MERCK

CORPORATE RESPONSIBILITY REPORT 2016

contents

Letter from the CEO

Ladies and Gentlemen, dear Friends of Merck,

At Merck, we work each and every day on new technologies that enrich lives and make our customers and partners more successful – and have been doing so for nearly 350 years.

Our long history has taught us that sustainable business success is always the result of responsible conduct. We take responsibility – not only for our company, but also for our customers, employees and society.

Furthermore, we pursue three spheres of activity, namely health, the environment, and culture & education. In 2016, we achieved a great deal.

We continued our efforts to advance access to health for people in low- and middle-income countries. The treatment of schistosomiasis, an insidious parasitic infection, is a prime example. Since 2007, we've been donating praziquantel tablets to the World Health Organization (WHO) to support the fight against this disease. In 2016 we donated the 500 millionth tablet, thus having enabled 100 million patients to be treated for schistosomiasis to date, primarily school children.

Non-communicable diseases such as cancer and diabetes also pose a heavy burden to people in developing countries because the health systems there are often unable to cope with these diseases. To improve outcomes, we have joined forces with 21 other pharmaceutical companies, along with the World Bank and the Union for International Cancer Control (UICC) to form the Access Accelerated initiative. I believe that through this partnership we can achieve so much more than any one single company or organization could ever do.

Our endeavors to promote health have received a great deal of recognition. I am very proud that we achieved a superb fourth-place ranking in the ATM Index of the Access to Medicine Foundation, which assesses the efforts of pharmaceutical companies to improve access to health worldwide. We thus moved up two places since the last survey was conducted in 2014.

Stefan Oschmann
Chairman of the Executive Board and CEO

At Merck, we develop high-tech products with a focus on minimizing our adverse impacts on the environment while also conserving natural resources. Take for instance organic light-emitting diodes (OLEDs), which not only allow for displays with razor-sharp images and brilliant colors, but are also far more energy-efficient than other technologies. Liquid crystal windows are another innovation that enhances energy efficiency. In buildings, for example, they can be used to regulate incoming light, thereby saving up to 40% of the energy needed for building climate control systems. We are investing in these two highly promising technologies. Last year we opened our new OLED materials production plant in Darmstadt and are currently building a factory for liquid crystal window modules in the Netherlands.

To be successful as a science and technology company, we need creativity and openness to new ideas. Music inspires; it overcomes barriers and brings people together, a fact demonstrated by the outstanding work of the Deutsche Philharmonie Merck. In 2016, we celebrated the 50th anniversary of our philharmonic orchestra. Beyond supporting culture, we also feel it important to inspire students across the globe to consider careers in science and technology. In 2016, the SPARK program run by our Life Science business sector hosted interactive events across 36 countries that sought to spark the curiosity of students in the fascinating world of science. Overall, we invested around € 3.2 million in education projects in 2016.

Sincerely,

Stefan Oschmann
Chairman of the Executive Board and CEO

Taking responsibility will continue to play a crucial role for us. We are deeply committed to the United Nations Global Compact and its principles on human rights, labor standards, environmental protection, and anti-corruption. After all, our nearly 350 years of history as a company has taught us that responsible conduct is the key to a successful future.

strategy & Management

We take on responsibility every day – and have been doing so for nearly 350 years. We look closer and discover solutions as a foundation for our groundbreaking products and technologies.

We think in generations instead of quarters and have made responsibility a pillar of our operations, an approach that underpins our lasting success. We are helping build the future through products and technologies that make a key contribution to solving global challenges.

Read More

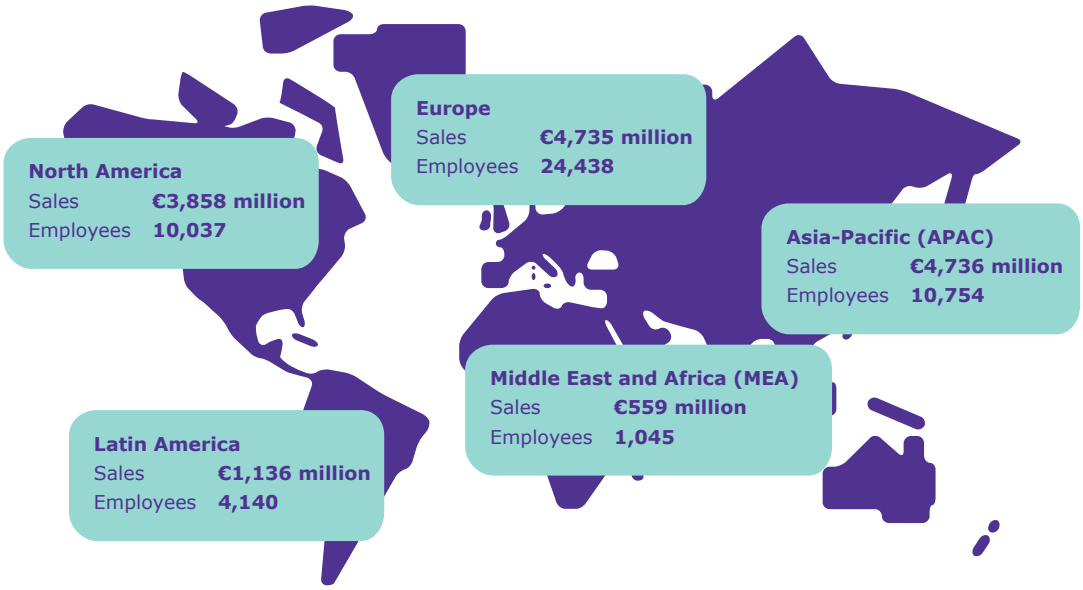
company profile

For nearly 350 years, curious people have been bringing ideas to life at Merck. A passion for research and discovery is our most valuable resource.

We are a leading science and technology company in healthcare, life science and performance materials. Our 50,414 employees work to further develop technologies that enrich lives – from biopharmaceutical therapies to treat cancer and multiple sclerosis, cutting-edge systems for scientific research and production, to liquid crystals for smartphones and LCD televisions. In 2016, our 215 subsidiaries with employees in 66 countries generated sales of € 15.0 billion. Our 91 production sites are located across 22 countries.

Founded in 1668, Merck is the world's oldest pharmaceutical and chemical company. The founding family remains the majority owner of the publicly listed corporate group. Merck KGaA, Darmstadt, Germany holds the global rights to the Merck name and brand. The only exceptions are the United States and Canada, where we operate as EMD Serono, MilliporeSigma and EMD Performance Materials.

Employees and sales by region



Group structure

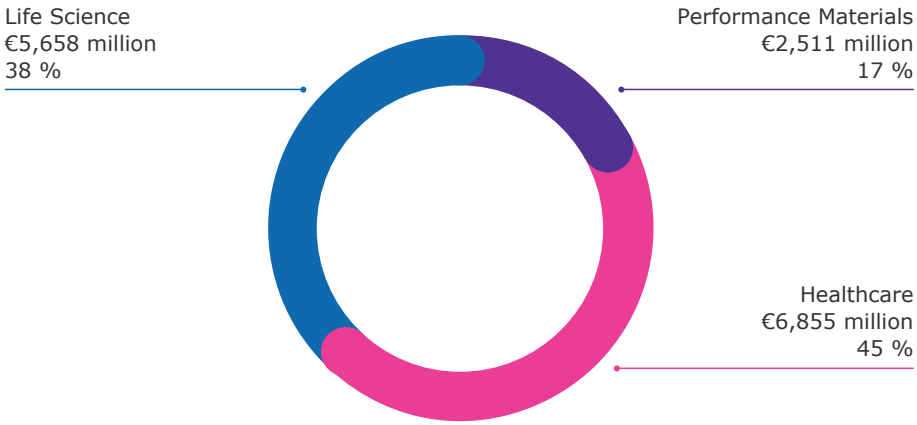
In line with our strategic direction, our company comprises three business sectors: Healthcare, Life Science, and Performance Materials, which encompass the Group's six businesses.

Our Healthcare business sector consists of four businesses, namely Biopharma, Consumer Health, Biosimilars, and Allergopharma. Our Biopharma business discovers, develops, manufactures, and markets innovative pharmaceutical and biological prescription drugs to treat cancer, multiple sclerosis (MS), infertility, and growth disorders, as well as certain cardiovascular and metabolic diseases. In our Consumer Health business, we focus on consumer-centric innovation under the umbrellas of several strategic brands such as Neurobion®, Bion®, Seven Seas®, Nasivin®, Femibion®, and Dolo-Neurobion®, as well as Vivera®/Floratil®, Sangobion®, Vigantoletten®, Apaisyl®, and Kytta®. Our Biosimilars business is committed to increasing access to top-quality biologics for patients across the globe. We are in the advanced stages of negotiations to divest the Biosimilars business, with the transaction expected to close in fiscal 2017. Our allergy business Allergopharma is one of the leading companies in the field of allergy immunotherapy (AIT).

Within Life Science, we conduct research for researchers, providing scientists with laboratory materials, technologies and services to make research and biomanufacturing simpler, faster and more successful. Life Science is organized into three business areas that reflect our customer segments. Research Solutions focuses on academia and pharmaceutical research institutions; Process Solutions markets products and services for the entire pharmaceutical production value chain, and Applied Solutions serves clinical and diagnostic testing laboratories, as well as the food and environmental industries.

Our entire specialty chemicals business is combined in our Performance Materials business sector. The portfolio includes high-tech chemicals for applications in fields such as consumer electronics, lighting, coatings, printing technology, paints, plastics, and cosmetics. Performance Materials comprises four business units: Display Materials, Integrated Circuit Materials, Pigments & Functional Materials, and Advanced Technologies.

Net sales by business sector – 2016



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

We are a leading science and technology company. Our goal is to enrich lives and make our customers and partners more successful. Embodied by values-based, economically sustainable corporate governance, this aspiration has been an integral pillar of our new brand promise since 2015, guiding the strategic development of the Group.

Over the past decade, we have transformed ourselves from a conventional supplier of chemicals and pharmaceuticals into a global science and technology company. The main driver was the realignment of our business portfolio, particularly through the divestment of our Generics business (2007) and the acquisitions of Serono (2007), Millipore (2010), AZ Electronic Materials (2014), and Sigma-Aldrich (2015). Furthermore, we focused our businesses on innovation-driven and highly specialized products, extensively revamped our internal structures and processes, and expanded our presence in global growth markets.

Governance

Responsibility has been an integral part of our corporate identity for nearly 350 years. It is therefore one of our six Values, accompanied by courage, achievement, respect, integrity, and transparency. These core values guide us in our daily work and define how we interact with our customers and business partners. In all our endeavors, we aim to create added value and help people achieve a better quality of life.

Framework for responsible governance

Our Group Mission Statement and Values, as well as the external regulations and initiatives to which we are committed, give rise to requirements for responsible governance that are integrated in both our Corporate Responsibility strategy and our Group-wide guidelines.

We support the following initiatives on responsible governance:

- **The United Nations Global Compact:** Since 2005, we have been a member of the United Nations Global Compact and are committed to complying with the compact's principles regarding human rights, labor standards, environmental protection, and anti-corruption. Our annual progress report illustrates how we live our responsibility in our day-to-day actions.
- **Responsible Care® Global Charter:** As a signatory to the chemical industry's Responsible Care® initiative, we voluntarily do more than is required by law and have adopted mandatory standards for product responsibility, environmental impact mitigation, health, and safety. We were among the first companies to sign the revised version of the Responsible Care® Global Charter in 2014.
- **Together for Sustainability**: In 2014, we joined the Together for Sustainability network, an initiative dedicated to improving the supply chain with respect to environmental, compliance and social standards.
- **"Chemie^3":** We are a member of the "Chemie^3" initiative, 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). This globally unique partnership aims to make sustainability a core part of the chemical industry's guiding principles and drive the sector's position within the German economy as a key contributor to sustainable development.

Our Group-wide guidelines

Our Group-wide guideline system comprises charters and principles valid for the entire company, as well as specific standards and procedures for individual business sectors and sites.

Our Corporate Environment, Health and Safety (EHS) Policy, for instance, forms the basis for implementing the Responsible Care® Global Charter. Our EHS Security and Quality Manual guides our product safety, environmental impact mitigation and occupational safety efforts across the Group, while our Safety Policy for chemical products defines product safety processes as well as the corresponding management structures.

Standards ensure implementation

Derived from the provisions contained in charters, principles and policies, our standards give specific guidance on how to implement our core values to those responsible for operational processes. These standards are continually updated by the relevant departments and are available on our Intranet. Our managers implement these standards in their respective areas of responsibility. We educate and train our employees on all guidelines that apply to them.

Guidelines integral to management systems

We use 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. We regularly undergo an ISO 14001 and ISO 9001 certification process conducted by an independent auditing firm to ensure our compliance with these standards. We hold Group certificates for both.

CR strategy

Mankind is facing major global challenges such as climate change, growing resource scarcity, an aging society, and barriers to health – particularly in low- and middle-income countries. To overcome these issues, not only policy makers and civil society but also the private sector must join forces to find solutions.

Looking, listening and doing things better

We are aware that our business operations impact our environment and the people around us, which is why we have made responsible conduct a pillar of our corporate culture. This approach is the cornerstone of our success. Through our innovative and top-quality high-tech products for the healthcare, life science and performance materials sectors, we seek to help resolve global challenges.

Our Group strategy is targeted to business success. However, we likewise value the interests of our employees, customers and shareholders, as well as those of the community. Our Group strategy underpins our corporate responsibility (CR) strategy. All our CR activities fall under the heading of "responsible governance", which for us most importantly means looking, listening and doing things better.

We take responsibility for our products, the environment, and the people around us – especially for our employees and the communities in which we operate. Through our products, we seek to meet customers' current and future needs. In doing so, safety and ethics matter just as much to us as business success. In our production activities, we seek to impact the environment as little as possible, which requires safe manufacturing techniques, high environmental standards and strict quality management. Furthermore, we strengthen our company by recruiting, developing and motivating talented employees. We strive to set an example for ethical conduct and make an active contribution to the communities in which we live.

Our CR strategy

We aim to quickly identify new global trends and challenges, allowing us to minimize risk while also leveraging the business opportunities that arise. In our CR efforts, we concentrate our strengths on those areas where we can make the biggest difference, which is why we pursue three strategic spheres of activity: health, environment, and culture & education.

Health

An estimated 400 million people have no access to adequate, affordable health care. Through our Group-wide Access to Health strategy, we seek to eliminate access barriers in low- and middle-income countries in an effort to provide underserved populations and communities in these countries with better, sustainable access to high-quality health solutions. Developments such as rising life expectancy and declining birth rates are also reflected in our health solutions, such as our cancer research, for instance, or our fertility treatments. You can find more information under Access to Health (p. 34).

Environment

Many of our innovative chemical and life science products help mitigate our impact on the environment. We strive to continuously enhance the sustainability footprint of our products while also helping our customers achieve their own sustainability goals.

As the market and technology leader in the global liquid crystals industry, we are driving the creation of state-of-the-art, energy-efficient displays. Furthermore, we are developing materials for energy-saving lighting and photovoltaics, one of the ways we're tackling the issue of climate change and energy scarcity. You can find more information under Sustainable product design (p. 29).

Culture & education

Culture inspires people and opens their minds to new possibilities, which is why we promote cultural initiatives worldwide and support education projects. After all, education is key to making culture accessible. Culture nurtures characteristics that are essential to our business activities as a high-tech company, such as creativity, enthusiasm for new discoveries, and the courage to transcend boundaries. You can find more information on our cultural activities under Community (p. 100).

Taking on responsibility worldwide

Our corporate responsibility activities align with the United Nations Sustainable Development Goals (SDGs). Here, we focus particularly on the SDGs that apply most closely to our business ethos. You can find more information on our SDGs under Sustainable Development Goals (p. 146).

Minimizing the adverse effects of our operations

We work to mitigate the ethical, financial and legal risks of our business activities, thereby ensuring our social license to operate. We adhere to legal, ethical, social, and ecological standards and have put extensive structures and systems in place to shore up this approach. Our environmental management activities aim to minimize environmental impacts at our production sites.

Corporate responsibility entwined with governance

Our CR strategy is approved by our Executive Board, which also makes decisions regarding our CR goals and reporting. Our Group-wide CR Committee oversees the implementation of our CR strategy. This council consists of representatives from our business sectors as well as from relevant Group functions such as EQ, HR, Compliance, and Procurement. Since June 2016, Public Affairs and Corporate Responsibility has been reporting to Belén Garijo, Executive Board member, CEO Healthcare and chairperson of the CR Committee.

Our CR Committee reviews our CR strategy to ensure that it covers the issues relevant to our company. In doing so, we draw on input from our stakeholders (p. 16) as well as the results of a materiality assessment (p. 19). This committee also defines measures to put our CR strategy into practice. The success of these measures is regularly reviewed, and the committee also 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 line managers as well as by interdisciplinary project teams.

The CR Committee meets three times per year. In 2015 and 2016, its meetings primarily focused on access to health, human rights, environmental and social standards along the supply chain, and animal welfare.

compliance

First and foremost, responsible entrepreneurship means legally compliant conduct. All our activities must adhere to laws and regulations worldwide. Failure to comply with these might not only involve legal prosecution, but could also seriously compromise our reputation as a business partner and employer.

Our principles

Stringent compliance requirements

Compliance is our primary consideration worldwide. Particularly as an international company with operations in developing and emerging countries, we have extremely high standards for effective compliance management. Yet for us, there is more to compliance than adhering to regulatory provisions. We consistently aspire to act in accordance with the ethical principles defined in our Values and believe that profitability should go hand in hand with the very highest ethical standards.

Mandatory guidelines

Our guidelines governing entrepreneurial conduct are mandatory for all our employees Group-wide:

- The Merck Code of Conduct provides our workforce with a tool that promotes ethical business practices. A copy is given to all employees, explaining the principles for dealing with business associates, general partners and employees, as well as the communities in which we operate.
- The Merck Human Rights Charter supplements our Code of Conduct with globally valid principles regarding human rights as well as the core labor standards of the International Labour Organization (ILO).
- Our anti-corruption guideline provides that all business activities must be conducted in accordance with applicable anti-corruption standards. All forms of bribery – whether giving or receiving – are strictly prohibited. In 2016, we revised our anti-corruption guideline to reflect the tightened provisions of the German Criminal Code.
- Our Pharma Code (for prescription medicines) and our Consumer Health Code (for over-the-counter medicines) set out important principles for interactions with our partners in the health industry.
- In 2016, our principles regarding antitrust and competition law, which were already integral to our Code of Conduct as well as to various business-specific guidelines, were consolidated Group-wide. This new antitrust and competition law guideline stipulates that all business activities across the entire Group are to be carried out in compliance with applicable competition regulations at all times. We acknowledge the importance of fair competition and expect the same of contractual partners acting on our behalf.

Realigned Compliance organization

Our Group Compliance Officer and other specialists within our Group Compliance function are responsible for defining our compliance program, which is continuously updated to reflect new requirements, such as those resulting from changes in legislation.

In 2016, we restructured Group Compliance to align it more closely with the specific compliance needs of our businesses. For each of our business sectors (Healthcare, Life Science and Performance Materials), we appointed a Compliance Officer who in turn oversees regional teams. Compliance Officers have also been appointed for our Group functions and are responsible for implementing the measures set out in our compliance program in their respective areas.

Furthermore, in 2016 we also improved our internal processes. Guidelines are now sent to relevant managers, Group Compliance and Legal via an online confirmation process. Recipients then confirm not only receipt of the relevant guidelines, but also that they are being adhered to and implemented appropriately at the relevant sites.

Data Privacy as part of compliance management

During the restructuring of our Compliance organization, we integrated our Data Privacy unit into Group Compliance. As required by law, this unit will continue to act independently and will report directly to the Executive Board as well as the Supervisory Board. The Data Privacy team comprises four employees in Darmstadt and is supported by around 80 data privacy officers at our various sites.

Regular reporting

Our 85 Compliance Officers worldwide report to the Group Compliance Officer, who informs the Executive Board at least twice a year 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.

Compliance audits

Our Internal Auditing Group function regularly reviews matters relating to compliance at our sites. Its audits determine which compliance guidelines, processes and structures are in place and how effective they are. In addition, Internal Auditing also checks for violations of our Code of Conduct and reviews the workplace requirements set out in our Human Rights Charter. The topic of corruption is also part of our standard audit program. Beyond internal audits, we also undergo external audits, such as the external assessment conducted by an auditing firm in early 2015. This led to the conclusion that the design of the compliance management system meets the key baseline requirements of the IDW PS 980 standard, in part even going above and beyond its requirements.

Compliance training

We regularly provide compliance training in the form of classroom and online courses, which focus on topics related to our Code of Conduct such as corruption, handling conflicts of interest and competition law. These courses are attended by employees of all levels as well as independent contractors and supervised workers (such as temps). We regularly review our training plan, adapting it to new developments.

Central SpeakUp Line

All Group employees are called upon to report compliance violations to their supervisor, Legal, HR, or other relevant departments. They can also use the SpeakUp Line, a central reporting system, to report violations by telephone or via a web-based application, doing so in their respective national language, free of charge and, if desired, anonymously. Business partners can also use our SpeakUp Line to report improper behavior.

SpeakUp Line reports are reviewed by Group Compliance before being submitted to the Group Compliance Case Committee, which consists of senior representatives from Internal Auditing, Compliance, Group Security, Data Privacy, and Human Resources. The committee coordinates the processing of reported violations and initiates corrective measures if necessary. Disciplinary actions are also taken, where needed, against employees who have committed a compliance violation. These actions may range from a simple warning to dismissal of the employee, depending on the severity of the violation.

In addition to the SpeakUp Line, there is also a central hotline to the Group Compliance Office, which employees can call for advice on ethical and compliant conduct.

Requirements for suppliers and business partners

If it is to be effective, compliance management needs to go beyond our own company – all our business partners worldwide must also follow our compliance principles. While our supplier management (p. 90) processes focus on vendor compliance with our standards, our Global Business Partner Risk Management Guideline governs relations with sales partners such as distributors and wholesalers. We only collaborate with partners who comply with all applicable laws, reject all forms of bribery, adhere to environmental, health and safety guidelines, and refuse to tolerate discrimination. Furthermore, we 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 monitor adherence to these standards even for existing business relationships – usually when a contract is being considered for renewal.

Risk analysis of business partners

We apply a risk-based approach to selecting sales-related business partners. The greater we estimate the risk to be regarding a certain country, region or type of service, the closer and more carefully we examine the company before entering into a business relationship with them. For these risk assessments, we use the Corruption Perceptions Index (CPI) maintained by Transparency International; we also tap into background information from various databases and information reported by the business partners themselves on aspects such as their own compliance programs.

If we encounter compliance violations, we decide whether to reject the potential business partner or terminate the existing relationship. 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 nearly 2,000 business partners.

EFPIA Transparency initiative

Since 2016, companies in the EU have been required to publish all contributions to medical professionals and organizations in the healthcare industry that are not related to research activities, along with the names of the individual recipients. This practice is stipulated by the Transparency initiative of the European Federation of Pharmaceutical Industries and Associations (EFPIA). The EFPIA published a revised version of these guidelines in 2016. Moreover, in the same year several countries introduced legislation requiring varying degrees of transparency in the pharmaceutical industry. We will include these amended requirements in our EFPIA report for 2016.

Alliance for Integrity

In October 2015, we joined the Alliance for Integrity. 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 developing and emerging countries. Its activities are concentrated in Ghana, India, Indonesia, Brazil, and Argentina.

We are a member of the Alliance for Integrity's Steering Committee, which leads the decision-making process for developing measures in its target countries. Advisory groups arrange implementation at the country level. Our local Compliance organizations collaborate with these groups and participate in training that is offered to small and medium-sized companies. We also help to organize conferences on fighting corruption, such as the World Conference held by the German Chamber of Commerce in May 2016 in Berlin.

Uniform data protection management system

We operate a data protection management system that has been harmonized across the Group. Our Policy for Data Protection and Personal Data Privacy defines the standards according to which we process, save, use, and transmit 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.

The Group-wide level of data protection is based on European and German legislation. At the same time, we also adapt our data security policies to local circumstances, as not all sites are covered by the European standards. We fundamentally respect the rights of those affected.

Data security measures

To protect our data against information theft and manipulation, we undertake technical and organizational measures based on ISO 27001, the standard for information security management. Technical measures include precautions for hardware and software, such as the creation of separate user accounts. Organizational measures cover formal review and release rules for all data we process, as well as clear access rules at our sites and visitor registration and tracking. Implementation of and compliance with our data security policy is also reviewed by Group Internal Auditing.

External auditing

Our data privacy management system is reviewed during an annual audit. In a benchmark survey carried out by Ernst & Young in 2015, our Group was rated as above average. In particular, the maturity of our data privacy culture and Data Privacy organization scored very well.

Progress

Internal audits

In 2015, 49 internal audits were conducted regarding corruption, with 55 having been conducted in 2016.

In 2015, 41 of these audits, which focused on the workplace requirements of our Human Rights Charter, were conducted in 31 countries. In 2016, 47 such audits were performed in 19 countries, including 22 audits at our global headquarters. No violations were observed.

The annual audit planning process is risk-based and includes factors such as sales, employee headcount and corruption risk, the latter of which is derived from the Corruption Perceptions Index published by Transparency International.

The sites of the company AZ Electronic Materials, which we acquired in 2014, have been fully covered by our Internal Audit process since January 2015. Since 2016, this has also applied to the subsidiaries of the U.S.-based life science company Sigma-Aldrich, which we acquired in 2015.

Training on Code of Conduct and anti-corruption guidelines

In 2015, we used our e-learning system to train 8,673 people on the Code of Conduct and increase awareness of the consequences of compliance violations. In 2016, 18,697 people received such training, which also focused on how to prevent compliance violations.

We also regularly inform our employees of new compliance requirements. In 2015, a total of 20,404 people received anti-corruption training, with 29,764 employees having been trained in 2016. In 2015, we had an online course on our anti-corruption guideline translated into 15 languages, thus allowing roughly 96% of employees to do the training in their native language. In 2015, we furthermore created an online course for the pharmaceutical business, which explains the specific regulations relevant to this area. To support the introduction of our new antitrust and competition law guideline, we also provided an online training course in 2016, which is to be available in 13 languages in 2017.

Some seminars on special topics are specifically developed for managers in certain roles. These include, for example, training courses on competition law, which were updated in 2016 due to the introduction of our new Group-wide guideline. To complement the online courses we offer, numerous classroom courses on compliance are also held for employees Group-wide with a particular focus on local issues.

Reports via the SpeakUp Line

Both the number of reports of suspected compliance violations and the number of actual compliance cases has remained largely stable in recent years. In 2015, 33 compliance-related reports that led to investigations were received via the SpeakUp Line and other channels, with 36 in 2016. In 2015, there were eight confirmed cases of violations to the Code of Conduct, with 12 in 2016. The majority of these violations constituted minor, isolated incidents resulting from the misconduct of individual persons; appropriate disciplinary action was taken.

In the 2015-2016 period, there were two cases of improper business practices involving managers. These incidents were related to improper incentives for our sales force to increase sales and similar practices in associated parties (distributors). Both cases have been addressed with comprehensive action plans and independent review by Compliance and Internal Auditing. There was one case of sexual harassment, which led to the dismissal of the employee.

First EFPIA Transparency Report published

In 2015, our work focused on making our partners in the health industry understand just how important the EFPIA's Transparency initiative is to us. We furthermore took measures to ensure data quality and security. Based on these efforts, in mid-2016 we published our first EFPIA report for all affected subsidiaries on a central website.

Compliance training for business partners

In 2015, we introduced compliance training for the employees of our business partners. This training is mandatory for all personnel who come into contact with our company or our products. It is available in eight languages and focuses on general compliance, preventing corruption and competition law. By the end of 2016, 3,875 employees from our partner companies had received this training, with 3,026 having been trained in 2015.

Human rights

First and foremost, states have a duty to establish a regulatory framework to protect human rights. Particularly for enterprises with global operations, it is important for this framework to be implemented across all countries so as to create uniform competitive conditions. As a company, we in turn also have a duty to uphold human rights, taking steps to ensure that they are not compromised by our business activities.

Our principles

Commitment to preserving human rights

We are committed to upholding human rights within our sphere of influence and welcome the Guiding Principles for Business and Human Rights (UNGPs) adopted by the UN Human Rights Council in 2011. The UNGPs codify the duty of states to protect human rights as well as the responsibility of companies to respect human rights, providing a framework for how states and businesses should do so.

At the end of 2016, the German federal government adopted a national action plan for implementing these principles. Through our current efforts and initiatives, we are on the right track to fulfilling these requirements.

In the United Kingdom, we are required by the UK Modern Slavery Act to report on the steps we are taking to counter forced labor and human trafficking. Our company intends to issue our first such report in 2017.

Our Human Rights Charter

The UN Guiding Principles for Business and Human Rights encourage companies to continuously assess the actual and potential impact they have on human rights, acting with the necessary due diligence, which includes identifying and managing risks.

We took the first step towards implementing the UNGPs in 2012, when we conducted an extensive, Group-wide human rights risk assessment aimed at identifying the human rights risks arising from our activities. Based on the results of this assessment, we adopted a Group-wide Human Rights Charter in 2013 that affirms our commitment to respecting and protecting human rights while also defining the requirements for our company. This charter unites and complements existing policies and guidelines on human rights, such as our Code of Conduct, our Corporate Environment, Health and Safety Policy and our Charter on Access to Medicines in Developing Countries.

Stakeholder dialogue on our Human Rights Charter

Our Human Rights Charter was developed after diligent consideration of input from external stakeholders regarding our human rights stance. Among these stakeholders were business and human rights experts from various countries, trade unions, and business federations, as well as experts on specific aspects covered in the planned charter.

Human rights due diligence

We seek to better understand the potential impact of our business activities and relationships on human rights and are examining our processes to identify the measures already in place at our sites that fulfill the function of human rights due diligence. This knowledge will help us adapt our Group-wide human rights due diligence efforts to better meet local needs and to develop approaches to overcome particular challenges. At the same time, we view the positive impacts of our operations as an opportunity.

Within the German Global Compact Network (DGCN), 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.

Progress

Training employees on our Human Rights Charter

In the 2015-2016 period, we used a variety of channels to educate our employees on our Human Rights Charter, including specific Intranet sites on human rights and videos featuring employees explaining how their work affects human rights.

Human rights impact assessment in India

A human rights impact assessment (HRIA) evaluates the actual consequences of a company's operations in an effort to promptly identify any problem areas. At the end of 2014, we conducted our first HRIA in India, which showed that we already have good internal systems and capacities in place for managing human rights risks. However, we intend to expand these structures in order to set a positive example for industry there. As a result of this HRIA, we joined the Alliance for Integrity, a multi-stakeholder initiative seeking to offer practical solutions for countering corruption (p. 12) in emerging economies.

Subsidiary self-assessments

In line with our Human Rights Charter as well as the UN Guiding Principles on Business and Human Rights, we started the process of conducting human rights self-assessments for our subsidiaries in 2016. This aims to help us better understand how our subsidiaries perceive human rights risks and manage them locally, while also raising human rights awareness and creating a foundation for systematic support.

Our subsidiaries took part in an online survey we developed ourselves, providing us with detailed information. We will continue to evaluate this data in the course of 2017, working with the respective departments to identify opportunities to improve Group-wide processes and their local implementation. Taking into account the requirements of the UK Modern Slavery Act, our efforts will focus on issues such as forced labor and human trafficking, as well as labor rights in local supply chains.

stakeholder dialogue

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

Our principles

Dialogue at various levels

Our most important stakeholders include our employees, customers and business partners, patients, the Merck family, and our suppliers. We maintain continuous contact with them through a variety of channels, including stakeholder questionnaires, issue-specific dialogues, round table discussions, and information forums. We also engage stakeholders through our advocacy work and industry coalitions.

Our stakeholders

Regular stakeholder surveys

We regularly conduct surveys among our employees, customers and business partners, as well as other relevant stakeholder groups. We want to know which issues they consider to be of importance to Merck now and in the future, and how they rate our performance in addressing these issues. We also want to understand their expectations of us as a responsible company. Our CR Report reflects the results of these surveys and the actions we've taken in response.

In November 2016, we conducted a Group-wide employee survey in 23 languages. Around 42,500 employees took part, representing an 83% response rate.

Issue-specific dialogues

Our business operations in the areas of healthcare, life science and performance materials intersect the interests of various social groups, whom we engage via questionnaires, workshops and seminars, or even round tables held at major conferences. Our departments organize such forms of exchange – at the local, national or international level, depending on the topic and degree of importance. Beyond this, we are also involved in industry networks and participate in symposia. In the 2015-2016 period, we intensified our efforts in the following areas:

Access to health: As part of our aim to improve access to health in low- and middle-income countries, we engage various stakeholders in a continuous dialogue. With our Access Dialogue Series, we have created a platform from which public and private sector stakeholders can exchange important information and share best practices. Key issues in the 2015-2016 period were managing intellectual property and challenges in local supply chains. Furthermore, we deepened our exchange with important stakeholders and experts on schistosomiasis and malaria. Further information on these stakeholder dialogues can be found under Access to Health (p. 34).

Mica sourcing: In February 2016, we attended the Mica Summit in Delhi, India, hosted by the Natural Resources Stewardship Circle (NRSC). The main topics discussed at the summit were transparency in the mica supply chain and improving the living conditions of the communities in the mining regions. As a follow-up to this dialogue, we are now involved in the NRSC's Responsible Mica program. You can find more information under Suppliers (p. 93).

New technologies: We seek to engage with pioneers who look far into the future and bring cutting-edge technologies to market. To this end, we established the annual Displaying Futures symposium, which was held for the sixth time in 2015 and the seventh time in 2016. At the 2015 symposium, experts of various disciplines from all corners of the world met in San Francisco, CA (USA) to discuss how innovative high-tech materials could be integrated into groundbreaking future technologies. In 2016, specialists from a range of industries convened at our global headquarters in Darmstadt to discuss the future of mobility. You can find more information under Sustainable product design (p. 29).

