0	0
North America	0	0	0	0	0
Asia-Pacific (APAC)	0	0	0	0	0
Latin America	0	0	0	0	0
Middle East and Africa (MEA)	0	0	0	0	0
by gender					
Women	0	0	0	0	0
Men	0	0	0	0	0

1 Including supervised workers

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

3 Figure retroactively adjusted

Both Merck employees as well as supervised workers have been included in the calculation of these indicators.

Through the LTIR, we record work-related accidents that involve at least one day of missed work. A work-related accident is an injury that results from the type of work, in the course of doing said work, and that has no internal cause. Work-related accidents are considered relevant if they occur on the premises, on business trips, during goods transport, as a result of external influences (e.g. natural disasters), or due to criminal acts involving personal injury. Commuting accidents and accidents during company sporting activities are not included. First-aid incidents are generally not included in the LTIR since these usually do not result in more than one day of missed work.

By 2020, we intend to sustainably lower the LTIR to 1.5. The aim is to permanently stabilize or outperform this challenging number, which we achieved for the first time in 2015.

The LTIR is the key occupational safety indicator for the Merck Group as a whole. Therefore, we do not publish any other indicators such as workplace accidents, lost days or days of absence. The LTIR is not broken down by gender as this differentiation is not relevant to our strategic planning.

For Merck KGaA (about 15% of the employees of the Merck Group), we only report work-related illnesses if these have been certified as an occupational illness by the employers' liability insurance association. In 2019 period, two cases of work-induced illness were verified (as of the end of December 2019).

Employees who regularly receive a performance and development evaluation

	2016[1]	2017[1]	2018 Merck Group[1, 2]	2019 Merck Group[3]	2019 thereof Merck KGaA
% of employees who receive a performance and development evaluation	**97**	**97**	**98**	**98**	**100**
by gender					
Women	97	97	99	98	100
Men	97	97	98	98	100
by employee category[4]					
Senior management (Role 6+)	100	100	100	100	100
Middle management (Role 4 & 5)	100	100	100	100	100
Low management (Role 3)	100	100	100	100	100
Other employees (below Role 3)	96	96	98	98	100

1 In 2016, 2017 and 2018 the job grading system had not yet been implemented for employees of all Sigma-Aldrich legal entities in Germany, or for employees of Allergopharma. In the facts and figures, these employees are included under "other employees (below Role 3)".

2 Since 2018, the figures exclude the Consumer Health business, which was divested on December 1, 2018.

3 The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

4 In 2017, we switched our job architecture from a Global Grading System to Roles. Figures have been retroactively adjusted for previous years.

Regular feedback and employee performance evaluations are essential to fairly ranking individual performance and to helping all employees follow their own career path at Merck. Our globally uniform Performance and Talent Management Process requires annual feedback meetings and performance assessments for all employees rated Role 2 and up in the job grading system that is used in 2019. Apart from evaluating employee performance, this helps us to identify individual development opportunities.

When it comes to applying this process, our individual subsidiaries can decide for themselves whether to include employees rated below Role 2. In Germany, all permanent employees have been participating in the Performance and Talent Management Process since 2013. In 2019, a total of 53,605 employees worldwide were involved in the process. The Performance and Talent Management Process is coordinated via our online platform HR4You.

Internationality of employees

As of Dec. 31	2016[1]	2017[1]	2018[1]	2019 Merck Group[2]	2019 thereof Merck KGaA
Number of nationalities	129	131	136	139	80
Number of nationalities in management positions (Role 4 or above)	70	65	70	73	30
% of non-Germans in management positions (Role 4 or above)	65	64	64	64	11

1 In 2016, 2017 and 2018 the job grading system had not yet been implemented for employees of all Sigma-Aldrich legal entities in Germany, or for employees of Allergopharma.

2 In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma.

Employee age by region

As of Dec. 31

Number of employees	Worldwide	North America	Europe (including Germany)	Merck KGaA	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2018							
Up to 29 years old	7,494	1,573	3,175	1,574	2,082	470	195
thereof women	3,534	661	1,537	633	966	285	85
30 to 49 years old	31,638	5,636	15,247	5,987	7,616	2,342	799
thereof women	14,238	2,511	7,044	2,281	3,123	1,183	377
50 or older	12,611	3,769	7,370	3,572	788	528	159
thereof women	4,971	1,570	2,883	1,183	259	180	79
Average age	**41.7**	**44.1**	**42.8**	**42.9**	**36.9**	**40.4**	**39.2**
Total employees	**51,749**	**10,978**	**25,792**	**11,133**	**10,486**	**3,340**	**1,153**
2019							
Up to 29 years old	8,560	1,829	3,282	1,208	2,713	498	238
thereof women	3,983	773	1,595	440	1,225	289	101
30 to 49 years old	34,377	6,441	15,540	4,355	9,067	2,373	956
thereof women	15,076	2,733	7,191	1,465	3,531	1,200	421
50 or older	14,134	4,559	7,893	2,911	948	562	172
thereof women	5,481	1,779	3,123	814	293	201	85
Average age	**41.7**	**44.4**	**43.0**	**43.4**	**36.8**	**40.3**	**38.6**
Total employees	**57,071**	**12,829**	**26,715**	**8,474**	**12,728**	**3,433**	**1,366**

Age of youngest employee

As of Dec. 31	2016	2017	2018	2019
Age of youngest employee, excluding apprentices	17	18	17	18

Voluntary insurance benefits (voluntarily introduced and (co-) financed)

As of Dec. 31	2016	2017	2018	2019 Merck Group[1]	2019 thereof Merck KGaA
% of employees with healthcare benefits[2]	68	68	67	68	0
% of employees with Group accident insurance[3]	39	42	39	36	4
% of employees with life insurance[4]	57	58	58	58	0
% of employees with disability insurance (short-term and long-term)[5]	32	35	37	39	0

1 The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

2 Any spend on voluntarily introduced and (co-) financed healthcare benefits for employees and possibly their dependents. Not taking into consideration any mandatory social security cover (mostly covered by an insurance policy).

3 Any spend on voluntarily introduced and (co-) financed accident insurance that pays a defined amount in case of death or disability caused by a work-related accident (not taking into consideration any mandatory social security cover, e.g. workman's compensation).

4 Any spend on voluntarily introduced and (co-) financed life insurance cover that pays a defined amount of money in case of natural death (not accidental).

5 Any spend on voluntarily introduced and (co-) financed insurance cover that disability pays for salary continuation in case of inability to work caused by an insured incident.

All our employees are covered by either statutory or voluntary accident and health insurance. Employees of Merck KGaA are covered by statutory insurance as stipulated by the regulations in force in Germany.

We offer a company pension in numerous countries along with various programs for supplemental company pensions and survivor's benefits.

The global benefits listed in the table above are designed to provide additional security to our workforce and their families and to improve their quality of life. Benefits represent voluntarily employer-initiated as well as employer-financed assistance to our workforce in addition to the regular compensation package.

Our benefits offer meaningful choices, where possible, to support a diverse workforce and are sensitive to the needs and customs of the employees who use them, regardless of country, age, family status, interests, or values.

Long-term pension obligations and post-employment benefits

€ million	2016	2017	2018	2019
Present value of all defined benefit obligations as of Dec. 31	4,698	4,707	4,719	5,644
Pension expenses	226	304	319[1]	357

1 Figure retroactively adjusted.

Depending on the legal, economic and fiscal circumstances prevailing in each country, different retirement benefit systems are provided for the employees of the Merck Group. Generally, these systems are based on the years of service and salaries of the employees. Pension obligations of the Merck Group include both defined benefit and defined contribution plans and comprise both obligations from current pensions and accrued benefits for pensions payable in the future. In the Merck Group, defined benefit plans are funded and unfunded (see our 2019 Annual Report, Note on Provisions for pensions and other post-employment benefits).

Flexible working hours in Germany

As of Dec. 31	2016	2017	2018	2019
% of employees utilizing the "mywork@Merck" working model	36	40	42	43

In coordination with their teams and supervisors, employees taking advantage of "mywork@merck" can choose when and where they work.

Parental leave in Germany

As of Dec. 31	2016[1]	2017[2]	2018[2]	2019[2]
Number of employees with a right to parental leave	359	353	308	375
thereof women (recorded via maternity leave in the respective year)	191	151	188	239
thereof men (recorded via special paternity leave in the respective year)	168	202	120	136
Number of employees who took parental leave[3]	480	352	500	542
thereof women	303	150	240	248
thereof men	177	202	260	294
Number of employees on parental leave who worked part time during their leave	102	49	128	164
thereof women	95	47	109	140
thereof men	7	2	19	24
Number of employees who returned from parental leave	174	312	312	536
thereof women	62	143	65	243
thereof men	112	169	247	293
Return to work rate (%)	36.3	88.6	62.4	98.9
thereof women	20.5	95.3	27.1	98.0
thereof men	63.3	83.7	95.0	99.7
Number of employees still working for Merck one year after their return from parental leave	190	238	268	–[4]
thereof women	73	89	26	–[4]
thereof men	117	149	242	–[4]
Retention rate (%)	95.6	89.8	93.1	–[4]
thereof women	93.8	85.6	63.4	–[4]
thereof men	96.8	92.5	97.9	–[4]

1 Figures only pertain to the Darmstadt and Gernsheim sites in Germany (which accounted for around 21% of Merck Group employees in 2016). Figures are calculated on the basis of the data from one entire year, which also includes those employees who took parental leave during the calendar year but who had not returned by Dec. 31.

2 Figures pertain only to Merck KGaA (which accounted for around 20% of Merck Group employees in 2017, roughly 22% in 2018 and around 15% in 2019). Figures are calculated on the basis of the data from one entire year, which also includes those employees who took parental leave during the calendar year but who had not yet returned by Dec. 31.

3 Since parental leave can be taken for a period ranging from one month to three years, it is possible for employees to be recorded across a period of up to four calendar years. This explains why the number of employees on parental leave exceeds the number of employees who have a right to it.

4 Figure will be available on December 31, 2020.

Employees with disabilities[1] (%)

As of Dec. 31	2016	2017	2018	2019
Employees with disabilities[1]	4.5	4.3	4.3	4.4

1 Only pertains to Merck KGaA (which accounted for around 15% of Merck Group employees in 2019, calculations based on the German Social Code IX - SGB IX).

Apprentices in Germany

As of Dec. 31	2016	2017	2018	2019
Number of apprentices	576	588	604	589
% of apprentices	4.6	4.4	4.5	4.3

Environment

Part of the non-financial report

Total greenhouse gas emissions (Scope 1 and 2 of the GHG Protocol)[1]

metric kilotons	2006[2]	2016	2017	2018[3]	2019[4]
Total CO_2eq[5] emissions	**782**	**681**	**689**	**666**[6]	**665**
Thereof					
direct CO_2eq emissions	378	384	373	353[6]	359
indirect CO_2eq emissions	404	297	316	313[6]	306
Biogenic CO_2 emissions	**0**	**14**	**13**	**13**	**12**

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 as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions (e.g. Sigma-Aldrich in 2015) or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

2 Baseline for our emission targets is 2006.

3 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

4 The figures exclude Versum Materials since the integration process is still underway. Based on the figures Versum Materials reported for the previous two years (not calculated in accordance with our metrics), we expect this to add roughly 1.3 million metric tons of CO_2eq per year to our carbon footprint. More information can be found under Report profile.

5 eq = equivalent

6 Figure retroactively adjusted.

Our response to the Carbon Disclosure Project contains a detailed description of our calculation methods.

We have included the following gases in our calculation of direct and indirect CO_2eq emissions:

Direct CO_2 emissions: CO_2, HFCs, PFCs; CH4/N2O negligible; SF6/NF3 not available.

Indirect CO2 emissions: CO2.

In 2019, we emitted 0.041 kg of CO_2eq per euro of net sales.

Other relevant indirect greenhouse gas emissions (Scope 3 of the GHG Protocol)[1]

	2016	2017	2018[2]	2019[3]
Total gross other indirect emissions (metric kilotons CO_2eq[4])	**426**	**353**	**380**	**373**
Fuel- and energy-related emissions, not included in Scope 1 or 2 (category 3)	127	118	131	127
Waste generated in operations (category 5)	127	68	80	84
Business travel - air travel (category 6)	103[5]	98	103	86
Business travel - rail travel[6] (category 6)	0.02	0.02	0.02	0.02
Business travel - rental car travel (category 6)	0.6	0.6	1.4	1.3
Employee commuting (category 7)	68	68	66	75
Upstream leased assets (category 8)	0.0[7]	0.0[7]	0.0[7]	0.0[7]
Processing of sold products (category 10)	0.0[8]	0.0[8]	0.0[8]	0.0[8]
Downstream leased assets (category 13)	0	0	0	0
Franchises (category 14)	0	0	0	0

1 Because of the characteristics of the Scope 3 emissions data we do not correct these data subsequently.

2 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

3 The figures exclude Versum Materials since the integration process is still underway. Exception: Category 7: The figure is based on the headcount as of December 31, 2019 and thus includes Versum Materials. With the exception of scope 3 category 6 emissions, the data from Intermolecular are already included. More information can be found under Report profile.

4 eq = equivalent

5 This figure covers roughly 95% of the employees of the Merck Group because the data for the employees of Sigma-Aldrich, acquired in November 2015, are only partially available.

6 German Railway

7 Already covered under Scope 1 and 2 emissions

8 Merck produces a huge variety of intermediate products for various purposes. Due to their many applications and our customer structure, the associated greenhouse gas emissions cannot be tracked in a reasonable fashion.

No data are available for Scope 3 categories not listed above. Their relevance to Merck is assessed in the Scope 3 document.

Biogenic emissions (Scope 3), if present, are not being recorded.

Emissions of ozone-depleting substances

metric tons	2016	2017	2018[1]	2019[2]
Total emissions of ozone-depleting substances	2.2	1.9	1.5	1.0
CFC-11eq[3]	0.1	0.1	0.1	0.1

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

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

3 CFC-11eq is a unit of measure used to compare the potential of various substances to deplete the ozone. Reference value 1 indicates the potential of CFC-11 to cause the depletion of the ozone layer.

Substances included: R-12, R-22, R-123, R-141b, R-401a, R-402a, R408a, R-409a, R-502.

Source for the emission factors: Montreal Protocol.

Other air emissions

metric kilotons	2016	2017	2018[1]	2019[2]
Volatile organic compounds (VOC)	0.3	0.3	0.3	0.3
Nitrogen oxide	0.2	0.2	0.3	0.3
Sulfur dioxide	0.05	0.03	0.01	0.01
Dust	0.02	0.04	0.01	0.01

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

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

The VOC, nitrogen oxide, sulfur dioxide, and dust emissions reported here are attributable to production activities as well as energy generation. These figures do not include emissions from vehicles. Emissions are determined partially based on measurements and partially based on calculations or estimates. Only some sites are required to measure individual parameters.

Transport of finished goods, by means of transportation

	2016	2017	2018	2019[1]
% truck	71	73	74	70
% boat	18	15	14	19
% airplane	11	12	12	11

1 The figures exclude Versum Materials and Intermolecular since the integration process is still underway. For more information, see report profile.