Round tables and information forums

We have set up round table discussions and forums for local residents at our major sites. In Darmstadt, we have been holding an annual public planning forum since 1994 at which we discuss the development of our site with members of the city council, local authorities and the community. In the 2015-2016 period, the main focus of the forum was on the changes resulting from our ONE Global Headquarters initiative (p. 72), particularly the new sewer system being laid by the City of Darmstadt and the future design of Frankfurter Strasse.

In expanding our biotech production facilities in Corsier-sur-Vevey, Switzerland, we initiated a dialogue with NGOs and local authorities to maximize the project's transparency. These annual meetings will continue to be held even after completion of the construction work. In 2016, key topics of discussion were the mobility plan and our wastewater treatment system, which was first tested in the same year.

Advocacy groups and industry coalitions

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

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

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

Stefan Oschmann, Chairman of the Executive Board and CEO:

- European Federation of Pharmaceutical Industries and Associations (EFPIA), Vice President
- German Chemical Industry Association e.V. (VCI), Board of Directors
- Deutsche Welle, Business Advisory Board

Udit Batra, member of the Executive Board and CEO Life Science:

- Greater Boston Chamber of Commerce, board member
- Massachusetts High Technology Council (MHTC), board member
- University of Delaware College of Engineering, Advisory Council member

Kai Beckmann, member of the Executive Board and Chief Administration Officer:

- Federal Employers' Association for the German Chemical Industry e.V. (BAVC), Vice Chairman
- Employers' Association for the Chemical and Related Industries in the State of Hesse e.V. (HessenChemie), board member
- Darmstadt Rhein Main Neckar Chamber of Industry and Commerce (IHK), Vice President
- Fraunhofer Institute for Computer Graphics Research (IGD), Chairman of the Advisory Board

Walter Galinat, member of the Executive Board and CEO Performance Materials:

- German Chemical Industry Association e.V. (VCI), Chairman of the Hessian Chapter
- Trade Policy Committee of the German Chemical Industry Association e.V. (VCI), member
- Board of Trustees of the Chemical Industry Fund (FCI) within the German Chemical Industry Association e.V. (VCI), board member

Belén Garijo, member of the Executive Board and CEO Healthcare:

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

Involvement in initiatives

We collaborate with numerous civically engaged organizations, such as the Goethe-Institut, the Remembrance, Responsibility and Future Foundation and the World Environment Center (WEC). Furthermore, we are also involved in initiatives and projects (p. 8) that share our interpretation of responsible entrepreneurial conduct. That is why we support, for instance, the Code of Responsible Conduct for Business and are members of the Chemie[3] and Responsible Care® initiatives.

Political donations

We do not make financial contributions to holders of or candidates for political office, political parties or related organizations. This is stipulated in our Code of Conduct. In the United States, Political Action Committees (PACs) have been set up through which our employees can donate money to support political candidates and organizations. These donations are not made by the company, but by the employees. The contributions donated are reported to the U.S. Federal Election Commission and published.

Materiality assessment

Which issues – in terms of our corporate responsibility – are of particular significance to our long-term business success? And what expectations do stakeholders have of our company? In an effort to answer these questions, we regularly conduct materiality assessments that aim to rate sustainability topics according to their importance to our company and external stakeholders. This method allows us to align our business activities with the requirements of our stakeholders. In applying this approach, we fulfill the requirements of the Global Reporting Initiative (GRI) G4 guidelines. In 2016, we refined our materiality analysis to further enhance the quality of the results.

Selecting topics

We first determined whether the CR issues of relevance to us had changed at all, basing our assessment on a comprehensive document analysis that included inquiries from investors, (sustainability) ratings, social media, and press releases. From the results, we identified 43 issues, 38 of which were covered by the materiality assessment in 2014. New topics included issues such as health awareness (p. 41) and digitalization (p. 26).

Ranking and weighting the issues

These 43 topics were evaluated by our most important stakeholders. This involved a total of 300 employees, scientists, customers, sales associates, and business partners ranking the relevance of these issues through an online survey. In addition, we conducted five interviews with select experts whose responses were key in determining the final ranking of our main CR topics.

We weighted the results of the materiality assessment according to the importance of the stakeholder groups to our company and their influence on the five value drivers of sales, reputation, employee satisfaction, cost reduction, and innovation.

Results: Product responsibility most important

The process and results of the materiality assessment were reviewed by internal specialists as well as our CR Committee. Our stakeholders continue to rate issues regarding product responsibility as most important, above all product quality, the safety of chemical products, innovation, and research & development. Topics rated as material form the focus of this CR Report. Since our stakeholders also expect information and transparency from us regarding less significant issues, we also report on these, albeit in less detail.

Material topics

Supply chain standards
- Supply chain standards

Ethical Conduct
- Bioethics
- Clinical trials
- Animal welfare

Product safety and quality
- Safety of chemical products
- Drug safety
- Counterfeit products
- Transport and storage safety
- Labeling of chemicals and other products
- Pharmaceutical and chemical residues in the environment
- Nanotechnology

Health for everyone
- Access to health
- Prices of medicines
- Medicals to combat rare and neglected diseases
- Health awareness

Good Business Practice
- Compliance
- Responsible marketing
- Community involvement
- Interactions with health systems
- Governance
- Advocacy
- Data security

Sustainable products
- Sustainable product design
- Re-use and recycling of our customers' waste

Resource efficiency
- Waste and recycling
- Water management

Human rights
- Human rights

Climate Change
- Energy efficiency and renewable energy
- Greenhouse gas emissions

Attractive employer
- Diversity and equal opportunity
- Attracting, recruiting and retaining employees
- Employee development
- Good leadership
- Employee engagement
- Safety and health
- Work life balance
- Compensation

Technology
- Innovation and R&D
- Digitalization
- Digitalization of the workplace

Environmental stewardship
- Process and plant safety
- Biodiversity
- Other emissions

Very high importance | High importance | Medium importance

Material issues in our value chain

The following table shows where our main issues fall within the value chain: upstream in our supply chain, in the course of our own activities, or downstream with customers and patients. Moreover, we have listed the issues to show the breakdown of materiality by Merck business sector and stakeholder group. These topics are linked to the respective chapters in this report.

	Upstream activities	Healthcare	Life Science	Performance Materials	Downstream activities	Material for:
Product safety and quality						
Chemical product safety		✓	✓	✓	✓	Customers, Merck family Shareholders, Government agencies, NGOs, Commercial and business associates
Drug safety		✓			✓	Merck family, Shareholders, Government agencies, NGOs, Health systems, Patients
Counterfeit products		✓			✓	Customers, Merck family, Shareholders, Federations and policy makers, Government agencies, NGOs, Commercial and business associates, Health systems, Patients
Transport and warehouse safety	✓		✓	✓	✓	Customers, Government agencies, Suppliers, Commercial and business associates, Communities
Labeling of chemicals and other products		✓	✓	✓	✓	Customers, Federations and policy makers, Government agencies, NGOs, Media, Suppliers, Scientists, Commercial and business associates, Health systems, Communities, Competitors
Pharmaceutical and chemical residues in the environment		✓	✓	✓	✓	Federations and policy makers, Government agencies, NGOs, Communities
Ethical conduct						
Bioethics		✓	✓		✓	Customers, Federations and policy makers, Government agencies, NGOs, Scientists
Clinical trials	✓	✓			✓	Merck family, Shareholders, Federations and policy makers, Government agencies, NGOs, Media, Suppliers, Scientists, Patients
Animal welfare	✓	✓	✓	✓		Government agencies, NGOs, Media, Suppliers, Scientists

Good business practice

Compliance

Material for: Employees, Merck family, Shareholders, Government agencies, NGOs, Suppliers, Commercial and business associates, Health systems, Competitors

Responsible marketing

Material for: Customers, Federations and policy makers, Media, Commercial and business associates, Health systems, Patients

Community involvement

Material for: Merck family, 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

Health for everyone

Access to health

Material for: NGOs, Media, Suppliers, Commercial and business associates, Health systems, Patients

Prices of medicines

Material for: Merck family, Shareholders, Government agencies, NGOs, Media, Commercial and business associates, Health systems, Patients

Medicines to combat rare and neglected diseases

Material for: NGOs, Scientists, Health systems, Patients

Health awareness

Material for: NGOs, Media, Scientists, Commercial and business associates, 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					

Sustainable products

Sustainable product design			✓	✓	✓	
Material for:	Customers, Scientists					
Re-use and recycling of our customers' waste			✓		✓	
Material for:	Customers					

Attractive employer

Diversity and equal opportunity		✓	✓	✓		
Material for:	Employees, Employee representatives, Merck family, Media					
Attracting, recruiting and retaining employees		✓	✓	✓		
Material for:	Employees, Employee representatives, 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					

Technology

Innovation and R&D		✓	✓	✓	
Material for:	Customers, Merck family, Shareholders, Scientists, Health systems, Patients				

Resource efficiency

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

Climate change

Energy efficiency and renewable energy		✓	✓	✓	
Material for:	Federations and policy makers, NGOs				
Greenhouse gas emissions	✓	✓	✓	✓	✓
Material for:	Customers, Federations and policy makers, Government agencies, NGOs, Media, Suppliers				

products

We offer top-quality products that enrich people's lives. When it comes to safety, environmental sustainability and ethical practices, we have extremely high expectations and standards.

Whether prescription medicines or over-the-counter products, the work of our Healthcare business sector makes a difference to millions of lives around the world. Through our Life Science products, we are dedicated to making research and biotech production simpler, faster and more successful. We continuously work to improve the sustainability footprint of our products. In our Performance Materials business sector, we develop specialty chemicals for particularly demanding applications, such as liquid crystals for energy-efficient displays.

Read More

Innovation and digitalization

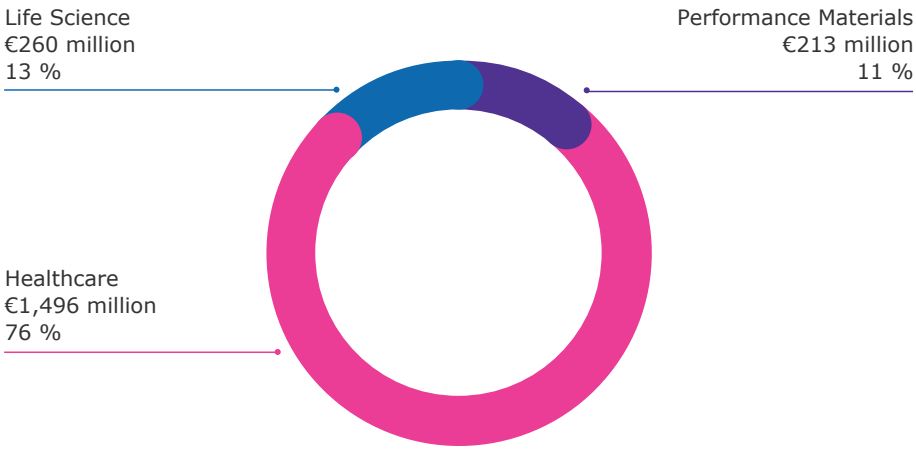
Research and innovation are the basis of our success. In 2016, we spent around € 2.0 billion on research and development (R&D). We develop technologies that enrich people's lives and are constantly on the lookout for groundbreaking developments and trends that can be translated into new products and pioneering business models. In particular, new technologies and the advance of digitalization are enabling us to create innovative products, services and business models that can positively impact lives. We intend to maximize this opportunity.

Our principles

Innovation strategy and organization

Our Group function Strategy & Transformation is in the process of developing a Group-wide innovation strategy. We are analyzing current megatrends, determining the influence they have on our business models, and defining the areas in which we see potential for new business ideas. In doing so, we are thinking far beyond our core business. To find novel approaches, we enter into strategic alliances with organizations that embody different perspectives. Many such potential partners are based in Silicon Valley, CA (USA), one of the key regions in the global high-tech industry. Here, we too are expanding our presence as a science and technology company.

Research and development costs by business sector – 2016



We are investing in forward-looking ideas. Our Merck Ventures Fund provides up to € 300 million for investments in start-ups that will advance or complement our business models.

To maximally leverage the opportunities of digitalization, we form strategic partnerships with companies such as the California-based Palantir Technologies, with whom we joined forces in January 2017. We hope to bolster patient outcomes by using their sophisticated data analysis capabilities to improve and accelerate the development, commercialization and distribution of drugs.

You can find more information on our strategic approach under Research and Development in our Annual Report for 2016.

Innovation Center – Making room for ideas

At our Innovation Center in Darmstadt, we offer our employees and external partners space and support to cultivate their ideas. We teach them innovative methods and provide the necessary infrastructure to advance pioneering projects.

Our work focuses on four strategic projects:

- **Accelerator:** Numerous start-ups around the world are working on innovative business models for our business fields. Our global Accelerator program supports such start-ups in the early stages of their development. In return, we gain insight into the highly innovative start-up community and can identify market trends early on.
- **Internal innovation projects**: We want to better harness the great innovation power within our company. We therefore offer our employees from all over the world the opportunity to work at our Innovation Center on select projects for up to a year. As well as receiving financial support for their projects, employees have access to select experts who provide input across all stages, from the seed of the idea to product development.
- **Innovation Think Tank:** In our Innovation Think Tank, we work with internal and external experts, research institutes and other companies to analyze current trends and technologies.
- **Innovator Academy:** The Merck Innovator Academy aims to bolster our company's capacity for innovation by organizing needs-based training courses and workshops with internal project teams, think tank participants and start-ups.

Innospire – Mobilizing employees

The goal of our innovation initiative Innospire (a combination of innovation and inspiration) is to mobilize the innovative potential of our people. Every two years, we call upon them to submit ideas for new products and develop business plans during a multi-stage process. You can find more information under Employees (p. 72).

Fostering young talent – An investment in the future

Well-trained talent is the best foundation for future innovations, which is why we endeavor to spark young people's interest in science. Students who are curious about chemistry and biology can use our Junior Lab and livfe BioLab to conduct their own research and experiments. We run both laboratories together with the Technical University (TU) of Darmstadt. Furthermore, in supporting TU Darmstadt's HIGHEST 1877 start-up program, we are promoting the innovative ideas of local start-ups.

We also collaborate with various schools in the vicinity of our global headquarters in Darmstadt. For example, we provide STEM subject teachers with educational materials and organize annual events devoted to STEM teachers such as Merck Science Days, where they learn how to incorporate new technologies into their science classes. We regularly invite groups of students to Merck to explore our research activities, or to our Children's University in an attempt to stimulate their thirst for knowledge. Moreover, for over 30 years we have been hosting the "Jugend forscht" student competition.

You can find more information on our educational initiatives under Community (p. 95) and in our "Fostering talent (p. 183)" story.

Digitalization as a driver of innovation

Digitalization is revolutionizing markets and business models. This technological change is also an important driver of innovation and is changing the pace at which new ideas are entering the market. We are constantly exploring new ways to leverage this potential and currently expect advances in the following areas:

- **Research and development**: Digital technologies enable us to access large quantities of data and quickly analyze it. We can use this information to accelerate our research and development activities. Particularly in our Healthcare business sector, we hope to accelerate the development of new drugs so as to provide patients with faster access to medicine with increased efficacy.
- **Supply chain management:** Digital technologies help us enhance our supply chain management process. By collecting all data pertaining to our supply chain centrally, we have access to crucial real-time information. This allows us to predict and respond quickly to issues such as supply bottlenecks worldwide, ensuring a more reliable supply of medicines.
- **Customer interaction:** Thanks to modern data collection and analysis techniques, we can make more efficient use of customer-relevant data to more fully understand our customers. Furthermore, digital platforms offer us new ways to interact with our clientele. By better understanding their needs, we can adapt our products and services accordingly.
- **Digital product innovations:** Digitalization is enabling us to expand our existing products and develop new products, services and business models. For instance, we are enhancing existing products with new digital services such as Baby Wish (p. 28). This platform educates couples on fertility issues and provides healthcare professionals with scientific information. Moreover, we are working to raise health awareness and improve patient treatment through e-health programs such as the Diabetes Online Risk Assessment (DORA) (p. 28).

Vocational training and continuing education

Innovation culture and digitalization are new topics at our Merck University for managers. In early 2017, we entered into a partnership with the Stanford Graduate School of Business, which will be teaching classes on these topics for us. Furthermore, under the banner of "Work 4.0", we are integrating new digital technologies into our vocational training programs and offering our employees a modern, innovative working environment. You can find more information under Employees (p. 64).

Data protection

Data protection is essential to implementing digitalization in a responsible manner, which is why we strictly adhere to all data protection guidelines, monitor the various regulatory frameworks, and respond immediately to changes. You can find more information on data protection under Strategy & management (p. 11).

Progress

Intelligent packaging processes and drug information in real time

Our Smart Packaging project allows us to make our drug packaging processes more efficient and flexible. By connecting our packaging machines via an Internet of Things, we can improve their accuracy and reliability while also increasing their output. Additionally, our new predictive maintenance capabilities will reduce machine breakdowns. By connecting systems across the entire organization and using advanced analytics, we will be able to decrease packaging waste and lead times when changes have to be made to the product information. This also means that, when new information about a product is discovered, we can inform our customers more quickly. We are also exploring options for active packaging that will allow patients to look up the latest information in real time on their smartphones.

In good hands: the Baby Wish digital platform

Through our fertility medicines, technologies and services, we are providing the support clinics need to help couples conceive. We also offer more direct aid to impacted individuals. Launched in April 2017, our Baby Wish digital platform features information on infertility and treatment options. In July 2016, we launched a different platform that provides healthcare professionals with access to the latest digital scientific information on infertility. Through this medium, we are helping providers offer the best care for couples seeking advice.

First Merck hackathon in Africa

As part of our Accelerator program, we support and organize hackathons in which young entrepreneurs from various sectors collaborate to quickly develop solutions to specific issues. In 2016, we hosted a hackathon in Accra, Ghana that was attended by approximately 150 social entrepreneurs from western Africa. At this gathering, dubbed Health Hack Accra, 29 teams of biomedical engineers, scientists, programmers, and university students had 48 hours to create solutions and business models to tackle Africa's toughest health challenges. With a focus on reproductive and maternal health, access to health, non-communicable diseases, and infectious diseases, this hackathon led to the development of 28 innovative solutions. Our Innovation Center is supporting the top three solutions in partnership with the Impact Hub in Accra:

- CrowdAfrica: A crowdfunding platform for healthcare.
- Peach Technologies: An electronic patient file.
- dynaMix: An awareness platform for reproductive health that also aims to increase the availability of contraceptives in rural regions.

Online campaign for diabetes

In Africa, approximately 62% of diabetes cases go undiagnosed. To improve early diagnosis and promote awareness for diabetes, we joined forces with various partners in March 2015 to launch a digital initiative known as DORA (Diabetes Online Risk Assessment). People in South Africa, Namibia, Kenya, Ethiopia, Ghana, Nigeria, Mozambique, and Mauritius can use their smartphones or computers to take an online test. In just a few clicks, they can ascertain whether they are at risk of developing diabetes. Since its launch, the DORA website has received more than 401,500 hits, with 74,294 coming from people who took the assessment.

sustainable product design

Respect for the environment and natural resources is at the heart of sustainable conduct. We too see this as our duty. Our Performance Materials business sector produces materials that our customers can use to develop more sustainable products. Take for example liquid crystals that increase display efficiency, or materials that continuously improve solar cells and organic photovoltaics.

Our Life Science business sector develops technologies and solutions to make research and biotech production simpler, faster and more successful. Here, too, we take sustainability into account at the very start of product development.

Our principles

Performance Materials

Our Performance Materials business sector manufactures numerous products that help our customers develop sustainable and environmentally compatible products. Our requirements are set out in the following guidelines:

- Our Product Safety Chemicals Policy: This specifies our Group-wide product safety requirements.
- Our Green Product Policy: This ensures that we adhere to all national and international laws and statutes (e.g. REACH and the European Union RoHS Directive) as well as industry and customer-specific requirements. Furthermore, this policy forbids the use of acutely toxic, mutagenic or otherwise hazardous substances that remain in the end product.
- For Display Materials products as well as Pigments & Functional Materials products, we adhere to our customers' Halogen-free Policy.

Across all our manufacturing facilities, our raw materials for the cosmetics industry fulfill the high standards of the Cosmetics Directive, for example Good Manufacturing Practices (EFfCI GMP).

Best practice examples to improve sustainability

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

Energy-efficient displays

Liquid crystals (LCs) ensure high picture quality in computer monitors and televisions, reducing their energy requirements. This is because our PS-VA technology (polymer-stabilized vertical alignment) arranges the liquid crystals so as to better utilize the backlighting, which is a display's largest power consumer. Thanks to PS-VA technology, devices consume significantly less energy than precursors.

Self-aligned vertical alignment (SA-VA) is the next-generation liquid crystal technology in development, with the first SA-VA products expected on the market in 2017. SA-VA helps conserve resources and is environmentally sustainable because less energy and solvent are required to manufacture the displays. Moreover, it is more efficient as fewer process steps are necessary. Since SA-VA technology can be used at lower temperatures, it is also suitable for sensitive materials such as those in premium products or pioneering applications such as flexible displays.

Mobile device displays have increasingly high resolutions but are still expected to be as energy-efficient as possible. This is exactly where our liquid crystals for touchscreen applications come in. Based on Ultra-Brightness FFS technology (UB-FFS), these liquid crystals provide displays with 15% more light transmission. This can reduce the energy consumption of smartphones and tablets by around 30%, thereby prolonging battery life. UB-FFS furthermore enhances picture resolution. We are currently working to advance this technology so that it can also be used in applications such as LCD televisions.

Switchable windows

Windows that darken in a matter of seconds are now a reality thanks to our liquid crystal window (LCW) technology. Because they also reduce heat input from sunlight, initial estimates show that these windows can lower the energy consumed by building climate control systems by up to 40%. Commercialized under our licrivision™ brand, this technology thus renders conventional sun shading redundant. We are currently investing € 15 million in the construction of a production facility for liquid crystal window modules in the Netherlands. The manufacture of these switchable glass modules is scheduled to begin there at the end of 2017. More information can be found in our story "Exploring the future (p. 179)".

OLEDs

Organic light-emitting diodes (OLEDs) likewise increase the energy efficiency of displays. They furthermore provide brilliant colors and razor-sharp images. Over the past several years, we've been researching innovative printing processes to efficiently produce large-screen OLED displays. To this end, we've been partnering closely with printer manufacturers. In September 2016, we opened a new production plant for OLED materials at our site in Darmstadt. Costing around € 30 million, this plant represents one of the largest single investments we have made at the Darmstadt site in recent years.

Innovations in photovoltaics

We supply the photovoltaics industry with materials for the production of highly efficient solar cells. These materials enable the realization of innovative applications for photovoltaics such as flexible, semi-transparent and lightweight solar cells that can be used in buildings, on curved or straight surfaces or even in clothing.

Phasing out plastic microbeads

We manufacture mineral-based pigments and functional fillers used by the cosmetics industry in formulations for various purposes. Our RonaFlair® functional fillers range provides an alternative to plastic microbeads contained in skin care products.

Through their use in cosmetics and other products, plastic microbeads end up in marine and terrestrial ecosystems, and are facing public criticism because they are not biodegradable. Through our alternative mineral products, we are supporting, for example, the declaration of Cosmetics Europe, which advocates a phase-out of microplastics in rinse-off products by 2020.

Increase in natural cosmetics

An ever-growing number of consumers place importance on natural cosmetics. Together with our customers in the cosmetics industry, we are responding to this rising demand by developing cosmetic formulations that meet strict criteria. The majority of our cosmetic raw materials meet the criteria of Ecocert's Cosmos standard for organic and natural cosmetics.

Life Science

We endeavor to reduce the environmental and health impacts of our Life Science products. This applies to their entire life cycle, from manufacture and use to end of life. At the same time, we want to make our products more efficient and user-friendly. That is why, right at the beginning of the product development phase, we ask ourselves how to best reconcile these requirements.

With our Design for Sustainability (DfS) program, we have developed a comprehensive approach. The DfS program provides our product developers with a range of tools, enabling them to analyze the impact of the product on the following areas: materials, energy and emissions, waste, water, packaging, usability, and innovation. For each of these areas, we have developed several sustainability criteria that are noted on a score card. When developing a new product, our aim is to improve on as many of these criteria as possible. To understand the potential impacts on the environment within different product life cycle stages, we conduct product life cycle analyses. The results of these analyses show us how we can improve our products and are incorporated into subsequent development stages. During this process, experts from R&D, Product Management, Quality, Procurement, and other departments are in constant contact.

Through our DfS process, we have improved the product properties across 32% of our BioMonitoring product developments and product updates in at least three of our self-defined sustainability criteria. We will be incorporating our suppliers into our Design for Sustainability program as well. In 2016, we launched a pilot project to define the relevant requirements for our suppliers.

In addition to following this design process, our Life Science research teams are developing innovative solutions in line with the 12 Principles of Green Chemistry formulated 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. Under the green chemistry approach, researchers look for alternative, ecologically sustainable reaction media with higher reaction rates and lower reaction temperatures to make production more energy efficient. In total, we offer more than 700 products that align with the Principles of Green Chemistry, making them a "greener" alternative to conventional products.

A wide range of solutions

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

More environmentally compatible laboratory filters

Using our DfS approach, we have significantly reduced the environmental footprint of our EZ-Fit™ Manifold laboratory filter. In comparison with its predecessor, the Hydrosol Manifold, we require 47% less raw material for the EZ-Fit™ Manifold. Its packaging consists of 100% recyclable cardboard and, overall, 95% of its parts are recyclable. Because the heads can be easily removed for cleaning, it is no longer necessary to clean the whole device, which saves energy and results in a 91% reduction in the carbon dioxide emissions produced during cleaning. In 2016, we furthermore expanded our range to include a disposable filtration device, which is used to determine the microbial count in liquid samples. Thanks to our DfS approach, we have particularly improved the packaging of this product.

Greener chemistry

In comparison with conventional alternatives, our greener solvents are based on natural resources such as corn cobs and sugar cane bagasse. They are more ecologically sustainable, easier to recycle and more biodegradable. Take for example the solvent Cyrene™, which we launched onto the market in 2016. It is bioderived from waste cellulose and is used as an alternative to dimethylformamide (formic acid), which has been the subject of increasing criticism in recent

years due to its mutagenic effects. With Cyrene™, we are helping our customers in the pharmaceutical and agrochemical industries make their production processes safer and more environmentally sustainable.

Instruments for biofuels

Our Guava® HT series of flow cytometers is helping to drive biofuel research and development. For example, our customers are using the Guava instruments to find an algae species that is suitable for diesel production. Our flow cytometers are also being used to produce ethanol from sugar; they test which bacteria digest sugars and thus produce gases that can be refined into ethanol.

Energy-efficient sterility tests

Using the DfS approach, we have reduced the energy consumption of our Steritest™ Symbio pumps for sterility tests by 15% to 30% compared with its predecessor.

Tool to assess the sustainability performance of chemicals

In 2016, we introduced a tool called Dozn™ to assess the green alternatives of various chemicals, thereby creating transparency for our customers. Based on the 12 Principles of Green Chemistry, we evaluate how our products score in three main categories, namely improved resource allocation, efficient energy use, and minimized risk to humans and the environment. One point is given for each of the 12 principles, allowing an easy comparison of the products. The results of the evaluation are verified by an independent body. To date, we have used the matrix to assess and improve more than 40 products.

Progress

Displaying Futures: Annual conference on the future of display technology

Pioneering advances such as our efficient UB-FFS display technology are only possible through close collaboration with our partners. We seek to engage trailblazers who look to the future and conceive groundbreaking technologies. This is why we instituted the annual Displaying Futures Symposium, which was held in 2016 for the seventh time.

In September 2016, the symposium centered on the theme "Driving Forces – Inspired by Performance Materials". At our Group headquarters in Darmstadt, experts from various fields discussed the future of mobility, from cars that communicate with one another to self-driving vehicles.

In 2015, we hosted two events with differing focuses. In October, we met with architects and designers in Chicago, IL (USA) to discuss materials that would transform architecture. We also took the opportunity to introduce our liquid crystal window technology to a large audience. In November, international experts from fields such as displays and electronics gathered together in San Francisco, CA (USA) under the banner "The Future is HOW? Inspired by Performance Materials". Attendees discussed how materials and high-tech chemicals could be used in future applications.

Award-winning programs

In 2015, we were granted the German Innovation Award in recognition of our UB-FFS technology (p. 29), which lowers the power consumed by mobile device displays.

Three of our Life Science products, Titripac®, EZFit™ Manifold and SNAP i.d.® 2.0, were honored in 2016 with the Green Good Design Award for sustainable product design. This award was also given in honor of our Design for Sustainability program, which enabled us to improve these products.

In recognition of close collaboration across company boundaries, we received the Enterprise Innovation Award from the Technical University of Darmstadt in June 2016. In a joint project with Siemens, we developed high-performance materials for energy-efficient generators. These innovative materials not only make the generators more efficient and more powerful, but also allow the construction of buildings that help conserve resources.

packaging

Packaging protects our products from external influences and ensures that they reach the customer undamaged. It also prevents materials from leaking. Our packaging must therefore remain intact across the product's entire life cycle – from transport to storage, and from usage to end of life.

Beyond safety, we also strive to design packaging that uses as few natural resources as possible. We are therefore working to reduce the amount of material required and are increasingly utilizing environmentally sustainable materials where possible. In the process, we ensure that the quality and safety of the packaging is not adversely affected.

Our principles

Sustainable packaging strategy

We aim to deliver our products in packaging that is safe and easy for our customers to handle, as well as sustainable.

The more than 300,000 products of our Life Science business sector – ranging from biochemicals to lab chemicals, from filter materials and systems to instruments – pose a wide range of challenges when it comes to packaging. We strive to improve the sustainability of their packaging through measures such as reusable packaging systems, or by avoiding the use of polystyrene. Our sustainable packaging strategy for our Life Science business sector stipulates the framework for this approach. A variety of guidelines help our experts to consider sustainable packaging alternatives and implement them during the product development stage.

We also work to enhance the sustainability of our packaging design for our Performance Materials products such as liquid crystals and pigments (p. 32).

Certified cardboard boxes

The majority of the corrugated cardboard boxes we use worldwide are certified to the standards governing sustainable forestry. These include the Sustainable Forestry Initiative (SFI), the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification Schemes (PEFC).

A variety of solutions for an extensive product portfolio

Our initiatives for sustainable packaging systems are as varied as our product portfolio. Here are several examples:

Cellulose instead of polystyrene

In the past, we secured glass reagent bottles using expanded polystyrene (EPS) molded foam to prevent them from breaking during transport. While EPS, also known as Styrofoam®, is an excellent cushioning material, it is manufactured from non-renewable petrochemicals. It is also difficult to recycle and takes up a lot of storage room. By contrast, molded pulp components can be easily recycled with other paper materials and compacted together for storage and transport. We have a substitution program in place that is working on solutions to replace EPS with molded components made of cellulose and recycled paper pulp.

When shipping items from our major distribution centers in the United States and Germany, a large portion of our reagent bottles are secured using molded pulp components. In 2015 and 2016, we conducted numerous safety tests on various molded pulp part designs to pad 4X4 liter bottles in shipping boxes. In 2017, we plan to start using pulp components for this package size, which will replace approximately 350,000 molded EPS parts per year. We are currently conducting safety tests on various pulp designs for shipping individual bottles of various sizes.

More cardboard instead of plastic

The analytical technique of titration is utilized in laboratories to assure the quality of various products by verifying the purity of the raw materials. Although the necessary solvents are conventionally packaged in plastic bottles, we use Titripac® because it offers a more environmentally compatible alternative for supplying solvents to our Life Science customers. By employing a cardboard carton and plastic liner with an integrated withdrawal tap, we made the packaging more recyclable while also cutting down the weight by more than half. As a result, the greenhouse gas emissions arising across the entire life cycle of the product are 61% lower than for plastic bottles. Because the withdrawal tap protects the product against contamination, the contents can be used to the very last drop, thereby reducing chemical waste. In 2016, Titripac® was recognized with the Green Good Design Award for sustainable product design.

Reusing EPS boxes

Many of our Life Science products must be kept cool during shipping and are therefore packed in special Styrofoam® boxes. To mitigate waste, we offer our U.S. customers the option of sending us back these boxes. If they are fully functional, we reuse them, which, at more than 20,000 boxes per year, reduces waste. We are in the process of expanding this program to serve customers outside of the United States as well.

Reusing liquid crystal canisters

In Korea and Taiwan, our Performance Materials liquid crystal mixtures are delivered to display manufacturers in stainless steel canisters. Our customers utilize these standardized

canisters directly on their production lines without decanting. The empty containers are then sent back to us and cleaned. Within this closed system, these canisters can be reused over several years.

Steel instead of glass

Thanks to our EMD ReCycler® bulk product delivery system, our solvents are delivered to our U.S.-based Life Science customers in special reusable steel containers. They can return the empty containers to us for refilling. Through this program, we are significantly reducing the consumption of primary packaging materials. Because the stainless steel containers are shipped without additional packaging, we are also saving a lot of the packaging material normally needed to ship glass bottles, which must be packed in boxes and cushioned by molded components.

In Europe, we also deliver solvents required in bulk quantities for preparative chromatography in reusable stainless steel barrels and drums. Our customers send the empty containers back to us, where they are properly cleaned and then reused. Approximately 20,000 of our stainless steel barrels and 20,000 stainless steel drums are currently in circulation across Europe. The rate of return is 90% for the barrels and around 50% for the drums.

Reuse and recycling

Through our recycling programs, we help our customers dispose of our products and packaging.

Our principles

Design for Sustainability

Our Design for Sustainability (DFS) program encourages our Life Science research & development teams to design products with reduced life cycle impacts. This process focuses on utilizing recyclable or reusable materials that can be easily recovered or separated. Through DfS, we are continuously working to reduce the ecological footprint of our products and make disposal as easy as possible for our customers.