The figures contain the volumes of the biggest global distribution centers of our Healthcare, Life Science and Performance Materials business sectors. These figures pertain to the total weight of transported products and indicate the primary means of transport.

In shipping finished goods from our production sites to the local warehouses of our subsidiaries, we have been working to reduce the use of air shipping in favor of sea freight. This change aims to both reduce costs as well as lower transport-related CO_2 emissions.

Energy consumption[1]

In GWh	2016	2017	2018[2]	2019[3]
Total energy consumption	**2,117**	**2,194**	**2,227**[4]	**2,240**
Direct energy consumption	**1,330**	**1,319**	**1,323**[4]	**1,339**
Natural gas	1,260	1,254	1,257[4]	1,273
Liquid fossil fuels[5]	36	32	32	33
Biomass and self-generated renewable energy	34	33	34	33
Indirect energy consumption	**787**	**875**	**904**[4]	**901**
Electricity	692	729	755[4]	756
Steam, heat, cold	95	146	149	145
Total energy sold	**0.3**	**0.1**	**0.0**	**0.1**
Electricity	0.3	0.1	0.0	0.1
Steam, heat, cold	0	0	0	0

In TJ				
Total energy consumption	**7,621**	**7,898**	**8,016**[4]	**8,065**
Direct energy consumption	**4,788**	**4,748**	**4,762**[4]	**4,821**
Natural gas	4,536	4,514	4,525[4]	4,583
Liquid fossil fuels[5]	130	115	115	119
Biomass and self-generated renewable energy	122	119	122	119
Indirect energy consumption	**2,833**	**3,150**	**3,254**[4]	**3,244**
Electricity	2,491	2,624	2,718[4]	2,722
Steam, heat, cold	342	526	536	522
Total energy sold	**1.1**	**0.4**	**0.0**	**0.4**
Electricity	1.1	0.4	0.0	0.4
Steam, heat, cold	0.0	0.0	0.0	0.0

1 In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the energy consumption has been calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

2 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

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

4 Figure retroactively adjusted.

5 Light and heavy fuel oil, liquefied petroleum gas (LPG), diesel and gasoline

At our sites in Billerica (MA, United States), Bedford (MA, United States), Molsheim (France), Tel Aviv (Israel), Rome (Italy), Guatemala City (Guatemala), Shizuoka-ken (Japan), and Shanghai (China), we use photovoltaics to produce power.

Merck currently only records purchased secondary energy – this is primarily electricity and, to a lesser extent, heat/steam/cold. Details on the local energy mix, including the respective percentage of primary energy, renewable energy, etc. are not available. Data on local energy efficiency in electricity or heat generation are not available either. Our production sites are located in countries with a widely varying energy mix.

Our Darmstadt and Gernsheim sites in Germany consume the most energy, representing 28% of our Group-wide total. Here, fossil energy (coal, gas, etc.) accounts for approx. 49%, nuclear energy approx. 13% and renewable energies approx. 38% of the energy mix. Renewable energies account for a higher share of electricity generation at production sites in Switzerland, with nuclear energy taking the lead in France. Based on an estimated global energy efficiency of 37% for the conversion and distribution of generated electricity, this results in a primary energy consumption of 2,043 GWh for 2019. Based on an estimated global energy efficiency of 85% for heat/steam/cold, this results in a primary energy consumption of 170 GWh for 2019. This yields a total primary energy consumption of 2,213 GWh for 2019. (The calcula-

tion is based on factors stated in the "Manual for energy management in practice - Systematically reducing energy costs" published by DENA, 12/2012.)

In 2019, Merck's energy intensity relative to net sales totaled 0.14 kWh/€.

Water withdrawal

millions of m^3	2016	2017	2018[1]	2019[2]
Total water withdrawal	**13.7**[3]	**14.0**	**14.7**	**14.0**
Surface water (rivers, lakes)	1.8	1.9	2.1	1.9
Groundwater	7.2	7.3	7.2	6.8
Drinking water (from local suppliers)	4.7[3]	4.8	5.3	5.2
Rain water and other sources	0.01	0.00	0.05	0.05

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.
2 The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.
3 Figure retroactively adjusted.

These figures do not include the ground water that we use for safety measures at our Gernsheim site in Germany. Here, the water is fed back directly into natural circulation.

Water reused

millions of m^3	2016	2017	2018[1]	2019[2]
Water reused	22.7	22.4	24.4	23.3

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.
2 The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.

The recirculating cooling system at our Darmstadt, Germany facility accounts for the majority of reused water as it allows the water to be re-utilized multiple times. The volume of reused water is thus greater than the total volume of consumed water.

Wastewater volume and quality[1]

	2016	2017	2018[2]	2019[3]
Total wastewater volume (millions of m^3)	**12.9**	**13.1**	**13.5**	**13.2**
Chemical oxygen demand (metric tons of O_3)	1,535	1,537[4]	1,509[4]	1,562
Phosphorous (metric tons)	12	8	10[4]	12
Nitrogen (metric tons)	378[4]	234	260[4]	481
Nickel (kg)	29	32	30[4]	32
Lead (kg)	31	35	30[4]	34
Cadmium (kg)	7	6	6	6
Mercury (kg)	2	1	0	0

1 In alignment with ICCA reporting requirements specified by Cefic, we track heavy metal emissions from lead, cadmium, nickel, and mercury.
2 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.
3 The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.
4 Figure retroactively adjusted.

The wastewater volume includes indirect discharge into both public and Merck-owned wastewater treatment plants, as well as direct discharge (such as rainwater and cooling water).

The wastewater treatment plant at our Gernsheim, Germany site also treats wastewater from the neighboring municipality of Biebesheim. The communal wastewater from Biebesheim is included in the wastewater volume as well as in the emissions stated in the table.

Emissions are determined partially based on measurements and partially based on calculations or estimates. Only some sites are required to measure individual parameters.

Hazardous and non-hazardous waste

metric kilotons	2016	2017	2018[1]	2019[2]
Total waste	**256**	**255**	**245**[3]	**244**
Hazardous waste disposed[4]	47	43	44	44
Non-hazardous waste disposed[4]	38	33	54	41
Hazardous waste recycled[5]	82	72	75[3]	78
Non-hazardous waste recycled[5]	89	107	72	81

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.
2 The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.
3 Figure retroactively adjusted.
4 Disposed = incineration (without energy recovery) and landfill
5 Recycled = incineration (with energy recovery) and material recycling

Exported/Imported hazardous waste

metric kilotons	2016	2017	2018[1]	2019[2]
Exported[3]	4.6	4.9	4.5	4.3
Imported	0.010	0.005	0.000	0.000

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.
2 The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.
3 Disposal primarily within the EU and the United States.

In 2019, approx. 3% of hazardous waste was shipped internationally.

Waste by disposal method

	2016	2017	2018[1]	2019[2]
Total waste (metric kilotons)	**256**	**255**	**245**[3]	**244**
Disposed waste	**85**	**76**	**98**	**84**
Landfilled waste	15	13	35	26
Incinerated waste	70	63	63	58
Recycled waste	**171**	**179**	**147**[3]	**160**
Material recycling	139	149	127[3]	132
Waste-to-energy	32	30	20	28
Recycling rate (%)	**67**	**70**	**60**	**66**

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.
2 The figures exclude Versum Materials since the integration process is still underway. More information can be found under Report profile.
3 Figure retroactively adjusted.

As in previous years, the total waste generated continues to be heavily influenced by the waste from construction and remodeling activities. Construction, excavation and demolition waste accounted for 31% of our waste in 2019. Around 49 metric kilotons of construction, excavation and demolition waste was recycled.

Significant spills

	2016	2017	2018[1]	2019[2]
Total number of significant spills	0	0	0	0

1 Since 2018, our reported figures have excluded the Consumer Health business, which was divested on December 1, 2018.

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

community

Spending on community involvement

€ million	2016	2017	2018[1]	2019
Total spending	43.0	33.8	35.7	46.2

1 From 2018 on, we are separating spending on programs of the Merck Foundation from our community involvement figures.

We calculate the value of pharmaceutical product donations according to the WHO Guidelines for Medicine Donations; for other product donations, we apply their fair value.

Total spending includes the community outreach activities of Versum Materials and Intermolecular from October to December 2019.

Community involvement spending by region[1]

	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2018					
€ million	10.1	2.2	2.6	0.7	20.1
%	28	6	7	2	57
2019					
€ million	**10.6**	**3.4**	**2.3**	**0.5**	**29.3**
%	**23**	**7**	**5**	**1**	**64**

1 This table presents the regions across the globe in which we support initiatives. For projects that benefit multiple regions, we have calculated the amount per region by dividing the project spending evenly per country.

Regional spending includes the community outreach activities of Versum Materials and Intermolecular from October to December 2019.

From 2018 on, we are separating spending on programs of the Merck Foundation from our community involvement figures.

Focus of our local community involvement[1]

%	2016	2017	2018[2]	2019
Global Health	35	38	34	33
Broad Minds: Education and culture	36	43	42	38
Sustainable Solutions: Environment	5	4	2	3
Disaster relief	2	2	2	2
Other	22	13	20	24

1 Based on number of projects

2 From 2018 on, we are separating spending on programs of the Merck Foundation from our community involvement figures.

Spending per category includes the community outreach activities of Versum Materials and Intermolecular from October to December 2019.

Motivations for our community involvement[1]

%	2016	2017	2018[2]	2019
Charitable activities	4	9	7	6
Community investment	87	84	88	91
Commercial initiatives in the community	9	7	5	3

1 Based on total spending on all projects

2 From 2018 on, we are separating spending on programs of the Merck Foundation from our community involvement figures.

We categorize the motivations for our activities based on the London Benchmarking Group model as well as the guidelines of the Bertelsmann Foundation for corporate social responsibility. Projects that primarily aim to make improvements within the community are classified as community investment.

Initiatives that are predominantly aimed at company-relevant factors such as image or personnel recruitment are classified as commercial initiatives in the community. Charitable activities cover any other projects that benefit a charitable organization, but cannot be listed under either of the other two motivation categories due to missing data or their narrow scope.

Spending per category includes the community outreach activities of Versum Materials and Intermolecular from October to December 2019.

Goals

Part of the non-financial report

Legend: New Goal | Goal achieved | In Progress | Goal not achieved

Business Ethics

Compliance

Goal: Bring compliance closer to the business

Action(s):	By:	Progress by end of 2019:	Status:
Third Party Risk Management	July 2020	The new Third-Party Risk Management process is still in preparation and will be implemented step-wise as of July 2020. Until then, the existing Business Partner Risk Management process will remain in use; the specific procedures were maintained and updated in 2019.	In Progress
Money Laundering Prevention	June 2019	We rolled out a new Anti-money Laundering Policy along with a corresponding screening process for incoming payments in 2019.	Goal achieved
Self-monitoring as part of the Compliance Risk Assessment process: Integrate self-assessment of compliance program implementation status in existing Compliance Risk Assessment	July 2019	In 2019, the Compliance Programs and Support team launched a redesigned compliance risk management process. We adapted the risk evaluation process and added a new self-monitoring component.	Goal achieved

Supply chain standards

Goal: Ensure that suppliers adhere to ethical, social, environmental and compliance standards

Action(s):	By:	Progress by end of 2019:	Status:
Perform a qualitative analysis of the available assessment and audit findings and define potential courses of action.	End of Q2/ 2019	In 2019 we redirected our efforts and focused on strengthening and further developing our risk-based approach. We have also laid the foundation of cross-collaboration across the company for an overarching concept to more efficiently manage CR-related matters in 2020.	
Develop a due diligence process for Responsible Minerals Sourcing according to the OECD guidance for upstream processes and integrate it into the working processes of the affected units.	End of Q3/ 2019	In the second half of 2019, a working group with representatives from business sectors and Group functions was established. At the end of 2019, the elements of a draft conflict minerals system were developed and will be further defined in 2020.	
Develop a due diligence process for palm oil sourcing according to international guidance and implement it within the working processes of the affected units.	End of 2019	In 2019, we focused on other topics and therefore did not reach our goal for palm oil sourcing. However, we aim to develop a due diligence process by the end of 2020.	

Animal welfare

Goal: Re-accredit relevant animal facilities

Action(s):	By:	Progress by end of 2019:	Status:
Re-accredit relevant animal facilities.	Ongoing	In 2019, one site in Italy has completed its re-accreditation. Re-accreditations are conducted every three years.	

Goal: Ensure animal welfare in our supply chain

Action(s):	By:	Progress by end of 2019:	Status:
Develop and implement an audit plan for suppliers.	Ongoing	Audit plans were developed and implemented in 2019 as planned. The process is up and running.	

Goal: Promote the 3Rs (Reduce, Refine, Replace)

Action(s):	By:	Progress by end of 2019:	Status:
Develop a Group-wide 3R program.	Ongoing	The internal 3Rs Award for increasing internal awareness was held again in 2019.	

products

Health for all

Focus programs

Goal: Eliminate schistosomiasis

Hand in hand with our partners, we aim to eliminate the tropical worm disease schistosomiasis worldwide

Action(s):	By:	Progress by end of 2019:	Status:
Donate up to 250 million praziquantel tablets annually to the World Health Organization (WHO) for African school-aged children.	Ongoing	Following the orders for 2019 by WHO, we donated nearly 233 million tablets for distribution in 35 countries, 32 of which in Africa. We continue to maintain production capacities at a level sufficient for manufacturing 250 million praziquantel tablets a year. We signed a new Memorandum of Understanding with WHO in July 2019, extending our partnership for another five years.	
Optimize the praziquantel formulation. Milestone for 2019: complete analysis of bioequivalence study.	End of 2020	In 2019, we analyzed the results of the first bioequivalence study, which had already been completed in 2018.	
Initiate new partnerships to promote behavioral change in African school children. Milestone for 2019: extend the project to two further districts in Ethiopia.	End of 2019	We extended the behavioral change project with NALA foundation to two new districts in Ethiopia. Health and education activities focusing on safe water, sanitation and hygiene were conducted in Mizan Aman and Guraferda.	
Continue to strengthen the position of the Global Schistosomiasis Alliance (GSA) as a partner platform for advocacy, implementation, research, communication, and strategy development.	Ongoing	The GSA has taken on the role to house and oversee the implementation of a Schistosomiasis Action Plan and adjusted its work program and working groups to drive progress on the Action Plan.	

Goal: Availability: Address unmet needs through the research, development and optimization of health solutions

We aim to improve global health for underserved populations in low- and middle-income countries, with a focus on combating infectious diseases.