Progress

Recycling program updated

Many of the products we supply to our Life Science customers are used once and then discarded. This is necessary to minimize the risk of contamination and is common practice within the industry. Moreover, this approach helps reduce costs because our customers don't have to clean disposable products, thereby saving time and natural resources such as energy and water. Recycling the plastic in these products is not easy, primarily due to inadequate recycling options, challenging material properties, and stringent regulatory requirements.

In cooperation with Triumvirate Environmental, a waste management company based in Massachusetts (USA), we launched a recycling program at the beginning of 2015 to serve our Life Science customers in the United States. Under this initiative, product waste from their research labs and biopharmaceutical manufacturing operations is collected and recycled in its entirety. This program has thus replaced our previous individual initiatives, which included our Biopharma Product Recycling Program as well as our Ech2o™ Collection and Recycling Program for water filter cartridges. These processes were not efficient because the various materials had to be separated before recycling.

Our partner company Triumvirate Environmental has developed an innovative process for recycling challenging waste streams. This method recycles 100% of the product without needing to first decontaminate or separate the materials. Triumvirate Environmental then takes the recycled mass and manufactures plastic materials that are used in the construction industry for items such as speed bumps. Since launching the program, we've recycled approximately 450 metric tons of waste generated from the use of our products. Six of our customers are already participating in the program.

We are currently investigating how we can expand this initiative beyond the United States to markets in Europe and Asia.

Access to Health

Across the globe, approximately 400 million people lack access to effective and affordable healthcare, especially in low- to middle-income countries. However, according to the World Health Organization (WHO), these regions bear approximately 90% of the world's disease burden. In cooperation with strong partners, we're working to tackle this complex challenge by researching innovative solutions, developing new approaches and improving existing programs to help people at the point of care. To achieve this, health solutions must be affordable and accessible (p. 40). Beyond these efforts, we're also raising awareness (p. 41) for diseases and teaching people how to manage them. The Access to Medicine Index has recognized the progress we've made on improving access to health (A2H). In 2016, we were ranked fourth, moving us two places higher than 2014.

Our principles

Our strategic approach

We endeavor to improve access to high-quality health solutions for underserved populations and communities in low- to middle-income countries. This goal forms the heart of our A2H approach. Indeed, Stefan Oschmann, Executive Board Chairman and CEO, focused on accelerating access to health in such regions during his presidency of the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA) from 2014 to the end of 2016.

At the World Economic Forum held in Davos, Switzerland in January 2017, we joined forces with 21 other leading pharmaceutical companies to announce Access Accelerated, a global initiative that seeks to improve both treatment and prevention of non-communicable diseases in low- and middle-income countries.

To improve access to health solutions, we're leveraging the expertise from all our businesses. We're aware that individual companies and organizations can only do so much to improve access to health, which is why we closely collaborate with a wide range of partners.

Our A2H strategy focuses on the 4 As:

- **Availability:** We research, develop and refine health solutions that address unmet needs and are tailored to local environments.
- **Accessibility:** We promote initiatives that strengthen supply chains (p. 39) and develop localized health solutions in order to deliver and reach out efficiently at the point of care.
- **Affordability:** We seek to provide assistance to those who are unable to pay for the health solutions they need. Further information can be found under Prices of medicines (p. 40) and Community (p. 96).
- **Awareness:** We contribute to raising awareness (p. 41) by empowering health workers, communities and patients so that they can make informed decisions.

The 4 As

Our A2H Charter defines our guidelines for the following topics:

- Our approach
- Pharmaceutical product donations and philanthropic activities
- Fake medicines
- R&D for neglected tropical diseases and priority communicable diseases
- Pharmaceutical product pricing
- Intellectual property rights

In the 2015-2016 period, we aligned our A2H strategy and goals (p. 132) with the Sustainable Development Goals (p. 146) of the United Nations. These efforts were recognized in the 2016 Access to Medicine Index (p. 36).

Effectively managing our A2H programs

Our Access to Health (A2H) unit investigates the factors that make it more difficult for underserved populations to receive healthcare, working with various partners to develop ways to lower these barriers. Our A2H team is backed by a steering committee featuring representatives from our Healthcare and Life Science business sectors as well as representatives from our subsidiaries. In this way, we ensure that our programs support our business strategy, can be implemented locally and have the desired effect.

We are currently developing quantitative and qualitative performance indicators to evaluate the efficacy of our programs. Using these indicators, we will assess our strengths and identify areas where we need to improve.

Beyond these efforts, we are also involved in industry-wide initiatives and are working with other companies to develop new approaches to assessing the efficacy of our A2H activities. For instance, in 2016 we endorsed the Business for Social Responsibility's (BSR) Guiding Principles on Access to Healthcare. As a member of the BSR Healthcare Working Group, we contributed to and led the development of the working paper entitled Advancing Access to Healthcare Metrics, which aims to help pharmaceutical and medical device companies improve their performance measurement and reporting on access to healthcare.

Sharing and protecting intellectual property

A great deal of time and money is required to develop new drugs, without a guarantee of success. It can take 10 to 15 years for an effective health solution to be market-ready. Pharmaceutical companies therefore need a solid, transparent and reliable legal framework to protect their intellectual property rights and enforce their patents, which provide a sufficient period of time to compensate for R&D costs.

Responsible treatment of intellectual property does not pose a barrier to health. It guarantees safety and high quality for patients worldwide. Most medicines that address the highest burden of disease in developing countries are not protected by patents. For example, 95% of the 2013 WHO Essential List of Medicines are off-patent.

FAST FACT

ESSENTIAL MEDICINES

We provide 45 medicines that are listed on the WHO Essential Medicines List and/or classified as first-line treatments, such as bisoprolol/amlodipine, metformin (Glucophage®), and praziquantel.

Our approach to intellectual property is set out in our Charter on Access to Health in Developing Countries – Rights to Intellectual Property.

In most developing countries, Merck neither files nor enforces patents. In markets where we do register product patents, we are committed to sharing data with researchers and to improving public access to clinical study data. We provide transparent information on our patents and patent applications via publicly accessible databases. We furthermore approve voluntary licensing agreements of all kinds, including non-exclusive voluntary licenses and legally binding non-assertion covenants or clauses that aim to improve access to health. We also support TRIPS, an international agreement administered by the World Trade Organization (WTO) that addresses trade-related aspects of intellectual property rights, as well TRIPS addenda such as the 2001 Doha Declaration (Special Declaration on the TRIPS Agreement and Public Health). The Doha Declaration extends the deadline for least-developed countries to apply TRIPS provisions on pharmaceutical patents until at least 2033 as per a decision taken by the WTO's council on November 6, 2015. We were in favor of extending this deadline until 2033 and therefore supported this move. Moreover, we support the concept of patent pools. However, we believe that these should be structured to improve access to medicines and should therefore prevent anticompetitive effects as well as geographic limitations. We consider joining patent pools when they are relevant to our portfolio and meet our efficacy, quality and safety requirements.

We share our knowledge and intellectual property and accelerate early discovery for infectious diseases. We are one of over 100 members of the WIPO Re:Search open innovation platform, which is sponsored by the World Intellectual Property Foundation (WIPO). In 2015, we initiated our first partnership as part of this platform, collaborating with the University of Buea in Cameroon. Our common goal is to

repurpose compounds from our library to develop a treatment for onchocerciasis, a disease also known as river blindness. In early 2016, the collaboration received the Pathfinder Award, a grant from the UK-based Wellcome Trust to fund research on this condition.

Our transparent approach to intellectual property was also recognized in the 2016 Access to Medicine Index (p. 36).

Engaging stakeholders

Partnerships and dialogue are key instruments to improving access to health. Our partners include multilateral organizations, government agencies, and NGOs, as well as academic institutions, health industry associations, companies, and experts from the private sector.

Through our Access Dialogues, we have created a platform that allows public- and private-sector stakeholders to exchange information and share best practices. This platform provides a way for participants to collaborate on improving access to health. These dialogues are part of our A2H efforts and commitments around awareness and aim to help stakeholders make well-informed health decisions.

In this vein, we hosted the Innovative Intellectual Property and Access Dialogue in 2015. At this event, we joined forces with leading experts on intellectual property and global health to discuss challenges and potential developments for our intellectual property strategy.

In addition to this gathering, dialogues on challenges in the local supply chain were held in 2015 and 2016 in conjunction with the Accessibility Platform, a multi-stakeholder initiative seeking to ensure that medicines are delivered safely, quickly and efficiently. Further information on the Accessibility Platform can be found under Supply chain (p. 39).

Progress

High ranking in the Access to Medicine Index

Every two years, the Dutch Access to Medicine Foundation assesses the performance and achievements of pharmaceutical companies in terms of their efforts to improve access to medicine in developing countries. The foundation then ranks these companies in their Access to Medicine Index. In 2016, we came in fourth place. The foundation recognized us in particular for aligning our strategy and objectives more closely with the UN Sustainable Development Goals. The following initiatives were singled out as best practices:

- Our transparent approach to intellectual property (p. 35) and sharing of intellectual property through research partnerships.
- Our leading role in raising health awareness, such as our thyroid disorder campaigns (p. 175) in Indonesia and the Philippines.
- The many years we've devoted to detecting counterfeit medicines using the GPHF Minilab® (p. 99).
- The expansion of our Su-Swastha program (p. 42) in rural India, aimed at supplying high-quality health products at affordable prices and establishing the required infrastructure.
- Our support for the network of vaccine manufacturers in developing countries (p. 39).
- Our Virtual Plant Team platform (p. 39), which we're using to ensure globally harmonized quality standards in local production facilities.
- Our continuous and holistic efforts in the fight against schistosomiasis, including our Praziquantel Donation Program (p. 97) in partnership with WHO.

Discourse to improve healthcare

Our Chairman of the Executive Board and CEO, Stefan Oschmann, took part in various events in the 2015-2016 period. For instance, at an event hosted in September 2015 to mark the 70th General Assembly of the United Nations, he gave a speech on the role of private industry in global healthcare. Oschmann also spoke on this topic in May 2015 at an event held on the occasion of the 68th World Health Assembly (WHA) of WHO. Moreover, in March 2015 he attended the Independent Expert Group (IEG) on Emergency Preparedness as an industry representative. This gathering was convened by Bill Gates at the request of Angela Merkel, Chancellor of Germany and G7 President.

Discussions at a global level

In the 2015-2016 period, we also participated in numerous other events, including the following:

- Building the Path to Universal Health Coverage: Innovative Financing in Access to Medicines, a round table hosted in September 2015 by UNITAID, Norwegian Church Aid and the Medicines Patent Pool (MPP) in Oslo, Norway.
- Munich Security Conference on global security and foreign policy, held in February 2016: forum on current crises and future challenges to international health security.
- Geneva Health Forum (GHF) in April 2016: Event sponsor and organizer of the round table on "Empowerment: Providing tools to make informed health decisions for chronic diseases aligned with the WHO 2030 Health Workforce Strategy".
- Supply Chain Conference hosted by the German Association for Supply Chain Management, Procurement and Logistics (BME) in February 2016; the topic was: "Accessibility Platform: Uniting Stakeholders for Optimal Global Health Impact".
- Event on the occasion of the 69th WHO World Health Assembly in May 2016; the topic was "Strengthening local supply chains through multi-stakeholder initiatives to eliminate barriers to access".

Activities at the local level

In 2015 and 2016, we also engaged stakeholders at a local level. Below are several examples:

- Continuation of our three-year Indonesia Free Anemia campaign: Raising awareness for the causes and treatment of anemia through social media.
- Together against malnutrition: We are supporting the Beyond Zero initiative of the Kenyan government. Our aim is to improve healthcare for mothers and their children.
- Various activities in China: Raising awareness for thyroid disorders through education programs, continuing education for physicians, and research projects. Collaboration with the National Health & Family Planning Commission as well as medical institutions such as the Chinese Medical Association.

Infectious diseases

Many infectious diseases that are endemic to developing countries are barely known in industrialized nations. Referred to as neglected tropical diseases, these infections consequently attract little public attention and research funding. One poignant example is schistosomiasis, an insidious parasitic disease that still lacks a treatment suitable for children under six.

Malaria also continues to pose a threat to public health. According to estimates by WHO, nearly half of the world's population is at risk of malaria. In 2015, roughly 212 million malaria cases worldwide and an estimated 429,000 malaria deaths were recorded. Approximately 92% of these deaths occur in Africa, with 70% in children under five years of age. Although a large range of approved products and investigational compounds are available to treat malaria, the number of resistant pathogens is on the rise. New treatments are therefore urgently needed together with solutions to effectively control malaria.

Our principles

Global Health innovation platform

The experts of our Global Health innovation platform are working on novel health solutions for vulnerable populations in developing countries, especially children and mothers. They promote and implement Group-wide initiatives and programs to address key unmet medical needs related to infectious diseases, with a focus on schistosomiasis and malaria (including co-infections). The team is applying an integrated strategy by concentrating not only on treatment (drugs) but also on detection, transmission and control.

We are focusing our work on three flagship programs:

1. Development of a pediatric formulation to treat schistosomiasis (p. 37)
2. Development of a diagnostic kit for malaria (p. 38)
3. Development of a new active ingredient for the treatment and prevention of malaria in children under six (p. 38)

In implementing our programs, we synergize competencies from our business sectors while also partnering with leading global health institutions and organizations in both developed and developing countries. Consider, for instance, the Pediatric Praziquantel Consortium, a public-private partnership (PPP) that is developing a pediatric formulation to treat schistosomiasis.

Under the Global Health platform, we are also sponsoring education programs and initiatives targeted to health workers in African countries.

Progress

Treating schistosomiasis in children under six

Around 10% of the approximately 220 million people worldwide with schistosomiasis are younger than six years old. These children cannot be treated with praziquantel, the standard therapy for the parasitic disease. This is something we intend to change. Since July 2012, we have been working with partners from industry and research institutes on the development of a pediatric formulation of praziquantel. As part of these efforts, in 2015 we successfully completed two Phase I bioavailability studies in healthy subjects in South Africa, as well as a taste study in children in Tanzania.

In 2016, the Pediatric Praziquantel Consortium initiated a Phase II study in Ivory Coast; the trial aims to assess the efficacy and safety of two different formulations for orodispersible tablets in schistosomiasis-infected children under the age of six. At the same time, we are preparing the Phase III study.

In recognition of all these efforts, the consortium was awarded a prestigious research grant from the Japanese Global Health Innovation Technology Fund in both 2015 and 2016, which followed the one awarded in 2014.

Accurately diagnosing malaria

In many African countries such as Zimbabwe and Uganda, the rate of co-infection with HIV and malaria is very high. In HIV-infected patients who develop a fever, it is therefore very important to establish whether they also have malaria. Current systems, however, are not accurate enough, which often leads to other febrile illnesses being wrongly diagnosed as malaria.

In 2015, we started expanding our Muse® Auto CD4/CD4% diagnostic kit, which until then had been used for monitoring the treatment of HIV patients in Sub-Saharan Africa and other developing regions. With this system, medical professionals can obtain information on the course of an HIV infection. The advantage is that blood samples no longer need be sent to clinics in the cities. The new Muse® malaria diagnostic kit can measure the presence and type of malaria parasite as well as co-infection with HIV. The system is expected to be launched in 2019.

Promising antimalarial compound

In developing antimalarial compounds, we are collaborating with Medicines for Malaria Ventures (MMV). Since current treatments are increasingly succumbing to drug resistance, MMV is focusing on the development of new compounds.

In March 2015, we obtained the rights to an investigational antimalarial compound from MMV. The compound potentially represents a novel mechanism of action and is intended to be developed for both the treatment and prevention of malaria in young children. This R&D project completed its preclinical phase in 2016 and is preparing for Phase I to start in 2017.

Building capacities in health systems

In addition to financing fellowships in Zimbabwe and Kenya, in 2016 we launched a partnership with the University of Namibia that is sponsoring two PhD fellows in their research. In support of Governmental Malaria Control Programs, these scientists are studying an extremely widespread malaria pathogen found in Namibia, Botswana and Zambia and are also working to characterize parasite subtypes in the populations in these African countries.

Moreover, we also co-sponsor several international fellowship programs for postdoctoral researchers from developing and emerging countries. In addition to receiving training on clinical aspects including clinical trial practices and clinical management, these research fellows are given the opportunity to work for a period of up to 24 months in leading pharmaceutical companies (including our company). On returning to their home countries and academic institutions, they then have the key resources needed to lead and implement their research in line with international regulatory requirements and standards.

Deepening the dialogue on malaria and schistosomiasis

In 2015 and 2016, we stepped up the dialogue on infectious diseases with important stakeholders and experts. Among other achievements, we gained a new partner for the Pediatric Praziquantel Consortium, namely the Schistosomiasis Control Initiative (SCI), which is part of Imperial College London in the United Kingdom. SCI works closely with health ministries in African countries and supports the consortium in efforts such as developing the access and delivery plan for our new pediatric drug for children under six.

Furthermore, in November 2015, we joined forces with the University of Cape Town (South Africa) to co-develop R&D platforms for identifying new lead programs for the treatment of malaria, with the potential for expansion to other tropical diseases. As part of the collaboration, research has been conducted using Merck's compound library.

Moreover, we took part in the following international conferences and events:

- Workshop entitled "Schistosomiasis in women and its impact on HIV" in Magaliesburg, South Africa in January 2015
- The International Schistosomiasis Conference on schistosomiasis elimination strategies in San Salvador, Brazil in August 2015
- The 9th European Congress on Tropical Medicine and International Health held in Basel, Switzerland in September 2015
- The American Society of Tropical Medicine and Hygiene (ASTMH) conferences in 2015 and 2016 in the United States
- The Better Medicines for Children Conference hosted by the European Medicines Agency (EMA) in London (UK) in October 2016
- The African Society for Laboratory Medicines (ASLM) conference held in Cape Town, South Africa in December 2016

supply chain

We want patients in low- and middle-income countries to have fast, safe and affordable access to medicines. Efficient supply chain management is key to accomplishing this, as is support for local manufacturing in line with our high standards.

Our principles

Efficient supply chain management

Efficient supply chains ensure that patients can be treated quickly and safely. Moreover, they incur lower costs. Our policies and procedures help to ensure that appropriate quantities of our products are delivered in the right condition, at the right place, and on time.

Together with our partners, we endeavor to improve supply chains in developing countries:

- We are a member of the Neglected Tropical Diseases Supply Chain Forum. This public-private partnership works to ensure a good end-to-end supply chain, which in turn will guarantee that the medicines reach the people who need them. Forum members include the World Health Organization (WHO), the Bill & Melinda Gates Foundation, the logistics firm DHL, and six leading pharmaceutical companies which run donation programs: Merck, MSD, GlaxoSmithKline, Pfizer, Johnson & Johnson, and Eisai.
- In the Rx-360 consortium, we are pursuing similar goals: to share best practices with other companies and partners on efficient, end-to-end secure supply chains.
- We are a founding member of the Accessibility Platform. This is an informal effort spearheaded by the private sector which aims to raise awareness of supply chain issues as part of the access to health challenge. It also seeks to increase knowledge sharing and information exchange through open, multi-stakeholder dialogue and identify opportunities for collective action.

Supporting local manufacturing

In our manufacturing plants in India and Indonesia, we produce various medicines for patients with diabetes, heart conditions and diseases of the lower respiratory tract. This allows us to supply medicines to local markets faster, as well as to neighboring countries such as Sri Lanka and Myanmar. Moreover, we can offer these drugs at considerably lower prices than in Europe.

Our pharmaceutical production plants operate to the same high standard of quality worldwide. We fully comply with the internationally harmonized guidelines set out in Good Manufacturing Practice (GMP) and Good Distribution Practice (GDP). This also applies to contract manufacturers. Our uniform quality assurance system ensures that our quality standard is adhered to everywhere. It comprises training courses tailored to each site, quality control monitoring, and technology transfer. Our Global Response Team publishes the results of all audits conducted by health authorities across the Merck Group, allowing the respective units to share lessons learned and benefit from one another's improvements.

Through our Virtual Plant Teams, we provide our contract manufacturers with the support they need to comply with our quality standards. In Africa, Asia and Latin America, our external partners are each assigned a Merck production expert to act as a virtual site leader and provide guidance. Our Virtual Plant Teams were recognized as a best practice in the 2016 Access to Medicine Index (p. 36).

Progress

Developing a cross-company database for medicinal products

To make medicines for neglected diseases reliably available in developing and emerging countries, we are working to improve supply chain management. In 2015 and 2016, we therefore collaborated with our partners in the Neglected Tropical Diseases Supply Chain Forum to develop a database to help achieve this goal. All forum members contribute information, which is used to assess the potential need for medicines in the relevant countries. We discuss, for example, which medicines have been ordered by WHO and which products have been supplied to which countries. This provides us with a comprehensive overview of the current distribution of medicines, thus allowing them to more quickly reach the areas where they are needed most.

Supporting regional vaccine manufacturers

We support vaccine manufacturers in developing and emerging countries. Together with the Developing Countries Vaccine Manufacturers Network (DCVMN), we sponsor educational programs and pass on our knowledge to ensure the safe and high-quality production of vaccines. Since 2014, we have conducted more than 12 training sessions as well as a number of technical workshops in Asia-Pacific and Latin America, with eight seminars taking place in 2015 and 2016.

For this initiative, we were honored in the 2016 Access to Medicine Index (p. 36).

Testing software for supply chain management

In the 2015-2016 period, we developed a software-based solution for northwestern Africa to ensure the continuous availability of our drugs, which has improved our inventory and order management. At any time, our customers can go to our e-shop to quickly and easily order medicines that have been approved by the respective regulatory authorities. The system makes demand more transparent while reducing lead time and miscommunication. After successfully testing the e-shop in Sudan and Ethiopia, we launched the platform in all northwestern African countries in 2015.

Prices of Medicines

Merck is committed to ensuring that patients have access to the best possible medicines. This requires optimal pricing, reimbursement, and access conditions for all of our in-line and future pipeline products. Across the world, the healthcare industry is undergoing a unique transformation: National and regional institutions and authorities, which decide on price-dependent market access and reimbursement in many markets, hold a growing role as key stakeholders, together with healthcare professionals, politicians, regulators, patients, and distributors. We are fully determined to continue succeeding in this changing environment.

We believe that the prices of our medicines should reflect their overall value, to include benefits to patients, healthcare systems and payers alike. Value reflects both individual clinical outcomes as well as impact on overall treatment, health system delivery and patient adherence.

Our principles

To meet the needs of patients, our health solutions must be affordable and accessible. In terms of organizational setup, our Group Market Access and Pricing unit reports directly to the Chief Marketing and Strategy Officer of our Healthcare business sector and sets initial prices in collaboration with Merck's individual businesses. Our subsidiaries are responsible for adapting and managing prices at the local level.

Innovative pricing models

We recognize the importance of fairly priced medicines and the fact that individual countries have varying abilities to pay for health solutions. Within a country, too, there are often significant regional and/or socioeconomic differences. We therefore partner with governments and other key stakeholders to develop individual pricing and contracting models. In addition, we continuously monitor the dynamic healthcare environments, pricing & reimbursement systems, guidelines, and policies, adjusting our prices as necessary.

We support product donations, flexible pricing, differential pricing, and post-patent competition between reference products and generics. We conduct yearly reviews of our pricing strategies to identify ways to continually expand access to health by aligning prices with affordability.

We have developed several product- and market-specific alternative reimbursement and contracting models (ACMs) with payers such as health insurance companies to provide the right patients with prompt access to our innovations. Examples of such ACMs include outcome-based and budget capitation agreements for Erbitux® as well as adherence-based payment agreements for Rebif® and Saizen® in its easypod™ injection device.

We also regularly participate in government tenders for products used in public hospitals serving low-income patients. Beyond this, we have established second "lower-price" brands of existing products. In South Africa, for example, second brands of Concor® and Ziak® (antihypertensive agents) are available at discounted prices.

Low- and middle-income countries

We recognize the importance of affordable access to medicines in low-and middle-income countries. As a result, we are committed to pricing our products responsibly and take part in innovative equitable pricing schemes in partnership with governments and other key stakeholders. In developing countries, we also regularly participate in government tenders. In this way, we're already supplying products to governments at reduced prices in Africa, Latin America, the Middle East, and Asia.

Different kinds of patient support enable us to offer products at a more affordable cost. Our Erbitux® China Patients Aid Program (p. 41) is a prime example of such an initiative. Our Patient Support Program Policy describes our uniform standards for such efforts.

Progress

Operational pricing and strategic price decisions

In 2016 we implemented a new Group-wide price management system. This global platform enables us to drive strategic price and reimbursement decisions and contains all information needed to set, modify and approve country-specific prices. It also serves as an analysis tool that enables us to make informed strategic pricing decisions.

Improved access to the oncology drug Erbitux®

In China, we are working with the China Charity Federation (CCF) to expand access to our oncology drug Erbitux®, which is used to treat conditions such as colorectal cancer. For patients with a good prognosis, the Erbitux China Patients Aid Program (ECPAP) will cover the majority of the costs for Erbitux® treatment. In addition to helping with costs, we also offer free services such as providing information on this disease, or ensuring that the medicine remains properly refrigerated until reaching patients. From the program's launch in 2011 to the end of October 2016, 6,800 patients had already benefited from ECPAP.

We also run similar programs in other countries such as India, where we likewise offer Erbitux® for the treatment of colorectal and head & neck cancer at reduced prices. Since 2014, this initiative has helped 1,725 patients. In South Africa, we support the Savanti Patient Access Program, which enables patients to be treated with Erbitux at a lower co-payment.

Health awareness

Many people are sick without realizing it. The result? Although effective medicines and therapies may be available, these individuals do not receive treatment, or don't receive it in time. To prevent such an outcome, we conduct global campaigns to raise awareness and improve knowledge of diseases, their symptoms and treatment options. As part of our strategy to increase access to health (p. 34) in developing countries, we help create awareness by empowering healthcare professionals, communities and patients with appropriate tools, knowledge, information, and skills so that they can make high-quality, informed decisions.

Our principles

Global awareness campaigns

We regularly conduct global campaigns to raise awareness for various diseases. Our efforts concentrate on those conditions in which we have in-depth expertise stemming from our core business. These primarily include cancer (specifically colorectal as well as head and neck cancer), thyroid disorders, diabetes, and multiple sclerosis (MS). In our awareness activities, we frequently collaborate with patient advocacy groups. In the 2015-2016 period, we conducted and/or participated in 17 campaigns, enabling us to reach millions of people. Of particular success in 2016 was the thyroid awareness campaign we spearhead every year during International Thyroid Awareness Week (p. 42), as were the Make Sense campaign held during Head & Neck Cancer Awareness Week and our World MS Day 2016 campaign.

In addition to these global efforts, we also lead special awareness initiatives to address specific local needs, such as anemia in Indonesia and malnutrition in Kenya. For such programs, we generally cooperate closely with national governments as well as other political actors. You can find more information under Access to health (p. 36).

Vocational training and continuing education for health workers

In developing countries, we empower private and public sector health workers to make decisions on the prevention, diagnosis and treatment of diseases based on the latest medical knowledge. One of our key initiatives is our five-year Capacity Advancement Program (CAP (p. 43)). Among other goals, CAP aims to improve medical training for doctors in Africa, Asia, Latin America, and the Middle East. Further activities include continuing education for medical professionals in India through our Su-Swastha program (p. 42) and vocational training for pharmacy technicians in Tanzania (p. 42). You can find an overview of all our projects here.

These efforts form part of our commitment to improving access to health (p. 34) worldwide.

Progress

Social media campaign on head and neck cancer

Every year, we support the Make Sense campaign, an initiative of the European Head & Neck Society. Its objective is to raise public awareness of head and neck cancer and its symptoms in an effort to drive earlier presentation, diagnosis and referral, as well as improve outcomes. Moreover, we hope to dispel the misconception that head and neck cancer primarily impacts older smokers and people with alcoholism, as young adults can also develop this disease. In September 2016, as part of our "Letting our tongues do the talking" campaign, we called on our employees to send us pictures of themselves sticking out their tongues. We subsequently received more than 200 pictures from across 22 countries. Through this effort, we reached around 122,000 people worldwide via our social media channels, thereby raising awareness for head and neck cancer.

Twitter marathon for multiple sclerosis

We endeavor to support people with multiple sclerosis (MS) and regularly work to raise public awareness of this disease. For instance, in May 2016 we joined forces with the MS International Federation (MSIF) and local MS patient advocacy groups to participate in World MS Day. The theme for 2016 was "Independence". With help from our worldwide MS patient ambassadors, we produced two movies entitled "MS – a silent disease" and "MS Does Not Stop Me". These films illustrate how people with MS preserve their independence, refusing to let their disease defeat them. The heart of the 2016 campaign was a 24-hour tweetathon held across 24 countries. Using a variety of hashtags such as #strongerthanMS and #msday24, our employees and various stakeholders across the globe tweeted brief messages on multiple sclerosis. Through this campaign, we also highlighted the efforts of our sites worldwide to support MS sufferers, from fund raising to support local patient advocacy groups to rock concerts. The tweetathon generated a total of 2.7 million responses.

Thyroid health: Focusing on mothers

In 2016, we supported the International Thyroid Awareness Week hosted by Thyroid Federation International (TFI), the eighth time we have done so. A survey we commissioned in 2016 revealed that 84% of mothers worldwide could not correctly identify the most common symptoms of thyroid disorders in their children. Our campaign therefore aimed to help parents recognize the signs. To this end, we partnered with TFI to develop a film, a children's book and additional educational material. These tools utilize two butterfly cartoon characters called "Hypo" and "Hyper" to explain the symptoms of hyperthyroidism and hypothyroidism. The campaign reached around 20 million people across 34 countries. More than 14,500 people additionally received a thyroid check-up and, if irregularities were identified, were advised to see a general practitioner for further testing. You can find more details in our story "Enriching lives (p. 175)".

Promoting women's health worldwide

Women in the workforce can have a profound impact on a country's productivity and prosperity, but only if they are healthy. In many countries, health issues often prevent women from obtaining and keeping a job, or hinder them from progressing in their career. This poses a challenge for both national economies as well as companies. A study has shown that economic success is predicated not only on increasing women's participation in the labor market, but also on creating gender parity. According to the report by management consultant company McKinsey, these changes could add US$ 28 trillion to global annual GDP by 2025.

Healthy Women, Healthy Economies (HWHE) has taken up this challenge. Under the auspices of the Asia-Pacific Economic Cooperation (APEC), we collaborated with representatives of the United States and other countries to initiate this public-private partnership (PPP) in 2014. Comprising members from the public and private sectors as well as non-governmental organizations, HWHE has developed a policy toolkit with political measures aimed at eliminating labor market barriers that women face due to health issues. In September 2015, the toolkit was rolled out at the APEC Women in Economy Forum.

In a joint effort with the Philippine government, we have launched the first HWHE public-private partnership addressing thyroid health, a problem that disproportionately affects women. In Jordan, we collaborated with the NGO Royal Health Awareness Society to roll out a similar program that likewise aims to bolster awareness for thyroid disorders among women.

Since 2016, we've also been partnering with the American Cancer Society (ACS) to raise awareness of women's cancers. In November 2016, we released a report entitled "The Global Burden of Cancer in Women", which documents the mortality and incidence rate of cancers that affect women and the burden worldwide.

Su-Swastha: Healthcare for rural India

In India, around 700 million people reside in rural areas and have no access to effective, affordable healthcare. This is because medical facilities are concentrated in India's urban areas, which account for 80% of the country's healthcare professionals and 70% of its hospital beds. Through our Su-Swastha project, we are working to improve healthcare in rural India. Our goal is to provide inexpensive medicines while also educating local patients and physicians on everyday health issues and their treatment. Healthcare professionals hold weekly community meetings on topics such as coughs, childhood ailments and prevention. Moreover, the program also provides patients with free check-ups and offers continuing medical education to help doctors advance their medical capacities. In 2016, 1,238 community meetings were held, reaching a total of 26,129 people.

For these efforts, we were recognized in the 2016 Access to Medicine Index (p. 36).

Vocational training for pharmacy technicians in Tanzania

The healthcare systems in numerous developing countries are struggling with a shortage of pharmaceutical professionals. For instance, Tanzania only has around 3,000 pharmacists, pharmacy assistants and pharmacy technicians to meet the needs of the country's more than 40 million inhabitants. This imbalance makes it especially hard for people in rural areas to access medicines.

To help relieve this situation, we supported a three-year program to expand vocational training facilities for pharmacy technicians. Under this initiative, which ran from 2014 until

2016, we partnered with the German Society for International Cooperation (GIZ) and the faith-based Kilimanjaro School of Pharmacy, as well as the companies Boehringer Ingelheim and Bayer HealthCare. We worked together to revise existing curricula into a new modular curriculum for a one- to three-year pharmaceutical training program. As a model school, the Kilimanjaro School of Pharmacy furthermore has been furnished with a laboratory and library and is additionally receiving financial support. The Global Pharma Health Fund donated four Minilabs (p. 97) and taught tutors from eight Tanzanian training centers how to use them to properly detect counterfeit medicines.

Expanding our Capacity Advancement Program

Through our Capacity Advancement Program (CAP), launched in 2012, we are collaborating with academic institutions to train medical professionals in the fields of research and development, clinical research, and drug safety to build capacity as well as to raise public awareness of non-communicable diseases (NCD) such as diabetes, hypertension, cancer, and infertility. Across the globe, CAP covers a wide array of initiatives with differing focuses.

By the end of 2016, the Merck Universities Program had reached 17,000 students from universities in Kenya, Uganda, Tanzania, Mozambique, Namibia, Ghana, Ethiopia, Angola, India, and the United Arab Emirates, providing them with European-accredited clinical diabetes and hypertension management training. Our goal is to reach more than 25,000 students through this program by the end of 2018. In 2015 and 2016, we presented the first-ever Merck Diabetes Award and Merck Hypertension Award to 20 promising medical students from universities in Kenya, Uganda, Tanzania, Ghana, Nigeria, the United Arab Emirates, Indonesia, and India, in an effort to drive research and awareness in these fields.

Our Merck Africa Embryology Training Program, which seeks to improve access to fertility care, offers a three-month hands-on course that has already benefited ten African embryologists from Sub-Saharan Africa.