Action(s):	By:	Progress by end of 2019:	Status:
Develop a pediatric formulation of praziquantel for the treatment of schistosomiasis in children under six. Milestone 2020: Develop access strategy for select African countries (Q4, 2020)	End of Q4/ 2020	The Phase III trial began at the Homa Bay clinical center in Kenya in September 2019. The study is ongoing. Based on the commitment to provide patients in need with sustainable access to pediatric praziquantel, an innovative access path is currently being designed together with international key stakeholders.	
Develop a pediatric formulation of praziquantel for the treatment of schistosomiasis in children under six. Milestone 2019: start of Phase III trial.	End of Q2/ 2019	The Phase III trial started in September 2019 at the Homa Bay clinical center in Kenya. The study is ongoing.	
Develop a new antimalarial (PeEF2 inhibitor). Milestone 2020: Design of Phase II and identification of combination partner (Q4, 2020)	End of Q4/ 2020	In addition to bringing Phase Ib to completion, our work focused on designing the Phase II study, identifying a combination partner and devising a commercialization path to tailor further development.	
Develop a new antimalarial (PeEF2 inhibitor). Milestone for 2019: Completion of Phase I/Ib.	End of Q4/ 2019	Testing of PeEF2 inhibitor completed under the seamless Phase I/human blood malaria challenge model (Phase Ib).	

Pharmaceutical supply chain

Goal: Accessibility: Strengthen supply chains and provide localized health solutions

Action(s):	By:	Progress by end of 2019:	Status:
Form a partnership to improve healthcare at the point of care in developing countries.	End of 2019	We successfully launched and implemented a project in Tanzania with Bahari, a local distributor, and in collaboration with Business for Health Solutions.	

Goal: Provide and further develop the GPHF Minilab™

Action(s):	By:	Progress by end of 2019:	Status:
Update the Minilab manuals and consolidate all test methods into one single volume.	End of 2020	A print version of a consolidated English manual was completed in 2019. French and Spanish versions will follow in 2020.	

Prices of medicines

Goal: Provide patients with access to affordable, high-quality products by making more of our branded generics available.

Action(s):	By:	Progress by end of 2019:	Status:
Continue with the expansion of our branded generics portfolio.	Ongoing	We launched four branded generic products in the Philippines, three in Angola, one in Brazil, and one in Mexico.	

Goal: Provide "beyond-the-pill" solutions to patients, caregivers and physicians to enable better management of the condition while maximizing treatment outcomes.

Action(s):	By:	Progress by end of 2019:	Status:
We entered a partnership on a leading medication adherence solution, Medisafe, to pilot a customized program to cardiometabolic patients in Brazil, Russia and Mexico.	Ongoing	Significant improvement in adherence to medication across all brands could be observed during the initial 12 months of the program delivery. We extended our partnerships in Russia and Brazil.	
We entered a partnership with a leading digital diabetes prevention program provider, Blue Mesa Health, to offer an effective and customized lifestyle counselling program to prediabetic patients across different regions.	Ongoing	A proof-of-concept pilot was completed in several countries and the program was or is being offered in Guatemala, Hong Kong, the United Arab Emirates and Brazil. Launch preparations are underway in the United Arab Emirates to make the program available commercially as well.	

product safety and quality

Chemical product safety

Goal: Guided by the precautionary principle, establish a globally aligned hazard and risk communication system for all our relevant chemical products in the supply chain

Action(s):	By:	Progress by end of 2019:	Status:
Implement the Global Product Strategy: Issue product safety summaries for all hazardous substances registered under REACH	End of 2020	The VCI has limited the product safety summaries to EU REACH lead substances. Following a review by the International Council of Chemical Associations (ICCA) and the UN, the ICCA took down the website with the product safety summaries on October 1, 2019 due the broad availability of such information on various portals, such as those of chemical agencies. It is therefore unnecessary for the ICCA to continue maintaining a web portal for product safety summaries.	-
Projects for hazard communication: Update safety data sheets for non-hazardous materials	By end of 2020	In both our Life Science and Performance Materials business sectors, all safety data sheets for non-hazardous materials had been updated by the end of 2019. These figures do not yet include the products/safety data sheets from the acquisition of Versum Materials and Intermolecular.	
Harmonize safety data sheets to align with a globally uniform standard	By end of 2020	In our Life Science business sector, the harmonization process was completed at the end of 2019. In Performance Materials, we have harmonized the majority of our safety data sheets Group-wide. However, national regulations limit what we can do in terms of completely harmonizing our safety information. In the process of integrating Versum Materials and Intermolecular, which we acquired in 2019, we are verifying whether their safety information complies with the applicable regulatory requirements as well as our internal standards, and are adapting the underlying processes where necessary.	

Patient safety

Goal: Enhance patient safety through stakeholder communication

Action(s):	By:	Progress by end of 2019:	Status:
Enhance the effective and timely communication to stakeholders in agreement with health authorities.	2019	New processes were introduced to meet new health authority requirements for the communication of safety signals. Mapping of local and regional requirements for safety issues were completed.	
Enhance patient interface in agReporter application and rollout of patient-centric pharmacovigilance videos.	2019	In 2019, we made the mobile patient-centric app for reporting adverse effects (agReporter) available in six additional languages: Russian, Simplified Chinese, Italian, Taiwan Traditional Chinese, German, and Turkish (simple form) In order to promote the use of the app by patients to report adverse effects, we introduced new features:	

- Application enhanced to support mobile browser as well as Safari and Chrome
- Improvement of data quality for reported adverse effects

Goal: Empower early and fully informed decisions by addressing unmet medical needs, deep biology and drug safety

Action(s):	By:	Progress by end of 2019:	Status:
Define a scoring model as basis for product prioritization and tiered portfolio management.	2023	We formed a workstream for portfolio prioritization and tiered portfolio management to enhance focus on high-priority assets. This action will be supported by an end-to-end vendor management framework.	
Implement a risk-based approach in global patient safety processes to improve efficiency.	2023	We formed a workstream for our risk-based approach, which will operate alongside the workstream for portfolio prioritization. It will be supported by an end-to-end vendor management framework to allow the team to efficiently work with vendors.	
Develop real-time pharmacovigilance intelligence on global, regional and local levels to enable strategic decision-making.	2023	We formed a work package under the workstream for our risk-based approach, in order to develop a pharmacovigilance intelligence governance structure and tools. This governance system will help to ensure that the risk-based approach is applied when centralizing our position for pharmacovigilance strategy and negotiations with health authorities.	

Goal: Provide up-to-date safety information to our customers worldwide, based on the benefit-risk profiles of our products

Action(s):	By:	Progress by end of 2019:	Status:
Practice predictive safety by developing a robust, cross-functional benefit-risk strategy that helps us deliver therapies that are truly differentiated and provide transformational value to patients.	2023	We formed a workstream for our benefit-risk blueprint strategy in close collaboration with multiple stakeholder functions. We aim to redesign and strengthen the benefit-risk strategy, and to establish effective communication of benefit-risk assessment to internal and external stakeholders.	
Optimize and automate the processing of individual case safety reports (ICSRs) from collection to reporting, in order to significantly reduce manual efforts and further improve quality, while maintaining a high level of timely compliance in reporting.	2023	We formed a workstream to leverage automation to avoid duplicating resources and generating unsustainable operating costs.	

Product-related crime

Goal: Strengthening cross-functional collaboration within the global security network and raising awareness among other target audiences of the strategic relevance of counterfeit medicines.

Action(s):	By:	Progress by end of 2019:	Status:
Expand organizational structures and certify employees who deal with product-related crime.	Ongoing	Continued holding product crime officer training programs as well as fortnightly conference calls.	
Host conferences and seminars; share best practices and lessons learned through international networks	Ongoing	Conducted workshops and training seminars in Africa, China and Latin America. Best-practice sharing via international networks: Participated in five Pharmaceutical Security Institute conferences.	
Establish the Security Academy learning and communication platform with the aim of better imparting the relevant expertise to all Security functions and key stakeholders.	Ongoing	Kick-off held in mid-February 2020, thereafter quarterly calls.	

Goal: Develop and implement security technologies and solutions for the authentication, identification, integrity, and security of the product supply chain

Action(s):	By:	Progress by end of 2019:	Status:
Support regional activities to counter product-related crime.	Ongoing	Started a project in China to monitor online marketplaces more purposefully and pinpoint suspected cases. Implemented projects and technical/organizational measures in Mexico and Italy to better monitor the external supply chain (road transport) and minimize the risk of pharmaceutical transport robbery and product theft.	
Step up internet searches to detect counterfeit products, illegal parallel imports as well as trademark infringements	Ongoing	Start a project in China to monitor online marketplaces in a more focused manner and investigate suspected cases.	
Monitor counterfeit pharmaceuticals in conventional distribution channels as well as online sales	Ongoing	Continued monitoring through external service providers to more rapidly identify counterfeit versions of our products and take countermeasures. In 2019, we focused on transparently tracking cybercrime in China.	

Transport and warehouse safety

Goal: Ensure warehouse and transport safety for our company and our suppliers.

Action(s):	By:	Progress by end of 2019:	Status:
Harmonize transport and warehouse safety master data through Group-wide ERP systems.	End of 2020	The harmonization process was completed Group-wide.	

Goal: Ensure warehouse and transport safety for our company and third-party warehouses and avoid incidents with risks for people and the environment.

Action(s):	By:	Progress by end of 2019:	Status:
Regularly evaluate audit results, incident reports and safety-related complaints and implement the resulting corrective actions.	Ongoing	The criteria for reusing shipping cartons was revised in order to reduce waste while also continuing to comply with all required safety standards.	

Employees

Career at Merck

Goal: Consistently fill at least two-thirds of leadership positions (Role 6+) with internal candidates.

Action(s):	By:	Progress by end of 2019:	Status:
Use the Talent Management Process to identify suitable employees with leadership potential and optimize the process to systematically advance them.	Ongoing	In 2019, 87% of vacant positions (Role 6+) were filled internally.	
Build a high-potential talent pool that reflects our demographic structure.	Ongoing	We are continuously developing our high-potential talent pool, which is a reflection of the diversity within our company.	

Goal: Position our Group as an attractive employer for university graduates

Action(s):	By:	Progress by end of 2019:	Status:
Participate in university fairs and organize in-house recruiting events for graduates; position our company via employer branding channels; partner with target universities, student initiatives and organizations/associations.	Ongoing	We are continuously positioning ourselves as an attractive employer for university graduates. Our employer branding and talent sourcing measures enabled us to fill all trainee positions and other direct entry jobs by the end of 2019.	
Approach select target universities.	Ongoing	We leveraged existing measures, for instance intensive collaboration with selected university departments and career services, to bolster our position as an attractive employer for university graduates.	

Goal: Increase the share of employees (Group-wide) with development plans to 70% by 2020

Action(s):	By:	Progress by end of 2019:	Status:
Conduct extensive internal communications and people development campaigns and optimize existing tools	End of 2020	The percentage of employees with development plans increased from 70% (2018) to 75% (2019).	
Create awareness and share knowledge	End of 2020	We are taking steps to raise awareness of development plans and help employees to create a solid one.	

Fairness and dialogue

Goal: Measure and improve employee engagement

Action(s):	By:	Progress by end of 2019:	Status:
Implement a regularly occurring process to measure employee engagement and take actions to improve it.	Ongoing	In 2019, we once again conducted a Group-wide employee survey.	

Diversity

Goal: Our target is to maintain a 30% representation of women in leadership roles (Role 4+) until 2021.

Action(s):	By:	Progress by end of 2019:	Status:
Deploy teams at business sector level to develop goals and measures to move women into positions in various hierarchies	End of 2021	All business sectors have set up their own teams that are dedicated to pursuing the objectives and measures and network with one another. For example, all business sectors have started to introduce our inclusion training. Moreover, we offer specific sponsoring or mentoring programs for women.	

Health and safety

Goal: Reduce the lost time injury rate Group-wide (to 1.5 or less)

Action(s):	By:	Progress by end of 2019:	Status:
Reinforce our safety culture to prevent behavior-related accidents. Roll out our BeSafe! program at all legacy Sigma-Aldrich sites and monitor ongoing implementation via appropriate performance indicators.	End of 2020	In 2019 we achieved a Group-wide LTIR of 1.5. Manager training and safety walkabouts helped us maintain a high level of safety awareness. We took these steps at numerous sites – including 12legacy Sigma-Aldrich facilities.	

Environment

Environmental stewardship

Goal: Incorporate all production sites into our Group ISO 14001 certificate for environmental management systems.

Action(s):	By:	Progress by end of 2019:	Status:
At newly acquired production sites, introduce environmental management systems in line with our Group ISO 14001 certificate and certify them accordingly.	Ongoing	In 2019, no new sites were added to our Group certificate. All sites relevant to the Group certificate had already achieved ISO 14001:2015 certification.	

Climate action

Goal: 20% reduction in our direct and indirect greenhouse gas emissions (Scope 1 and 2) by 2020 relative to the 2006 baseline

Action(s):	By:	Progress by end of 2019:	Status:
Systematically examine the energy consumption at our individual production sites	End of 2020	In line with the EU Energy Efficiency Directive, we performed renewed energy audits pursuant to EN 16247 at various European sites. Our Energy Management & Technology unit (from the Darmstadt/Gernsheim sites (both Germany)) supported our sites in this endeavor and performed audits in Calais, Meyzieu and Semoy (all in France) as well as in Ivrea (Italy). Furthermore, our Life Science business sector conducted energy management surveys at its sites in 2019. We use the data points collected to create a roadmap so as to streamline our energy management approach. Moreover, in July, Healthcare launched the EHS dashboard, a tool that aims to increase knowledge and transparency of environmental emissions to top leaders and the EHS community.	
Identify and implement potential energy savings.	End of 2020	In developing a new climate action target, we are revising our approach to promoting energy efficiency projects and hosted an energy efficiency conference to discuss the matter. In addition, we set up an Energy Management intranet site to provide a platform for sharing best practices and lessons learned and to evolve energy efficiency strategies; we furthermore formed international work groups to address interdisciplinary topics relating to energy efficiency.	
Reduce process-related emissions	End of 2022	In early 2019, we transferred a production line to a new site and can now manufacture these products in an emission-free plant. This led to an additional 10,000 metric tons of CO_2eq savings. Throughout 2018 and 2019, we initiated two additional process emission reduction projects that will continue through the year 2022. Using 2018 production volumes as our baseline, these projects are expected to save an additional 55,000 metric tons of CO_2eq. Further projects are being evaluated for feasibility.	
Renewable energies	End of 2020	In 2019, we started integrating the purchase of electricity from renewable sources into the scope of our climate action goal. In line with the Greenhouse Gas Protocol (GHG Protocol), we are now capturing our emissions using both the market-based and the location-based approach. Moreover, in the United States, we have additionally purchased renewable energy credits (REC) in order to achieve our 20% target.	

Waste and recycling

Goal: Reduce the environmental impact of our waste disposal (Merck Waste Score) by 5% by 2025 (baseline 2016)

Action(s):	By:	Progress by end of 2019:	Status:
Continuously look for ways to improve our production processes and disposal methods.	Ongoing	Through a pilot of our ProMec initiative, we are recycling approximately 1,300 metric tons of liquid production waste per year.	

Water management

Goal: Introduce a sustainable water management system at 24 of our manufacturing facilities with high water use by 2020

Action(s):	By:	Progress by end of 2019:	Status:
Meet the "advanced" requirements set out in the CEFIC flagship self-assessment tool (stage 3). This will assess our sites' impact on the water situation in the vicinity of each individual site.	May 2020	During stage 3 of the self-assessment, we will assess the environmental impacts caused by our discharged water. This process will continue until May 2020 without an interim audit.	

Goal: Reduce our water use at sites in water-stressed areas by 10% relative to the 2014 baseline.

Action(s):	By:	Progress by end of 2019:	Status:
Processes optimized to curb water consumption at seven production sites in Mexico, Spain, Taiwan, and the United States.	2020	Water use was reduced by 21% at the respective sites.	

Recognition and rankings

The following overview presents a selection of major awards and recognition that we have received or achieved. Information on additional recognition and accolades received by individual businesses or sites can be found in the respective chapter of our 2019 Corporate Responsibility Report, or on our website.

CR performance

Access to Medicine Index

In 2018, our company ranked fourth in the Access to Medicine Index, a position we have held since 2016 and one that has consistently put us among the top five firms in the Index. Published every two years by the international non-profit Access to Medicine Foundation, this index ranks the top 20 largest pharmaceutical companies based on their efforts to address access to medicine in low- and middle-income countries.

www.accesstomedicineindex.org

CDP climate and water

We've been reporting our climate actions to the CDP (formerly the Carbon Disclosure Project) since 2008. In 2019, our climate impact mitigation activities scored a C in the CDP, the same as in 2018. This initiative measures the strategies companies use to reduce emissions along with their successes, as well as how they manage their risks and opportunities on climate change.

In addition to reporting on our climate action, since 2016 we have been reporting our water-related performance and processes to the CDP. In 2019, we received a B for our water management practices, up from a B- in 2018.

The CDP evaluates companies' performance in the areas of climate and water on a scale from A to D-, with A being the top score.

www.cdp.net

EcoVadis rating

The independent rating agency EcoVadis evaluates suppliers from 150 countries across the categories of Environment, Labor and Human Rights, Ethics, and Sustainable Procurement. As a member of the Together for Sustainability initiative, we also undergo this assessment; in 2019 we were again assessed and awarded platinum status in 2020, putting us among the top 1% of all participating companies.

www.ecovadis.com

ESG Rating from MSCI

MSCI is one of the world's largest providers of financial services for institutional investors as well as environment, social and governance ratings (ESG). This independent organization assesses companies according to their exposure to industry-significant ESG risks and their ability to manage those risks relative to industry peers. In May 2019, MSCI gave us an "AAA", their highest ESG rating and one that puts us among the top 2% of all companies evaluated. They particularly praised our Group-wide ISO 9001 certification, our compliance activities and our robust quality management system.

www.msci.com/esg-ratings

ESG Rating from Sustainalytics

Sustainalytics is a firm that rates the sustainability of listed companies based on their environmental, social and corporate governance (ESG) performance. In 2018, this organization awarded us 79 out of 100 points, putting us among the leading pharmaceutical companies. We received particularly high marks in the categories of corporate governance and community outreach, and our environmental performance likewise earned a high score that far exceeded the average.

www.sustainalytics.com

Good Company Ranking

In 2018, the management consultancy Kirchhoff Consult released its sixth Good Company Ranking, an index that is published every two years. Among the German blue-chip companies in the DAX 30, we took fourth place in this latest round, having moved up six positions from our 2016 rating. The ranking is published every two years.

www.kirchhoff-consult.com

Institute for Ecological Economy Research ranking

In 2018, the Institute for Ecological Economy Research (IÖW) and "future e. V. – Verantwortung unternehmen" issued its tenth ranking of sustainability reporting by major German companies. Published every two years, this index assesses factors such as the environmental impacts of production processes, transparent communication and efforts to enhance supply chain sustainability. Our 2017 CR Report achieved a score of 426 in the latest ranking, putting us in sixth place. The ranking is published every two years.

www.ranking-nachhaltigkeitsberichte.de/en

ESG company rating

In 2019, the Institutional Shareholder Services (ISS) group of companies again gave our Group a B- on a scale of A+ (top mark) to D-, once more granting us Prime Status ("good" to "very good") as in 2018.

www.issgovernance.com/esg

Children's rights and business

The Boston Consulting Group and the "Global Child Forum", a Stockholm-based non-profit foundation to promote children's rights conducted a global benchmark study in 2019 entitled "The State of Children's Rights and Business 2019: From Promise to Practice". We achieved an average score of 9.5 out of 10 and have been classified as a "Leader" regarding our action for children's rights. Our performance in the "Workplace" and "Community & Environment" categories received particularly high marks that were far above average.

www.globalchildforum.org

sustainability indices

Ethibel Sustainability Index (ESI) Excellence Europe and Ethibel EXCELLENCE Investment Register

Since 2015 we have been a constituent of the ESI Excellence Europe, a sustainability index that comprises the 200 top-rated European companies based on their corporate responsibility performance. We are also included in the Ethibel EXCELLENCE Investment Register.

www.forumethibel.org

Euronext Vigeo Eiris Index

Since 2015, we have been a constituent of the Euronext-Vigeo Eurozone 120, an index that features the 120 most successful European companies in terms of their environmental, social and governance practices. Since June 2019, we have also been constituents of the Euronext Vigeo Europe 120 index.

www.vigeo-eiris.com

FTSE4Good Index

Since 2008, we have been included in the FTSE4GOOD Index, a leading international ethical investment stock market rating that annually measures the performance of companies in demonstrating strong environmental, social and governance practices.

www.ftse.com

STOXX® Global ESG Leaders Index

In 2019, our company was once again included in the STOXX Global ESG Leaders sustainability index, which assesses companies based on key environmental, social and governance criteria.

www.stoxx.com

CR awards

Prize for research and development

The R&D 100 Awards are among the most prestigious innovation awards in the world, honoring research and development pioneers. In November 2019, one of these awards recognized our first-to-market innovation Eshmuno® CP-FT Resin , which can be used to efficiently remove aggregates from antibodies, thus lowering the risk to patients. Moreover, this product yields higher capacities than traditional methods and results in a smaller ecological footprint from manufacturing.

www.rdworldonline.com

Top Employers Institute recognition

The annual international evaluation conducted by the Top Employers Institute recognizes leading employers around the world through a stringent evaluation process. Including more than 1,500 companies across 118 countries, this evaluation is based on a detailed assessment of HR processes and structures. In February 2019, we were named one of only 14 global employers of choice by the Top Employers Institute, which recognized our achievements in talent development, performance management, and career and succession planning.

In addition to the Global Top Employer 2019 certification, our Group was also named as a Top Employer Europe 2019 as well as a Top Employer Germany 2019.

www.top-employers.com/en

Most Attractive Employers ranking

The success of our efforts is also confirmed by our ranking among the 100 most attractive employers for students and professional scientists in Germany. This index is published annually by employer branding specialist Universum and involves a survey of more than 5,000 people. In the category of Natural Sciences, we again ranked fifth in the student survey and even moved up one place to be ranked sixth by experienced professionals in 2019.

www.universumglobal.com

Award from Science Magazine

Science, a leading peer-reviewed academic journal, once more named us a top employer. Almost 8,000 employees and managers from biotech and pharmaceutical companies took part in the magazine's online survey, ranking our company fourth. We were praised especially for prioritizing thinking ahead, adapting, and communicating.

www.sciencemag.org

subsidiary awards

CSR Award for "Happy Workplace"

In April 2019, Merck in Taiwan received the 2019 CSR Award for "Happy Workplace" from Global View Magazine, a prestigious business magazine in Taiwan. We are honored to be recognized alongside other multinational and Taiwan-based global companies.

Best places to work

In 2019, the Boston Business Journal added us to their list of Best Places to Work, which honors leading employers in the Boston area (Massachusetts, USA) that have built outstanding work environments for their employees. The final rankings were determined through online surveys conducted among employees of each company.

www.bizjournals.com

One of the most sustainable pharmaceutical companies

In 2019, the business magazine "Exame" listed us as one of the most sustainable pharmaceutical companies in Brazil. The magazine highlighted our promotion of diversity and inclusion specifically in terms of gender equality.

non-financial report

Part of the non-financial report

Index for the combined separate integrated non-financial report

Through our combined separate integrated non-financial report, we fulfill the legal requirements. The separate non-financial report of the Merck Group has been combined with the separate non-financial report of the parent undertaking, Merck KGaA, in accordance with Section 289b (3) sentence 2 in conjunction with Section 298 (2) of the German Commercial Code, and integrated into our Corporate Responsibility Report. The following index provides an overview of the contents of the non-financial report and contains links to the relevant passages in the CR report. External references within our CR Report are not part of the non-financial report.

To provide the type of framework stipulated in Section 289d in conjunction with Section 315c (3) of the German Commercial Code, we have applied the standards of the Global Reporting Initiative (Option: Comprehensive) for this report.

Description of business model

We describe our business model, corporate structure, governance and Group strategy under Company profile.

Strategic and organizational approach to sustainability

Under Governance, we present external guidelines and initiatives to which we've committed ourselves, along with Group-wide guidelines that are the cornerstone of our responsible governance. Our CR strategy sets out how we practice corporate responsibility, both in terms of strategy and at the organizational level.

Material aspects and issues

To determine the aspects and matters of relevance to the non-financial report, we conducted a materiality analysis that identified several matters that could not be assigned to any of the five aspects defined as minimum contents under Section 289c (2) of the German Commercial Code. Along with these five aspects, we have therefore decided to report on the following additional relevant matters:

Aspect	Matter
Environmental matters	▪ Environmental stewardship ▪ Pharmaceutical and chemical residues in the environment (incl. abandoned hazardous waste) ▪ Plant and process safety
Employee-related matters	▪ Health and safety ▪ Good leadership ▪ Employee engagement ▪ Employee development ▪ Recruiting and retaining employees ▪ Diversity and equal opportunities ▪ Work 4.0
Social matters	▪ Patient safety ▪ Product-related crime ▪ Responsible marketing ▪ Data protection
Respect for human rights	▪ Bioethics (incl. genome editing) ▪ Clinical studies

Anti-corruption and anti-bribery	▪ Compliance ▪ Interactions with health systems
	▪ Chemical product safety (incl. labeling of chemicals) ▪ Transport and warehouse safety ▪ Prices of medicines ▪ Innovation and R&D ▪ Digitalization

Within our approach to comprehensive risk and opportunity management, we also identify current and potential risks and opportunities in the areas of environment, community and governance. This includes information on the gross risks in terms of potential damage and probability, as well as the residual net risks remaining after mitigation measures have been effected. We did not identify any net risks that fulfill the materiality criteria as set forth by Section 289c (3) no. 3 and 4 of the German Commercial Code. Additional risks are described in the Report on Risks and Opportunities in the combined management report.

Aspect: Environmental matters

Within our Group, environmental matters fall under environmental stewardship. In the following section, we report on the measures implemented to further environmental stewardship, enhance plant and process safety, and address pharmaceutical and chemical residues in the environment (incl. abandoned hazardous waste).

Matter	Concepts incl. due diligence processes and outcome of activities
Environmental stewardship	▪ Our approach to environmental stewardship ▪ How we structure our environmental stewardship practices ▪ Material investments in environmental impact mitigation ▪ Projects and measures regarding environmental stewardship ▪ Goals and progress: Environment
Pharmaceutical and chemical residues in the environment (incl. abandoned hazardous waste)	▪ Provisions for environmental impact mitigation
Plant and process safety	▪ Our approach to plant and process safety ▪ How we organize our plant and process safety ▪ Our commitment: Standards and legislation ▪ Projects and measures regarding plant and process safety

Aspect: Employee-related matters

Within our Group, employee-related matters fall under the purview of Human Resources (HR). Under this aspect, we report on concepts pertaining to being an attractive employer. These include the matters of health and safety, good leadership, employee engagement, employee development, recruiting and retaining employees, diversity and equal opportunities and work 4.0.

Matter	Concepts incl. due diligence processes and outcome of activities
Health and safety	▪ Our approach to preventing accidents and promoting health ▪ How we manage occupational health and safety ▪ Policies and work agreements regarding health and safety ▪ Projects and measures regarding health and safety ▪ Goals and progress: Employees
Good leadership	▪ Our approach to good leadership ▪ How we facilitate good leadership ▪ Leadership behaviors ▪ Projects and measures regarding good leadership
Employee engagement	▪ Our approach to employee engagement ▪ How we engage our employees ▪ Our commitment: Group-wide Social and Labor Standards Policy ▪ Projects and measures regarding employee engagement ▪ Goals and progress: Employees
Employee development	▪ How we organize recruiting, vocational training and advanced training ▪ Employee development guideline ▪ Projects and measures regarding employee development ▪ Goals and progress: Employees
Recruiting and retaining employees (incl. work-life balance)	▪ Our approach to attracting and retaining talent ▪ How we organize recruiting, vocational training and advanced training ▪ Projects and measures ▪ Goals and progress: Employees ▪ Our approach to ensuring a good work-life balance ▪ How we strengthen work-life balance ▪ Group guidelines and local regulations regarding work-life balance ▪ Projects and measures regarding work-life balance
Diversity and equal opportunities	▪ Our approach to diversity and equal opportunity ▪ How we are making diversity a pillar of the company ▪ Our commitment regarding diversity and equal opportunities: industry-wide initiatives and regulations ▪ Projects and measures regarding diversity and equal opportunities ▪ Goals and progress: Employees
Work 4.0	▪ Projects and measures ▪ Leveraging the opportunities of digitalization

Aspect: Social matters

"Social matters" encompasses our relationship with consumers. Under this heading, we report on concepts relating to patient safety, product-related crime, responsible marketing, and data protection.

Matter	Concepts incl. due diligence processes and outcome of activities
Patient safety	▪ Our approach to ensuring patient safety ▪ How we monitor patient safety ▪ Guidelines and statutory requirements regarding patient safety ▪ Projects and measures regarding patient safety ▪ Goals and progress: Patient safety
Product-related crime	▪ Our approach to product-related crime ▪ How we are tackling product-related crime ▪ Our commitment: Group-wide guidelines and standards regarding product-related crime ▪ Projects and measures regarding product-related crime ▪ Goals and progress: Product-related crime
Responsible marketing	▪ Our approach to responsible marketing ▪ How we conduct ethical marketing ▪ Code of Conduct and industry-wide regulations regarding responsible marketing ▪ Projects and measures regarding responsible marketing
Data protection	▪ Data Privacy integrated into Group Compliance ▪ Harmonizing data privacy Group-wide ▪ Ensuring data privacy and information security ▪ Internal reporting

Aspect: Respect for human rights

Under "Respect for human rights", we report on concepts related to bioethics (including genome editing) and clinical studies.

Matter	Concepts incl. due diligence processes and outcome of activities
Bioethics (incl. genome editing)	▪ Our approach to ethical business conduct ▪ How we assess bioethical topics and issues ▪ Identifying topics and issues early on ▪ Merck Bioethics Advisory Panel discussions ▪ Projects and measures regarding bioethics
Clinical studies	▪ Our approach to safe and transparent clinical studies ▪ How we govern clinical studies ▪ International guidelines and agreements regarding clinical studies ▪ Projects and measures regarding clinical studies

Aspect: Anti-corruption and anti-bribery

Within our corporate structure, anti-corruption efforts fall under Compliance Management, so we report here on compliance and interactions with health systems.