Furthermore, the 2016 Merck Africa Luminary provided 460 African healthcare providers, policy makers and researchers with development sessions to improve disease management, early detection and prevention of NCDs.

In 2015, we also launched an awareness campaign for diabetes, hypertension and cancer that has reached over 175,000 people in Kenya. By 2018, we hope to have reached 200,000 people to provide them with services such as diabetes screening.

Through Merck More than a Patient, we empower women cancer survivors by educating them and helping them start their own small business so as to lead independent lives. Similarly, through Merck More than a Mother, we provide information, education, and healthcare while also working to change the mindset and culture that stigmatizes infertility and infertile women. Through the Empowering Berna Project, we help women in such circumstances to start a business and achieve independence. More than 1,000 infertile women from Ghana, Central African Republic, Ivory Coast, Uganda, Kenya, and Nigeria were enrolled in the project in 2016.

The 2016 UNESCO-Merck Africa Research Summit sought to empower women in the fields of healthcare and research, where they are currently underrepresented in Africa. At the summit, we also launched the Best African Woman Research Awards in an effort to promote women's contribution to science, technology, engineering, and mathematics (STEM).

chemical product safety

Many of our chemicals are classified as hazardous substances. However, they must not pose any risk to people or the environment. In developing these substances, product safety is our primary consideration. We fulfill all statutory requirements, often exceeding them, and provide our customers with extensive information so that they understand our products and can use them safely.

Our principles

Statutory regulations and Group-wide guidelines

Numerous national and international regulatory requirements have been put in place to ensure that chemical products do not pose any danger to humans or the environment. We have implemented Group-wide guidelines that guarantee compliance with these regulations at all times when it comes to the import, production, commercialization, handling, recycling, and disposal of our chemical products. We have also signed general voluntary commitments of the chemical industry such as the Responsible Care® Global Charter.

To meet the product safety regulations relevant to our company, our Product Safety Chemicals policy details our Group-wide processes for managing and implementing product safety, including the necessary management structures. These include the Globally Harmonised System of Classification and Labeling of Chemicals (GHS) and its implementation in regional legislation (such as the CLP regulation in the European Union and HazCom 2012 in the United States), the EU chemicals regulation REACH, the U.S. Toxic Substances Control Act (TSCA), and the German federal law on protection from hazardous substances (ChemG). Our Group-wide policy also incorporates legal norms concerning the transport of hazardous chemicals, biocides and cosmetics, as well as the chemicals used in food and animal feed.

Safety analysis during product development

At Merck, product safety starts during the development stage. By conducting hazard, exposure and risk assessments, we seek to ensure that our chemical products can be safely used later down the road. All our product innovations undergo a formal EHS analysis, which examines aspects such as impact on human health and the environment. In conducting these safety assessments, Regulatory Affairs provides advice and support to employees in our Life Science and Performance Materials business sectors.

Standardized 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 for all our chemical products that contains instructions for use and handling to prevent them from posing a danger to people and the environment. Our goal is to give our customers product safety information that has been standardized worldwide.

We issue all chemicals classified as hazardous with safety data sheets that contain information on the physicochemical, toxicological and ecotoxicological properties of the agent. Our safety data sheets reflect the latest local regulatory requirements and are available in 37 languages as well as 61 language-country combinations. Although not legally required, our non-hazardous substances also come with safety data sheets. In total, we make roughly 22 million safety data sheets available to our customers. Since all these documents must be kept up to date and consistent, in 2015 and 2016, we automated the majority of our Group-wide hazard communication processes and are now harmonizing the systems of our business sectors and sites.

FAST FACT

KEEPING CUSTOMERS INFORMED

All information on the safe use of our products is also available on our website, where customers can additionally access the ScIDeEx® program. This tool allows them to check whether they can use a chemical agent safely in line with the EU chemicals regulation REACH.

Transcending laws

In an effort that transcends statutory requirements, we support the goals of the Global Product Strategy, an international initiative of the chemical industry. In this vein, we publish product safety summaries for all lead substances we've registered under REACH on the website of the International Council of Chemical Associations (ICCA).

Organizational structure for product safety

In response to the acquisition of Sigma-Aldrich, a U.S.-based life science company, we adapted our organizational structures for product safety in the 2015-2016 period. Our Life Science and Performance Materials business sectors each have their own product safety units. Working in close collaboration, these units are responsible for all product safety activities such as risk assessment, hazard communication in

the form of safety data sheets and safety labels, as well as the registration of chemical products.

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

Our Group Corporate Governance unit ensures that critical gaps in regulatory compliance are independently addressed. This unit reports directly to the head of the Group function Corporate Environment, Health, Safety, Security, Quality. Any necessary corrective or preventive action is carried out by the operating units within each business sector.

Take for instance the U.S.-based GHS Compliance Program. Since we had acquired several product portfolios in the United States that lacked safety information, in 2012 we initiated a multinational program to push regulatory coverage and bring the portfolios up to our stringent standards. Our objective was not only to close existing safety gaps, but also to be the front runner in implementing the new GHS requirements under HazCom 2012 in the United States, which took effect in June 2015. We fully achieved this goal while also meeting the deadline.

Safe nanotechnology

Nanotechnology is a highly innovative field of development that researches and uses structures 50,000 times thinner than a human hair. This technology makes it possible to produce materials with completely new properties and functions for a myriad of applications.

Nanotechnology opens up many opportunities for our Group. In our Life Science and Performance Materials business sectors, we can use nanoscale materials to develop products with new functions and properties – thus, for instance, helping use resources and energy more efficiently. In our Healthcare business sector, we partner with external companies to explore the use of nanomaterials to improve therapies. Under the auspices of European research partnerships, we are also investigating the suitability of nanoparticles as vehicles for active pharmaceutical ingredients.

However, the special structure of nanoparticles can also entail risks. We assess these risks and furthermore only utilize the new technology with the greatest care. In doing so, we consider Group-wide requirements for safety as well as environmental and health protection, employing our existing processes and systems for product safety. We abide by the precautionary principle and take nanomaterial safety issues very seriously. Our Group-wide Policy for Use and Handling of Nanomaterials governs the handling of nanomaterials, whether used in pharmaceutical and chemical laboratories, production plants, filling plants or warehouses.

In the manufacture and processing of our products, we adhere strictly to all statutory regulations and other applicable standards, such as the guidelines of the German Federal Institute for Occupational Safety and Health (BAuA) as well as the German Chemical Industry Association (VCI). We also provide our customers with information on the proper handling of nanomaterials across their life cycle, including transport, processing, storage, and disposal.

We are continuously engaged in a discourse on the opportunities and risks of nanotechnology. Our internal nano-coordination group consists of analysts, researchers, toxicologists, safety experts, and other professionals from relevant areas of our company. To guide our decisions and actions, we participate in committees and working groups that include other companies, associations and regulatory agencies. Examples of such groups include the nano-coordination group of the VCI's Technology and Environment committee as well as Responsible Production and Use of Nanomaterials, a joint technology working group of DECHEMA (Society for Chemical Engineering and Biotechnology) and the VCI.

Training and awareness

We aim to increase awareness of, as well as provide best practice advice and information on, the safe use of hazardous chemicals. To this end, we regularly conduct seminars worldwide that teach basic lab safety rules such as the handling of flammable solvents and the storage of chemicals in safety cabinets and warehouses.

Progress

REACH registration on schedule

We are working to register all our chemical substances under REACH. We successfully completed registration phase 1 in 2010 and registration phase 2 in 2013. The next step, part of phase 3, is for us to evaluate and register all substances produced or imported in quantities ranging from one to 100 metric tons annually by June 2018. This process now also includes substances from Sigma-Aldrich and is on schedule.

In line with the Strategic Approach to International Chemicals Management (SAICM), a global policy framework overseen by the United Nations, the Act on the Registration and Evaluation of Chemicals (AREC) took effect in Korea in early 2015. The requirements of AREC are very similar to those of REACH, so much so that AREC is often referred to as "K-REACH". Thanks to our experience in implementing REACH, we are well prepared for such a procedure and have already initiated the registration process for select substances.

Drug safety

Our pharmaceutical products must be safe. We consistently monitor risks and adverse effects as they arise and take the necessary action to minimize them. Through rigorous benefit-risk assessments, we ensure that the benefits of our drugs always outweigh the risks for patients.

Our principles

Benefit versus risk

Our pharmaceutical products need to be effective in treating the respective disease while also posing as little risk as possible to patients. To ensure their safety, every new medicine passes a series of precisely defined development stages. Prior to using a drug in humans, we first 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 dose. This also helps us determine the dose that humans can safely tolerate. Only once this is complete do we perform clinical studies (p. 55) 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 risk-benefit profile. Only if the medicine has a positive risk-benefit profile do we submit an application for marketing authorization to the regulatory authorities.

After market launch, the number of patients being treated with the drug increases significantly. In certain circumstances, rare adverse effects may occur that went undetected during clinical development, which is why we continually monitor and update the risk-benefit profiles even after market launch.

Continual monitoring

We always provide physicians and patients with the latest information on the safety of our drugs. This applies to the entire life cycle of a product, ranging from development, market launch and commercialization to expiration of the marketing authorization.

Pharmacovigilance is the process of continuously monitoring a drug to detect, assess and understand adverse effects in an effort to take appropriate action to minimize risk.

Our Global Drug Safety unit is responsible for pharmacovigilance; it continually collects current safety data from a wide variety of sources across the globe, to include clinical studies, spontaneous reports on adverse effects, and articles published in medical and scientific journals. Our experts ensure that all information on the potential risks and adverse effects of our medicines is properly documented, tracked and, if necessary, reported to the respective regulatory authorities. Global Drug Safety analyzes all data and, as required, uses this to reassess the risk-benefit profile. We then inform the regulatory authorities, physicians and patients about potential risks and changes in the risk-benefit balance.

We always adhere to all statutory pharmacovigilance regulations in force in those countries where we market our products and continuously work to incorporate requirement changes in our Group-wide standards and processes.

Regulatory authorities also conduct regular inspections to verify that we are complying with statutory requirements and our own internal drug safety standards.

Furthermore, we perform our own audits to ensure that all our departments, subsidiaries, vendors, and licensing partners involved in pharmacovigilance are meeting all requirements across the globe at all times.

Medical Safety and Ethics Board

Our Medical Safety and Ethics Board (MSEB) oversees the safety and risk-benefit evaluations of our drugs throughout clinical development and commercialization. As required, it will initiate appropriate measures to minimize risk, such as package insert updates. Our Chief Medical Officer (CMO) is the chairman of the MSEB, which also consists of senior physicians, scientists and experts from Merck. Throughout a drug's entire life cycle, the MSEB reviews and assesses all relevant medical, ethical and safety issues. Furthermore, its tasks include the release of new investigational products for first-in-human use after conducting a thorough risk-benefit analysis based on all preclinical examination results.

Product labeling

The package insert informs physicians and patients how to properly use the respective drug. In accordance with the statutory regulations, the insert contains all relevant information such as ingredients and dosage, storage, mode of action, instructions for use, warnings, precautions, and adverse effects. Should the medicine contain ingredients that impact the environment, the package insert may also contain information on the proper disposal of the product.

As necessary, we review and update all package inserts, ensuring that they contain the latest information about our drugs. The leaflets also reflect changes initiated by the MSEB, such as new warnings.

In accordance with statutory requirements, all modifications to the inserts are submitted to the respective regulatory authorities for approval.

Strict quality assurance

In producing pharmaceuticals, quality assurance is a key aspect. The Current Good Manufacturing Practice (CGMP) regulations ensure that pharmaceuticals meet the standards set for identity, purity, potency, and safety. Compliance with these regulations is mandatory for pharmaceutical companies and is closely monitored by the health authorities. As a pharmaceutical manufacturer, we have appropriately trained employees, as well as suitable facilities, processes and procedures in order to meet all requirements.

Reliable distribution processes

We want our pharmaceutical products to be readily available to physicians and patients and always arrive on time. Therefore, our distribution process must function reliably all over the world. By continually auditing our distribution network, we ensure that both our subsidiaries as well as our partners and contractors adhere to our quality and safety requirements. All distribution activities must comply fully with Good Distribution Practices (GDP).

Employee training

All employees involved in the safety and quality of pharmaceutical products, or in planning, conducting and monitoring clinical studies, are trained according to our global training standards. These standards stipulate how we conduct and document training at all our sites. We verify compliance with these requirements by performing regular audits.

In this way, employees are kept up-to-date at all times. This includes their professional expertise as well as adherence to GCP, GDP, internal standard operating procedures, and other relevant requirements. We provide our training via a global e-learning platform on our intranet.

Progress

Joint recommendations for improved risk-benefit profiles

To optimize the risk-benefit balance of our pharmaceutical products, we work closely with other companies and public-sector organizations such as health authorities and academic institutions. We are involved in PROTECT, a research project run by the Innovative Medicines Initiative (IMI), which is a joint undertaking between the European Union and the European Federation of Pharmaceutical Industries and Associations (EFPIA). PROTECT aims to further develop tools and methods used in evaluating the risks and benefits of drugs. IMI project teams, in which we have taken on a leading role, have established a framework to help accomplish the initiative's mission. Building on this, we have introduced a Benefit-Risk Guide to our Drug Safety unit and have been using this guide as a source of improvement since 2015. We last made use of its recommendations when compiling the documentation for marketing authorization for our cladribine tablets.

No critical observations in pharmacovigilance inspections

In Germany, there are two pharmaceutical regulatory agencies: the German Federal Institute for Drugs and Medical Devices (BfArM) and the Paul Ehrlich Institute (the German Federal Institute for Vaccines and Biomedicines). Both agencies conducted pharmacovigilance inspections on our company in February 2015 on behalf of the European Medicines Agency.

Furthermore, pharmacovigilance inspections were conducted by the respective national authorities in Australia, Austria, Colombia, Ghana, Japan, Spain, Croatia, and the United States in 2015 and 2016.

All inspections have continually confirmed the proper functioning of our Pharmacovigilance system.

Sharing expertise with other countries

We also pass on our drug safety expertise to other countries, especially those in which health workers (such as health agencies, physicians and nurses) still lack the necessary knowledge regarding pharmacovigilance. In 2016, for instance, we supported training events and conferences in Peru, China and Ivory Coast.

At the third Merck Africa Luminary conference, held in Ivory Coast in October 2016, government representatives from Liberia, Uganda, the Central African Republic, Nigeria, and Kenya came together with more than 250 medical professionals as well as experts from Merck. The theme of the conference was “Unlocking the Pharmacovigilance Power in Africa”. Here, we provided information (p. 41) on monitoring the safety of drugs for cardiovascular diseases, thyroid disorders, diabetes, and infertility.

In China, too, we shared our knowledge. In partnership with the China Food and Drug Administration (CFDA), we conducted several training seminars for pharmacovigilance experts from the local Chinese pharmaceutical industry. At these seminars, we not only informed participants of the local drug safety requirements, but also about key global regulations and recommendations. Moreover, in Peru we participated in workshops on collaboration between pharmaceutical manufacturers and health authorities.

counterfeit products

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 increasing available on the market through unlicensed internet pharmacies and underground business-to-business (B2B) platforms, posing a risk to public health.

Our company develops and manufactures products of the utmost quality. In order to protect customers and patients, we are deeply committed to fighting product-related crime. For instance, we collaborate with law enforcement agencies and take steps to secure our products against counterfeiting. Our guidelines, standards and processes apply to all our business sectors and markets worldwide, thus protecting our reputation as a supplier of quality products.

Our principles

Organization and guidelines

Our Group function Corporate Security coordinates all our anti-counterfeiting activities, basing its actions on our "Crime relating to products of the Merck Group" guideline, which describes our goals and strategies for combatting this issue. All such activities are carried out under the supervision of the Chief Security Officer and the Head of Environment, Health, Safety, Security, Quality (EQ).

Furthermore, all our sites have a Product Crime Officer who investigates potential cases of counterfeiting, acting as the interface between local regulatory and law enforcement authorities, national associations, Group functions, and our sites.

Moreover, our Group Product Crime Investigation Standard has been in place since September 2016. It defines binding guidelines, harmonizes knowledge within the company and provides a more solid legal footing when dealing with illegal products.

Fighting product crime

Our Group-wide Merck Anti-Counterfeiting Operational Network (MACON) is responsible for globally monitoring and implementing all anti-counterfeiting measures for our products. As well as coordinating preventive measures and the development of security systems, it is also responsible for investigations. Discourse between the members of the network creates synergies and bolsters our efforts to fight product-related crime. Comprised of experts from various units such as Legal/Trademarks, Product Security, Export Control, Supply Chain, and Quality Assurance, MACON is coordinated by our Corporate Security unit. In 2015, we expanded the network to include representatives from Global Drug Safety as well as various subsidiaries. All MACON activities are now overseen by the new Global Anti Product Crime unit, created in 2016.

In all relevant cases, MACON collaborates with the appropriate law enforcement agencies and regulatory authorities, allowing us to detect more cases of counterfeiting and take decisive action in pursuing existing cases, especially in high-risk countries. The network reviews and handles up to 100 cases of product-related crime per year, including inquiries from authorities that arise during backtracking investigations. In 2015, we uncovered several underground laboratories that were counterfeiting several of our products.

Moreover, in 2016 we launched a new, Group-wide internal reporting system with which all incidents can be better analyzed and documented. This provides us with a more complete picture of the security situation, better equipping us to prevent such incidents in the future.

FAST FACT

DEFINING PRODUCT CRIME

1. Product counterfeiting: In line with the Trade-Related Aspect of Intellectual Property Rights Agreement (TRIPS) and WHO standards, 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 agent, but not one produced under GXP conditions
- that have expired
- that were removed from the legal supply chain (e.g. through theft)

2. Illegal diversion of products: This term refers to the diversion of either chemical or pharmaceutical products from within the legitimate supply chain for illegal export, for use in the production of illegal drugs, weapons or explosives, or for any other illegal purposes.

3. Black market crimes: This refers to the sale of counterfeit and/or diverted products via illegal channels (e.g. the Internet), or for illegal purposes.

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

Tracking system for chemical substances

We have established an internal system to monitor and track chemicals that could be misused to produce illegal weapons, explosives or narcotics. Our tracking system flags suspicious orders and/or orders of sensitive products, which are only released once we have confirmed the existence of a (verified) end-user declaration. Moreover, we collaborate closely with regulatory authorities and law enforcement.

In addition to our 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 fulfilling our commitment to the German Chemical Industry Association (VCI) and to the Guideline for Operators published by the European Commission.

Supporting customers and patients

We believe that patients should be able to determine the identity and authenticity of a pharmaceutical product themselves, which is why we implement the requirements of the EU Falsified Medicines Directive, for instance by applying a unique serial number to our pharmaceutical packaging. In the United States, the Food and Drug Administration (FDA) requires all drug packages to be labeled with a unique product identifier by the end of 2017, which we are currently working to implement.

In parallel to meeting these international provisions, we also pursue our own initiatives:

- On all our products, we apply Security-M, a security label containing our color travel pigments. This label enables users to easily verify the authenticity of our products and is considerably harder to counterfeit than the holograms that are commonly used.
- With our Track and Trace shipment tracking system, patients can trace the supplier of the medicine to verify its authenticity. We have already implemented this system for all our pharmaceutical products in the United States and China, and are currently considering expansion to other markets.
- Our free Check My Meds app for smartphones allows patients in the United States to scan the serial number of their medicines and quickly verify their authenticity. In 2015, the trade journal PharmaVOICE listed the app among its top innovative health-focused apps and websites.
- In our Mobile Anti-Counterfeiting System (MAS) project in Nigeria, we are working closely with our suppliers on a text message-based identification system. Patients scratch off a barcode that is printed on the product packaging. They then send this code via text message to an assigned number, which immediately sends them back a response telling them whether their code is authentic.
- We sponsor the non-profit Global Pharma Health Fund (GPHF), which supplies GPHF Minilabs® to test the quality of 85 different active ingredients. With this compact test kit, counterfeit medicines can be detected quickly, easily and inexpensively in developing and emerging countries. Further information on this project can be found under Community (p. 97).
- We offer our customers in the pharmaceutical industry Candurin® pearl effect pigments, which feature unique color properties that make tablets and capsules more difficult to counterfeit.

Educating our employees and business partners

We endeavor to raise awareness of product-related crime among our employees and business partners, training our employees worldwide on this subject. In the countries where

we don't have our own subsidiaries, we offer training for our business partners.

Conducting security audits

We regularly check whether our distributors and contract manufacturers are complying with GMP and GDP (Good Manufacturing Practice/Good Distribution Practice). In doing so, we also ascertain the extent to which our security requirements are being implemented, conducting corresponding security audits if significant deviations are identified. This auditing system is based on the EMA ICH Q10 pharmaceutical quality assurance standard. In 2015 and 2016, we conducted 37 security audits of our partners worldwide and subsequently provided them with the results of these audits so that the necessary corrective action could be taken.

Industry-wide exchange and collaboration with authorities

We have joined forces with organizations such as EFPIA, IFPMA and VFA in an effort to fight product crime. We also support industry-wide initiatives and collaborate closely with regulatory authorities and law enforcement at the regional, national and international level. We work particularly closely with the Pharmaceutical Security Institute (PSI). This non-profit organization is dedicated to protecting public health by sharing information on pharmaceutical counterfeiting and initiating enforcement actions through the appropriate authorities. In May 2015, we hosted a meeting of the PSI for the first time, at which we engaged in discussions on current trends and holistic approaches to fighting product-related crime. In 2016, our Chief Security Officer was appointed Vice Chair of the PSI Board of Directors.

Furthermore, we are also a member of Rx-360, a consortium of global pharmaceutical manufacturers and suppliers that aims to prevent counterfeit products through the introduction of global quality assurance systems and audit programs.

When cases of product crime are identified, we collaborate with the relevant law enforcement agencies and customs authorities in the respective countries. We furthermore work with Interpol, the World Customs Organization, health authorities, and our peer industry.

Reviewing our efforts

We evaluate the effectiveness of our measures according to the number of reported, investigated and solved cases, as well as their severity. Furthermore, in 2015 and 2016, we scrutinized our existing communication and information management processes to identify potential improvements, and are now making the necessary changes to optimize these processes.

Progress

New training program developed

In the 2015-2016 period, we devised a training program for all our employees in Security roles, such as Product Crime Officers. Via e-learning modules, the program aims to enhance their competencies and promote best practice sharing. In 2015 and 2016, we held ten training courses at various sites. Moreover, participants shared lessons learned during the MACON summit in Darmstadt in June 2016, which was attended by 25 Product Crime Officers from key countries.

Transport and warehouse safety

We transport and store products and materials worldwide such as chemicals, pharmaceuticals, raw materials, intermediates and waste, as well as technical materials and packaging, all of which could pose a hazard if handled incorrectly. In doing so, we adhere to extremely strict safety regulations Group-wide to prevent danger to people and the environment.

Our principles

Organization and standards

Environment, Health Safety, Security, Quality (EQ) (see Environmental stewardship (p. 77)), the Group function in charge of transport and storage safety, sets Group-wide standards and guidelines. In addition, our individual sites are also subject to various national and international regulations governing environmental protection and public safety, which local site directors are responsible for implementing.

Our sites worldwide generally have a dangerous goods manager who advises the site director on issues regarding the safe transport of dangerous goods while also monitoring compliance with regulatory requirements. This position reflects the EU regulations requiring the appointment of a dangerous goods safety advisor.

In 2014, we acquired the company AZ Electronic Materials and in 2015, Sigma-Aldrich, a U.S.-based life science company. We have since aligned their transport and storage systems with our Group-wide standards and updated them where necessary.

Warehouse safety

Our global safety concepts and standards ensure the safe storage of hazardous substances. The Warehouse Safety standard, for instance, defines measures to prevent substances from leaking or igniting. According to this standard, risk evaluations must be conducted on all stored substances. Special rules of conduct apply to all warehouse employees. In 2015 and 2016, we audited more than 20 of our warehouses and, based on the results, identified areas for improvement.

To ensure third-party warehouses also adhere to our strict safety requirements, our Group standard Warehouse requirements for third-party warehouses defines specific structural and organizational requirements for a facility. Before we sign contracts, warehouse providers must submit a statement detailing how they plan to meet our stringent safety standards. Our EHS managers regularly visit third-party warehouses. In 2015 and 2016, we audited ten of these warehouses and developed corrective action plans to address the identified shortcomings.

In Germany, the "Technical Rules for Hazardous Substances" (TRGS) stipulate the storage of hazardous substances in non-stationary containers. In 2016, we decided to introduce these rules for storage at all our warehouse and distribution centers worldwide.

We comply with the current requirements of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) at all our sites with the exception of India, where the GHS system has not yet been fully integrated into national regulations.

Ensuring transport safety worldwide

We seek for all shipments to reach our customers and sites safely, undamaged and with the required safety information. Several substances that we transport are classified as hazardous materials. Hazardous goods transport – whether by road, rail, plane, or ship – is governed across the globe by extensive regulations such as the "European Agreement concerning the International Carriage of Dangerous Goods by Road" (ADR).

Our Group Transport Safety standard defines the safety levels for our sites 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 on the transport of hazardous materials. We update our Group standard to reflect current requirements every two years and support our local site directors in implementing the relevant changes. On January 1, 2017, we introduced the amended IATA regulations on the transport of dangerous goods by air and the RID/ADR regulations on transport by rail and road.

We regularly perform audits to ensure that our own sites as well as our freight forwarders are complying with transport safety regulations. In 2015 and 2016, no incidents that would have had a significant impact on the environment or community were recorded, nor were there any infringements of international regulations.

In Germany, we transport the majority of our hazardous waste ourselves, but do sometimes also enlist the services of other companies if necessary.

Furthermore, we participate in the German Transport Accident Information 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.

Continuously improving safety concepts

Our local EHS and dangerous goods managers regularly review and evaluate our transport and storage activities, informing site directors of shortcomings and opportunities for improvement. Moreover, our sites are audited by EQ every five years.

Based on a strength and weakness analysis of each site, we calculate key performance indicators on transport and storage safety, which help us determine where to institute additional improvements. In 2016, for instance, we developed an e-learning concept for basic management courses on the transport of dangerous goods and launched a subsequent pilot program.

Employee training and internal best practice sharing

We regularly train warehouse workers and all employees involved in the transport of goods on our standards and procedures, as well as on changes to international requirements and incident management.

Furthermore, our EHS managers meet regularly at the EHS conference in Darmstadt, Germany, where they have the opportunity to share experiences and best practices, as well as participate in transport and storage safety training. These topics are also covered in the three-day orientation seminar that is mandatory for all new EHS managers.

Progress

Award for truck improvements

The safe transport of dangerous goods necessitates safe vehicles, another area we pursue. In 2015, we won the VCI Hesse's Responsible Care competition for our continuous improvements to our SafeServer truck body technology. In this design, the aluminum panels integrated into the side

walls of the truck render the walls extremely stable, making it largely unnecessary to secure cargo. Over the past several years, our transport employees have worked to continuously hone this system, collaborating with our truck body manufacturers to implement the design changes.

In 2016, we won first prize in the Transport Safety category of the Germany-wide Responsible Care competition in recognition of our "TUIS, Messkonzept Südhessen" project. When a transport or warehouse accident occurs, this system can quickly calculate the rate at which hazardous substances are spilling and spreading.

Responsible Marketing

Pharmaceutical marketing is regulated by legislation worldwide. For instance, manufacturers in Germany are only permitted to advertise prescription drugs to medical professionals such as physicians and pharmacists. In doing so, they must always disclose the active ingredients, side effects, and contraindications of the advertised drug.

Our company commercializes both prescription medicines as well as over-the-counter products. In marketing our products, we voluntarily commit to various standards that exceed statutory regulations. Because patients deserve effective, high-quality treatment, they are always our primary consideration.

Our principles

Guidelines and organization

We adhere strictly to all regulations on pharmaceutical marketing. Our Group-wide Pharma Code for Conducting Pharmaceutical Business and Pharmaceutical Operations defines the relevant standards for ethical marketing practices. This code also governs our interactions with physicians, medical institutions and patient advocacy groups. We furthermore comply with the codes of conduct of national and international industry organizations such as the Code of Practice and Code of Pharmaceutical Marketing Practices published by the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA). Our pharmaceutical activities in the United States are governed by yet another guideline, entitled Pharmaceutical Operations of Merck KGaA and Merck Serono S.A. in the United States.

All guidelines pertaining to marketing and advertising are part of our Group-wide compliance program, which stipulates that we always conduct business in compliance with the law and according to the highest ethical standards. We regularly review all guidelines, adapting them to new developments.

We have defined processes for all international, national and regional sales and marketing activities, and have appointed individuals responsible at each of these levels. We furthermore conduct regular audits of our sales and marketing activities.

High global standards for advertising materials

Through our Principles of Review and Approval of Promotional Materials and Other External Communications, we ensure that all advertising materials meet our rigorous standards. In 2016, we updated these principles and rolled out a Group-wide review and approval system that meets the latest technical requirements. This system helps us check whether all advertising materials meet our standards. All employees involved in creating advertising materials worldwide have been trained on the updated principles as well as this new system.

Direct marketing only permitted in certain countries

Direct-to-consumer advertising (DTC) for prescription drugs is allowed in some jurisdictions such as the United States and New Zealand. We only pursue DTC campaigns in these countries. Through direct advertising, we hope to increase people's awareness of certain diseases as well as available therapies, empowering consumers and patients to make informed decisions about their treatment.

Compliance violations

The industry associations in which we are members have put in place various reporting channels for people to report any wrongdoing with regard to marketing practices.

Furthermore, we have also established a SpeakUp Line, which allows our employees to anonymously report potential compliance violations. If our marketing or advertising rules of conduct are violated, we have a committee in place to take immediate corrective and, if need be, punitive action.

Voluntary self-regulation

We are a member of the German Association of Voluntary Self-Regulation for the Pharmaceutical Industry (FSA), which has defined its own code of conduct for collaboration between physicians and the industry. When violations of the FSA code are suspected, members and third parties can file complaints directly with an arbitration board. In 2015, we were involved in proceedings that resulted in a fine.

Regular employee training

Individuals responsible for our pharmaceutical advertising, as well as employees working in sales, marketing and regulatory positions, receive regular training on our current guidelines. Furthermore, via our Intranet the responsible employees also have access to our compliance guidelines on the marketing and promotion of pharmaceuticals.

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 furthermore 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 & Customs Regulations unit, as well as by trade and export control officers at our local subsidiaries. If we suspect misuse, we terminate our business relationship with that customer.

Bioethics

Bioethics are foundational to guiding how humans use the rapidly advancing power of life sciences and technology responsibly and ethically to the ultimate benefit of mankind, animals, plants and all living beings. In the course of our Healthcare and Life Science activities, we are faced with various bioethical issues, including stem cell use, animal testing, the use of genetically modified microorganisms, the potential impact of new gene editing techniques such as CRISPR/Cas, and our own clinical research. Beyond compliance with the relevant regulations and laws, we have a strong commitment to conducting research in an ethical manner, which is why we continuously evaluate all manner of positions on controversial topics in order to make informed decisions. In treating patients with our drugs and interacting with participants in our clinical studies, their wellbeing is always of utmost importance.

Our principles

Merck Bioethics Advisory Panel

As a global company, it is important for us to promptly identify and address all international developments concerning bioethical issues. This approach is what enables us to define our own stance, as does the advice of external experts.

To this end, the Merck Bioethics Advisory Panel (MBAP) convenes once a year to advise the company. Consisting of renowned international experts in the fields of bioethics, theology, science, and law, the MBAP is jointly headed by our Chief Medical Officer (CMO) and our Head of Global Health. The MBAP provides clear guidance on bioethical questions, which we take as a basis for our entrepreneurial conduct. For the benefit of our employees, we publish summaries from MBAP meetings on our Intranet.

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 has formulated ethical principles for medical research involving human subjects, and the Good Clinical Practice (GCP) guidelines of the International Council for Harmonization (ICH). More details can be found under Clinical studies (p. 55).

Stem cell research

We do not 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. However, we do make use of stem cells in our research. In addition, we offer our customers several select stem cell lines. Our Stem Cells and Human Cloning Principles ensure compliance with our ethical approach. Furthermore, our Stem Cell Research Oversight Committee (SCROC), which was established in 2016, reviews our business strategies as well as all internal human stem cell research proposals to verify compliance with our ethical and legal guidelines. This also includes collaboration with external partners. The mandate of the SCROC is based on the recommendations of the Merck Bioethics Advisory Panel.

Infertility treatment research

We develop treatments to improve the success rate of in vitro fertilization and are currently revising our Fertility Research Policy based on recommendations from the MBAP. You can find more information under Progress (p. 54).

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 centers for medical biotechnology are in Darmstadt, Boston (MA, USA), Beijing (China), and Tokyo (Japan). Major biotech production sites are located in Aubonne and Corsier-sur-Vevey, Switzerland, the latter of which is one of the largest biopharmaceutical production facilities in Europe.

We manufacture our biotech products according to the highest standards. 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 pertaining to biotech products and adapt our processes accordingly, thus ensuring we adhere to all statutory requirements.

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, i.e. 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 new applications can benefit patients. However, to use a drug in this way, solid evidence must exist showing that it can be effective in the treatment of the specific disease.

In 2016, we instituted a new Group-wide policy that sets out our principles for disseminating information regarding off-label use. In particular, 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 and only provide such information upon direct request to healthcare professionals for medical purposes. 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.

Progress

Merck Bioethics Advisory Panel discussions

In 2015 and 2016, the MBAP discussed the following issues:

1. Selecting partnerships according to ethical standards

We collaborate with numerous partners in research and development, production, and marketing and sales. The MBAP has emphasized that it is crucial to form partnerships with organizations whose values align with ours. Our values are described in guidelines such as our Code of Conduct, our Human Rights Charter and the Merck Responsible Sourcing Principles.

2. Biosampling & biobanking

A biobank is a repository that stores tissue samples and body fluids, as well as coded patient and specimen data. Although these are extremely important to our research, their storage and use for research require adherence to stringent ethical standards, not only in terms of specimen collection, including those for genetic analyses, but also for biobank operation. For this reason, we explain to all study participants the purposes for which we are using their samples. The participants then sign an informed consent form to confirm that they understand and that they authorize the use of their specimens.