Matter	Concepts incl. due diligence processes and outcome of activities
Compliance	▪ Our approach to compliance ▪ How we ensure compliance ▪ Guidelines and standards regarding compliance ▪ Projects and measures regarding compliance ▪ Goals and progress: Compliance
Interactions with health systems	▪ Our approach to interacting with health systems ▪ How we ensure transparency and compliance at an organizational level ▪ Group-wide guidelines and industry standards regarding interactions with health systems ▪ Projects and measures regarding interactions with health systems

Other matters

In the following section, we report on significant issues that are not covered in any of the five minimum aspects stipulated in section 289c (2) of the German Commercial Code:

Matter	Concepts incl. due diligence processes and outcome of activities
Chemical product safety (incl. labeling of chemicals)	▪ Our approach to safe chemical products ▪ How we ensure chemical product safety ▪ Legal requirements and Group-wide guidelines regarding chemical product safety ▪ Projects and measures regarding chemical product safety ▪ Goals and progress: Chemical product safety
Transport and warehouse safety	▪ Our approach to safe transport and storage ▪ How we achieve transport and warehouse safety ▪ Internal standards and international rules regarding transport and warehouse safety ▪ Projects and measures regarding transport and warehouse safety ▪ Goals and progress: Transport and warehouse safety
Prices of medicines	▪ Our approach to pricing medicines ▪ Setting medicine prices ▪ Medicine price guidelines and principles ▪ Projects and measures regarding prices of medicines
Innovation and R&D	▪ Our approach to innovation ▪ How we drive innovation ▪ Our commitment: Protecting innovative ideas ▪ Projects and measures regarding Innovation and R&D
Digitalization	▪ Our approach to driving digital innovation

GRI content index

General disclosures

The CR Report 2019 has been prepared in accordance with the GRI Standards: 'Comprehensive' option. The following GRI content index provides an overview of general disclosures, the GRI Standards and management approaches that were identified to be relevant. It also indicates where the corresponding information can be found. The GRI content index, as a part of the CR report 2019, has received an independent audit certificate after undergoing a limited assurance audit.

GRI Content Index: General disclosures

GRI Standards and Disclosure Number		Comment	Reference
Organizational profile			
102-1	Name of the organization		Company profile
102-2	Activities, brands, products, and services		Company profile Products & Industries
102-3	Location of headquarters		Company profile
102-4	Location of operations		Company profile List of shareholdings
102-5	Ownership and legal form		Company profile
102-6	Markets served		Company profile Macroeconomic and Sector-Specific Environment
102-7	Scale of the organization		Company profile Indicators: employees Indicators: environment Net sales Capitalization Consolidated Balance Sheet
102-8	Information on employees and other workers	Supervised workers such as temps are not logged in our employee data system.	Indicators: employees Career at Merck
102-9	Supply chain		Supply chain standards Mica supply chain Pharmaceutical supply chain
102-10	Significant changes to the organization and its supply chain		Company profile Supply chain standards Fundamental Information about the Group
102-11	Precautionary Principle or approach		CR strategy Environmental stewardship Transport and warehouse safety Health and safety Climate action Plant and process safety Chemical product safety Patient safety

102-12	External initiatives	CR strategy Governance Compliance Human rights Sustainable Development Goals Diversity Fairness and dialogue
102-13	Membership of associations	Stakeholder dialogue Environmental stewardship Compliance Human Rights Supply chain standards Global strategy
Strategy		
102-14	Statement from senior decision-maker	Letter from the CEO
102-15	Key impacts, risks, and opportunities	Letter from the CEO CR strategy Materiality analysis Goals Report on Risks and Opportunities
Ethics and integrity		
102-16	Values, principles, standards, and norms of behavior	CR strategy Governance Compliance Human rights Health for all Diversity Good leadership Bioethics Clinical studies Animal welfare Sustainable products Environmental stewardship
102-17	Mechanisms for advice and concerns about ethics	Compliance Diversity Mica supply chain Human rights Bioethics Clinical studies Animal welfare Indicators: business ethics
Governance		
102-18	Governance structure	CR strategy Management Statement on Corporate Governance
102-19	Delegating authority	CR strategy Procedures of the corporate bodies
102-20	Executive-level responsibility for economic, environmental, and social topics	CR strategy
102-21	Consulting stakeholders on economic, environmental, and social topics	CR strategy Stakeholder dialogue Materiality analysis Environmental stewardship Fairness and dialogue Interactions with health systems Global strategy

102-22	Composition of the highest governance body and its committees	Management Statement on Corporate Governance The Executive Board The Supervisory Board Objectives of the Supervisory Board with respect to its composition
102-23	Chair of the highest governance body	Management Statement on Corporate Governance
102-24	Nominating and selecting the highest governance body	Diversity The Executive Board Statement on Corporate Governance Gender quota Diversity policy Objectives of the Supervisory Board with respect to its composition
102-25	Conflicts of interest	Compliance Information on corporate governance practices
102-26	Role of highest governance body in setting purpose, values, and strategy	CR strategy Values and compliance Report of the Supervisory Board
102-27	Collective knowledge of highest governance body	CR strategy The Executive Board Statement on Corporate Governance
102-28	Evaluating the highest governance body's performance	Company profile Board of Partners The Supervisory Board Articles of Association Statement on Corporate Governance
102-29	Identifying and managing economic, environmental, and social impacts	CR strategy Materiality analysis Stakeholder dialogue Compliance Report profile Report on Risks and Opportunities Statement on Corporate Governance
102-30	Effectiveness of risk management processes	CR strategy Report profile Report on Risks and Opportunities Report of the Supervisory Boards
102-31	Review of economic, environmental, and social topics	CR strategy Report profile Report on Risks and Opportunities Report of the Supervisory Boards
102-32	Highest governance body's role in sustainability reporting	Report profile
102-33	Communicating critical concerns	Compliance Values and compliance
102-34	Nature and total number of critical concerns	Compliance Values and compliance

102-35	Remuneration policies		Compensation report
102-36	Process for determining remuneration		Compensation report
102-37	Stakeholders' involvement in remuneration		Career at Merck Compensation report Voting results Annual General Meeting 2019
102-38	Annual total compensation ratio	Competitive salaries and additional benefits not only increase our attractiveness as an employer; they also motivate our people and build loyalty to the company. The compensation we offer is based on market analyses in the relevant field and the value of the respective position, as well as the employee's skill set and performance. Our Global Rewards Policy defines the framework for compensation and benefits across the entire Group. As far as possible, we strive to offer all our employees comparable compensation structures. Furthermore, we monitor Compliance with minimum standards. We do not consider the information required under GRI 102-38 and GRI 102-39 to be relevant to assessing the fairness of our compensation structures.	
102-39	Percentage increase in annual total compensation ratio	Competitive salaries and additional benefits not only increase our attractiveness as an employer; they also motivate our people and build loyalty to the company. The compensation we offer is based on market analyses in the relevant field and the value of the respective position, as well as the employee's skill set and performance. Our Global Rewards Policy defines the framework for compensation and benefits across the entire Group. As far as possible, we strive to offer all our employees comparable compensation structures. Furthermore, we monitor Compliance with minimum standards. We do not consider the information required under GRI 102-38 and GRI 102-39 to be relevant to assessing the fairness of our compensation structures.	
Stakeholder engagement			
102-40	List of stakeholder groups		Stakeholder dialogue
102-41	Collective bargaining agreements		Fairness and dialogue
102-42	Identifying and selecting stakeholders		Stakeholder dialogue Materiality analysis
102-43	Approach to stakeholder engagement		Stakeholder dialogue Materiality analysis
102-44	Key topics and concerns raised		Stakeholder dialogue Materiality analysis

Reporting practice

102-45	Entities included in the consolidated financial statements	Report profile Company profile
102-46	Defining report content and topic Boundaries	Report profile Materiality analysis
102-47	List of material topics	Materiality analysis
102-48	Restatements of information	Report profile
102-49	Changes in reporting	Report profile Materiality analysis
102-50	Reporting period	Report profile
102-51	Date of most recent report	Report profile
102-52	Reporting cycle	Report profile
102-53	Contact point for questions regarding the report	Report profile
102-54	Claims of reporting in accordance with the GRI Standards	GRI content index
102-55	GRI content index	GRI content index
102-56	External assurance	Report profile Assurance report GRI content index

Economic standards

GRI Content Index: Economic Standards

GRI Standards and Disclosure Number		Comment	Reference
GRI 201: ECONOMIC PERFORMANCE 2016			
103-1	Explanation of the material topic and its Boundary		Materiality analysis Climate action Water management Statement on Corporate Governance Governance Economic performance Pension schemes Report on Risks and Opportunities
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
201-1	Direct economic value generated and distributed		Indicators: community Indicators: employees Indicators: economics Consolidated Income Statement Consolidated Cash Flow Statement Information by business sector /country and region Personnel expenses
201-2	Financial implications and other risks and opportunities due to climate change	We report in detail on various aspects of climate change as part of our participation in the CDP (formerly known as the Carbon Disclosure Project).	Climate action Water management Global Compact CoP CDP Report on Risks and Opportunities
201-3	Defined benefit plan obligations and other retirement plans		Indicators: employees Pension schemes
201-4	Financial assistance received from government		Accounting: Property, plant and equipment Property, plant and equipment Research and development costs

GRI 202: MARKET PRESENCE 2016			
103-1	Explanation of the material topic and its Boundary		Career at Merck Good leadership Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
202-1	Ratios of standard entry level wage by gender compared to local minimum wage	This indicator is not relevant to us, which is why we do not collect data on the ratio of the standard entry level wage compared to local minimum wage. Our Global Rewards Policy applies to all our subsidiaries worldwide and guarantees a systematic compensation structure. Both base pay and short-term variable compensation are oriented to the median base pay of the relevant reference market. Our pay brackets are reviewed on an annual basis and reflect market conditions. It goes without saying that we always adhere to local minimum wage levels.	Career at Merck
202-2	Proportion of senior management hired from the local community	We encourage both local hiring and international appointments across all levels of the company. The percentage of local managers is not recorded as it is not relevant to our strategic personnel planning.	Good leadership
GRI 204: PROCUREMENT PRACTICES 2016			
103-1	Explanation of the material topic and its Boundary		Supply chain standards Mica supply chain Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
204-1	Proportion of spending on local suppliers		Supply chain standards
GRI 205: ANTI-CORRUPTION 2016			
103-1	Explanation of the material topic and its Boundary		Compliance Interactions with health systems Materiality analysis Values and compliance Responsible marketing
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
205-1	Operations assessed for risks related to corruption		Compliance Indicators: business ethics Values and compliance Report on Risks and Opportunities
205-2	Communication and training about anti-corruption policies and procedures		Compliance Indicators: business ethics
205-3	Confirmed incidents of corruption and actions taken	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Compliance Indicators: business ethics Report on Risks and Opportunities

GRI 206: ANTI-COMPETITIVE BEHAVIOR 2016		
103-1	Explanation of the material topic and its Boundary	Compliance Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
206-1	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	Indicators: business ethics

Additional material topics

TECHNOLOGY (Innovation and R&D, Digitalization)		
103-1	Explanation of the material topic and its Boundary	Innovation and digitalization Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
DATA PROTECTION		
103-1	Explanation of the material topic and its Boundary	Compliance Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	

Environmental standards

GRI Content Index: Environmental Standards

GRI Standards and Disclosure Number		Comment	Reference
GRI 301: MATERIALS 2016			
103-1	Explanation of the material topic and its Boundary	In all our endeavors, we attempt to efficiently utilize materials and recycle as much as possible. Where feasible, we use recycled materials (in packaging, for instance.) Overall, our company considers material consumption to be a major concern. There are few opportunities to use recycled material in our production processes, because our business model puts us at the start of the value chain. We therefore do not collect such data at the Group level. Individual data and measures are reported in the respective chapters.	Sustainable product design Packaging and recycling Environmental stewardship Waste and recycling Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
301-1	Materials used by weight or volume	Siehe GRI 103: 301	Waste and recycling Sustainable product design Packaging and recycling
301-2	Recycled input materials used	Siehe GRI 103: 301	Waste and recycling Packaging and recycling
301-3	Reclaimed products and their packaging materials	Owing to the multitude of products we supply and the minimal comparability of our various initiatives, we do not collect quantitative data at the Group level. The individual measures taken by our various businesses are reported in the respective chapters.	Waste and recycling Packaging and recycling
GRI 302: ENERGY 2016			
103-1	Explanation of the material topic and its Boundary		Environmental stewardship Climate action Sustainable product design Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
302-1	Energy consumption within the organization		Climate action Indicators: environment
302-2	Energy consumption outside of the organization		Climate action
302-3	Energy intensity		Climate action Indicators: environment
302-4	Reduction of energy consumption		Climate action Indicators: environment
302-5	Reductions in energy requirements of products and services		Sustainable product design

GRI 303: WATER AND EFFLUENTS 2018			
103-1	Explanation of the material topic and its Boundary		Environmental stewardship Water management Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
303-1	Interactions with water as a shared resource		Water management Indicators: environment
303-2	Management of water discharge-related impacts		Water management
303-3	Water withdrawal	The amount of seawater, produced water and other water withdrawn and discharged is not significant and is therefore not reported separately.	Water management Indicators: environment Climate action
303-4	Water discharge	The amount of seawater, produced water and other water withdrawn and discharged is not significant and is therefore not reported separately.	Water management Indicators: environment
303-5	Water consumption	Most of the water we use in our production is discharged directly or indirectly. Evaporation processes are not a material part of our production. At individual production sites, we bind small amounts of water in our products. We are working to implement collection systems for this consumption. As we have no water storage capacity, this information is not relevant for our company.	Water management Indicators: environment
GRI 304: BIODIVERSITY 2016			
103-1	Explanation of the material topic and its Boundary		Environmental stewardship Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
304-1	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	Land use planning takes impacts on bioversity into account, with appropriate measures being taken on a case-by-case basis.	Environmental stewardship
304-2	Significant impacts of activities, products, and services on biodiversity		Environmental stewardship
304-3	Habitats protected or restored		Environmental stewardship
304-4	IUCN Red List species and national conservation list species with habitats in areas affected by operations	Land use planning takes impacts on bioversity into account, with appropriate measures being taken on a case-by-case basis.	Environmental stewardship

GRI 305: EMISSIONS 2016			
103-1 103-2 103-3	Explanation of the material topic and its Boundary The management approach and its components Evaluation of the management approach		Environmental stewardship Climate action Materiality analysis Sustainable product design Packaging and recycling
305-1	Direct (Scope 1) GHG emissions		Climate action Indicators: environment
305-2	Energy indirect (Scope 2) GHG		Climate action Indicators: environment
305-3	Other indirect (Scope 3) GHG emissions		Climate action Indicators: environment CDP
305-4	GHG emissions intensity		Climate action Indicators: environment
305-5	Reduction of GHG emissions		Climate action Indicators: environment Sustainable product design Packaging and recycling CDP
305-6	Emissions of ozone-depleting substances (ODS)	This disclosure is not material to Merck.	Indicators: environment
305-7	Nitrogen oxides (NO_X), sulfur oxides (SO_X), and other significant air emissions	This disclosure is not material to Merck.	Indicators: environment
GRI 306: EFFLUENTS AND WASTE 2016			
103-1 103-2 103-3	Explanation of the material topic and its Boundary The management approach and its components Evaluation of the management approach		Environmental stewardship Waste and recycling Packaging and recycling Materiality analysis Plant and process safety
306-1	Water discharge by quality and destination	Please note that the effluents-related content in the current GRI 306: Effluents and Waste 2016 Standard has been updated and can be found in GRI 303: Water and Effluents 2018	
306-2	Waste by type and disposal method		Waste and recycling Packaging and recycling Indicators: environment
306-3	Significant spills		Plant and process safety Indicators: environment
306-4	Transport of hazardous waste		Indicators: environment
306-5	Water bodies affected by water discharges and/or runoff	Please note that the effluents-related content in the current GRI 306: Effluents and Waste 2016 Standard has been updated and can be found in GRI 303: Water and Effluents 2018	

GRI 307: ENVIRONMENTAL Compliance 2016		
103-1	Explanation of the material topic and its Boundary	Environmental stewardship Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
307-1	Non-Compliance with environmental laws and regulations	Environmental stewardship
GRI 308: SUPPLIER ENVIRONMENTAL ASSESSMENT 2016		
103-1	Explanation of the material topic and its Boundary	Supply chain standards Materiality analysis Mica supply chain
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
308-1	New suppliers that were screened using environmental criteria	Supply chain standards Mica supply chain
308-2	Negative environmental impacts in the supply chain and actions taken	Supply chain standards Mica supply chain

social standards

GRI Content Index: Social Standards

GRI Standards and Disclosure Number		Comment	Reference
GRI 401: EMPLOYMENT 2016			
103-1	Explanation of the material topic and its Boundary		Career at Merck Human rights Materiality analysis Work-life balance
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
401-1	New employee hires and employee turnover		Indicators: employees
401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	At Merck KGaA (15% of the company's total workforce), part-time employees receive the same job benefits as full-time workers. Employees with temporary contracts, however, are not entitled to all company benefits, such as a company pension.	Indicators: employees Career at Merck
401-3	Parental leave		Indicators: employees Work-life balance
GRI 402: LABOR/MANAGEMENT RELATIONS 2016			
103-1	Explanation of the material topic and its Boundary		Materiality analysis Fairness and dialogue
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
402-1	Minimum notice periods regarding operational changes	The regulations on periods of notice vary worldwide. We apply the rules that are in force locally. There is no need for us to track periods of notice at Group level.	

GRI 403: OCCUPATIONAL HEALTH AND SAFETY 2018

103-1 103-2 103-3	Explanation of the material topic and its Boundary The management approach and its components Evaluation of the management approach	The disclosures under GRI 403 relate to our employees and other supervised staff, both internal and external. The employees of third-party contractors are not included.	Health and safety Materiality analysis
403-1	Occupational health and safety management system		Health and safety
403-2	Hazard identification, risk assessment, and incident investigation		Health and safety
403-3	Occupational health services		Health and safety
403-4	Worker participation, consultation, and communication on occupational health and safety	Occupational health and safety committees are required by law in Germany. All employees of Merck KGaA are therefore represented by such committees, which operate at the site level. These employees account for around 15% of our total workforce. The majority of sites outside Germany also have health and safety committees to represent their employees. Each individual site is responsible for arranging and maintaining such committees. Health and safety issues are governed Group-wide by our EHS Policy. The organizational implementation of the policy is the responsibility of our individual sites and is subject to local laws and regulations. Merck KGaA, which accounts for approximately 15% of our total workforce, has works agreements in place on occupational health and safety.	Health and safety
403-5	Worker training on occupational health and safety		Health and safety
403-6	Promotion of worker health		Health and safety
403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships		Health and safety Supply chain standards
403-8	Workers covered by an occupational health and safety management system		Health and safety
403-9	Work-related injuries	We have identified the lost time injury rate (LTIR) as a key performance indicator for our company.	Health and safety Indicators: employees
403-10	Work-related ill health		Indicators: employees Health and safety Plant and process safety

GRI 404: TRAINING AND EDUCATION 2016			
103-1 103-2 103-3	Explanation of the material topic and its Boundary The management approach and its components Evaluation of the management approach		Career at Merck Good leadership Materiality analysis Plant and process safety Work-life balance Diversity Environmental stewardship
404-1	Average hours of training per year per employee	We do not keep track of the average hours our employees spend on vocational training and continuing education because this indicator does not have any bearing on the quality or success of our efforts.	Career at Merck Plant and process safety Environmental stewardship Good leadership
404-2	Programs for upgrading employee skills and transition assistance programs		Career at Merck Diversity Good leadership Work-life balance
404-3	Percentage of employees receiving regular performance and career development reviews		Career at Merck Indicators: employees
GRI 405: DIVERSITY AND EQUAL OPPORTUNITY 2016			
103-1 103-2 103-3	Explanation of the material topic and its Boundary The management approach and its components Evaluation of the management approach		Diversity Career at Merck Materiality analysis Objectives of the Supervisory Board with respect to its composition
405-1	Diversity of governance bodies and employees	Since there is no globally uniform definition of the term "minority", we do not record this sort of data. Moreover, many countries in which we operate have strict data privacy regulations governing the recording of personal employee data.	Diversity Indicators: employees The Executive Board The Supervisory Board Objectives of the Supervisory Board with respect to its composition
405-2	Ratio of basic salary and remuneration of women to men	The salaries we offer are predicated on the respective job description and are based on our Global Job Catalog, which has fixed salary bands that are identical for men and women. Variable salary components that fall under performance-based compensation are paid on the basis of whether mutually agreed targets have been achieved. A performance management system governs this process.	Career at Merck

GRI 406: NON-DISCRIMINATION 2016		
103-1	Explanation of the material topic and its Boundary	Diversity Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
406-1	Incidents of discrimination and corrective actions taken	Diversity Compliance
GRI 407: FREEDOM OF ASSOCIATION AND COLLECTIVE BARGAINING 2016		
103-1	Explanation of the material topic and its Boundary	Supply chain standards Mica supply chain Human rights Compliance Materiality analysis Fairness and dialogue
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
407-1	Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	Supply chain standards Mica supply chain Human rights Fairness and dialogue
GRI 408: CHILD LABOR 2016		
103-1	Explanation of the material topic and its Boundary	Supply chain standards Mica supply chain Human rights Compliance Materiality analysis Fairness and dialogue
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
408-1	Operations and suppliers at significant risk for incidents of child labor	Supply chain standards Mica supply chain Indicators: employees Fairness and dialogue
GRI 409: FORCED OR COMPULSORY LABOR 2016		
103-1	Explanation of the material topic and its Boundary	Supply chain standards Mica supply chain Human rights Compliance Materiality analysis Fairness and dialogue
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
409-1	Operations and suppliers at significant risk for incidents of forced or compulsory labor	Supply chain standards Mica supply chain Human rights Fairness and dialogue

GRI 412: HUMAN RIGHTS ASSESSMENT 2016			
103-1	Explanation of the material topic and its Boundary		Human rights Compliance Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
412-1	Operations that have been subject to human rights reviews or impact assessments		Human rights
412-2	Employee training on human rights policies or procedures		Human rights
412-3	Significant investment agreements and contracts that include human rights clauses or that underwent human rights screening		Human rights
GRI 414: SUPPLIER SOCIAL ASSESSMENT 2016			
103-1	Explanation of the material topic and its Boundary		Supply chain standards Mica supply chain Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
414-1	New suppliers that were screened using social criteria		Supply chain standards Mica supply chain
414-2	Negative social impacts in the supply chain and actions taken		Supply chain standards Mica supply chain
GRI 415: PUBLIC POLICY 2016			
103-1	Explanation of the material topic and its Boundary		Stakeholder dialogue Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
415-1	Political contributions		Stakeholder dialogue
GRI 416: CUSTOMER HEALTH AND SAFETY 2016			
103-1	Explanation of the material topic and its Boundary		Patient safety Responsible marketing Interactions with health systems Clinical studies Chemical product safety Sustainable product design Materiality analysis Report on Risks and Opportunities
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
416-1	Assessment of the health and safety impacts of product and service categories		Patient safety Clinical studies Chemical product safety Sustainable product design
416-2	Incidents of non-Compliance concerning the health and safety impacts of products and services	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Report on Risks and Opportunities

GRI 417: MARKETING AND LABELING 2016			
103-1	Explanation of the material topic and its Boundary		Patient safety Chemical product safety Responsible marketing Interactions with health systems Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
417-1	Requirements for product and service information and labeling	Within our businesses, product labels are both important and mandatory. All pharmaceuticals and chemicals are subject to reporting and notification requirements, which we completely fulfill. The individual requirements are reported in the respective chapters	Chemical product safety Patient safety Responsible marketing
417-2	Incidents of non-Compliance concerning product and service information and labeling		Patient safety Chemical product safety Report on Risks and Opportunities
417-3	Incidents of non-Compliance concerning marketing communications	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Responsible marketing Report on Risks and Opportunities
GRI 418: CUSTOMER PRIVACY 2016			
103-1	Explanation of the material topic and its Boundary		Clinical studies Compliance Materiality analysis
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
418-1	Substantiated complaints concerning breaches of customer privacy and losses of customer data		Indicators: business ethics Clinical studies Compliance
GRI 419: SOCIOECONOMIC Compliance 2016			
103-1	Explanation of the material topic and its Boundary		Compliance Materiality analysis Report on Risks and Opportunities Responsible marketing
103-2	The management approach and its components		
103-3	Evaluation of the management approach		
419-1	Non-Compliance with laws and regulations in the social and economic area	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Indicators: business ethics Report on Risks and Opportunities Responsible marketing

Additional material topics

ETHICAL CONDUCT (bioethics, clinical studies, animal welfare)		
103-1	Explanation of the material topic and its Boundary	Bioethics Clinical studies Animal welfare Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
HEALTH FOR ALL (access to health, prices of medicines, health awareness)		
103-1	Explanation of the material topic and its Boundary	Global strategy Focus programs Open innovation sharing Prices of medicines Health awareness Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
PRODUCT-RELATED CRIME		
103-1	Explanation of the material topic and its Boundary	Product-related crime Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
COMMUNITY INVOLVEMENT		
103-1	Explanation of the material topic and its Boundary	Community involvement Global Health Broad Minds Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	
WORK 4.0		
103-1	Explanation of the material topic and its Boundary	Career at Merck Good leadership Materiality analysis
103-2	The management approach and its components	
103-3	Evaluation of the management approach	

global compact cop

Communication on Progress in 2019 in implementing the principles of the UN Global Compact

We have been a participant in the United Nations Global Compact since 2005. As a signatory to the initiative, we have committed ourselves to ten principles based on key UN conventions regarding human rights, labor standards, environmental protection, and anti-corruption. At the same time, the UN Global Compact calls on all its signatories to actively support the implementation of the principles within their own sphere of influence.

The following table summarizes the key actions we took in 2019 to implement the principles of the Global Compact.

COMMUNICATION ON PROGRESS

UN GLOBAL COMPACT

This is our **Communication on Progress** in implementing the Ten Principles of the **United Nations Global Compact** and supporting broader UN goals.

We welcome feedback on its contents.

Link: www.unglobalcompact.org

Human rights

Principle 1:	**Key actions in 2019:**	**Relevant GRI disclosures:**	**Reference:**
Businesses should support and respect the protection of internationally proclaimed human rights.	▪ Broadened human rights and modern slavery risk assessment within our Compliance Risk Reporting and Self-Monitoring process ▪ Reported human rights topics as part of our Compliance Risk Reporting ▪ Addressed the topics of human rights and modern slavery in the "EHS StartUp!" onboarding course for new EHS managers ▪ Opened our SpeakUp Line, previously only available to employees, to external stakeholders ▪ Updated the Merck Human Rights Charter with the involvement of external stakeholders ▪ Adopted the Group-wide Social and Labor Standards Policy ▪ Introduced an annual e-learning course on our Human Rights Charter and Social and Labor Standards Policy, targeted to all managing directors and senior leaders reporting directly to the Executive Board	103-2: 412, 412-2	Compliance Human rights

Principle 2:	Key actions in 2019:	Relevant GRI disclosures:	Reference:
Businesses should make sure that they are not complicit in human rights abuses.	▪ Trained Procurement employees on the topic of sustainability and human rights ▪ Invited suppliers to a Together for Sustainability (Initiative for sustainable supply chains in the chemical industry) training course in Shanghai (China) ▪ Conducted CR-relevant internal and external audits and inspections of suppliers and collected self-reported information ▪ Held the presidency of the Responsible Mica Initiative and participated in working groups	412-3, 414-1, 414-2	Human rights Compliance Supply chain standards

Labor standards

Principle 3:	Key actions in 2019:	Relevant GRI disclosures:	Reference:
Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining.	▪ Conducted internal audits on workplace aspects of our Human Rights Charter that are specified in our Social and Labor Standards Policy ▪ Conducted internal and external audits and inspections of suppliers regarding corporate responsibility and collected self-reported information ▪ Regularly and extensively included local employee representatives in company's decision-making ▪ Reviewed human rights aspects within the scope of our Site Security Risk Assessments	102-41, 402-1, 407-1	Human rights Compliance Fairness and dialogue Supply chain standards

Principle 4:	Key measures in 2018	Relevant GRI disclosures:	Reference:
Businesses should support the elimination of all forms of forced and compulsory labor.	▪ Conducted internal audits on workplace aspects of our Human Rights Charter that are specified in our Social and Labor Standards Policy ▪ Published on our website the UK Modern Slavery Statement endorsed by our Executive Board ▪ Conducted CR-relevant internal and external audits and inspections of suppliers and collected self-reported information ▪ Addressed the topics of human rights and modern slavery in the "EHS StartUp!" onboarding course for new EHS managers	409-1	Human rights Compliance Fairness and dialogue Supply chain standards

Principle 5:	**Key measures in 2018**	**Relevant GRI disclosures:**	**Reference:**
Businesses should support the effective abolition of child labor.	▪ Conducted internal audits on workplace aspects of our Human Rights Charter that are specified in our Social and Labor Standards Policy ▪ Held the presidency of the Responsible Mica Initiative and participated in working groups ▪ Regular, unannounced inspections of mica mines and processing plants by the Indian organization IGEP ▪ Conducted CR-relevant internal and external audits and inspections of suppliers and collected self-reported information	408-1	Human rights Compliance Fairness and dialogue Supply chain standards Mica supply chain

Principle 6:	**Key actions in 2019:**	**Relevant GRI disclosures:**	**Reference:**
Businesses should support the elimination of discrimination in respect of employment and occupation.	▪ Revised the mandate of our Diversity Council ▪ Developed goals and measures to achieve a more balanced gender structure in different hierarchical levels of our business sectors and functions; exceeded our 2021 target of maintaining a 30% representation of women (2019: 33%) in leadership roles (“Role 4+”) ▪ Expanded internal diversity programs ▪ Rolled out and integrated throughout the Group a training program on unconscious bias ▪ Set up the Job Analyzer, a digital tool for gender-neutral communication with applicants	102-8, 202-1, 202-2, 401-1, 401-3, 404-1, 404-3, 405-1, 405-2, 406-1	Compliance Diversity