Because we might want to use patient samples at a later date in other studies, the MBAP has recommended that we include this possibility in the Informed Consent form for our study participants. Furthermore, in 2017 we will be adopting a policy on patient specimen handling and establishing a committee to advise our researchers on the use of these samples.

3. Fertility and the German Embryo Protection Act

Because we develop therapies to treat infertility, we are frequently confronted with various bioethical issues relating to such treatments. For instance, may embryos resulting from artificial insemination be screened for genetic disorders and then selected on this basis? The German Embryo Protection Act provides guidance on such questions. The MBAP has discussed the various issues thoroughly, and, based on these deliberations, we are currently revising our Fertility Research Policy.

4. Use of genome editing systems

We are a leading supplier of gene-editing technologies such as CRISPR/Cas9, which can be used to target and modify specific genes. 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", the use of genetic editing techniques in plant cultivation. Statutes in different countries allow for a varying degree of latitude in applying this technique, which is why the MBAP has thoroughly discussed the possibilities and ethical boundaries of genome editing systems. The results of this discourse are being incorporated into our new Gene Editing Policy, which is under development. Moreover, in response to guidance from the MBAP, we are currently working to establish the Genome Editing Consortium, whose tasks shall include determining the responsibility and bioethical role of gene editing tool providers.

clinical trials

Our company develops medicines that help people with serious diseases. Before obtaining regulatory approval, we conduct clinical studies with patients and, if necessary, healthy subjects to test the safety and efficacy of these products. Prior to doing so, extensive preclinical testing must first be performed to demonstrate that the drug poses no unacceptable risks. This preclinical test phase may include procedures such as animal testing. We only test medicines in patients if the compounds show great therapeutic promise and have a positive risk-benefit ratio.

Our principles

Adhering to the highest standards

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 and society as a whole. In addition to this prerequisite, 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 the respective scientific questions.

Our Clinical Research policy provides the framework for conducting clinical studies and ensures that we adhere to all legal, ethical and scientific standards. In addition to the relevant national laws and regulations, these standards include:

- The Good Clinical Practice (GCP) guidelines of the International Council on Harmonisation (ICH) of Technical Requirements for Registration of Pharmaceuticals for Human Use
- The Declaration of Helsinki published by the World Medical Association
- The Belmont Report
- Good Pharmacovigiliance/Laboratory/Manufacturing/Distribution Practices (GVP/GLP/GMP/GDP)
- The International Ethical Guidelines for Biomedical Research Involving Human Subjects 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 Japanese Pharmaceutical Manufacturers Association (JPMA), and Pharmaceutical Research and Manufacturers of America (PhRMA)
- The "Principles for Responsible Clinical Trial Data Sharing" published by the EFPIA and PhRMA

Clinical research governance

Our Head of Global Research and Development bears overall responsibility for pharmaceutical development as well as the related governance process. Two committees support this individual in overseeing our clinical studies. The Integrated Clinical Study Committee (ICSC) is responsible for studies in pharmaceuticals that are under clinical development, while the Global Medical Affairs Decision Board is responsible for studies involving approved medicines. Both bodies consist of medical scientific experts and executives with long-standing experience in clinical research. Each committee meets regularly to conduct a comprehensive review of the proposed clinical study concepts to verify that our studies are scientifically sound, have a legitimate scientific purpose, and are performed according to the latest standards and best practices. Furthermore, in 2015 we also established therapeutic area review boards, which assess proposed study concepts and use their expertise in the various therapeutic areas to advise the ICSC.

Before administering a new drug in human subjects for the first time, we conduct extensive preclinical testing to demonstrate that the medicine has the potential to offer clinical benefits, is sufficiently safe for use in humans, and has a positive risk-benefit profile. Potential risks for subjects are carefully and continuously analyzed before and during the clinical study. Our Medical Safety and Ethics Board (MSEB) oversees the safety of subjects participating in our clinical studies and, as necessary, also reviews the risk-benefit profiles of the investigational drugs. You can find further information on the MSEB under Drug safety (p. 46) and Bioethics (p. 53).

Our clinical study procedures are regularly audited by health authorities to ensure compliance with the applicable laws and guidelines. We also conduct our own internal quality assurance audits. In both cases, we respond immediately to any issues found by adapting our processes accordingly.

Conducting clinical studies responsibly

Protecting the safety, wellbeing, dignity, and rights of the volunteers and patients 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 extremely important, and the confidentiality of all data and information collected is ensured in compliance with statutory regulations.

Prior to enrolling subjects, every clinical trial must 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 subjects must give their informed consent before enrolling in a clinical study. We fully inform subjects 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 posed by potential participants are answered by the clinical investigator or another qualified healthcare professional familiar with the study. As far as possible, non-interventional studies (observational studies) are also assessed by an ethics committee, and subjects are provided with thorough information.

Once started, every study follows precisely defined procedures. This ensures that the study 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. This approach also ensures that the data are accurately generated, documented and reported in line with all applicable requirements. In the 2015-2016 period, we received no significant complaints regarding this clinical study procedure from 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 subjects. In this way, we ensure the safe use of our pharmaceuticals. Potential adverse effects and risks are taken into consideration in an effort to evaluate the risk-benefit ratio of our products and manage risk. Product information, including the Investigator's Brochure and Subject Information, is updated accordingly. You can find more information under Drug safety (p. 46).

Conducting clinical trials in vulnerable populations

When a drug is intended for use in vulnerable populations, we must sometimes conduct clinical studies in populations such as children or underprivileged individuals. Their well-being is one of our top priorities as, in general, these groups are relatively (or absolutely) incapable of protecting their own interests. We therefore only conduct studies with patients from vulnerable populations if there is no other way to achieve conclusive results in other, less vulnerable study participants. When performing such studies, especially when informing subjects and obtaining their consent, we comply with all statutory regulations throughout the entire process.

More information can be found on our website and under Infectious diseases (p. 37).

Clinical study collaboration

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 – especially contract research organizations (CROs) performing studies on our behalf – to abide by the same set of high standards when conducting clinical studies.

To verify their compliance with Good Clinical Practices (ICH-GCP), our CROs, partners and other vendors are subjected to regular audits as part of our quality assurance efforts. We also arrange for audits of study centers involved in our clinical studies.

In the 2015-2016 period, these audits did not show any indication of studies that were failing to comply with ICH-GCP standards or the Declaration of Helsinki.

Close dialogue with patients and advocacy groups

We want to ensure that patients' voices and needs are adequately taken into consideration when planning and carrying out clinical studies. To this end, we established patient advisory boards for clinical studies in 2014. During advisory board meetings, caregivers and representatives from patient advocacy groups are invited to provide feedback on clinical study issues. Cumulatively, we use this information to render clinical development and clinical studies more patient centric.

Furthermore, we are involved in the European Patients' Academy on Therapeutic Innovation (EUPATI), a five-year public-private partnership within the Innovative Medicines Initiative (IMI) launched in 2012. 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. This project focuses on helping patients better understand pharmaceutical research and development while also offering them a way to incorporate their needs into the development of clinical studies. EUPATI furthermore aims to improve the availability of objective and reliable information for the public.

Responsible data sharing

We support scientific circles and academic institutes in advancing medical and scientific knowledge. To this end, we provide them with data from our clinical studies to use in their own research. When disclosing data from clinical studies, the privacy of our patients is always safeguarded; national legal systems are always respected, and incentives are always provided for investments in biomedical research.

To ensure responsible clinical study data sharing, we also collaborate with the European Federation of Pharmaceutical Industries and Associations (EFPIA) as well as the Pharmaceutical Research and Manufacturers of America (PhRMA). In accordance with their voluntary commitments, we provide qualified researchers from medicine and science with study protocols, anonymized patient data, study data, and clinical study reports.

Publication of clinical studies

We are obliged to disclose information from our clinical studies. We communicate this information publicly in a complete, accurate, balanced, transparent, and timely manner. We publish clinical study designs and results in the international database ClinicalTrials.gov 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. Furthermore, in accordance with EU regulations, we publish results of our clinical studies in the European Union Drug Regulating Authorities Clinical Trials (EudraCT) database, which is run by the European Medicines Agency (EMA).

We make sure that results from our clinical studies are published in medical journals in line with applicable laws and industry codes. In doing so, 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.

Clinical studies in developing countries

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

In performing clinical studies in developing countries, we apply the same principles that apply when conducting such studies in industrialized countries. When we perform studies in developing countries, we also:

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

Under our Praziquantel Donation Program, we are partnering with the World Health Organization to combat the parasitic disease schistosomiasis in African school children. However, in their currently available form, praziquantel tablets are only suitable for adults and children older than six. For children younger than six, it is currently not possible to properly treat the disease. Within a public-private partnership (PPP), we are researching a new formulation of praziquantel that is also suitable for infants and toddlers. As part of this research, we are currently conducting clinical studies with children in Africa. Further details can be found under Infectious diseases (p. 37).

Progress

Immuno-oncology: Strategic alliance with Pfizer

Immuno-oncology investigates the extent to which the body's immune system can be activated or strengthened to mount an immune response against cancer. As part of a strategic alliance with the U.S. pharmaceutical company Pfizer, we are studying the antibody avelumab as a potential treatment for various tumor types. In 2015, we thus launched JAVELIN, our expansive international clinical study program in which we are investigating the potential therapeutic benefit of avelumab in multiple tumor types. By October 2016, more than 3,000 patients had been evaluated as part of this program, which is investigating avelumab in more than 15 tumor types.

In 2016, we achieved important milestones in the indication of metastatic Merkel cell carcinoma (mMCC), a rare and aggressive form of skin cancer. We submitted the Biological License Application (BLA) for mMCC to the U.S. Food and Drug Administration (FDA) in the third quarter, and the FDA accepted it for Priority Review in November. In October, the European Medicines Agency (EMA) validated for review our Marketing Authorization Application (MAA) for mMCC. To date, there is no approved therapy available for this kind of tumor.

Enabling early access to new medicines

Not all patients can take part in a clinical study and so must wait for a new pharmaceutical product to be approved. Through our Early Access Program, we are, under specific circumstances, enabling patients to gain early access to new, potentially life-saving medicines. The offer is aimed at people with serious conditions who have already used all available therapies without success. It allows them to obtain medicines that have already been clinically tested but not yet obtained marketing approval. Here too we meet the most 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 our patients. We published a position paper on this topic in 2015.

Coming to terms with the past

In the 1950s and 1960s, drugs from various manufacturers were tested on orphans in Germany. The majority of such clinical studies were performed in collaboration with (university) hospitals and general practitioners. By making available files in our historical archives at Group headquarters in Darmstadt, we are now supporting efforts to understand and come to terms with this episode in the history of science. In 2015, we granted a historian access to the files in our corporate archives so that she could do in-depth research for her dissertation. Her scholarly endeavor will ultimately help us all to navigate this complex issue. We guarantee full transparency and will do everything necessary to help the affected institutions come to terms with the past.

Animal welfare

From an ethical and scientific perspective, animal research is indispensable and is furthermore mandated by law. Through animal studies, we test both the safety of our chemical and medicinal products, as well as the efficacy of our pharmaceuticals. We enforce stringent animal welfare standards that exceed applicable laws and expect our suppliers, contract research organizations and other partners to do likewise.

The majority of our animal testing is conducted in our Healthcare business sector as part of the official drug approval process. However, animal welfare has also become a more prominent issue for our Life Science business sector. The acquisition of the U.S.-based life science company Sigma-Aldrich in autumn 2015 has increased the number of products of animal origin in our Life Science portfolio. For instance, certain animals are kept so that their blood can be used to produce antibodies. Before the acquisition, Sigma-Aldrich also conducted animal studies as part of contract research work for third parties, a line of business we are continuing to pursue.

Our principles

The 3Rs of animal welfare

In the housing, care and feeding of our lab animals, we are committed to consistently applying the most stringent ethical standards and are continuously working to improve upon them. When conducting research, we adhere to established methodology and endeavor to use animal alternatives wherever possible and permissible by law.

We therefore subscribe to the internationally recognized 3Rs for animal-based research:

- **R**eduction - using the minimum number of required animals
- **R**efinement - minimizing distress or discomfort before, during and after testing
- **R**eplacement - replacing animal studies with non-animal systems

We promote the 3Rs outside our company as well. For instance, under the International Consortium for Innovation and Quality in Pharmaceutical Development (IQ Consortium), we have joined forces with other companies to support the Global 3Rs Awards Program. In partnership with the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC International), this initiative recognizes innovative contributions toward the 3Rs of animal research to advance ethical science in academia and industry. In 2016, one of the Global 3R Awards went to Madhav Paranjpe, a scientist from our Life Science business sector. He was recognized for publishing a study showing how the number of mice used to evaluate the carcinogenicity of a new drug can be reduced by 25%.

Legal requirements

Animal research is only permitted if there are no recognized alternative methods available. However, in many fields, animal studies are indispensable and legally mandated by the ICH guidelines or REACH. The safety of humans is our number one priority. Laws and regulations govern all aspects of animal research, such as the housing conditions of research animals, the conduct and approval of studies, and the reliability and expertise required of all involved individuals.

Group-wide methodology and guidelines

Through our Group-wide Use, Care and Welfare of Laboratory Animals policy, we make a commitment to global animal welfare principles and the highest possible ethical standards in animal research.

This policy further sets out principles on the housing, care and feeding of laboratory animals. We strive to provide our animals with high-quality living conditions and consistently seek ways to make improvements. This ethos applies equally to the contract animal research services we've been offering third parties since acquiring Sigma-Aldrich.

In addition to our policy, our Group-wide Animal Science and Welfare manual describes the requirements for implementing, maintaining and improving animal welfare practices.

Organizational structures

Merck's Corporate Animal Science and Welfare (EQ-A) unit is headed by the Chief Animal Welfare Officer, who is responsible for creating uniform animal welfare standards. The Chief Animal Welfare Officer also initiates audits, sometimes performing these themselves, and consistently works to drive improvements in our own animal welfare practices as well as those of our partners. Moreover, all our animal science and welfare experts meet on a regular basis through our global laboratory animal science network, which monitors the animal welfare units at our sites and supports all projects and processes related to animal science and welfare.

In 2016, we furthermore established the Group Animal Welfare Council, which convenes several times a year. Comprising representatives from all our business sectors, this council monitors policy developments, updating our Animal Welfare Strategy where necessary.

Our sites are generally subject to additional 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 when 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. Our Chief Animal Welfare Officer has an active role in various committees to advocate our position on animal welfare. In 2015, for instance, he chaired the IQ Consortium and currently represents EFPIA on the AAALAC International Board of Trustees, where he ensures adherence to European standards. Moreover, at the end of 2016 he was appointed to the Executive Committee of AAALAC International for a term of three years.

Collaborating with partners and suppliers

We perform the majority of animal studies ourselves and for the most part procure our lab animals from specialized animal breeders. Sometimes, however, we also hire contract research organizations (CROs) to conduct animal research on our behalf. Furthermore, we work with both the private sector and academic institutions. When collaborating with such organizations, we expect them to adhere to the same high standards as we do, as set out in our Use, Care and Welfare of Laboratory Animals policy. We review compliance with this policy by performing regular audits.

The suppliers gained from the Sigma-Aldrich acquisition are also subject to our strict animal welfare requirements. Since 2016, we have been working on harmonizing our standards and developing a suitable audit concept.

Employee training

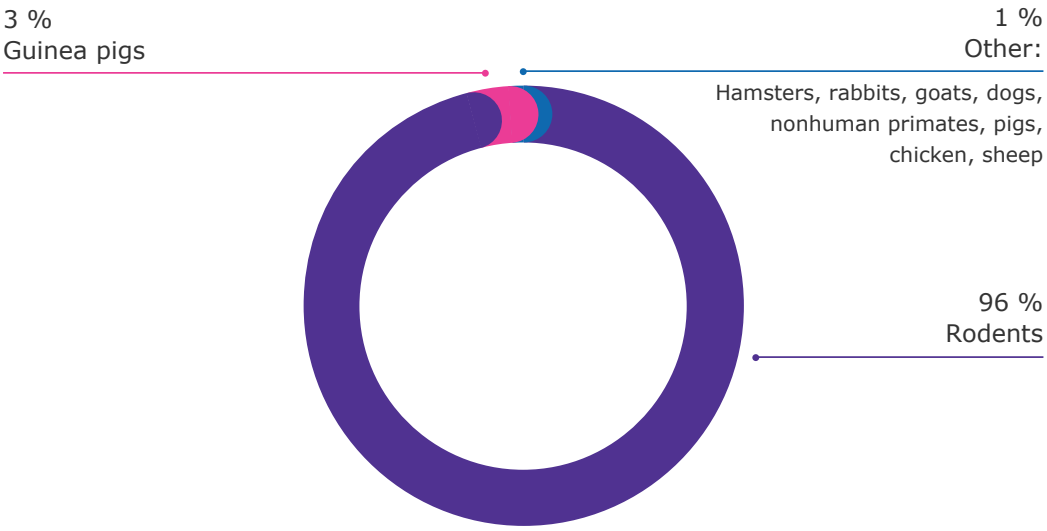
We regularly provide training to all employees working with laboratory animals at Merck, thereby ensuring that animal studies are conducted according to the latest scientific standards and that animals receive the best care possible. The nature and scope of this training is based on national and international legislation, as well as local requirements. The respective regulatory authorities monitor our activities to ensure they are in compliance. In addition to this training, our employees regularly participate in external continuing education programs such as accredited laboratory animal science courses offered by the Federation of European Laboratory Animal Science Associations, the American Association for Laboratory Animal Science, the Society of Laboratory Animal Science, the Laboratory Animal Science Association, and the Interessengemeinschaft Tierpfleger (Community of Animal Caregivers).

Progress

The majority of laboratory animals are rodents

Roughly 96% of the laboratory animals we use are rodents (mice and rats). Other animal species are only used if specified by statutory regulations or if deemed necessary for scientific reasons. For example, regulatory agencies sometimes require investigational drugs to also be safety tested on a non-rodent species such as monkeys, dogs or pigs. Guidelines such as REACH also require testing on non-rodents under certain circumstances. This allows researchers to identify potential side effects with the necessary accuracy and include them in the risk assessment of a substance. In performing tests on non-rodents, researchers must meet additional requirements pertaining to animal care and study design.

Animal types



Auditing our animal research facilities

We perform regular audits on our animal research facilities to ensure adherence to our animal welfare standards. In 2016, for instance, our Corporate Animal Science and Welfare unit conducted three internal audits at our sites in the United States, the United Kingdom and Israel. These audits identified the need for better environmental enrichment to promote species-typical behavior. They also suggested improvements relating to occupational safety, veterinary care and organizational issues. Corrective actions have since been taken.

It goes without saying that we adhere to the highest international animal welfare standards at all times. Since early 2016, all our Healthcare laboratory animal facilities have been certified to the standards of the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC International). One facility in our Life Science business sector is also AAALAC-accredited.

Conducting audits of partners

We perform regular audits on our animal breeders and contract research organizations to ensure compliance with our animal welfare standards. As part of our work with Interpharma, we have developed a cross-company audit concept that concentrates on those partners we feel to harbor potential risks. In the 2015-2016 period, a total of three audits were conducted in European countries excluding Germany. The audit results are shared among Interpharma member companies and treated confidentially.

Developing alternative testing methods

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

To help rectify 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 sectors seeks to pool knowledge and resources to accelerate the development of alternative approaches to animal use in regulatory testing.

Through our membership in the German Association of Research-based Pharmaceutical Companies (vfa), we also support the set Foundation, which seeks to reduce and replace animal testing. To achieve this objective, the foundation funds projects that conduct research into alternative methods. The Merck Chief Animal Welfare Officer is currently Vice Chairman of the set Board of Trustees.

Our own scientists are also working on developing alternative methods and have received numerous accolades for their efforts.

Awards for developing alternative testing methods

- 2014: The Hessian Animal Welfare Research Prize for Alternative Methods to Replace or Reduce Animal Testing
- 2010: The IUTox Bo Holmstedt Scientists Award for Alternative Test Strategies according to the 3Rs
- 2009: The Eurotox Gerhard Zbinden Young Scientists Award
- 2008: The Eurotox Bo Holmstedt Young Scientists Award for Alternative Test Strategies according to the 3Rs
- 2007: The Hessian Animal Welfare Research Prize for Alternative Methods to Replace or Reduce Animal Testing
- 2006: The German Animal Welfare Research Prize awarded by the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) for alternative methods to replace or reduce animal studies
- 2005: The Eurotox Gerhard Zbinden Young Scientists Award

Interactions with health systems

We want all patients to receive the best possible medical treatment. To achieve this, it is essential that research institutes, physicians, patient organizations, and other key actors in health systems have access to detailed and current information on diseases and treatments. We help facilitate this access by sponsoring independent initiatives and medical capacity advancement programs, and by donating money and supplies. In addition, we promote outstanding research projects. Since transparency is always our number one priority, we provide detailed reports on donations and activity sponsorship. Furthermore, we are committed to various voluntary requirements within our industry.

Our principles

Statutory and voluntary requirements

We explicitly endeavor to exert no influence over financial or non-financial contributions, nor over the information communicated to key actors in healthcare systems. Consequently, we have committed ourselves to providing transparency. In all transfers of value, we comply with the principles set forth by the European Federation of Pharmaceutical Industries and Associations (EFPIA) in its "Code on disclosure of transfers of value from pharmaceutical companies to healthcare professionals and healthcare organizations". We also adhere to statutory transparency requirements worldwide, such as the stipulations of the Sunshine Laws in the United States, or the Loi Bertrand in France.

Transparently promoting research and education

To support health systems, we make monetary contributions and donate supplies to institutions such as professional medical associations, hospitals and university clinics. These contributions are expressly not intended to influence decisions regarding treatment, prescriptions or purchasing. On our website, we publish all relevant payments to partners in the health industry as well as our R&D spending in the relevant countries. This practice aligns with the code of conduct of the German Association for the Voluntary Self-Regulation of the Pharmaceutical Industry (FSA), as well as the codes of conduct of the pharmaceutical associations in the member states of the EFPIA. We update the disclosed information on an annual basis.

Furthermore, we sponsor research and continuing medical education around the world in order to contribute to medical advances that will benefit patients. Through our Grants for Innovation, we support research projects in fertility, multiple sclerosis, oncology, and growth disorders. Through our Global Medical Education unit, we also provide grants to continuing medical education providers, enabling them to develop and deliver advanced medical training for scientists, physicians, nurses, pharmacists, and other healthcare professionals. We conduct these efforts in a transparent fashion. All direct and indirect financial aid aligns with the principles of the EFPIA.

Partnering with patient advocacy groups

Patient advocacy groups support patients, family members and care givers, providing them with information on disease management. Just like these organizations, we have set ourselves the goal of improving patient quality of life, which is why we endeavor to support their crucial work. We explicitly strive to exert no influence or control over the information that the organizations communicate to their members. We provide the highest level of transparency on our donations by publishing the details of contributions to European patient organizations on our website. This information is updated annually, which enables us to fulfill the commitment we made through our membership in the European Federation of Pharmaceutical Industries and Associations (EFPIA). In 2016, we published a new Group-wide guideline entitled "Good Practice and Process Guidance: Engagement with Patients, Patient Opinion Leaders and Patient Organizations". This document governs our interactions with patients and patient advocacy groups worldwide except in the United States, where a separate regulation applies. It furthermore ensures that patient wellbeing is considered.

Progress

First report in line with transparency initiative requirements

Since 2016, companies in the EU have been required to publish all financial and non-financial contributions to medical professionals and organizations in the healthcare industry not related to research activities. As set out in the transparency initiative of the EFPIA, the information provided must include the name and address of the individual recipient as well as the purpose and amount of the transfer. In 2015, our work focused on informing our partners in the health industry just how important the transparency initiative is to us. We also took steps to ensure data quality and data privacy in all affected countries. At the end of 2016, we reported for the first time in line with the new requirements. Currently, we are involved in new legislative initiatives launched in several European countries as part of the transparency initiative, which will impact our reporting process as of 2017. We will ensure that we fulfill all requirements.

Employees

The people working for us are crucial to our success, playing a central role in our business endeavors.

In accordance with our Values, we live a culture of inclusion and respect, seeking to hire, foster and motivate the best-suited individuals. Moreover, we are strongly committed to a diverse workforce and take pains to safeguard the health of all.

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Attractive employer

We recognize that our employees are crucial to our business success. To secure our future viability, we seek to attract employees who have the potential for greater future roles. Demographic change is heating up the competition for the best employees, especially in Europe, the United States and parts of Asia. By contrast, filling management positions is one of the greatest challenges we face in several emerging countries.

Owing to the ever-faster pace of technological progress, professional requirements are also increasing, which makes it crucial for us to cultivate our employees and continuously strengthen their skills. In doing so, we as an employer must also meet the growing expectations for work-life balance.

Our principles

Recruiting and retaining talent

Our goal is to attract qualified employees and retain them over the long term. We want to give each and every one the opportunity to develop professionally and personally, ultimately realizing their full potential. Skilled professionals expect competitive compensation and a healthy work-life balance. We seek and advance promising individuals within our company so that we can quickly fill open positions.

HR Global Talent and Development works on strategies to advance and promote our employees, coordinating the necessary measures. At our sites around the world, our HR staff implements these measures in collaboration with senior managers from the business sectors. In doing so, they comply with global HR guidelines and requirements, which we monitor by means of internal audits.

Digitally steering HR processes

To make our HR processes more consistent around the world, in 2012 we introduced HR Suite, an online platform accessible to all employees. This platform is used to manage all key HR functions, such as development and succession planning, recruitment, continuing education, and employee performance assessments. Moreover, it helps calculate compensation and bonus payments.

Providing feedback and supporting development

We regularly provide our employees feedback on their performance. The Performance and Potential Management Process ensures that, in addition to providing regular feedback on employee performance, a meeting is held once a year to evaluate employees' overall performance. Since 2015, this process has been applicable to all employees Group-wide with a Global Grade of ten or higher, and in Germany for all non-exempt employees as well.

Supervisors and subordinates work together to define personalized objectives that reflect current strategic priorities as well as each employee's core tasks. In a separate process, they also draw up a detailed development plan. In creating their development plan, all employees can make use of the Development Advisor. Building on Merck's competencies, this online tool provides a selection of development measures that employees can tailor to their own needs.

Our Group-wide advanced training and continuing education program ensures that our employees develop the skills needed to help us realize our company strategy and continue down the path of success. Our employees can use the My Learning online tool to sign up for suitable activities such as seminars and online training courses.

Finding promising talent, securing succession

We seek to identify promising individuals within the company as early as possible and put them on the path to advancement. As part of our Succession Management Process, we systematically prepare candidates for management roles, which allows us to fill vacant positions quickly and efficiently.

Attracting qualified university graduates

We work to attract the best university graduates. As part of our efforts, we partner with organizations such as the German online network "careerloft". Furthermore, we regularly attend job fairs to reach out to potential applicants, informing them about job opportunities and career tracks within our company. In countries outside of Germany such as the United States or China, we likewise use career fairs as a way of making personal contact with university graduates.

In addition to recruitment, we also provide financial assistance to talented students. That's why we collaborate with organizations such as the German National Academic Foundation and the Foundation of German Business, and furthermore support the Deutschlandstipendium (German national scholarship program).

University graduates can apply for a position at Merck directly or complete one of our trainee programs. Our trainees acquire international experience in various areas of the company and take part in tailored advanced training courses.

The foundation: Vocational training

For us, vocational training is one of the most important ways to meet the current and future need for qualified professionals. In Germany, we offer numerous apprenticeship positions for various professions, as well as dual vocational training programs. We are continuously investing in new technologies and integrating these into our vocational training.

We also give young adults the opportunity to complete their vocational training on a part-time basis. If, after completing their apprenticeship, they wish to continue studying while working, we will cover up to 100% of the costs and also allow them to take special leave. Furthermore, apprentices can take part in community outreach projects.

Performance-based pay

We endeavor to reward the performance of all our employees and maintain a competitive edge in attracting qualified professionals, which necessitates commensurate compensation. At our company, compensation is based on the requirements of each position, as well as employee performance. In addition to competitive remuneration, we also offer attractive fringe and social benefits. Our benefits4me package encompasses three pillars, namely company-funded benefits including our company pension, health & well-being, and services. To meet the various needs of our workforce worldwide, we offer a variety of benefit packages designed using established steering mechanisms.

To ensure a competitive compensation structure, we regularly review our compensation policy. In doing so, we take internal factors and market requirements equally into account. In making adjustments to this policy, we involve relevant stakeholders such as employee representatives (p. 73) in the early stages of the process. Current analyses show that there are no gender-based compensation differences within the Group.

Finding work-life balance

We recognize how important work-life balance is for a productive and motivated workforce, which is why in many countries we allow our employees the flexibility to organize their own work schedule. Our workers make use of more than 30 different part-time models.

In Germany and the United States, where 44% of our workforce is based, we offer parental leave conditions that go beyond the statutory minimum requirements. Moreover, in Darmstadt we hold special seminars and offer referral services for employees who provide care for family members.

Progress

Assessing performance and identifying development opportunities

In 2016, approximately 49,000 employees took part in the Performance and Potential Management process that supervisors use to evaluate the performance of their staff. Every three years, employees can opt to be additionally assessed by select peers and external consultants. Known as 360-degree feedback, this approach helps to identify personal strengths and development opportunities. In 2016, we updated our Development Advisor, which is used to create employee development plans, adapting it to our new Competency Model.

We offer our employees around the world classroom training courses. In 2015, these courses were attended by over 4,000 participants, with 5,700 people having attended in 2016. In addition, our employees can also take a wide range of online courses and language training.

Good standing in employer rankings

Under the slogan "Make great things happen", we are positioning ourselves in the global job market as an attractive employer. This campaign highlights our strengths: we offer diverse opportunities to contribute to the development and commercialization of innovative products, as well as numerous career options in an international, motivating and state-of-the-art work environment. Through the "Make great things happen" campaign, we are also communicating our strong sense of social responsibility and commitment to work-life balance.

The success of our efforts is confirmed by our ranking among the 100 top employers for students and experienced scientists in Germany. This index is published annually by the research and consulting firm Universum and involves a survey of more than 5,000 people. In 2016, our Group ranked sixth in the student survey and seventh among experienced professionals.

Since 2015, we have been working on a new global employer brand for the Merck Group. Our goal is to better distinguish ourselves from our competitors and sharpen our profile as an attractive employer in the field of science and technology.

Sparking student and graduate interest in Merck

In 2016, we employed around 50 trainees, primarily in Inhouse Consulting, Finance and Production. In 2017, we plan to launch further trainee programs in Marketing, Sales and Research & Development, which will have room for 25 new trainees per year. Moreover, in the United States 12 additional trainees are expected to start their careers in Inhouse Consulting.

We offer internships to high school and college students. Through our Keeping Ties to Students program, we stay in touch with talented individuals who demonstrate especially good performance during their internship. Furthermore, every year we invite students from German and Swiss universities to come to Merck, where we tell them about career tracks and job opportunities at our company.

Impressive hiring rate and new dual vocational training programs

In 2016, a total of 576 young people were enrolled in vocational training programs at our sites in Germany. In 2015, 156 young people began their apprenticeship at Merck, with 163 having started in 2016. In total, we offer apprenticeships across 23 occupations, primarily in production, laboratory work and office administration. Furthermore, 14 young adults in 2015 and 16 young adults in 2016 embarked on dual vocational training programs in the fields of business administration, business IT, process engineering (chemical engineering), and mechanical engineering. Since 2014, we have been offering permanent employment contracts to all apprentices and graduates of dual vocational training programs working in occupations for which we have long-term demand. In 2015 and 2016, the hiring rate for graduates of these programs – taking voluntary terminations into account – was over 90%.

Early career training

In Darmstadt, our "Start in die Ausbildung" program helps young people who have a high school diploma but have been searching for an apprenticeship for at least one year without success. We offer them the opportunity to complete a one-year program at Merck, giving them insight into professional life and improving their chances of gaining an apprenticeship. In the 2015-2016 period, this initiative helped a total of 42 participants aged 16 to 25 get the qualifications they needed to apply for an apprenticeship. Since its launch in 2006, 167 young people have taken part in the program; 89 of them have successfully completed an apprenticeship while 55 are still undergoing training.

In October 2016, we established a similar program for refugees forced to flee their home countries. The "Integrating refugees through training" initiative is preparing 12 young people for vocational training, thereby opening the door to the German labor market. The project comprises linguistic, technical, cultural, and career-related training.

Leveraging the opportunities of digitalization

Our work is becoming increasingly digital and flexible, a development described by the term "Work 4.0". This trend is impacting our vocational training and continuing education programs as well; we are continually integrating new technologies such as 3D printing into our curricula and trying out novel learning and innovation methods such as design thinking. You can find more information under Innovation and digitalization (p. 26).

Our EVA platform is another example of an innovative, cutting-edge environment. EVA stands for "**E**xpertise everywhere, **V**irtual teams, **A**ccess to information" and has been bringing Merck employees together from across the globe since 2015. It allows virtual teams to collaborate and communicate across departmental boundaries and national borders. Approximately 50,000 people in total have access to the platform, which has won a number of international awards.

Expanding flexible working models

We offer our employees in Germany and the United States various flexible and innovative working models. The mywork@merck program, initially implemented in 2013 for all exempt employees at the Darmstadt and Gernsheim sites in Germany, aims to strengthen the culture of performance and trust within the company. In agreement with their teams and supervisors, employees can freely choose when and where they work. Since October 2014, non-exempt employees at these sites with positions suitable for this working model have also been eligible. We furthermore introduced mywork@merck at Merck Accounting Solutions & Services Europe GmbH, Merck Export GmbH, Merck Schuchardt OHG, Merck Selbstmedikation GmbH, Merck Versicherungsvermittlung GmbH, and Merck Chemicals GmbH. Employees and their respective line managers can best decide for themselves when and how often fixed physical presence in the office is necessary for all team members. Working hours are no longer logged or monitored. At the end of December 2016, a total of 4,507 employees were making use of this model.