Environmental stewardship

Principle	Key actions in 2019:	Relevant GRI disclosures:	Reference:
Principle 7: Businesses should support a precautionary approach to environmental challenges.	▪ Passed external audits pertaining to the ISO 14001:2015 Group certificate at ten sites ▪ Performed 41 internal EHS audits, whereby 93% of the audited sites were assessed as "good" or "satisfactory" ▪ Reduced CO_2 emissions by 15% (2018: 11%) relative to the 2006 baseline amid operating business growth (2020 reduction target: 20% compared with the 2006 baseline) ▪ Implemented measures to ensure product safety (e g. REACH, GHS, Global Product Strategy) as well as plant and process safety (e.g. Risk Management Process) ▪ Used our Waste Scoring System with the aim of shrinking the environmental footprint of our waste by 5% by 2025: We achieved a 1.6% reduction in 2019 (2018: 0.9%) ▪ Rolled out the ProMec initiative at the Darmstadt site so as to promote the circular economy by expanding solvent recycling to reduce negative environmental impacts when disposing of product waste ▪ Reduced our water use at sites in water-stressed areas by 21% relative to the 2016 baseline (2018: 10.8%)	201-2, 301-1, 302-1, 303-1, 305-1, 305-2, 305-3, 305-6, 305-7	Environmental stewardship Climate action Water management Waste and recycling Plant and process safety Chemical product safety Transport and warehouse safety
Principle 8: Businesses should undertake initiatives to promote greater environmental responsibility.	▪ Systematically examined potential energy savings at our production sites ▪ Rolled out 70 standardized signs created by our Life Science business sector for waste, recycling and composting at all sites ▪ Commercialized greener products such as Cyrene™, which was named "Environmental Product of the Year" at the Environmental Leader Awards 2019 ▪ Offered sustainable mobility options for employees (for instance "job tickets", i.e. public transit passes, and the possibility to lease or borrow bicycles) ▪ Installed at our global headquarters an extensive electric vehicle charging infrastructure, part of which is available to our employees for their own personal use	301 - 308	Climate action Waste and recycling Sustainable product design

Principle 9:	Key measures in 2018	Relevant GRI disclosures:	Reference:
Businesses should encourage the development and diffusion of environmentally friendly technologies.	▪ Launched a new version of our digital tool DOZN™ for use by our customers to assess more sustainable alternatives to various chemicals ▪ Developed sustainable products such as liquid crystal technologies, raw materials for natural cosmetics and "greener" alternatives to chemicals; expanded our range of "green" solvents ▪ Reduced the amount of packaging material and used more sustainable packaging materials as part of "SMASH Packaging", our sustainable packaging strategy ▪ Continuously expanded the recycling program for our Life Science customers	302-4, 302-5, 305-5	Sustainable product design Packaging and recycling

Anti-corruption

Principle 10:	Key measures in 2018	Relevant GRI disclosures:	Reference:
Businesses should work against corruption in all its forms, including extortion and bribery.	▪ Performed 50 internal audits on corruption-related risks ▪ 35,000 employees and external workers completed an e-learning course on our Anti-Corruption Policy ▪ More than 50,000 employees and contractors completed our business sector-specific e-learning course on our Code of Conduct; expanded the course to 20 further languages ▪ Conducted a Group-wide communications campaign to raise awareness of our SpeakUp Line to report corruption anonymously ▪ Published annual EFPIA transparency reports.	102-16, 102-17, 205-1, 205-2, 205-3, 415-1	Compliance Interactions with health systems

Assurance reports

Assurance report CR

Limited Assurance Report of the Independent Auditor regarding Sustainability Information[1]

To the Executive Board of Merck KGaA, Darmstadt

We have been engaged to perform an independent limited assurance engagement on the qualitative and quantitative disclosures on sustainability in the "Corporate Responsibility Report 2019" (further "Report") of Merck KGaA, Darmstadt (further "Merck" or "Company") for the fiscal year 2019 published at https://www.merckgroup.com/en/cr-report/2019.

It was not part of our engagement to review product or service related information, references to external information sources, expert opinions and future-related statements in the Report.

Management's Responsibility for the Report

The legal representatives of Merck are responsible for the preparation of the Report in accordance with the Reporting Criteria. Merck applies the principles and standard disclosures of the Standards of the Global Reporting Initiative in combination with the Corporate Accounting and Reporting Standard (Scope 1 und 2), the Corporate Value Chain Standard (Scope 3) of the World Resources Institute/World Business Council for Sustainable Development (WBCSD) as Reporting Criteria (further "Reporting Criteria).

The responsibility includes the selection and application of appropriate methods to prepare the Report and the use of assumptions and estimates for individual qualitative and quantitative sustainability disclosures which are reasonable under the circumstances. Furthermore, this responsibility includes designing, implementing and maintaining systems and processes relevant for the preparation of the Report in a way that is free of – intended or unintended – material misstatements.

Independence and quality assurance on the part of the auditing firm

We are independent from the company in accordance with the requirements of independence and quality assurance set out in legal provisions and professional pronouncements and have fulfilled our additional professional obligations in accordance with these requirements.

Our audit firm applies the legal provisions and professional pronouncements for quality assurance, in particular the Professional Code for German Public Auditors and Chartered Accountants (in Germany) and the quality assurance standard of the German Institute of Public Auditors (Institut der Wirtschaftsprüfer, IDW) regarding quality assurance requirements in audit practice (IDW QS 1).

Practitioner's Responsibility

Our responsibility is to express a conclusion on the report based on our work performed within the scope of our limited assurance engagement.

We conducted our work in accordance with the International Standard on Assurance Engagements (ISAE) 3000 (Revised): "Assurance Engagements other than Audits or Reviews of Historical Financial Information" and the International Standard on Assurance Engagements (ISAE) 3410: "Assurance Engagements on Greenhouse Gas Statements" of the International Auditing and Assurance Standards Board (IAASB). These standards require us to plan and perform the assurance engagement to allow us to conclude with limited assurance that no matters have come to our attention that cause us to believe that the Report was not prepared, in all material respects, in accordance with the Reporting Criteria. We do not, however, issue a separate conclusion for each disclosure. In a limited assurance engagement the evidence gathering procedures are more limited than in a reasonable assurance engagement and therefore less assurance is obtained than in a reasonable assurance engagement. The choice of audit activities is subject to the auditor's own judgement.

[1] Translation of the independent assurance report, authoritative in German language.

Within the scope of our engagement, we performed amongst others the following procedures:

- Inquiries of personnel on Group level responsible for the materiality analysis, in order to gain an understanding of the processes for determining material sustainability topics and respective reporting boundaries of Merck.
- A risk analysis, including a media search, to identify relevant sustainability aspects for Merck in the reporting period.
- Evaluation of the design and implementation of the systems and processes for the collection, processing and control of the sustainability disclosures included in the scope of this engagement, including the consolidation of the data, at corporate and site level.
- Interviews with relevant staff on corporate level responsible for providing and consolidating the data and information, as well as carrying out internal control procedures on the data and information, including the explanatory notes.
- Assessment of local data collection and reporting processes and reliability of reported data via a sampling survey at the sites in Calais (France) and Darmstadt
- Evaluation of selected internal and external documents.
- Analytical evaluation of data and trends of quantitative disclosures which are reported by all sites on group level.
- Use of the insights and relevant work performed for the group and statutory audit of the (consolidated) financial statements for the year ended December 31, 2019 of Merck KGaA with regard to audit procedures on those information and indicators that were derived from those consolidated financial statements.
- Reviewing the consistency of GRI Standards in accordance option "Comprehensive" as declared by Merck with sustainability information in the Report
- An evaluation of the overall presentation of the information, including the explanatory notes, within the scope of our engagement.

As described in the Report, Merck engaged external providers to perform assessments and audits. The adequacy and accuracy of the conclusions from these external assessments were not part of our limited assurance engagement.

Conclusion

Based on our limited assurance engagement, nothing has come to our attention that causes us to believe that the qualitative and quantitative disclosures on sustainability for the business year 2019 included in the scope of this engagement and published in the Report are in all material respects not prepared in accordance with the Reporting Criteria.

Restriction of use/Clause on General Engagement Terms

This assurance report is issued for purposes of the Executive Board of Merck KGaA, Darmstadt, only. We assume no responsibility with regard to any third parties.

Our assignment for the Executive Board of Merck KGaA, Darmstadt, and professional liability is governed by the General Engagement Terms for Wirtschaftsprüfer and Wirtschaftsprüfungsgesellschaften (Allgemeine Auftragsbedingungen für Wirtschaftsprüfer und Wirtschaftsprüfungsgesellschaften) in the version dated January 1, 2017 (https://www.kpmg.de/bescheinigungen/lib/aab_english.pdf). By reading and using the information contained in this assurance report, each recipient confirms notice of provisions of the General Engagement Terms (including the limitation of our liability for negligence to EUR 4 million as stipulated in No. 9) and accepts the validity of the General Engagement Terms with respect to us.

Frankfurt am Main, March 20, 2020

KPMG AG
Wirtschaftsprüfungsgesellschaft

[Original German version signed by:]

Glöckner
Wirtschaftsprüfer
[German Public Auditor]

Brokof
Wirtschaftsprüferin
[German Public Auditor]

Assurance report NFR

Part of the non-financial report

Limited Assurance Report of the Independent Auditor regarding the combined separate non-financial report[1]

To the Supervisory Board of Merck KGaA, Darmstadt

We have performed an independent limited assurance engagement on the non-financial consolidated statement of Merck KGaA according to § 315b of the German Commercial Code (HGB), that is combined with the non-financial statement of the parent company in accordance with § 289b HGB, (further "combined separate non-financial report") integrated in the Corporate Responsibility Report 2019 of Merck KGaA, Darmstadt (further "Merck" or "Company") for the period from January 1 to December 31, 2019.

Management's Responsibility

The legal representatives of Merck are responsible for the preparation of the Report in accordance with §§ 315b, 315c in conjunction with 289b to 289e HGB.

This responsibility of the legal representatives includes the selection and application of appropriate methods to prepare the combined separate non-financial report and the use of assumptions and estimates for individual disclosures which are reasonable under the given circumstances. Furthermore, this responsibility includes designing, implementing and maintaining systems and processes relevant for the preparation of the combined separate non-financial report in a way that is free of – intended or unintended – material misstatements.

Independence and Quality Assurance on the Part of the Auditing Firm

We are independent from the company in accordance with the requirements of independence and quality assurance set out in legal provisions and professional pronouncements and have fulfilled our additional professional obligations in accordance with these requirements.

Our audit firm applies the legal provisions and professional pronouncements for quality assurance, in particular the Professional Code for German Public Auditors and Chartered Accountants (in Germany) and the quality assurance standard of the German Institute of Public Auditors (Institut der Wirtschaftsprüfer, IDW) regarding quality assurance requirements in audit practice (IDW QS 1).

Practitioner's Responsibility

Our responsibility is to express a conclusion on the combined separate non-financial report based on our work performed within a limited assurance engagement.

We conducted our work in accordance with the International Standard on Assurance Engagements (ISAE) 3000 (Revised): "Assurance Engagements other than Audits or Reviews of Historical Financial Information" published by IAASB. This Standard requires that we plan and perform the assurance engagement to obtain limited assurance whether any matters have come to our attention that cause us to believe that the Report for the period from January 1 to December 31, 2019, has not been prepared, in all material respects in accordance with §§ 315b and 315c in conjunction with 289b to 289e HGB. We do not, however, issue a separate conclusion for each disclosure. In a limited assurance engagement the evidence gathering procedures are more limited than in a reasonable assurance engagement and therefore less assurance is obtained than in a reasonable assurance engagement. The choice of audit procedures is subject to the auditor's own judgement.

[1] Our engagement applied to the German version of the combined separate non-financial report 2019. This text is a translation of the Independent Assurance Report issued in German, whereas the German text is authoritative.

Within the scope of our engagement, we performed amongst others the following procedures:

- Inquiries of personnel on group level who are responsible for the materiality analysis in order to gain an understanding of the processes for determining material sustainability topics and respective reporting boundaries for Merck
- A risk analysis, including a media research, to identify relevant information on Merck's sustainability performance in the reporting period
- Evaluation of the design and implementation of systems and processes for the collection, processing and monitoring of disclosures on environmental, employee and social matters, respect for human rights, and combating corruption and bribery, including data consolidation
- Inquiries of personnel on group level who are responsible for determining disclosures on concepts, due diligence processes, results and risks, the conduction of internal controls and consolidation of the disclosures
- Evaluation of selected internal and external documents
- Analytical evaluation of data and trends of quantitative disclosures which are reported by all sites on group level
- Assessment of local data collection and reporting processes and reliability of reported data via a sampling survey at the sites in Calais (France) and Darmstadt
- Assessment of the overall presentation of the disclosures

As described in the combined separate non-financial report, Merck engaged external provider to perform assessments in order to ensure compliance with Merck's requirements concerning environmental impacts. The adequacy and accuracy of the conclusions from these external assessments were not part of our limited assurance engagement.

Conclusion

Based on the procedures performed and the evidence obtained, nothing has come to our attention that causes us to believe that the combined separate non-financial report of Merck KGaA for the period from January 1 to December 31, 2019 is not prepared, in all material respects, in accordance with §§ 315b and 315c in conjunction with 289b to 289e HGB.

Restriction of Use/Clause on General Engagement Terms

This assurance report is issued for purposes of the Supervisory Board of Merck KGaA, Darmstadt, only. We assume no responsibility with regard to any third parties.

Our assignment for the Supervisory Board of Merck KGaA, Darmstadt, and professional liability is governed by the General Engagement Terms for Wirtschaftsprüfer and Wirtschaftsprüfungsgesellschaften (Allgemeine Auftragsbedingungen für Wirtschaftsprüfer und Wirtschaftsprüfungsgesellschaften) in the version dated January 1, 2017 (https://www.kpmg.de/bescheinigungen/lib/aab_english.pdf). By reading and using the information contained in this assurance report, each recipient confirms notice of provisions of the General Engagement Terms (including the limitation of our liability for negligence to EUR 4 million as stipulated in No. 9) and accepts the validity of the General Engagement Terms with respect to us.

Frankfurt am Main, February 17, 2020

KPMG AG
Wirtschaftsprüfungsgesellschaft
[Original German version signed by:]

Glöckner
Wirtschaftsprüfer
[German Public Auditor]

Brokof
Wirtschaftsprüferin
[German Public Auditor]

glossary

3R principle
The international guiding principle for all animal testing. The number of laboratory animals used as well as the stress placed on them before, during and after testing are to be kept to an absolute minimum by using methods to replace animal experiments (replacement), reduce the required number of tests and animals (reduction), and improve the test methods (refinement).

African sleeping sickness
Human African trypanosomiasis (HAT), also known as sleeping sickness, is a parasitic disease transmitted by the bite of the tsetse fly. The disease mostly affects poor populations living in remote rural areas of Africa. Untreated, it is usually fatal.

Big Data
Extremely large data sets that may be analyzed computationally to reveal patterns, trends and associations, especially relating to human behavior and interactions.

Biodiversity
The diversity of ecosystems, habitats and landscapes on earth, the diversity of the species, and the genetic diversity within a biological species or population.

Buruli ulcer
An infectious disease caused by bacteria that occurs most commonly in rural sub-Saharan Africa and Australia.

Chagas disease
A potentially life-threatening illness caused by the protozoan parasite. An estimated eight million people are infected worldwide, mostly in Latin America.

Chatbot
A computer program or an artificial intelligence that conducts a conversation via auditory or textual methods.

CLP
Short for "Classification, Labelling and Packaging of Substances and Mixtures", this is a European regulation based on the Globally Harmonized System (GHS) of Classification and Labelling of Chemicals.

CMP
Chemical Mechanical Planarization is a process of smoothing surfaces through chemical and mechanical forces.

Co-infection
Also known as a double infection, this involves the simultaneous infection of a host by multiple pathogen species that can negatively influence the disease process and lead to higher mortality.

CO_2 equivalents
CO_2 equivalents (CO_2eq) indicate how much a specified quantity of a specific greenhouse gas contributed to the greenhouse effect, using the global warming potential of carbon dioxide as a reference.

Compliance
Adherence to laws and regulations as well as to voluntary codices that are internal to a company. Compliance is a component of diligent corporate governance.

CRISPR/Cas
A biomolecular method for targeting, cutting and editing the DNA of an organism (gene editing). Experts think this technique has great potential for curing diseases or generating plants and animals with new traits.

Design thinking
An approach to developing new ideas. Design thinking uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.

DMF
Dimethylformamide is a clear, colorless, hygroscopic liquid with a high dielectric constant. It is employed as a solvent in the production of textiles, pharmaceuticals, pesticides, and adhesives. The ECHA (European Chemicals Agency) has designated DMF as a substance of very high concern (SVHC) and included it in the candidate list for authorization.

Dual-use products
Goods that are normally used for civilian purposes, but that may also have military applications.

Due diligence
A risk analysis exercised with particular care.

EHS
Short for "Environment, Health and Safety", this refers to environmental management, health protection and occupational safety throughout a company.

End-user declaration
A binding customer statement regarding the intended use of a product.

Endemic countries
Countries in which a certain disease, in many cases an infectious disease, occurs.

EQ
Our Group Environment, Health, Safety, Security, Quality function.

Equality Act
A pending U.S. law with a special focus on LGBTQ people (lesbian, gay, bisexual, transgender, queer). It prohibits discrimination on the basis of the sex, sexual orientation and gender identity.

ESG ratings
These are used to assess a company's financial performance through factors that include aspects of environmental management, social issues and good governance.

Essential medicines
Defined by the World Health Organization as "those drugs that satisfy the health care needs of the majority of the population".

Exposure assessment
The U.S. Environmental Protection Agency defines exposure assessment as the determination or estimation (qualitative or quantitative) of the magnitude, frequency, duration, and route of exposure between an agent and an organism. This analysis forms part of the chemical safety assessment process.

FDA
The U.S. Food and Drug Administration is the U.S. government agency responsible for protecting and advancing public health, especially as concerns food and drugs.

First-line treatment
A therapy regimen that is generally accepted by the medical establishment for the initial treatment of a given disease. If the first-line treatment is not adequately successful, a second-line treatment may be administered.

Freshwater
Water containing 1,000 mg or less of dissolved solids per liter.

Global Product Strategy
An initiative of the International Council of Chemical Associations (ICCA) through which participating companies of the chemical industry make a commitment to comprehensive product responsibility.

Globally Harmonized System of Classification and Labelling of Chemicals (GHS)
An international standard system to classify chemicals that covers labeling as well as safety data sheets.

Good clinical practice (GCP)
An international quality standard that enforces tight guidelines on ethical aspects of clinical studies.

Good distribution practice (GDP)
An EU guideline that regulates the proper distribution of medicinal products for human use.

Good manufacturing practice (GMP)
A system for ensuring that products are consistently manufactured and controlled according to quality standards. These guidelines are used in the production of medicines, active pharmaceutical ingredients and cosmetics, as well as foodstuffs and feed.

Greenhouse gases
Gases in the atmosphere that contribute to global warming. They can be either naturally occurring or caused by humans (such as CO_2 emissions generated by burning fossil fuels).

GxP
The general term for good practice quality guidelines and regulations that are used in many fields, especially the medical, pharmaceutical and pharmaceutical chemistry industries.

HazCom 2012
A U.S. OSHA (Occupational Safety and Health Administration) standard pertaining to the safe handling of chemicals in the workplace, with an emphasis on occupational safety and environmental protection. This standard requires manufacturers and distributors to provide information on the hazards posed by a product as well as ways to minimize risks.

Humanoid
A term that means human-like.

ICH
The International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) aims to promote uniform assessment criteria for product registration in Europe, the United States and Japan. The ICH develops guidelines for the evaluation of the quality, effectiveness and safety of medicinal products.

In vitro
Procedures involving components of an organism that were isolated from their usual biological surroundings (such as test tube experiments).

In vivo
Latin for "within the living", this term describes processes that take place within a living organism.

Investigational drug
A pharmaceutical form of an active ingredient or placebo being tested or used as a reference in a clinical trial, including approved as well as unapproved products when used or assembled (formulated or packaged) in a way different from the approved form, when used for an unapproved indication, or when used to gain further information about an approved use.

ISO 14001
This international environmental management standard sets globally recognized requirements for an environmental management system.

ISO 50001
This international standard defines globally recognized requirements for energy management systems.

ISO 9001
This international standard defines globally recognized requirements for a quality management system.

Lead substances
Manufacturers/importers of a certain substance must submit a joint registration according to REACH. In this context, the company responsible for collecting the substance data and preparing the registration dossier uses the term "lead substance".

Leishmaniasis
A group of diseases caused by protozoan parasites. These parasites are transmitted to humans by the bites of the infected female phlebotomine sand fly. There are three main forms of leishmaniasis: cutaneous, visceral or kala-azar, and mucocutaneous.

LGBT+, LGBTQ, LGBTQI
These acronyms stand for lesbian, gay, bisexual, transgender, queer or questioning, and intersex.

Liquid biopsy
Sampling and analysis of non-solid biological tissue such as blood.

Liquid crystals (LC)
A hybrid of a crystalline and liquid state. In general, molecules are perfectly arranged only when in a solid crystal state, in contrast to the liquid state, when they move around chaotically. However, liquid crystals are a hybrid of the two states: Although they are liquid, they exhibit a certain crystalline arrangement. Their rod-shaped molecules align themselves like a shoal of fish. In addition, they respond to the electromagnetic waves of light like tiny antennae. Therefore, such swarms of molecules can either allow specially prepared "polarized" light to pass through, or they can block it. This takes place in the pixels of liquid crystal displays – as it does similarly in liquid crystal windows, which can provide shade against sunlight.

Liver-stage malaria
Certain forms of the malaria parasite (P. vivax and P. ovale) can remain dormant after infecting liver cells. In this stage, they persist for many weeks and even years until they relapse into a new disease cycle. Currently, it is not possible to treat this dormant form.

Location-based approach
The location-based method quantifies the Scope 2 emissions that are emitted on average in the area where the electricity consumption takes place. As a rule, the average at country level is used.

LTIR
The lost time injury rate measures the number of accidents resulting in missed days of work (one or more days) per one million man-hours.

Managing director
At Merck, this individual is ultimately responsible for ensuring that their subsidiary, including R&D and manufacturing centers, complies with all laws and regulations applicable to its business, including Merck Guidelines.

Market-based approach
This method quantifies the GHG emissions emitted by an electricity supplier or an individual electricity product.

Memorandum of understanding (MoU)
A type of agreement between two or more parties. It expresses a convergence of will between the parties, indicating an intended common line of action.

Monoclonal antibodies
Monoclonal antibodies are proteins that specifically recognize and bind to other unique proteins called antigens.

Neglected tropical disease (NTD)
Diseases that occur primarily in developing countries. NTDs include schistosomiasis, intestinal worms, trachoma, lymphatic filariasis, and onchocerciasis. This group of diseases is called neglected because, despite the large number of people affected, they have historically received less attention and research funding than other diseases.

NMP
N-Methyl-2-Pyrrolidone a polar aprotic compound that is miscible with water and has good solvency properties. NMP is used in the manufacture of polymers, semiconductors, batteries and pharmaceuticals. The ECHA (European Chemicals Agency) has designated NMP as a substance of very high concern (SVHC) and included it in the candidate list for authorization.

Nucleases
A group of enzymes whose primary function is to partially or fully degrade nucleic acids.

OHSAS
The Occupational Health and Safety Assessment Series (OSHAS) is an international occupational health and safety management system.

Onchocerciasis
A chronic parasitic infection caused by nematodes that occurs in the tropical regions of Africa and South America. In approximately 10% of those infected, the disease leads to blindness, which is why onchocerciasis is also referred to

as river blindness.

Organoid
An organoid is a miniaturized and simplified version of an organ produced in vitro in three dimensions by means of a cell culture. It shows realistic micro-anatomy similar to an organ. Organoids are derived from one or a few tissue cells, embryonic stem cells or induced pluripotent stem cells, which can self-organize in a three-dimensional culture, owing to their self-renewal and differentiation capacities. Organoids are, among others, used as model systems in the investigation of diseases and the development of drugs.

Orodispersible tablet
A tablet that dissolves in the mouth within 30 seconds and does not have to be taken with water. The active ingredient is absorbed through the mucous membrane in the mouth and also partly through the lining of the stomach.

Other water
Water containing more than 1,000 mg of dissolved solids per liter.

Patent pool
A consortium of at least two competing companies that allows partners to share the use of patents relating to a particular technology.

Patient access programs
Self-sustaining commercial programs with a revenue-driven purpose which provide medicines for underserved populations, either through free products or a reduced treatment fee.

Patient support programs
Any organized system providing services and direct patient or patient-caregiver interactions that are intended and designed to educate patients about certain diseases, and help patients with access to and/or the management of prescribed medicines and/or disease outcomes and/or offer doctors support for their patients.

Pharmacovigilance
The science and activities related to the detection, evaluation, understanding, and prevention of adverse reactions or other drug-related problems.

Phase I study
Phase I clinical trials test a new biomedical intervention in a small group of people (for example, 20-80) for the first time to evaluate safety (for instance, to determine a safe dosage range and to identify side effects).
Source: http://www.who.int/ictrp/glossary/en/

Phase II study
Phase II clinical trials study the biomedical or behavioral intervention in a larger group of people (several hundred) to determine efficacy and to further evaluate its safety.
Source: http://www.who.int/ictrp/glossary/en/

Phase III study
Phase III studies investigate the efficacy of the biomedical or behavioral intervention in large groups of human subjects (from several hundred to several thousand) by comparing the intervention to other standard or experimental interventions as well as to monitor adverse effects, and to collect information that will allow the intervention to be used safely.
Source: http://www.who.int/ictrp/glossary/en/

Prediabetes
A condition regarded as indicative that a person is at risk of progressing to Type 2 diabetes.

Process-related emissions
Greenhouse gases released into the atmosphere during manufacturing operations.

Product safety summary
Intended to provide a general overview of the chemical substance and its use. It cannot take the place of a safety data sheet.

Public-private partnership (PPP)
A collaboration between public sector (government) organizations, private companies and/or not-for-profit organizations.

REACH
A European Union chemical regulation (EC No. 1907/2006) that took effect on June 1, 2007. REACH stands for Registration, Evaluation, Authorization, and Restriction of Chemicals.

Registration dossiers
One part of the complex and time-consuming REACH registration process is the preparation of a technical dossier and its submission to the European Chemicals Agency (ECHA). The information that a registration dossier should contain includes the physical-chemical, toxicological and ecotoxicological characteristics of the substances, human and environmental exposure, intended uses, classification and labelling, and recommended risk management measures.

Risk-sharing agreement
An agreement between the producer or manufacturer and the payer or provider that allows access to a health technology through coverage or reimbursement under certain conditions.

Role
Merck uses a market-oriented system to rate positions within the company. To facilitate consistency across the organization, each position is assigned a specific role, with an overarching job architecture classifying each role as one of 11 levels, 15 functions and an array of career types (Core Operations, Services & Support Groups; Experts; Managers; Project Managers).

Schistosomiasis
A parasitic disease spread in warm lakes and ponds by snails that serve as intermediate hosts.

Scope 3
Scope 3 includes indirect greenhouse gas emissions, such as the extraction and production of purchased materials, transport-related activities, waste disposal, and employee travel.

Scorecard
An evaluation tool for measuring, documenting and controlling activities using metrics.

Scrum
A framework for agile project management. It is a method that is simple, flexible and quick to deliver results.

Security
This term stands for all necessary measures and governance activities to detect, analyze, handle, and mitigate security- and crime-based threats to the company. This helps to protect employees as well as the tangible and intangible assets of the company.

Signal management
A set of activities performed to determine whether, based on an examination of individual case safety reports, aggregated data from active surveillance systems or studies, scientific literature information, or other data sources, there are new risks associated with an active substance or a medicinal product or whether known risks have changed, as well as any related recommendations, decisions, communications, and tracking.

Spontaneous reports on adverse effects
If a side effect occurs while using a medicine and is reported, this is called a spontaneous report because the adverse reaction is reported spontaneously (for example by doctors or patients) and not in a trial or an observational study.

Stakeholder
People or organizations that have a legitimate interest in a company, entitling them to make justified demands. Stakeholders include people such as employees, business partners, neighbors in the vicinity of our sites, and shareholders.

STEM
Science, technology, engineering, and mathematics.

Stem cell lines
Groups of stem cells derived from animal or human tissue. They can be cultivated in vitro and multiply indefinitely.

Stem cells
Undifferentiated cells with the potential to develop into many different cell types that carry out different functions.

Sunshine Act
The Sunshine Provisions of the U.S. Patient Protection and Affordable Care Act aim to create more transparent relationships between manufacturers of drugs, medical devices and medical aids on the one hand, and doctors and teaching hospitals on the other.

Traces
Substances dissolved in water that are present only in minute amounts. Also referred to as micropollutants, these are synthetic substances present in concentrations ranging from one nanogram to one microgram per liter of water.

Transfer of value
Direct and indirect transfers of value, whether in cash, in kind or otherwise (for instance promotional purposes).

TRIPS
The Agreement on Trade-Related Aspects of Intellectual Property Rights is an international legal agreement between all the member nations of the World Trade Organization. TRIPS seeks to ensure that the measures and procedures for enforcing intellectual property rights do not become a barrier to lawful trade.

WASH
This stands for “water, sanitation and hygiene”.

WLTP
Lawmakers require standardized test procedures to measure how much fuel a car consumes and whether it complies with the emissions limits. The new Worldwide Harmonised Light Vehicle Test Procedure (WLTP) took effect in the EU on September 1, 2017 and is now the official type approval testing procedure for new passenger cars across the EU. It succeeded the NEDC (New European Driving Cycle), which took effect in 1992.

Working out loud
This technique is about deliberately sharing and providing knowledge as well as forming relevant working relationships. The goal is to discover new topics and ideas.

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