In 2016, 4.7% of our employees worldwide worked part-time, 10.6% of whom were men. We believe that with these flexible working models, we are on the right track to not only more efficient processes, but – most importantly – to greater employee satisfaction and employer appeal.

Supporting parents

We endeavor to make it easier for our employees to return to work following parental leave, which is why in 2016 we launched the Parents@Merck program in Darmstadt and Gernsheim. It gives mothers and fathers on parental leave the opportunity to talk and share lessons learned while also helping them keep in touch with the company. Moreover, they can make use of the various training and networking offerings.

In the United States, we offer the female employees in our Life Science and Healthcare business sectors eight weeks of paid maternity leave. In Life Science, fathers are eligible for two weeks of paid paternity leave, which also applies when adopting a child, while Healthcare staff are given five

weeks of paid paternity or adoption leave. By contrast, the statutory minimum only provides for 12 weeks of unpaid parental leave per year. Furthermore, we also reimburse up to US$ 5,000 in adoption fees.

At Darmstadt and Gernsheim, our largest sites in Germany (around 20.9% of our total workforce), 480 employees were on parental leave as of the end of December 2016, 37% of which were fathers. In other key countries, we go beyond the legal requirements to offer other kinds of new parent support such as extended time in the United States and Brazil, and nursing care allowances in Taiwan.

Daycare center expanded

For 49 years, our headquarters in Darmstadt has featured a daycare center for children aged 1-12. This facility is funded by the Merck family (Merck'scher Kindertagesstätten-Verein e.V.) and offers 150 slots. Since 2013, we've been providing year-round care from 6:30 a.m. to 7:00 p.m. For the children of our employees in Gernsheim, five slots are available at a public daycare center.

Our Darmstadt site also offers provisional daycare services to cover times when an employee's regular childcare becomes unavailable. During school breaks in the German Federal State of Hesse, we host a variety of vacation camps focused on sports, art, research, and nature. In 2016, we increased the capacity of our vacation camp program to approximately 450 children.

Since June 2016, we have additionally been providing temporary care for sick children. For up to two days, parents throughout Germany can engage the services of a professional educator free of charge to care for their children at home.

Family and elder care: Better informed

In 2016, we revised the way in which we provide employees with information on career and family care in Germany. Twice a year, we offer our workforce family care seminars that focus on various topics. An external associate provides advice on all issues relating to family care and guides people in their search for suitable options. In Darmstadt, our company health insurance fund also puts people in contact with nurses.

Diversity and equal opportunity

We are an international company, with employees who represent a varied cross-section of nationalities, cultures, religions, and age groups, as well as different gender identities and sexual orientations. We believe that a diverse workforce – paired with an inclusive corporate culture – strengthens the innovative power of our Group and contributes significantly to our business success. With this in mind, we work hard to foster a culture of diversity and inclusion.

Our principles

Increasing diversity, providing opportunities

Our goal is to further drive diversity across our workforce and offer all our employees equal opportunities for advancement. In particular, we endeavor to promote women in leadership positions, cultivate an international working environment and form teams with a balanced age structure. We offer our employees global development opportunities. Moreover, we are working to increase the percentage of executives from international growth markets across the Group to leverage their knowledge of local markets.

Diversity: A pillar of the company

Our Chief Diversity Officer is responsible for overseeing our Group's diversity strategy and reports directly to Kai Beckmann, the Executive Board member whose responsibilities include Group Human Resources. Our Diversity Council consists of executives from all our business sectors and select Group functions, and performs four key functions:

1. It is responsible for implementing our strategy for greater diversity.
2. It evaluates and refines proposals to increase diversity submitted by our business sectors.
3. The council members inform their own business sectors about the work of the council and are responsible for overseeing the respective issues in their areas.
4. The members are direct points of contact for the employees in their business sector.

In order to further enhance diversity within the company, Group Human Resources (HR) has implemented a number of programs and processes. Our strategic competencies, which guide our employees and managers in their tasks, are set out in our Competency Model. The Competency Model is a fundamental element of HR processes such as recruitment, feed-

back processes and training for managers. In 2016, we rolled out software that analyzes our personnel data quickly and reliably. This was the first time we have implemented such a tool, which also provides anonymized information. Select data (p. 110) are presented in this report.

Creating an inclusive work environment that promotes mutual respect is a particular focus of our human resources work. We support specific employee networks in order to foster exchange among like-minded individuals. In addition to our internal women's networks in various countries, we also partner with networks outside the company that are committed to ensuring women's advancement in the workplace.

Taking action against discrimination

As stipulated in our Code of Conduct, we do not tolerate discrimination within our company. If an employee feels they have been discriminated against, they can report the issue via various channels. Their first point of contact is their supervisor, but they can also contact Human Resources, Legal or Compliance. Alternatively, employees can call our SpeakUp Line anonymously from anywhere Group-wide. Alleged cases fall under the purview of Group Compliance and are handled by the Compliance Committee. In confirmed cases of discrimination, a subcommittee provides a recommendation for disciplinary action that is implemented by our management team. In this way, we ensure that similar cases are dealt with consistently worldwide.

Supporting industry-wide initiatives

In an effort to promote further diversity, we also support industry-wide initiatives. By adopting the German "Charta der Vielfalt" (Diversity Charter) in 2013 and signing the Equal Opportunity Charter of the German Mining, Chemical and Energy Industrial Union (IG BCE) in 2015, we underscored our commitment to fairness and tolerance in the workplace, promising to do everything in our power to achieve gender equality within the company. In 2011, we joined other DAX® 30 companies in signing a declaration committing to advance women in leadership roles.

Women in leadership roles: Requirements and objectives

In 2011, we set the strategic goal of increasing the percentage of management positions held by women to 25%-30%, a target we reached in 2016. Group-wide, women currently occupy 28.8% of leadership roles. The figures are steadily increasing across the company as a whole, but not consistently across business units, Group functions and hierarchical levels. Our target for 2021 is to maintain a 30% representation of women on the managerial level, and we working to further increase the percentage in senior management positions and business units where women are still underrepresented. To achieve this objective, we plan to form special teams that will be responsible for developing goals and measures at departmental level to help us move female candidates into positions in different areas and hierarchies.

In addition to working towards our own goals, the German Law on Equal Participation of Women and Men in Leadership Positions in the Public and Private Sector has been in effect in Germany since September 30, 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.

Progress

Global Diversity Days

We seek to raise awareness among our workforce for diversity and inclusion. In 2015, for instance, we expanded our Diversity Day from one day a year to a whole month. Every year in September, we now place diversity center stage. In September 2016, we organized a range of activities around the world under the banner of "The Power of WE – The Power of Diversity". Overall, employees from 17 countries across six continents took part in a number of events. The members of the Diversity Council also supported the campaign by holding online events that saw participation from more than 580 employees Group-wide.

Networks to bolster diversity

Our company is a corporate partner of the Healthcare Businesswomen's Association (HBA), a non-profit organization committed to furthering the advancement and impact of women in the healthcare industry. We encourage our female employees to get involved because it gives them the opportunity to attend various seminars and conferences in Darmstadt (Germany), Lyon (France) or Boston, MA (USA), as well as to take part in mentoring programs. In autumn 2016, some of our employees participated in the HBA's European conference in Leiden (Netherlands) as well as its annual conference in St. Louis, MO (USA). Furthermore, two of our female employees are board members of HBA Europe.

Through our Rainbow Network for homosexual, bisexual and transsexual employees, we supported Christopher Street Day 2016 in Frankfurt and Darmstadt, Germany. As well as taking part, we were the official corporate sponsor of the event in Darmstadt. In 2016, the Rainbow Network was also launched in the United States.

The U.S.-based Black Leadership Network is dedicated to advancing and developing African American employees, offering its members advanced training and continuing education programs, tailored career advice and networking opportunities.

Owing to the acquisitions we have made in recent years, there has been a steady increase in the number of our employee networks. Going forward, we intend to better

leverage the potential of these networks for our business activities. Networks with similar objectives are to be merged and expanded internationally. Moreover, we want to help establish leadership structures within these networks and define their goals. To this end, in 2016 we held the first round of workshops with network representatives.

Successful international collaboration

Our company is becoming increasingly international. We currently employ people from a total of 129 nations, 23.1% of whom are German citizens. Our managerial staff (Global Grade 14+) includes representatives of 70 nationalities. In the 2015-2016 period, 65% of management positions were held by non-German employees. At the end of 2016, 17% of our employees were working outside their home countries, versus 6% in 2014.

To best facilitate this international collaboration, we offer intercultural seminars for all employees and are also increasing the availability of company documents in English. We support employees posted to other countries through language courses and international networks to help them settle more quickly into their new country. For instance, around 200 expatriate employees are members of the International Community, which gets together regularly in Darmstadt.

No cases of discrimination

In 2015 and 2016, no suspected cases of discrimination were reported via the SpeakUp Line or other channels.

On the path to equality

Consisting of 37.5% women (6 out of 16 members), our Supervisory Board already meets the stipulations of the new German legislation on the women's 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, in 2015 we set an initial goal of maintaining the then figure of 21% at both levels until the end of 2016. In late 2016, women numbered 16% on the first management level and 24% on the second, which means the target defined for the first management level was not met. Here, the lower representation of women was mainly attributable to personnel changes made to the Executive Board itself and the resulting changes to the first management level. Organizational changes (transfer of two female executives abroad) and fluctuation (one female executive employee left the company) also had an impact on the number and percentage of women at this management level. By contrast, owing to the successful recruitment and promotion of women employees, we exceeded our target of 21% for the second management level by reaching 24% female representation. This development creates a strong basis for future appointments to the first management level. Our new targets for these two management levels are to increase the ratio of women on the first level to 21% and on the second level to 26% by the end of 2021.

Addressing demographic change

Another issue we're addressing is demographic change. We expect the average age of our workforce to continue rising in the coming years. In Germany, we are responding to this trend with various initiatives including our health management program (p. 70). Within this program, for instance, we are adapting workplaces to the needs of older people. In 2015 we developed new shift models and introduced preventive health measures for shift workers. Moreover, at our site in Darmstadt we offer special courses for employees over the age of 40, such as the seminar "Staying on the ball – Learning at 40+". In 2015, we took another step toward sensitizing our employees to the limits of their own physical and mental resources by participating in a research project focusing on mindfulness jointly run by the Kalapa Leadership Academy and Coburg University of Applied Sciences.

Using our new personnel data evaluation software, we intend to analyze the age structure of our workforce in the United States and Asia and subsequently adapt our local initiatives to address demographic change.

Health and safety

We take responsibility for the health and safety of our employees, doing everything in our power to safeguard them against work-related illnesses and accidents. In the world of office work, issues such as stress prevention, nutrition and mobility are especially commonplace. We focus our efforts on prevention to help our employees mitigate temporary or long-term health problems.

Our principles

Preventing accidents and promoting health

We seek to promote the health of our employees and maintain their ability to perform over the long run, which requires a safe workplace. One of our Group-wide objectives is to step up our safety culture. Our goal for 2020 is to keep our lost time injury rate (LTIR) under 1.5. Furthermore, we aim to make health management a greater part of our corporate culture and leadership.

Occupational health and safety: An organizational cornerstone

Our Environment, Health and Safety Policy details our approach to occupational health and safety. This policy is an integral part of our Environment, Health, Safety (EHS) management system, which is aligned with standards such as OHSAS 18001. Since 2015, we've been undergoing an external certification process for OHSAS 18001.

Our Environment, Health, Safety, Security, Quality (EQ) Group function is responsible for our EHS management system. EQ reports to Kai Beckmann, Executive Board member and Chief Administration Officer, setting objectives, overseeing global initiatives and conducting internal audits. Local EHS managers ensure that each individual site adheres to occupational safety laws and regulations.

Systematic data collection and clear rules of conduct

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.

Experience shows that most workplace accidents can be prevented by proper conduct. Through our "BeSafe!" safety culture initiative, we are working to raise employee awareness of dangers in the workplace and provide them with rules of conduct that help keep them safe.

Health management: A pillar of our corporate culture

Our Group Health Policy defines how we ensure workplace safety for our employees while also promoting their health and welfare. 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 various countries. Our individual sites are responsible for performing local workplace risk assessments and hazard analyses.

In addition to this policy, our health management system in Germany also helps weave health awareness into our corporate culture. Strategy, focal areas and initiatives are developed by an interdisciplinary steering committee. Topics include health fundamentals, good leadership and tailored health programs such as health prevention for shift workers.

Defining bylaws

At our sites in Germany, we work in partnership with employee representatives to craft bylaws on occupational health and safety. These bylaws define processes such as health counseling, which helps our managers promptly identify health risks and psychological stress in their employees.

Progress

Safety certification expanded, accident rates reduced

By the end of 2016, all Performance Materials production sites had been certified to the international standard OHSAS 18001. The certification process helps us pinpoint weak areas, identify opportunities for improvement, and implement suitable measures.

The lost time injury rate (LTIR) is the indicator used to assess the success of our efforts. This figure measures the accidents resulting in at least one day of missed work per one million man-hours. We track the LTIR for both employees and temporary workers. In 2010, we set the goal of reducing our lost time injury rate to 2.5 by 2015 – in 2015 we far surpassed this objective by achieving an LTIR of 1.5. But this is not enough for us. In our view, nothing is worth an accident. We therefore made our next goal even more ambitious: to sustainably lower our LTIR even further by 2020. By 2016, we'd already reached this objective with an LTIR of 1.3. The majority of incidents resulting in lost time were slips, trips and falls, accidents involving the operation of machinery, and car accidents on business trips.

Despite our efforts, there were unfortunately two work-related accidents resulting in fatalities in 2015. In the United States, one employee died in a car accident, while in Germany, one worker was fatally injured during a mishap involving a forklift. There were no fatal incidents in 2016.

BeSafe! program rolled out worldwide

Through our BeSafe! program, we are working to raise employee awareness of occupational safety. We have now incorporated all production and warehouse sites into the program. Since the completion of the acquisition, Sigma-Aldrich facilities have also started implementing BeSafe!. In October 2016, we successfully held events at four sites in the United States, the first time for our operations in that country.

In 2016, we conducted initiatives, campaigns, and awareness efforts across the Group as part of the BeSafe! program. For instance, several subsidiaries in Latin America held safety competitions. To underscore the importance of safety, we launched the Safety Excellence Award in 2010, which is presented annually to all production sites that have no workplace accidents on record for the year. In total, 61 out of 91 facilities received this award in 2016, with 41 out of 61 production sites having received it in 2015. On January 29, 2016, the workforce at our U.S. site in Branchburg, New Jersey achieved a major milestone of one million man-hours worked without a single reportable accident.

Solvent for production purification processes replaced

In 2015, we replaced tetrahydrofuran (THF) with non-hazardous substances for most of the purification processes at our organic production plants in Darmstadt. THF is a solvent suspected to be carcinogenic. Through this measure, we save nearly € 700,000 per year.

Increasing safety through global best practice sharing

Our EHS managers attend regional and international conferences in an effort to share best practices and lessons learned. In 2015, our Group-wide conference took place in Darmstadt and was attended by 70 employees. In 2016, we also held forums in Taoyuan (Taiwan), with 35 participants, and in Cork (Ireland), with 41 participants. These meetings focused on safe logistics, waste treatment and the integration of Sigma-Aldrich sites. In autumn 2015 and 2016 we hosted the fifth and sixth EHS Best Practice Sharing Meetings in Bari (Italy), which were attended by representatives from business, industrial associations and academic institutions. Moreover, in 2015 and 2016, we conducted safety training in Darmstadt and Gernsheim for 53 managers from 19 countries.

Expanding health management

As part of our EHS management activities, we implemented two new Group-wide processes in 2015. Our Travel Health & Medical Advisory Service assists employees who spend a lot of time abroad on Merck business, providing them with advice on vaccinations and hygiene risks. Our Physical Ability Test and Health Preservation ensure that all employees meet the health requirements for their particular tasks. This test helps us implement targeted intervention as necessary.

At our Darmstadt and Gernsheim sites, our Health Management unit conducts numerous campaigns and programs to promote the health of our workforce. In summer 2016, 3,682 employees took part in the Global Corporate Challenge (GCC) hosted by the employee engagement firm Virgin Pulse. Seven-person teams used pedometers to track their step count over a period of 100 days. The result? Altogether, participants walked the equivalent of 67 times around the world. By the end of the GCC, 84% of participants were walking 10,000 steps or more per day, versus 29% before the challenge. Besides being motivated to exercise more than usual, everyone furthermore benefited from practical tips on nutrition and stress management. We also offer our employees services such as our Fit@Merck fitness program, which provides them with up to € 195 per year towards health prevention classes. We furthermore offer a company athletics program that currently features 25 different sports.

We analyze the ergonomics of individual workstations and then implement relevant occupational health measures. In our liquid crystal production facilities, for instance, we have made technical improvements such as drum lifters. Our workers have also received training on ergonomics in the workplace. Our Life Science employees in the United States have access to the Early Symptom Intervention and Prevention Program (ESI), which provides training and teaches about workplace ergonomics.

Employee engagement

As a science and technology company, we are always looking for new solutions and working to evolve. Engaged, curious employees are key to our ability to innovate, and therefore also to our success. We need a corporate culture that broadens the knowledge base of our employees, one that creates exciting opportunities and motivates them to take a proactive role in shaping our company processes. Candid feedback from our employees helps show us where we have room for further improvement.

Our principles

Engaging employees

We strive to create a work environment that empowers our employees to think outside the box and seek new solutions, opening the door to creative ideas and the discovery of new market opportunities. To bolster employee engagement, we have set clear goals and defined the steps necessary to accomplishing them.

Rewarding innovative ideas

We seek to inspire our employees to think creatively. At our Darmstadt site, all workers are encouraged to submit suggestions for improvements within the company. We reward any ideas that are successfully implemented by offering employees a bonus based on how much the suggestion improves our processes or cuts down our costs.

In addition to rewarding good suggestions, we also regularly hold a Group-wide innovation competition called Innospire that allows employees to submit ideas for new business models. In contrast to our conventional idea management process, Innospire specifies the topic on which employee proposals should focus. Furthermore, we annually present the Merck Awards in recognition of outstanding ideas, teamwork and projects.

Innovating with young scientists

Our Merck Biopharma Innovation Cup is targeted to recent graduates from around the world in an effort to spark the interest of young talent in our company, while also offering a forum for new ideas. We select 30 participants from a pool of applicants spanning the globe. During a one-week summer camp, they learn first-hand how research and development works in the pharmaceutical industry, collaborating with retired Merck employees to create new, innovative concepts. The team with the best concept receives a prize of € 20,000.

Making room for ideas

Over the last several years, Merck has undergone a major evolution and grown through acquisitions. We are transforming our site in Darmstadt into a global headquarters that will bolster our ability to innovate, enabling us to respond flexibly to growth while also reflecting our corporate identity. To this end, we launched our strategic ONE Global Headquarters initiative in 2013.

The heart of our redesigned global headquarters is our new Innovation Center (p. 27), scheduled for completion in 2017. In 2015, we opened a modular Innovation Center to give our employees room to explore their creativity by joining interdisciplinary teams and collaborating on pioneering projects.

Keeping employees informed and encouraging discourse

We keep our employees up to date and encourage discourse through a number of formats tailored to specific target groups. Take, for instance, our international collaboration platform EVA and our international employee magazine "pro". This magazine is published in seven languages and is available in a digital format as well as via an app. Through "pro", we reach more than 90% of our approximately 50,000 employees worldwide in their local language. Several subsidiaries also publish local editions of "pro", for example in Germany, Korea, the Netherlands, and Russia. In addition to these formats, a variety of newsletters are also published by our businesses. Moreover, we publish articles on EVA and host various events to raise employee awareness of corporate responsibility issues.

Understanding our workforce

We seek to understand the needs of the people who work for us and therefore regularly conduct employee surveys. Engagement and Inclusion, a unit within our HR organization, creates and oversees these questionnaires. The results show us ways we can improve. After each survey, we plan improvements that are managed by the relevant units.

At the beginning of 2016, we revised our approach to employee surveys and had implemented the changes by the end of the year. To give us a better sense of the situation within the company as a whole and to better benchmark against our competitors, we will be conducting all future surveys across the entire Merck Group.

Guaranteeing co-determination

We regularly include employee representatives in our decision-making processes. Within Germany, 14 of our subsidiaries have employee representation. Local works councils as well as an overall Group works council represent the interests of our workforce, discussing topics such as compensation, working hours, and organizational realignment. The Senior Executives Committee represents the interests of senior management, while the Merck Euroforum represents our employees at the European level, focusing on the economic situation, employment rates and significant changes within our company.

Progress

Rewarding employee ideas

In 2016, our employees used our idea management program to submit approximately 2,300 suggestions for improvement, with 3,200 having been submitted in 2015. These ideas led to savings of approximately € 3.4 million in 2016 and approximately € 1.7 million in 2015. In recognition of their contributions, our employees received bonuses totaling € 0.7 million in each year.

In the 2015-2016 period, we reached out to our employees through our Innospire innovation program and asked them for proposals on new materials, systems and business models across 12 categories. This resulted in the submission of 680 proposals, more than twice as many as in 2014. Eight suggestions were transformed into actual business plans, four of which are currently being implemented.

Recognizing innovation

The team that won the 2016 Merck Biopharma Innovation Cup proposed an innovative approach to controlling the transmission of schistosomiasis. Overall, more than 900 scientists from across 53 countries competed for this renowned honor.

Presented every year, the Merck Awards recognize outstanding employee ideas. In 2016, prizes were presented in the categories of Innovation, Change, Customer Focus, and Employee Development. In total, 55 teams and individuals competed for the awards. The project "Fertility technologies" won in the Innovation category.

Turning ideas into innovations

In 2015, the first group of project teams took up residence in our modular Innovation Center in Darmstadt, which is serving as a prototype for the future Innovation Center. Within the facility's walls, ten internal project teams are currently developing their ideas. We have also invited numerous external startups to take advantage of the center as part of the Merck Accelerator program, an initiative that supports fledgling enterprises. The startup teams move into the Innovation Center for three months at a time and receive financial assistance, training and access to Merck experts worldwide. The resulting exchange of ideas and best practices benefits not only the startups, but also our own teams.

The Innovation Center regularly conducts events, workshops, seminars, and webinars. Through these channels, we introduce our employees to new innovation methods such as design thinking. There is already a great deal of interest in this initiative. We also hope to accelerate the exchange of innovative ideas within the company and build a Group-wide network of innovation ambassadors. Furthermore, we plan to expand the scope of our Accelerator program, with a focus on locations with a thriving or burgeoning start-up culture. The first offshoot of this program took root in 2015 in Nairobi (Kenya).

Testing new forms of collaboration

In 2015, we launched our new collaboration platform EVA, which encompasses our global intranet for all subsidiaries and business sectors and furthermore consolidates numerous collaboration applications in one central location. According to an employee survey, EVA ranks as one of the most important internal communication media – second only to e-mail – receiving approximately 1.3 million hits from across 64 countries per month.

Globally harmonized employee engagement survey

Between December 2013 and June 2015, we conducted an Organizational Health Index (OHI) survey in all business units and Group functions, using the results to identify strategic focus topics and devise initiatives. In 2016 we continued our efforts to embed these topics more deeply into the organization. In November 2016, we conducted a global employee survey in 23 languages. Approximately 42,500 employees (83%) took part. A measure of employee engagement, our company-wide score was 60%, a level comparable to other companies in the chemical and pharmaceutical industries. As of early 2017, we will be working with the results across the company.

Sparking young interest in science

Launched in 2016, the SPARK Global Volunteer Program (p. 100) offers our Life Science employees an opportunity to make a difference in the community by igniting a passion for science in the next generation.

Through our efforts to promote scientific education and research, we hope to have a positive impact on the local community. Beyond school programs, we are also supporting causes such as the San Diego Festival of Science & Engineering in San Diego, CA (USA) and the Royal Society of Chemistry in Bangalore (India).

In the vicinity of our global headquarters in Darmstadt, we support a wide array of educational initiatives such as "Jugend forscht", a state-level science competition for students that we host every year.

Good leadership

Within our company, teams collaborate across sites and international boundaries. Team members bring a variety of skills, strengths and experience to the table, creating great potential that can be leveraged by management. Our management processes fundamentally follow an international approach. Global collaboration is also playing an increasingly important role in the development of our next generation of managers.

Our principles

Strategic competency model

Our strategic competency model describes core competencies on which employees of all levels should base their conduct. Our competency model was revised in 2015 and now more clearly defines the leadership culture through which we will grow our business. Our six core competencies are purposeful, future-oriented, innovative, results-driven, collaborative, and empowering. In our day-to-day work, these core competencies play an important role in our success. Our competency model provides the foundation for all development activities within our HR work – for employees, but also for our managers, who act as role models and are therefore key to building employee buy-in for the competency model.

Our competency model

Management program

We have instituted three programs to enhance the leadership skills of our managers. Our goal is for at least 50% of our senior managers and promising Global Grade 14+ employees to have participated in one of the programs by the end of 2018. We always adapt the programs to the particular needs of various countries.

We use our Performance and Potential Management Process (p. 64) to gauge the impact of these development initiatives. Furthermore, our employees also take surveys (p. 72) to rate the quality of leadership within Merck.

Progress

We have three programs in place to develop our managers. The Managerial Foundation and Advanced Management programs were both launched in 2013, while the Global Leadership program was established in 2016 based on the results of an evaluation of our leadership and business model. The Global Leadership Program teaches our managers how to think and act with a global focus so as to ensure successful international collaboration. Within two years, we intend for all top 400 managers (Global Grade 16+) to have completed this program. Since the introduction of these initiatives, approximately 2,400 managers have taken part in total.

Expanding talent development Group-wide

Since 1999, we've been working in partnership with top international universities to offer Merck University, a multi-regional and modular program. Over a period of ten months, participants complete classes on management techniques and unique features of growth markets. To date, 373 senior managers have taken part. Since the 1990s, our up-and-coming managers have also had the opportunity to complete the International Management Program, where participants work on an interdisciplinary project over a period of six months. The results are presented to the Executive Board. Moreover, we also partner with universities across the globe in an effort to help our employees obtain qualifications such as an executive MBA.

Leveraging growth-market potential

In the training of our managers, we also offer opportunities for employees in growth markets. In 2015, for instance, we launched our Growth Markets Management Program for local managers in India and Latin America. Over a period of up to two years, this training covers business administration topics such as marketing and financial analysis, along with content specific to our business such as our strategy and corporate culture. We launched similar programs in China in 2013, and in the Middle East, Latin America and Asia-Pacific in 2016. To date, **235** managers have taken part.

Furthermore, in 2015-2016 three of our employees successfully completed "Afrika kommt!", a one-year scholarship program offered by the German Society for International Cooperation (GIZ). This program aims to help specialists and managers from Sub-Saharan Africa obtain qualifications, thereby building a pool of regional partners for German industry. Five former scholarship recipients now work for us, two of them in their home countries of Ghana and Nigeria and the remaining three still in Darmstadt. In 2016, eight new candidates were chosen for the fifth round of "Afrika kommt!"

Environment

We are dedicated to environmental stewardship, working to conserve resources such as energy, water and raw materials while also reducing emissions and waste.

Climate impact mitigation and resource scarcity are key challenges facing society, ones for which we naturally accept our share of the responsibility. Through certified environmental management systems and targeted environmental measures, we work to minimize the environmental impacts of our activities.

Read More

Environmental stewardship

As a science and technology company with manufacturing operations, we utilize resources and materials that could have a potentially negative impact on the environment if not handled properly. To mitigate this effect, all our sites meet a strict set of environmental requirements.

A holistic approach is needed to minimize negative impacts on the environment and sustainably preserve resources in the long run. Intelligent environmental stewardship reduces resource use and lowers costs.

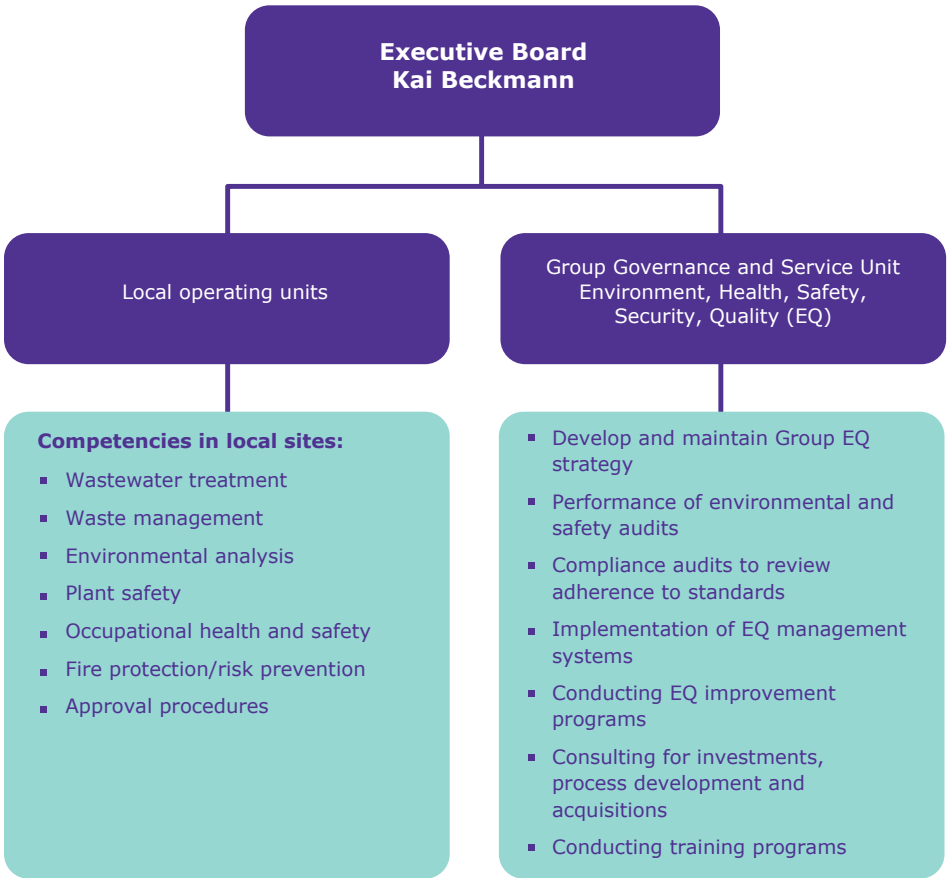
Our principles

We continuously seek to reduce our environmental footprint, which requires us to utilize resources such as raw materials, energy and water both sparingly and efficiently while also cutting emissions and waste.

Clearly assigned responsibilities

Ultimate responsibility for environmental stewardship is borne by Kai Beckmann, Executive Board member and Chief Administration Officer. The Group function Environment, Health, Safety, Security, Quality (EQ) is in charge of steering all environmental measures 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 day-to-day support and advice from Environment, Health and Safety (EHS) managers, with EHS coordinators performing this role at smaller facilities.

Our Group function EQ (Environment, Health, Safety, Security, Quality)



Fundamental strategy for environmental sustainability

Our approach to environmental stewardship is built on our Corporate Environment, Health and Safety Policy, which we updated in 2016. This policy is now aligned more closely with the stipulations of the chemical industry's Responsible Care ® Charter, as well as environmental management standard ISO 14001, and it emphasizes our management's responsibility toward environmental stewardship, health and safety (p. 70). Moreover, it addresses our suppliers (p. 89), encouraging them to adopt similarly high standards for environmental sustainability and safety. In doing so, our Corporate Environment, Health and Safety Policy complements the Responsible Sourcing Principles of our Group Procurement function.

The principles of our EHS policy are implemented through internal guidelines, standards and operating manuals. For instance, our Group EHS, Security and Quality Manual describes how environmental stewardship and occupational safety are organized across the company. We ensure compliance with all requirements through internal and external audits. Additionally, employees have the option of reporting compliance violations to Group Compliance (p. 11). In the 2015-2016 period, no significant violations of environmental laws or regulations were recorded within the company.

We regularly review and update our internal guidelines, standards and operating manuals. Following the 2015 acquisition of the U.S.-based life science company Sigma-Aldrich, all their existing EHS standards were reviewed and aligned with ours.

ISO 14001 Group certificate

We manage our environmental sustainability efforts via an ISO 14001:2004 certified management system. Since 2009, our company has had a corresponding Group certificate, which means that all production sites with more than 50 employees must implement the requirements of the certificate. Smaller sites are not obligated to implement an ISO-certified environmental management system. New sites must incrementally establish a corresponding environmental management system and obtain ISO 14001 certification. Every year, we contract a third party to perform a certification audit. Furthermore, we conduct internal surveillance audits to ensure compliance with our requirements.

Progress

ISO 14001 certification expanded

In 2015 and 2016, we passed all ISO 14001 surveillance audits. Seven Sigma-Aldrich sites already had ISO 14001-certified environmental management systems, which were transferred to our Group certificate in 2016. Our certificate now covers 57 sites worldwide. In 2017 and 2018, we intend to integrate 30 additional Sigma-Aldrich sites into the certificate.

All manufacturing facilities of AZ Electronic Materials, a company we acquired in 2014, have been ISO 14001 certified and integrated into our Group certificate since early 2015. Moreover, we have also incorporated all AZ sites into our internal audit program. Corrective measures have been taken to remedy any defects found.

Switch to ISO 14001:2015

In September 2015, the International Organization for Standardization (ISO) introduced ISO 14001:2015, an updated version of this standard. Among other changes, ISO 14001:2015 more strongly emphasizes a supply chain approach. We have to adapt our environmental management system to reflect the new version by 2018. In 2015, we conducted internal audits to determine the extent to which we were already meeting the new requirements. In 2016, we then analyzed our individual sites in detail to see where changes still needed to be made. We expect the results in early 2017 and will use them to adapt our approach to environmental management.

climate

Climate change is one of the most pressing challenges of the 21st century. Thus far, it has only directly impacted us to a minor extent. Nevertheless, because our operations generate greenhouse gas emissions, we intend to do our part to mitigate our impact on the climate. In view of burgeoning regulations and rising energy costs, climate impact mitigation is also becoming an increasingly smart investment.

Our principles

Doing our part

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. Scope 1 covers emissions that we produce ourselves, for instance by burning fossil fuels to generate power, while scope 2 pertains to emissions from the consumption of purchased energy, such as electricity or district heating. Across the globe, 37 of our sites account for roughly 80% of our greenhouse gas emissions, which is why we are focusing our efforts here.

Energy conservation represents an important component of our climate impact mitigation activities. By adapting and modernizing our technology, we are improving the energy efficiency of our R&D operations, our production processes and our buildings.

We are further lowering greenhouse gases by increasing our use of renewable energies. Moreover, we are also reducing emissions that stem directly from energy generation and manufacturing operations.

Our Group function Environment, Health, Safety, Security, Quality (EQ) is responsible for globally overseeing all climate impact mitigation measures (see Environmental stewardship (p. 77)). At our individual sites, operating units are responsible for implementing the actions and initiatives stipulated by EQ.

Regulatory framework for climate impact mitigation

We are subject to a wide array of national and international energy and emissions regulations, such as the German Energy Conservation Act, the German Renewable Energy Sources Act and the European Union emissions trading system. For instance, EU Directive 2012/27/EU stipulates that we must establish energy management systems and regularly audit our energy consumption. The sites subject to these requirements are responsible for implementing them and furthermore undergo audits conducted by internal or external experts.

With the 2015 Paris Agreement on climate change now in place and phase four (2021-2030) of the EU emissions trading program due to start soon, we expect to see a tightening of greenhouse gas emission regulations. Going forward in phase four, we foresee having to purchase the emissions allowances that we're still mostly obtaining for free during phase three (2013-2020).

Strategic approach to climate impact mitigation

In 2009, we launched our strategic Edison program to consolidate all our initiatives for improving energy efficiency and reducing process-related greenhouse gas emissions. Under Edison, our Group function EQ collaborates with a working group comprising representatives from all business sectors. Any site can propose a project. The working group assesses the proposals according to three criteria: 1.) the total absolute CO_2 savings, 2.) the potential cost savings, and 3.) the ratio of CO_2 savings to required spend.

Internal standards and external certification

Our Corporate Environment, Health and Safety (EHS) standards on energy management and emissions from coolant ensure that energy and process-related emissions are managed consistently across the Group. In 2016, these standards were also implemented for Sigma-Aldrich sites. Site management conducts local audits at random to verify compliance with all EHS standards.

Efficient energy management plays a particularly important role in climate impact mitigation and is also increasingly important to our customers. With this and other reasons in mind, 13 of our sites decided to obtain ISO 50001 certification, the international standard for energy management, by the end of 2016. Further facilities are currently preparing for this certification process.

Educating employees on climate impact mitigation

We encourage our employees to do their part to preserve the climate. We regularly report on our Group-wide climate impact mitigation activities in our employee magazine “pro” (p. 72) and in our employee newsletter, while also providing helpful information and tips on our Intranet. Moreover, we support employees who prefer greener modes of transport. For instance, we are constantly updating our pool of leased vehicles with more efficient models to reduce the average CO_2 emissions of our business car fleet by 30% by 2020, relative to 2013. We also provide further incentives in the form of the Jobticket (p. 81) for public transport and attractive deals for leased bicycles (p. 81).

Switching to sea freight

In an effort to reduce greenhouse gas emissions resulting from the transport of our products, we utilize sea rather than air freight whenever possible. However, this is only an option for products that are not damaged by protracted transport times. At the same time, we cannot allow the quality of customer service to suffer due to extended transport times.

Transparency for CO_2 emissions and energy consumption

Since 2008, we've been reporting in detail on our climate impact mitigation efforts as stipulated by the CDP (previously Carbon Disclosure Project). We track our greenhouse gas emissions in line with the Greenhouse Gas (GHG) Protocol, an internationally recognized standard, reporting on scopes 1 and 2, as well as parts of scope 3. Scope 3 includes other indirect emissions, such as the extraction and production of purchased materials, transport-related activities, waste disposal, and employee travel. Tracking scope 3 emissions is a rather complex undertaking. We track emissions from business trips and employee commuting, from waste management, and from the manufacture and transport of fuel.

Besides emissions, we also measure energy consumption at our sites. This does not, however, include energy use outside our field of activity, such as the production of our raw materials, as we do not have sufficient data available to perform these complex calculations.

Progress

Slight drop in energy consumption

In total, we used 2,253 gigawatt hours of energy in 2016, versus 2,256 gigawatt hours in 2015. Our energy intensity relative to sales totaled 0.150 kWh/€ in 2016.

Emissions lowered despite growth

Despite growth in our operating business, we managed to reduce our greenhouse gas emissions by 10% relative to the 2006 baseline. In 2016, we emitted 715,000 metric tons of CO_2 equivalents, with 729,000 metric tons in 2015.

Between 2006 and 2016, we more than doubled our sales, which means that, relative to sales, our emissions have dropped significantly. Due to the previously mentioned acquisitions, we set an interim goal for the sites of our Life Science business sector of lowering the greenhouse gas emissions of our former Merck Millipore business by 10% by 2015, relative to 2006. By the end of 2015, we had even managed to surpass this target by achieving a reduction of 11%.

Hundreds of climate projects initiated

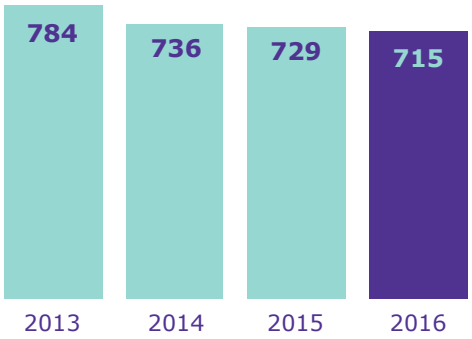
Through the approximately 270 Edison projects initiated since 2012, we aim to annually save around 94 metric kilotons of CO_2 in the medium term. Since the program's launch, these efforts have conserved around 82,000 MWh of energy in total. At nearly 64,000 MWh, electricity use accounted for the greatest savings. For 2017, 81 new projects have been approved, in the hopes of achieving additional savings of around 34,000 metric tons of CO_2 annually.

In 2015 and 2016, we carried out projects such as:

- Our site in Onahama, Japan is one of the highest energy consumers within our Group, requiring large quantities of steam for pigment production. In 2015, we therefore switched process steam generation for production from kerosene to natural gas combustion. In addition, our pigment kilns are now fired with natural gas instead of liquefied gas. These changes will reduce CO_2 emissions by approximately 3,200 metric tons per year. In 2016, we successfully replicated this change at other facilities. At our Shizuoka site, for instance, we switched from heavy oil to natural gas for steam generation while also revamping the boiler and conduit system. In doing so, this site cut back its CO_2 emissions from the manufacture of high-tech chemicals for the microchip and display industry by approximately 850 metric tons per year.
- Our production sites in Darmstadt and Gernsheim, Germany account for approximately 29% of our global energy consumption, which led us to invest roughly € 27 million in the construction of two state-of-the-art energy stations, one of which went online in 2014 and the other at the end of 2015. These energy stations provide our pharmaceutical production operations, pharmaceutical research facilities, chemical plants, and chemical labs with electricity, heating and cooling. The new installations will reduce our CO_2 emissions by around 2,500 metric tons per year.
- In Shanghai, China, we commissioned a new photovoltaic plant in 2015 that is lowering this site's CO_2 emissions by roughly 280 metric tons annually.

Total greenhouse gas emissions (metric kilotons)[1]

(Scope 1 and 2 of the Greenhouse Gas Protocol)



[1] In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the greenhouse gas emissions have been calculated based on the current corporate structure of the reporting year and retroactively adjusted for acquisitions (e.g. Sigma-Aldrich in 2015) or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

Green mobility: Jobtickets, leased bikes and subsidies

We offer our workforce in Darmstadt a "Jobticket", an annual subscription to use local public transportation for which we cover part of the cost. In 2016, more than 3,800 employees made use of this option. Since 2016, our people have also had access to an online tool that helps them organize carpools.

Our Life Science employees in the United States can charge their electric vehicles for free at special charging stations directly on site. Our Darmstadt facility introduced such charging stations in 2016. Individual sites in France and Ireland likewise offer this service.

As of January 2017, we further lowered the CO_2 emission rate for newly registered company cars from 150 g/km to a maximum of 135 g/km. At most of our German subsidiaries, we offer a subsidy of € 100 towards monthly lease payments to employees who voluntarily choose a greener car model. Relative to 2013, we have managed to decrease the CO_2 emissions of our company car fleet by 12%, and intend to expand this incentive to include all employees in Germany.

Our workforce in Darmstadt and Gernsheim also have the option of leasing a bike with payments coming out of their pre-tax income (bike4me). In 2017, we intend to offer this option to all employees in Germany.

Furthermore, our employees can also use the Call a Bike service throughout Germany at reduced prices to rent a bike for short periods of time. Deutsche Bahn, the German national rail company, is also setting up further rental stations all around our sites in Darmstadt. In support of this initiative, we are sponsoring an additional 50 bikes in the city.

In the United States, too, we provide our people with financial incentives to live greener. For instance, they receive up to US$ 1,000 in subsidies towards the construction of a private solar power unit and up to US$ 100 towards an energy consultant for their private home. They are also eligible for as much as US$ 3,500 towards the purchase of a hybrid or electric car, an incentive that has motivated more than 200 employees to switch to one of these types of vehicles.

Reduction in transport-related CO_2 emissions

In 2016, we switched additional transport routes from air transport to sea freight. Our Performance Materials business sector is now shipping its products between Germany and Japan, as well as between Japan and Korea, by boat instead of plane. Our Life Science business sector has also switched transport between the United States and Argentina to sea freight. These changes are cutting our annual CO_2 emissions by a total of 300 metric tons.

Positive rating from the CDP

In 2016, the CDP reworked its scoring methodology and now only gives one rating per company. The score incorporates more than just successes in and strategies for reducing greenhouse gas emissions. The CDP also assesses the ways in which companies are working to minimize the risks and consequences of climate change. The rating scale ranges from A to D-, with A being the top score.

According to this new methodology, we received an A- in 2016. As a Sector Leader for the DACH Region, we rank among the top 16% of companies in the Healthcare, Pharma & Biotech category in Germany, Austria and Switzerland. In 2015, when the CDP was still using the old evaluation model, our performance scored a C and our reporting was rated 98 out of 100 points, putting us in sixth place in the Healthcare category in Germany, Austria and Switzerland.

Resource efficiency

Natural resources are growing ever scarcer, which makes it imperative for us to use raw materials as efficiently as possible and contribute to waste reduction. By conserving energy, water and materials, we are not only mitigating our impact on the environment, but are also lowering our costs.

We work continuously to reduce the environmental footprint of our products and even help our customers lower their own resource use, thus improving our competitive advantage.

Our principles

Holistic approach to resource efficiency

Our holistic approach to resource efficiency helps us minimize our consumption of energy, water and materials while also maximizing resource reuse. Because we utilize the majority of resources for the manufacture of our products (p. 29), resource efficiency is a critical factor in product development and production processes. The measures required to accomplish this are an integral component of our approach to environmental stewardship (p. 77) and are organized by Environment, Health, Safety, Security, Quality (EQ).

Reducing resource use

Our manufacturing operations consume a great deal of energy, but our buildings likewise require energy in the form of electricity and heat. We are working to improve our energy efficiency through a wide array of initiatives. Under our Edison program, for instance, we are investing in measures to boost energy efficiency, which form just one part of our commitment to the climate (p. 79).

We use water primarily for cooling, as process water and for exhaust air purification. Our water management (p. 84) approach combines water use reduction with wastewater treatment. Alongside climate impact mitigation, water management is a key focus of our environmental stewardship efforts.

We primarily use chemical and pharmaceutical raw materials for our manufacturing operations. Additionally, we also employ operating supplies and packaging materials such as folding boxes, glass bottles and ampules. Our waste and recycling (p. 82) management approach helps us efficiently utilize materials and maximize reusage.

Progress

Higher material consumption

We utilized 330.6 metric kilotons of material in 2015 (excluding Sigma-Aldrich) and 798.1 metric kilotons in 2016 (including Sigma-Aldrich). We only track the weight of materials that are directly used in our pharmaceuticals and chemicals.

Waste and recycling

Waste material contains valuable raw materials that can be reused in the production stream, which is why we consider it highly important to prevent or recycle as much of our waste as possible.

Our principles

Preventing, recycling and disposing waste

We work to minimize the environmental impacts of our waste as far as possible and limit the loss of raw materials. This means that we first attempt to prevent waste. However, this not always being feasible, we seek to recycle as much of our waste as possible. Waste that cannot be recycled is discarded in an environmentally sustainable manner in line with the most stringent waste disposal standards.

Waste management at Group and site levels

Waste management is part of our Group-wide ISO 14001-certified environmental management system. The Group function Environment, Health, Safety, Security, Quality (EQ),

which is in charge of environmental stewardship (p. 77), bears overall responsibility for waste management. As well as undergoing external certification, we also conduct internal Corporate Environment, Health and Safety audits to review our waste management approach and programs. We regularly inform and educate our local EHS managers and site directors on various waste disposal issues in an effort to ensure Group-wide compliance with our environmental standards.

Our Group-wide EHS standard "Waste Management" provides a consistent framework for waste management across all our sites, defining organizational structures and minimum requirements. In line with this standard, all facilities document their waste by type and quantity, reporting this data to EQ.

The Merck Waste Scoring System

At Merck, we use several methods for recycling and disposing of waste. In an attempt to better manage our various waste streams, in 2016 we developed the Merck Waste Scoring System, which is based on a five-level waste hierarchy:

1. Waste prevention
2. Materials recycling
3. Waste-to-energy
4. Thermal disposal
5. Landfill

In terms of the resource footprint of the waste, it progressively worsens from level one through level five. Waste prevention is the best, most desired form of waste management as it avoids using raw materials and prevents negative environmental impacts. Materials recycling allows raw materials contained in the waste to be recovered. Depending on the waste type, this process saves significant quantities of raw materials and energy even though it somewhat reduces product quality (downcycling). Waste-to-energy is the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes. Power generation through waste incineration plants, which reduce the use of fossil fuels, is a perfect example. Waste for disposal is either incinerated or sent to landfills, making it impossible to recover raw materials.

Each individual type of waste – plastic, paper, metal, glass, hazardous waste, etc. – requires individual evaluation.

Merck Waste Score as a performance indicator

In 2016, we created the Merck Waste Score to help us quantify the resource conservation target for our waste streams and compare the amount of waste our sites are producing. Under this system, each site's waste is allocated a score for each of the five steps of the waste hierarchy. This score is then multiplied by the percentage that results from dividing the waste quantity of the given disposal method by the waste quantity. The sum of the scores of each level provides the total Merck Waste Score.

In 2017, we plan on using this system to assess waste disposal Group-wide. This assessment will help us define a target for the Merck Waste Score and gauge the progress of our waste management efforts.

Responsibility for entire waste disposal process

As a generator of waste, we are responsible for the final disposal of our waste products and therefore choose our service providers with the utmost care, contractually stipulating disposal requirements. Each of our vendors must be able to prove that they have properly discarded our waste. We conduct regular audits to ensure that our waste is disposed of in an appropriate fashion, especially in the case of hazardous substances.

Progress

Decline in waste generated

The amount of waste we produced in 2016 dropped to 254 metric kilotons, versus 317 metric kilotons in 2015. This sharp decrease is primarily attributable to lower quantities of construction and demolition waste, which continued to account for the majority of our total waste – 30% in 2016 and 49% in 2015. In particular, the remodeling of our Group headquarters in Darmstadt has generated large quantities of such waste material.

Employees help separate trash

At our site in Molsheim, France, we implemented a recycling system over five years ago and have been continuously refining it ever since. This facility performs function testing and lab tests that regularly produce large quantities of waste. In response, our local EHS officers have developed a trash separation system, conducted training and enhanced the necessary processes. Today, employees at this site separate up to ten different types of waste, allowing more than five metric tons of plastic to be recycled per year.

60% less solvent used

In the 2015-2016 period, our site in Shizuoka, Japan started using special plastic liners in our containers for specialty chemicals. This change considerably reduced the required amount of an acetic ester derivative that had previously been utilized as a solvent to clean the containers. As a result, this facility is saving 70 metric tons of this solvent per year, representing a 60% reduction of the acetic ester derivative used for washing processes at this site.

Shizuoka reduces filter waste

In 2015, we switched the multi-step filter process for photoresists at our Shizuoka site in Japan to a single-step process. Instead of requiring several filters, the process now uses only one, thus decreasing filter waste by 70%. In 2016, we introduced the single-filter process at our facilities in Hsinchu, Taiwan, and Suzhou, China, where we eliminated 50% of our filter waste at each site. We are currently investigating whether we can implement the new filter process at other facilities as well.

Recycling process saves on solvent

At our facility in Kaohsiung, Taiwan, we implemented a recycling process for the solvent diisopentyl ether in 2012, which we have since worked to continuously improve. Thanks to this effort, we recycled 88% of the solvent used in 2016. Within four years, we thus saved approximately 200 metric tons of solvent waste and more than € 2 million. We have introduced a similar recycling process at Kaohsiung for the solvents acetone and pentane.

water management

An increasing number of regions across the globe are facing potable water supply issues. At our sites, we too are dependent on a reliable supply of water that meets certain quality standards. We use water in our manufacturing operations as process water as well as for functions such as cooling and exhaust air purification, which makes sustainable water management a key focus of our environmental stewardship (p. 77). Because our wastewater may contain traces of heavy metals or pharmaceutical active ingredients, protecting water as a resource is one of our primary considerations.

Our principles

Reducing use, minimizing impacts

We seek to lower our water use, especially in those regions where water is growing ever scarcer. At the same time, it is our responsibility to minimize the impact of our wastewater across all our sites.

The Group function Environment, Health, Safety, Security, Quality (EQ), which is in charge of environmental stewardship, bears overall responsibility for water management. At our individual sites, technicians collaborate closely with our Environment, Health and Safety managers on implementing measures to reduce water use and furthermore receive regular training from EQ.

Sustainable water management

We systematically analyze 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 tools help us determine whether a site is located in areas of high water stress, meaning regions where water consumption exceeds the supply. At the beginning of 2016, we set the goal of implementing a sustainable water management system at sites with high consumption levels by 2020.

For our sustainable water management efforts, we use an assessment tool of the European Chemical Industry Council (CEFIC) to evaluate water management practices and progress at our sites. Based on this assessment, our facilities draft a list of steps that need to be taken and implement them one at a time.

But we also encourage efficient water management at facilities in areas of low or moderate water stress, which is why we are continuously expanding our best practice sharing platform for water management projects. Through this medium, our EHS officers can share ideas and lessons learned.

Reducing water use

Sites in areas of high water stress must transparently report their water use and identify the process steps that require a particularly high amount. We then define measures to help our individual facilities reduce their water use.

Our production sites in Mexico City (Mexico), Mollet del Vallès (Spain), Kankakee, IL (USA), and Norwood, OH (USA) are located in areas of high water stress and consume more than 30,000 cubic meters of water per year. Furthermore, our facilities in Savannah, GA (USA), Hsinchu (Taiwan) and Taoyuan (Taiwan) are at increased risk due to the local groundwater shortage or seasonal water scarcity. At each of these sites, we aim to reduce water use by 10% by 2020, relative to the 2014 baseline.

Water Protection standard

Our processes and responsibility for clean wastewater are defined in our EHS Water Protection standard, which is based on the commitments we've made under Responsible Care®. In line with this global initiative, all our sites are required to measure and assess the risks and impacts of the hazardous substances in their wastewater.

We regularly conduct internal audits to check compliance with our EHS Water Protection standard. Our Group-wide ISO 14001-certified environmental management system (p. 77) also covers aspects of water management, with a greater focus on manufacturing sites than administrative facilities.

Minimizing residues

We seek to minimize the residues in our wastewater. In support of this goal, all our sites develop and implement a water pollution response plan.

Our EHS Water Protection standard particularly focuses on trace residues that impact the environment. For instance, we are optimizing production and purification processes to reduce the amount of pharmaceutical active ingredient residue in our wastewater as much as possible. All pharmaceutical manufacturing facilities also have wastewater treatment plants in place and regularly measure the composition of their wastewater.

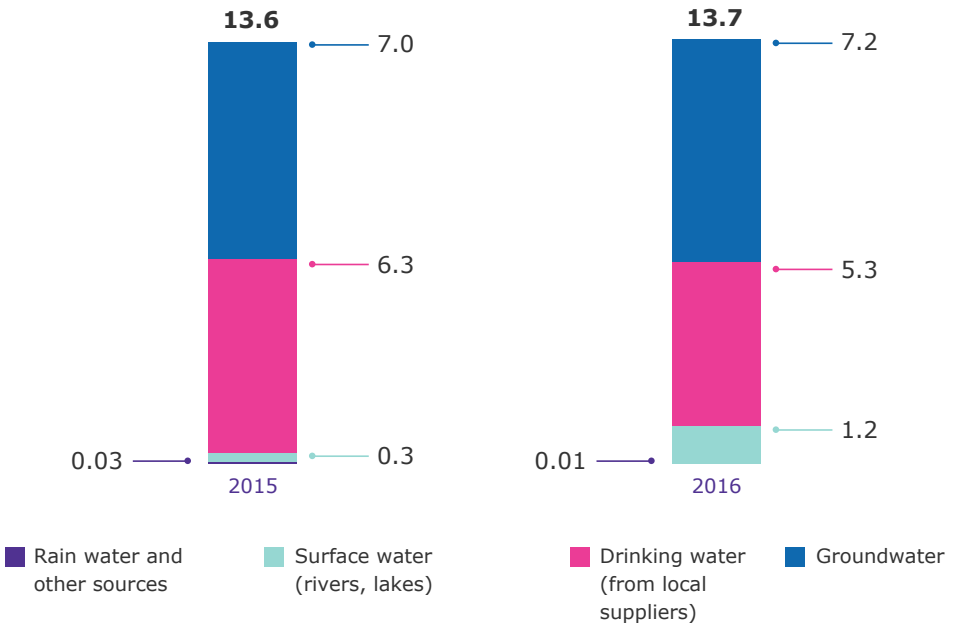
Progress

Water from our own sources

For the most part, we draw groundwater from our own wells and drinking water from local suppliers. We never do anything to compromise sensitive water sources.

In the 2015-2016 period, our water use was broken down as follows:

Water consumption (millions of m^3)



For the most part, our cooling water for production processes runs in a circular system. Depending on regulatory standards, we sometimes use fresh water in a once-through cooling system if it improves our energy footprint. For certain applications, we treat production wastewater and reuse it. In 2015, we reused 23.0 million cubic meters of water, with 22.7 million cubic meters reused in 2016.

Water stewardship

At the end of 2015, we developed a new process that enables bismuth oxychloride products to be manufactured at our site in Savannah, GA (USA) without the use of nitrates. Thanks to this innovation, we no longer utilize hazardous materials such as nitrate and nitric oxide and have reduced water usage by approximately 85%, meaning 21,500 cubic meters per year. At our Hsinchu site in Taiwan, we started recycling HVAC water condensate in 2015, enabling us to reduce water usage by 5% per year in the 2015-2016 period. In 2016, we thus saved more than 1,300 cubic meters of water.

Our facility in Kankakee, IL (USA) also uses a great deal of water. In 2015 and 2016, we achieved approximate savings of 30% by optimizing our own fresh water treatment plant.

We also implement measures to minimize our negative impacts at sites that are not located in high water stress regions. Our manufacturing facilities in India abide by a zero discharge policy that requires used water to first be treated before being allowed to drain back into the soil. Furthermore, our Goa site collects rain water and lets it seep back into the soil as well, a process that has enabled us to stop the water level there from sinking further.

China: Simultaneously reducing energy and water

A project at our site in Suzhou, China shows how the consumption of different resources can be interconnected. Through a single measure, we have cut down the water and energy used for recycling a solvent mixture by distillation. We leave a portion of the water in the solvent mixture that would otherwise have to be discarded as wastewater. In doing so, we have reduced wastewater by nearly 633,000 cubic meters per year, which represents a 66% decrease in wastewater. When customers reuse the solvent mixture, they need not add more water, creating additional water savings. This change furthermore allowed us to save more than 390,000 kilowatt-hours of electricity (around 22% less) and approximately 263,000 cubic meters of liquefied gas (around 57% less).

Wastewater continuously monitored

In 2015 and 2016, our wastewater management activities were continuously monitored and reviewed in line with our Water Protection standard. As such, 77 internal EHS audits were conducted, as were 18 external ISO 14001 certification audits.

In 2016, we generated 12.1 million cubic meters of wastewater, with 11.8 million cubic meters in 2015. The wastewater generated at our Darmstadt site is treated in our state-of-the-art treatment plants before being fed into Schwarzbach-Ried Creek, a tributary of the Rhine River. In 2016, we discharged a volume of water representing approximately 5% of the average annual discharge of Schwarzbach-Ried Creek. We continuously work to meet the increasingly stringent quality regulations set forth by law, regularly coordinating our efforts with the respective authorities. In the 2015-2016 period, we did not discharge any other wastewater into bodies of water.

plant and process safety

The safety of our plants and processes is a key element of our environmental sustainability efforts. This approach allows us to ensure the safety of our workforce as well as the people in the vicinity of our sites. Functional safety systems also help minimize production errors, which in turn reduces the risk of economic losses.

Our principles

Preventing disruptions

We seek to eliminate as many manufacturing hazards as possible to prevent workplace accidents, production outages, and chemical leaks. We attempt to detect technical defects before they have a chance to cause damage. By providing training for our employees, we prevent human errors as much as possible.

Group-wide organization

Our Group function Environment, Health, Safety, Security, Quality (EQ) is in charge of environmental stewardship and safety worldwide, and oversees plant and process safety at Merck. At the operational level, responsibility for plant and process safety falls to our individual sites and their EHS managers. Our local EHS organizations report to and work hand in hand with EQ.

Safety requirements

All sites are subject to the same requirements for plant and process safety set out by our Group-wide EHS Plant and Process Safety standard, which describes the safety rules for all production plants and warehouses. These requirements encompass the entire life cycle of a plant, from cradle to grave. Before we commission a plant, we draft a safety concept that is continuously updated until the facility is decommissioned. This concept contains an overview of potential risks and the corresponding protective measures. In the 2015-2016 period, we started implementing our Plant and Process Safety standard for Sigma-Aldrich sites as well, with completion expected in the course of 2017.

Minimizing risk

Our Group-wide EHS Spillage Control standard governs the handling of hazardous materials and stipulates organizational measures to prevent toxic substances from spilling or leaking during storage and transport. In addition to this standard, our Risk Management Process guides all our sites in identifying and assessing risks. As needed, this process can be used to develop and implement measures to minimize such risks. In 2016, we conducted our Group Procedure Hazard and Operability Study, which clearly defined the individual responsible for identifying potential hazards during a project

as well as the manner in which risks should be identified and documented.

Training employees

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

Legislative changes

The EU Directive adopted in 2012 on the control of major accident hazards involving dangerous substances (aka Seveso III) was transposed into German law at the end of 2016. In 2017, we will therefore be updating existing processes and documents on the assessment and communication of potential hazards in production plants and warehouses.

Making safety measurable

Through our EHS performance indicators, we make it possible to measure safety and thus identify opportunities for improvement. We track EHS performance indicators at all production and warehouse facilities, as well as at major research sites such as Chilworth (UK) and Billerica, MA (USA). In doing so, we record both accidents and near-accidents. We investigate each individual incident before devising appropriate countermeasures in an effort to prevent such accidents in the future.

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

- the number of workplace accidents involving Merck employees and contractors who work at our sites
- environmentally relevant incidents as defined by the European Chemical Industry Council (CEFIC) and the German Chemical Industry Association (VCI), for instance product spills
- the activation of operational safety precautions that do not have an adverse impact on people and the environment, such as a preemptive systems shutdown
- deviations identified during external reviews and audits

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

Learning from incidents across all sites

It is important to share best practices and lessons learned, an approach that enables all our production sites to learn from the incidents at other facilities and thereby implement preventive measures. For instance, once a month, site directors and EHS managers participate in safety leadership calls to share new lessons learned.

Progress

Steady decline in accident rate

Our EHS Incident Rate (EHS IR) indicates that the number of accidents within our company is steadily sinking. In 2015, our EHS IR was 4.3, with 3.4 in 2016.

Spills without significant adverse effects

Across all production, research and storage sites, we recorded a total of 32 incident-related spills in 2015 and 41 incident-related spills in 2016, none of which led to significant environmental pollution.

Taking countermeasures after a malfunction

In February 2015, a filter fire in a pigment production facility in Gernsheim led to damage costing millions of euros. We investigated the incident and, as a preventive measure, installed a temperature monitoring system for the filter inner area of all pigment production lines at the site. We are now better equipped to promptly detect when the production lines grow unusually hot.

Training new personnel

In 2016, 25 new employees, primarily from Sigma-Aldrich, took part in our onboarding process, where they received training on many topics, including plant and process safety. The U.S.-based EHS managers from Sigma-Aldrich participated in a separate onboarding process in the United States.

Biodiversity

The increasing loss of biodiversity is a global challenge that impacts our company as well. After all, we depend on ecosystems for natural resources such as raw materials. A prime example from our Healthcare business sector is comfrey root extract, which is used in our Kytta® pain relief cream. We therefore have a vested interest in preserving and promoting biodiversity.

Our principles

Holistic approach to conserving biodiversity

Our wide array of environmental sustainability efforts, such as water management (p. 84) and climate impact mitigation (p. 79), directly contribute to the conservation of biodiversity. Representing part of our commitment to environmental stewardship (p. 77), our measures to protect biodiversity are overseen by our Group function Environment, Health, Safety, Security, Quality (EQ).

Across all our sites, we take into consideration the unique features of the ecosystems in our immediate vicinity with the goal of minimizing our direct impacts as far as possible.

Designing with biodiversity in mind

Substances that could compromise biodiversity should not be discharged into the environment, which is why we design and operate our plants in accordance with our Group-wide safety and environmental requirements. For instance, our Corporate Environment, Health, and Safety (EHS) standards define the manner in which we manage waste (p. 82) and wastewater (p. 84) treatment as well as improve plant safety (p. 86).

In designing new sites and plants, we always include our EHS unit to ensure that ecological aspects are also taken into consideration.

Minimizing surface sealing

Unsealed surfaces represent an important habitat for plants and animals. At our facilities, however, we are required to seal certain surfaces to minimize the risk of chemicals ending up in the ecosystem. Our goal is to increase the percentage of unsealed surfaces insofar as safety requirements permit.

Environmental risk assessment for acquisitions

Our production sites are located in established industrial and commercial zones.

Before acquiring a company, we first investigate ecological risks, taking into consideration information from public sources such as neighbors and non-governmental organizations (NGOs). The results of the investigation influence whether we decide in favor of the acquisition. Most recently, we conducted such risk assessments for the acquisitions of AZ Electronic Materials and Sigma-Aldrich.

Implementing the Nagoya Protocol

The Nagoya Protocol is an international supplementary agreement to the UN Convention on Biological Diversity (CBD). Its aim is to implement one of the three objectives of the CBD, namely the fair and equitable sharing of benefits arising from genetic resources, with the other two convention objectives being the conservation of biological diversity (or biodiversity) and the sustainable use of its components. In October 2015, the Nagoya Protocol was transposed into German law. We are currently reviewing our processes in preparation to implement the new legislation within our Life Science business sector.

Progress

Biodiversity conservation at our sites

Our Darmstadt site is a prime example of our commitment to preserving biodiversity. Since 2016, we've been conducting an assessment of our facilities in both Darmstadt and Gernsheim to evaluate their nature conservation efforts. The results will help us develop an action plan for improving the surrounding ecosystem for plants and animals. 30% of the premises (0.4 square kilometers) have already been greened. In 1995, we developed a green open space concept for our Darmstadt site, while a 2008 agreement with the city of Darmstadt stipulates how nature conservation is to be integrated into the land use of our site.

suppliers

We take on responsibility for our supply chain, expecting all our suppliers to adhere to our compliance, environmental and social standards.

Our approach to supplier management focuses on more than just quality, delivery reliability and competitive pricing – for us, compliance with fundamental environmental and social standards is also key. To achieve this, we have implemented commensurate strategies, processes and guidelines that we consistently work to improve. Our objective is to prevent violations of our standards in the supply chain.

Read More

90 Supply chain standards

93 Mica supply chain

supply chain standards

Merck requires numerous raw materials, packaging materials, technical products, components, and services, which we procure from more than 70,000 suppliers across 130 countries.

Our principles

Supplier management

Our supplier management aims to maintain fundamental environmental and social standards – as well as high quality, delivery reliability and competitive pricing. To this end, we have introduced strategies, processes and guidelines that we continuously improve to prevent violations of our standards in the supply chain.

We assign our vendors a risk category, taking into account their country risk, product category and the share of their sales that come from Merck. In doing so, we pay particular attention to suppliers from non-OECD countries as we consider vendors in these countries to be at higher risk of disregarding environmental and social standards.

Guidelines establishing supplier requirements

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

As well as these standards, we also support the Compliance Initiative of the German Association for Supply Chain Management, Procurement and Logistics (BME), which is committed to promoting compliant procurement practices. Moreover, we have signed the BME Code of Conduct, which sets out rules for combating corruption, antitrust violations and child labor, as well as for upholding human rights, protecting the environment and promoting fair working conditions.

Our Group Procurement Policy stipulates our expectations of our suppliers and specifies how we monitor compliance with our standards. This policy reflects both internal and external guidelines, such as the Merck Code of Conduct, the Merck Human Rights Charter, our EHS Policy (Environment, Health and Safety Policy), ISO 14001 (an environmental management standard), and the BME Code of Conduct.

In the Merck Responsible Sourcing Principles, we define what we require of our suppliers in terms of corporate responsibility and obligate them to apply these standards to their own vendors. The Merck Responsible Sourcing Principles are integrated Group-wide with our general terms and conditions.

Organization and responsibilities

Our Group function Procurement is responsible for integrating corporate responsibility requirements into each stage of our sourcing and supplier management processes. An office within Group Procurement coordinates all relevant measures, such as regularly updating our guidelines, revising existing processes and coordinating our participation in industrial initiatives. Our Procurement employees in all countries receive training on our guidelines and processes.

If the legal framework is modified, we incorporate these changes and, if necessary, initiate the appropriate measures. A recent example is the UK Modern Slavery Act (p. 14) 2015, which requires all companies with a certain turnover in the United Kingdom to produce a statement detailing the steps they are taking to address slavery and human trafficking in their business. We intend to issue our first such statement in 2017.

Supplier monitoring: TfS membership

In 2014, we joined the Together for Sustainability (TfS) initiative, which provides extensive supplier assessments via its EcoVadis platform. We encourage our vendors to be assessed by EcoVadis and now have access to the assessments of more than 670 of our key suppliers – 400 of which we initiated. Suppliers are assessed either on self-reported and publicly accessible information or via audit. Since joining this initiative, 26 Merck-initiated TfS audits have been conducted on our vendors. After first implementing the TfS methodology for our raw material suppliers, we have now expanded it to all our procurement activities, including consultancy services, information technology and logistics services. We are currently developing a method to systematically incorporate TfS results when evaluating and choosing vendors.

FAST FACT

TFS INITIATIVE

The TfS initiative was launched in 2011 by companies in the chemical industry and aims to systematically assess and improve sustainability practices within global supply chains, with a focus on ecological and social aspects. The results of the supplier assessments are shared among member companies in compliance with all restrictions stipulated by competition law.

Conducting our own risk-based audits

In addition to the TfS audits, we also conduct our own annual CR audits on select suppliers based on the potential risk they pose. To do so, we assign our vendors a risk category based on their country risk, product category and sales. We generally assign higher risk categories to suppliers from non-OECD countries. Regardless of their OECD status, we also audit vendors who show evidence of non-compliance with our requirements.

Any deviations from the Merck Responsible Sourcing Principles or from national statutory requirements identified during an audit are classified as critical, major or minor. We provide suppliers with a report detailing the audit results, and the audit team additionally sets a timeline for follow-up audits.

When an audit reveals non-conformances, we require the vendor to present a corrective action plan that describes the steps needed to address these issues. Regarding defects classified as critical or major, we also check whether the corresponding corrective action has been taken. If the problems are not sufficiently rectified, we consider terminating the business relationship.

FAST FACT

DEFECT CLASSIFICATION

Critical defects: Any defect rated as critical must be rectified or mitigated as soon as possible. The supplier must submit a corrective action plan to Merck within one week of receiving the audit report.

Major defects: For major defects, the supplier must respond and submit a corrective action plan within one month of receiving the audit report.

Minor defects: Minor defects do not require a formal corrective action plan, nor do we monitor implementation of the corresponding corrective actions.

Giving preference to local suppliers for certain products

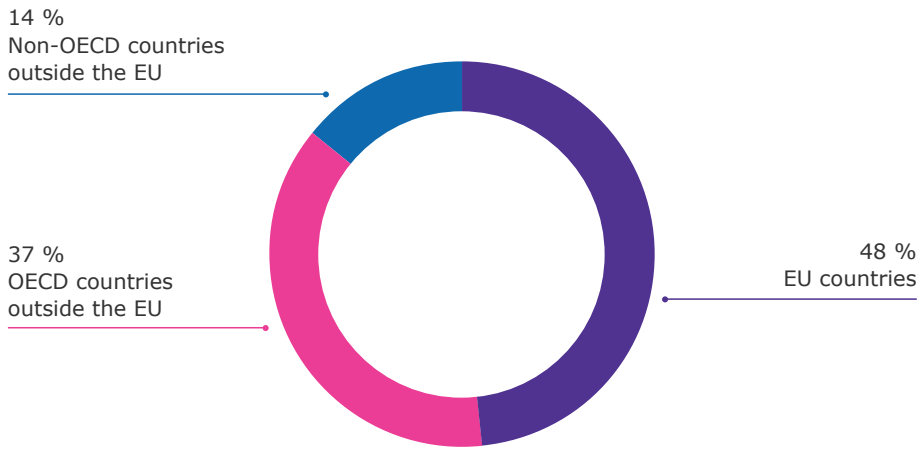
We have no internal guidelines stipulating that preference be given to local suppliers in allocating contracts. We generally procure our goods and services globally, depending on availability and price. For instance, the availability of production technology across production sites plays a role and means that not all products are equally available in each country.

However, in some cases local vendors do have an advantage. Products bought locally may be less expensive as additional transport costs are eliminated. This is often the case with packaging materials. Country-specific regulations such as import duties and licenses also help us decide whether to source our goods locally or globally. Furthermore, in some countries statutory provisions require contracts to be awarded to regional suppliers, which especially applies in the pharmaceutical industry.

Global procurement

All goods and services purchased in 2015 totaled around € 5.2 billion, with € 6.5 billion in 2016 (including Sigma-Aldrich). Of the goods and services (including R&D services) procured in 2016, we purchased 48% from suppliers based in EU countries and 37% from vendors in OECD countries outside the EU. The share of goods and services sourced from non-OECD countries outside the EU decreased from 15% in 2015 to 14% in 2016.

Share of overall goods and services purchased



Progress

Recent audit results

In addition to TfS audits, we also conducted four risk-based CR audits in 2015 and three in 2016, in which we assessed our suppliers according to environmental and social criteria. The non-conformances identified as having an environmental impact were related to exceeding emissions limits and the disposal of waste. In terms of social aspects, in one case there was no clear evidence to prove that minimum wages had been paid. To address these findings, we worked with the relevant suppliers to define a course of action and checked whether the corresponding improvements had been made. Owing to the identified defects, we had to sever our relationships with two suppliers. Our audits found no indication of infringements of freedom of association or collective agreements, nor any form of child, forced or compulsory labor.

Supplier assessments

In conducting TfS supplier assessments in 2015 and 2016, we focused our efforts on the CR performance of key existing suppliers, identifying possible adverse impacts for 45 vendors. In 20 cases, the issues pertained to environmental impacts, in 38 to labor practices and human rights, and in 14 to impacts on local communities and society as a whole. Some suppliers had multiple issues. In 2017 we're implementing measures to address the negative impacts identified. We have not yet performed these assessments on new suppliers.

Supplier workshops on CR standards

We aim to build long-term relationships with our suppliers and endeavor to support them in adhering to our standards. In line with this ethos, in 2016 we ran a workshop for our vendors in China that covered topics such as quality requirements as well as our CR and EHS standards. Moreover, we also take part in local and regional supplier workshops organized by the TfS initiative. One such workshop was held in Brazil in 2015, while another took place in India in 2016.

Good EcoVadis rating

As a member of the TfS industry initiative, we encourage our suppliers to be assessed by the independent rating agency EcoVadis. We too have been evaluated by EcoVadis and in 2016 were awarded a gold medal for our sustainability performance. At 75 out of 100 points, we are among the top 5% of all companies rated. EcoVadis assesses suppliers from 101 countries and 150 sectors across the four categories of Environment, Labor Practices, Fair Business Practices, and Sustainable Procurement. Our holistic environmental management system and clear guidelines on human rights earned especially high marks. This excellent score also benefits our business, as customers who value corporate responsibility are increasingly inquiring after such assessments.

Mica supply chain

We utilize mica as a primary raw material in effect pigment production. These pigments are then used in automotive and industrial coatings, as well as in the cosmetics and food industries. Mica naturally occurs in many countries around the world. We mainly procure our mica from India, where it is mined in the states of Jharkhand and Bihar. Plagued by political instability and poverty, child labor is widespread in this region, so we've taken special measures to ensure compliance with our environmental and social standards.

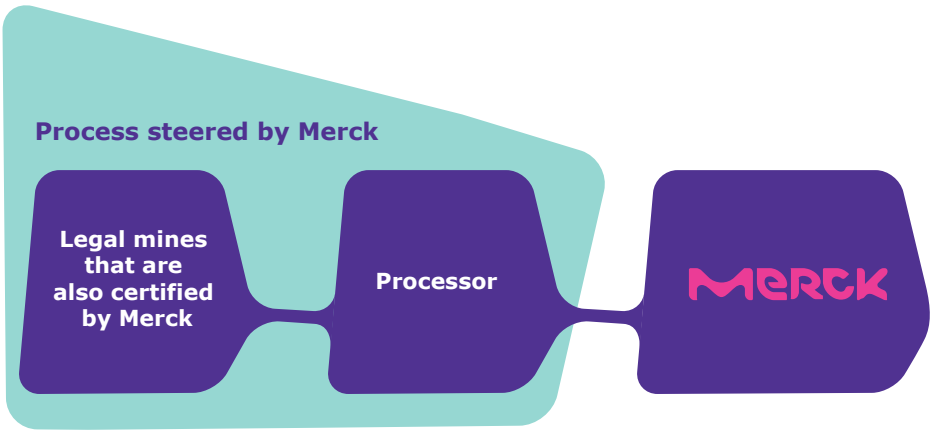
Our principles

Responsibility in the mica supply chain

During a study conducted in 2008, we discovered that people in Jharkhand and Bihar were collecting mica from the tailings of abandoned mines or off the ground – sometimes with their children. This is a clear violation of our Values and the principles of our Human Rights Charter. We do not tolerate child labor and, as a signatory to the United Nations Global Compact, are actively working to end this practice. We require all our suppliers to act accordingly and as such prohibit child labor in our contracts.

We have made a conscious decision to maintain our business relationships in the north of India and are taking on responsibility for this region by safeguarding jobs there. To ensure that the mica we procure has been mined without the use of child labor, we have completely overhauled our supply chain, only sourcing this raw material from regulated mines. This formal work environment is the only way to ensure compliance with our standards, as we cannot rule out the use of child labor for mica collected in publicly accessible areas.

Governance of the mica supply chain



We maintain direct contact both with the mine operators and the mica processing plants, which is why we have set up an office in Jharkhand. Through this proximity to our business partners, we can better educate them on our social and environmental standards as well as monitor adherence to them. Local mine owners and processing plants help us keep the mica supply chain free of child labor.

Conducting audits

To ensure that all mines and processing plants comply with our requirements regarding environmental stewardship, safety and labor standards, we monitor the practices of our business partners. In addition to comprehensive audits announced in advance, surprise checks also take place. Once a month, for instance, the local organization IGEP performs unannounced investigations into the working standards in the mines, monitoring work safety and ensuring compliance

with the ban on child labor. Moreover, the international organization Environmental Resources Management (ERM) performs annual audits that review working conditions, as well as environmental, health and safety standards. Audit reports are compiled to document any identified issues and specify corrective action. Our employees in Jharkhand then make sure that the issues have been resolved.

Tracking system to guarantee certified origin

Using a tracking system, we ensure that the mica supplied to us does not come from unregulated sources, but instead exclusively from legally operated mines that have undergone our certification process. All mine owners have a logbook in which they record the daily amount of mica produced in their mines. These records provide the basis for the license fees that they pay to the government. Were they to use mica from an unregulated source, they would also have to pay license fees for the additional amounts. Such a practice would be uneconomical, as it would cost more than the mica from their own mine. Every month, we crosscheck the amounts of mica recorded in the logbooks and delivered to processing units.

Community outreach in the mica supply chain

The states of Jharkhand and Bihar are among the most impoverished regions in India. In partnership with IGEP, we are working to improve the living conditions of the families in the mica mining regions. According to a 2016 study by the international organizations Terre des Hommes and Stichting Onderzoek Multinationale Ondernemingen, the literacy rate and the number of children who go to school there are far below the national average. In an effort to remedy this situation, we are running three schools in Jharkhand with adjoining nursery schools, as well as two vocational training centers for tailoring and carpentry. More than 500 children and young people are now enrolled at these institutions. At a fourth school opened by one of our mica suppliers in 2014, we also provide scholarships for 150 children, with plans to increase this number to 200 in 2017.

In addition to our education efforts, we are also committed to improving access to healthcare. To this end, in 2010 we established a health center operated by IGEP to serve the region’s 20,000 residents. The facility has two doctors and a nurse, who also provide health services at schools. Previously there was no healthcare of any kind in this region.

Finding new mica sources in other countries

We have found additional sources of mica outside of India that meet our stringent quality, social and environmental standards. Now, for example, part of our mica volume is supplied by companies in Brazil, and we also have access to a certified source in the United States. In this way, we are ensuring the availability of this raw material over the long term and avoiding potential supply bottlenecks. Furthermore, to provide an alternative to pigments based on natural mica, we also manufacture effect pigments based on synthetic substrates.

Progress

Business relationship with a supplier ended

The international organization Environmental Resources Management (ERM) conducted six audits in early 2016. At the time of the audit, 90% of the necessary corrective measures specified in previous audits had already been taken or were still being implemented. The defects identified were primarily related to occupational safety precautions and gaps in the implementation of management systems. However, we terminated our business relations with one of our suppliers because they failed to carry out the required corrective action in a satisfactory manner.

In 2015 and 2016, IGEP performed monthly unannounced inspections of our mica suppliers. These efforts revealed improvements in the management processes of our vendors, such as occupational safety and regular updating of important documentation. Our suppliers also provided the requested training courses for their employees. Overall, no relevant deviations from our standards were noted.

Stakeholder dialogue on the mica supply chain

We keep interested customers and other stakeholders regularly informed on our mica sourcing activities. The employees in our Jharkhand office are in contact with our project partners and other advocacy groups, as well as local and national authorities. In February 2016, we attended the Mica Summit in Delhi, hosted by the Natural Resources Stewardship Circle (NRSC). As a partner of this initiative, we also helped to organize the event. Following this summit, we have become involved in the Responsible Mica Initiative, also established by the NRSC, which aims to improve the traceability of mica in the supply chain and sustain the natural environments of the communities living in mica mining regions.

Community

We take on responsibility for the community, focusing our resources primarily on those areas where we can leverage our expertise to achieve the most.

We are part of the community, which makes corporate responsibility an integral pillar of our culture. Our efforts focus primarily on health, culture and education. We provide disaster relief in emergency situations, especially in those regions in which we operate.

Read More

96 Community involvement
97 Health
100 Culture & education

community involvement

We take on responsibility for the community in those areas where we can leverage our expertise to achieve the most. In particular, we support health, culture and education projects in the vicinity of our sites and in the countries where we operate. Moreover, we provide disaster relief in emergency situations.

Our principles

Organization and management

Our Group function Public Affairs and Corporate Responsibility coordinates our Group-wide community involvement and manages global projects, reporting directly to the Executive Board. In addition, our business sectors and subsidiaries initiate their own projects, choosing for themselves the spheres of activity within our CR strategy that they would like to support.

The Merck family, too, has long been committed to addressing social issues. Their activities fall under the umbrella of the Merck Family Foundation.

Framework for our projects

Our individual business sectors and subsidiaries align their projects with our Group-wide Responsibility for the Community Policy, which emphasizes that our activities should have a positive effect on the community. That is why we mainly promote long-term initiatives through which we seek to strengthen our relationship with our stakeholders and reinforce our social license to operate.

Our community involvement in numbers

In 2016, our subsidiaries were involved in 197 projects, while in 2015 they were involved in 138. In 2016, we spent a total of around € 43 million (€ 100 million in 2015). This figure does not include initiatives that primarily serve to market our products.

Progress

Partnership with the German Red Cross

In April 2015, we entered into a three-year partnership with the German Red Cross (DRK) that aims to provide quick and straightforward assistance in the event of a catastrophe. In December 2015, for instance, we donated € 50,000 to run medical emergency stations in refugee camps in Lebanon in an effort to fight local causes for fleeing and support the people in these regions.

Supporting refugees

In response to the rapidly increasing numbers of refugees, we rendered aid at various sites in 2015. Our subsidiary in Austria, for example, donated € 19,000 in medicines and medical equipment to relief organizations and emergency accommodation for refugees. Moreover, we also supported causes such as hospitals in Lebanon by providing medical expertise, and Iraqi cancer patients by sending free medicines.

In October 2016 – based on our "Start in die Ausbildung" program – we launched the "Integrating refugees through training" program in Darmstadt to support people forced to flee their home countries. This initiative is preparing 12 young people for vocational training and thus for the German labor market. The project comprises linguistic, technical, cultural, and career-related training.

Our apprentices, too, have helped out. In November 2015, for instance, 88 of them renovated refugee accommodations in Darmstadt. As part of our Merck Rest Cents campaign, we also donated € 20,000 to build a playground in front of the housing facility, along with € 3,500 to create a mobile studio that will be used for art therapy. Moreover, we offered the use of our gym for the activities of clubs and schools in Darmstadt that have made their own gymnasiums available to accommodate refugees. Employees at our various sites have also organized their own initiatives and in the last two years have continually been collecting donations of supplies and cash for refugees.

FAST FACT

MERCK REST CENTS PROGRAM

For 28 years, many of our employees in Germany have been donating the cents or euros from their payslips. We double the total amount at the end of the year and give the money to charitable organizations in the region. In 2016, we raised more than € 90,000 together with our employees.

FAST FACT

RAKS THAI FOUNDATION

A local branch of the global humanitarian organization CARE International, the Raks Thai Foundation deploys development programs in the most impoverished regions of northern and southern Thailand. The aim of these programs is to empower people to earn their own income while still safeguarding their natural resources.

Award-winning efforts in Thailand

Our site in Thailand is a shining example of how our subsidiaries take on corporate responsibility in their communities. For ten years, our employees there have been supporting the reforestation of rain forests through the "Together we Grow" project. In 2015, for instance, 300 employees planted around 10,000 trees in just one day. Moreover, we have been partnering with the Raks Thai Foundation since 2002. We support several of the foundation's projects, such as an initiative to teach sustainable rice farming methods. In 2015, we received the Asia Corporate Excellence and Sustainability Award (ACES Award) in the sustainability category, in honor of our many years of purposeful commitment in Thailand.

China: Award for school water project

As part of the School Water Project, our employees in China teach children at six primary schools about the environment and clean water, educating around 400 school children per year. At the same time, we support the schools by providing drinking water purification systems. In 2016, this project won the More than a Market Award from the German Chamber of Commerce and Industry in Shanghai, China. In recognition of our efforts, we also received the EU Chamber CSR Award in 2015.

Health

We support health initiatives around the world. While our efforts are particularly focused on eliminating the neglected tropical disease schistosomiasis, we are also involved in the fight against counterfeit medicines in developing countries.

Our principles

Fighting schistosomiasis

More than 200 million people in Africa suffer from the tropical worm disease schistosomiasis. It is estimated that more than 280,000 people die per year as a result of this parasitic infection.

In the 1970s, we developed the active ingredient praziquantel as part of a joint research partnership. It is the only active ingredient with which all forms of schistosomiasis can be treated. Since 2007, we have been donating praziquantel tablets to the World Health Organization (WHO), up to 250 million per year depending on need.

We realize that we're not going to eliminate this insidious disease with tablets alone. That is why we launched the Global Schistosomiasis Alliance (GSA) at the end of 2014, to address the remaining gaps in the fight against schistosomiasis. Its founding members include the Bill & Melinda Gates Foundation, the Schistosomiasis Control Initiative, the United States Agency for International Development (USAID), and World Vision International.

Within the Pediatric Praziquantel Consortium, a partnership we initiated, we are currently working on the development of a pediatric formulation of praziquantel for children under six (p. 37). Moreover, we are supporting educational campaigns at schools in Africa. Using comic booklets and posters, we teach children about the causes of schistosomiasis along with ways to prevent the disease.

Fighting counterfeit medicines

Interpol estimates that up to 30% of all medicines in developing countries are illegal, counterfeit or substandard – and thus pose a deadly hazard.

The Global Pharma Health Fund (GPHF), a non-profit initiative funded by our company, is dedicated to fighting counterfeit medicines. As part of its efforts, the GPHF has developed the Minilab, a portable, compact laboratory in a tropics-resistant suitcase. This kit can detect counterfeit medicines quickly, easily and inexpensively, and enables trained personnel to check medicines for external abnormalities, identity and contents. There is currently no other product like it. The GPHF provides the Minilabs at cost.

The majority of Minilabs are deployed in countries in Africa and Asia. These test kits are primarily utilized by national health agencies – often in partnership with the labs of governmental drug inspection centers or within multilateral health initiatives led by various UN organizations (including WHO, UNOPS, UNICEF), U.S. and German aid organizations (for example USAID, PQM/USP, PFSCM, GIZ), the Global Fund (GFATM), and faith-based networks (EPN, Difäm).

Alone or in collaboration with international partners, the Global Pharma Health Fund also trains local health workers to correctly perform the tests using the Minilabs.

Health projects worldwide

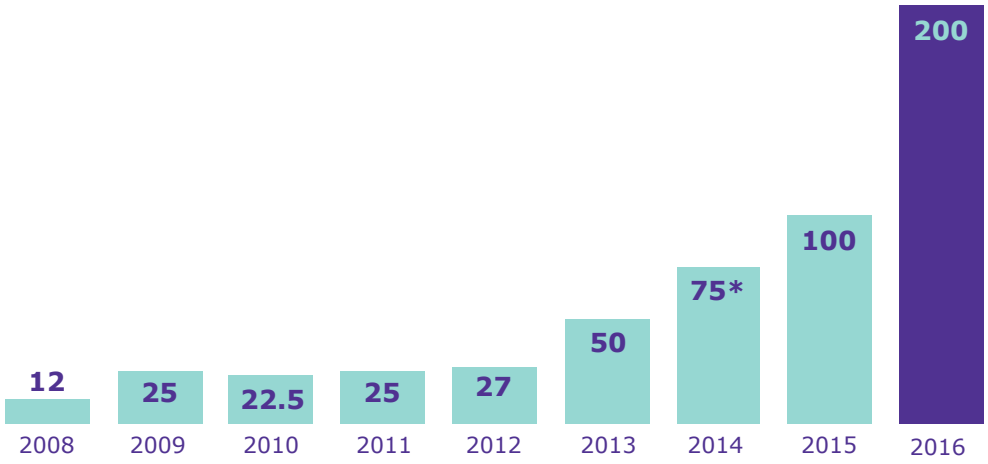
Our subsidiaries also support health efforts around the world. These projects primarily focus on supporting the development of local healthcare systems, providing vocational training and continuing education for medical professionals, and raising public health awareness.

Progress

Schistosomiasis: 100 million children treated

In 2016, we donated more than 200 million praziquantel tablets to WHO for distribution across 33 African countries. Since starting the program, we have supplied WHO with more than 500 million tablets free of charge. In total, this has enabled the treatment of over 100 million patients, primarily school children.

Number of praziquantel tablets donated to WHO (millions)



* In 2014, Merck produced around 75 million tablets, 72.2 million of which were supplied to 20 African countries by the year's end, a collaborative effort with the World Health Organization.

Beyond donating medicine, we are also working on the development of a new formulation of praziquantel (p. 37) so that children under the age of six can also receive treatment, a currently unmet need. To this end, we launched a Phase II study in Ivory Coast in 2016.

Global effort to fight schistosomiasis

Since its establishment in 2014, the Global Schistosomiasis Alliance (GSA) has become the central platform in the fight against this parasitic infection. In various working groups, the members of the alliance are developing projects to eliminate the disease in Sub-Saharan Africa. In October 2015, for instance, the GSA held a conference in Cotonou, Benin to step up the dialogue between NTD (neglected tropical

diseases) project managers in endemic countries. Moreover, in collaboration with China's National Institute of Parasitic Diseases, the GSA Research Group hosted a meeting of international schistosomiasis experts in June 2016.

With its website and social media presence, the GSA has also developed a successful communication platform. In 2015, for instance, the digital campaign Something in the Water managed to create greater awareness for schistosomiasis and went on to win six prizes, namely the German Digital Award, the German Brand Award, the Econ Special Award, all of which are Germany-based, the European silver People's Lovie Award, the U.S.-based Annual Multimedia Award, and the U.S.-based W3 Award.

Schistosomiasis education program expanded

In partnership with WHO, we are providing posters and booklets to African schools that are available in English, French, Arabic, Portuguese, and Swahili. In 2016, we expanded our education program and donated a total of 340,000 booklets to WHO for distribution in ten countries (Ivory Coast, Mali, Burundi, Congo, Nigeria, Rwanda, Ghana, Sudan, Guinea Bissau, and Tanzania).

Strong partners

In 2015, the team responsible for our Praziquantel Donation Program received an internal Merck Award of € 10,000. These employees chose to donate the funds to the NALA Foundation to support a WASH (water, sanitation, hygiene) project in Ethiopia that is working to improve the water supply in schools so as to ensure proper sanitation there. The WASH project is an example of how the NALA Foundation is working to combat the root causes of schistosomiasis.

FAST FACT

NALA FOUNDATION

The NALA Foundation works toward eliminating the root causes of neglected tropical diseases and other diseases that are often related to poverty. Through health education and community engagement, the aim is to facilitate behavioral change.

In addition to supporting this initiative, in 2015 we also helped the Uraha Foundation Germany set up a local radio station in the north of Malawi. Called Radio Dinosaur, the station reports on politics, environmental issues, history, culture, and health in the local languages of Kyangonde and ChiTumbuka. It also broadcasts awareness pieces on schistosomiasis.

Counterfeit medicines: Expanding Minilab use

In 2016, the Global Pharma Health Fund (GPHF), a non-profit initiative funded by our company, developed testing methods for five additional active ingredients. As of 2017, the Minilab can now test 85 active ingredients, ranging from antimalarials and antibiotics, to analgesics and antipyretics.

Since 1998, the GPHF has supplied 795 Minilabs to 95 countries at cost, 109 of which were provided in 2015 and 2016 alone. 80% went to nations in Sub-Saharan Africa. Of the 109 test kits, the GPHF donated seven and our company nine Minilabs to African pharmaceutical regulatory agencies and health projects in Ghana, Tanzania, Mozambique, Botswana, the Democratic Republic of Congo, and Ivory Coast.

In the 2015-2016 period, we also hosted six Minilab seminars in Tanzania, Angola, Kenya, Zambia, Rwanda, and Mozambique, with well over 100 participants. In 2016, a one-day Minilab workshop was also held in Germany as part of the "Pharmacology in international development and disaster relief" course, which was offered by the Pharmaceutical Institute of the University of Tübingen.

New partnership in fight against counterfeit medicines

In 2016, the GPHF joined forces with the German Federal Ministry for Cooperation and Development (BMZ) for the first time ever to collaborate on a project for the six member states of the East African Community (EAC). As part of this effort, the BMZ provided 20 Minilabs in total, with six sent to Rwanda, and a further six each for Burundi and Tanzania/Zanzibar. In 2016, the first-ever Central Minilab Capacity Building workshop was held in the Rwandan capital of Kigali for participants from the EAC member states of Rwanda, Burundi, Uganda, Kenya, and Tanzania/Zanzibar. This project is being spearheaded by the National Metrology Institute of Germany (PTB).

Projects across the globe

In India, we are cooperating with the non-profit organization Narmada Samagra. Their river ambulance transports health workers and provides healthcare solutions to local populations living in the remote region along the Narmada River. In early 2016, we donated a new boat to Narmada Samagra so that they can reach even more people. The river ambulance serves around 12,000 people along a 200-kilometer stretch of river.

We are working to improve medical care around the world. Every year, our Global Medical Education Department sponsors a number of continuing education initiatives for healthcare professionals. In doing so, we are helping build the capacities of nurses and physicians, increasing their awareness of symptoms and familiarizing them with advanced treatment methods. This enhanced expertise ultimately

benefits patients. In 2016, we supported more than 90 different continuing education programs offered by 25 independent educational institutions in the medical sector with over € 10 million. Via e-learning platforms and continuing education courses, more than 150,000 medical professionals benefited from the courses offered by these institutions.

We also support a wide variety of other projects. An overview of our efforts is provided on our website.

culture & education

Through cultural and educational initiatives, we are striving to increase public acceptance and tolerance of new ideas as well as to bolster creativity and curiosity. We believe that music and literature in particular help build bridges between cultures. To us, education is essential to people's intellectual and professional development. We therefore support education projects at many of our sites by granting scholarships, for instance, or sponsoring specific classes.

Our principles

Promoting education worldwide

Our goal is to spark a passion for science in the next generation and pave the way for them to pursue a degree in the STEM subjects. We seek to promote school and university students with a love of the sciences, which is why we invite children and adolescents to come to our Junior Lab and explore their enthusiasm for conducting experiments. In addition to this program, we have also been supporting the "Jugend forscht" competition for more than 30 years. Since 1996, we've been organizing the state-level competition for the German Federal State of Hesse and have also hosted the nationals twice.

Music and literature as ambassadors

We founded the Deutsche Philharmonie Merck in Darmstadt in 1966. What began as a company ensemble is now a professional symphony orchestra. Our philharmonic is an integral part of cultural life in Darmstadt and also regularly goes on international concert tours. In addition to concerts, we also offer orchestra workshops where children and adolescents can experience playing in a professional orchestra.

Like music, literature is also an important ambassador between cultures. We therefore award five literary prizes worldwide that particularly recognize authors who distinguish themselves by unifying cultures as well as science and literature.

Progress

SPARK: Igniting a passion for science in the next generation

In early 2016, our Life Science business sector launched the SPARK initiative to kindle students' curiosity, ignite a passion for science, and inspire them to consider a STEM-related career. Curiosity Labs™ are at the center of SPARK. The program is designed to educate and inspire students through hands-on, interactive science lessons – from DNA and chemiluminescence, flavors and fragrances, to water filtration – typically conducted right in their own classrooms.

The SPARK initiative focuses on skills-based volunteering of our Life Science employees. In February and March 2016, 3,465 of them participated in SPARK events across 36 countries. Beyond the positive impact SPARK has had on employees, we have motivated young people around the world through our Curiosity Lab™ lessons, site tours, career discussions, and other activities. Building on the positive feedback from the students, we have begun creating our own SPARK teams at our various Life Science sites.

Second Junior Lab opened at TU Darmstadt

Since 2008, we've been partnering with the Technical University (TU) of Darmstadt to operate a junior laboratory for chemistry. In 2016, we upped our efforts by adding a second lab to the offering. In the "livfe BioLab", students can now also perform biology experiments under guidance from college students. This initiative links classroom lessons with trending topics and modern methods of biological research.

Scholarships for students in India

In India, many young people cannot attend university as they do not have the means to finance a degree. The Merck India Charitable Trust (MICT) is therefore supporting students from underprivileged families in Mumbai. In 2016, 89 students received a scholarship that covers five to seven years of tuition fees as well as study materials.

Helping medical and pharmacology students in China

Since 2011, we've been awarding two-year scholarships to talented students in China who come from an economically disadvantaged background. We are focusing our support particularly on medical and pharmacology students at Fudan University in Shanghai, which is one of the most renowned academic institutions in China and ranks among the top 100 universities worldwide. To date, 600 students have benefited from our scholarships, with 120 in 2016 alone. Recipients have included PhD fellows and graduates working towards an advanced degree.

Moreover, since 2016, our Healthcare business sector has been providing scholarships for MBA students of the National School of Development (NSD) at the University of Beijing.

India: Making an art of learning

In 2016, we took part in Art By Children, an event held in India that motivated 5,000 children across 100 schools to explore their artistic side. This initiative is part of the Kochi Muziris Biennale, the largest public art event in southern Asia. Art By Children seeks to link learning with arts education to develop their inherent capacity for creativity.

50 years of the Deutsche Philharmonie Merck

During its second season of 2016, the Deutsche Philharmonie Merck celebrated its 50th anniversary, and the festivities are continuing in the first season of 2017. The first highlight was the opening concert of the anniversary season, which was held in September 2016 in the basilica of Eberbach Abbey in Eltville am Rhein, Germany. Moreover, with its "HipHop trifft Klassik" concert in the same month, the Deutsche Philharmonie Merck performed its first-ever crossover project. This joint effort with the Munich-based hip hop group Einshoch6 was held in the Frankfurter Jahrhunderthalle.

In 2016, approximately 23,000 people attended the concerts of the Deutsche Philharmonie Merck. In May 2016, our symphony orchestra played a concert at an internal Merck event in Madrid (Spain).

Literary awards for bridge builders

In Germany, we've been presenting the Johann Heinrich Merck Award for literary criticism and essays since 1964. Worth € 20,000, this prize went to the author Kathrin Passig in 2016. According to the German Academy for Language and Poetry, she was chosen for "her highly original texts, which address a broad spectrum of topics and expertly span the blog, book and essay formats." The journalist and writer Gabriele Goettle won this award in 2015.

The Merck Kakehashi Literature Prize in Japan was presented in partnership with the Goethe-Institut Tokyo for the first time in 2014. Every two years, it recognizes works by German authors made accessible for a Japanese readership and comes with prize money totaling € 10,000, split evenly between the author and their translator. In 2016, writer Ilma Rakusa and her translator Fuminari Niimoto received the award.

The 2016 Merck Tagore Award went to Sudhir Kakar, an Indian psychoanalyst and writer. In numerous landmark works, Kakar has analyzed the society of the subcontinent from a psychoanalytical perspective, thereby reflecting upon the spiritual soul of India. We present the award every two years in partnership with the Goethe-Institut Kolkata. Worth 500,000 Indian rupees (approx. € 7,200), this literary prize is granted to authors who have made a significant contribution to cultural exchange between Germany and India.

We have been awarding the Premio Letterario Merck since 2003 in recognition of authors who make science accessible to a broad audience. The prize is worth € 10,000. In 2016, the Premio Letterario Merck went to Italian physician Alberto Mantovani and British historian Helen Macdonald, who have a special understanding of how to build bridges between literature and science. In 2015, the award went to American science author and writer David Quammen and French writer Maylis de Kerangal.

In 2016, we expanded our efforts by launching the Merck Translation Award in Russia. With € 4,000 in prize money, this partnership with the Goethe-Institut Russia recognizes the crucial role that translations play in intercultural exchange. Presented for the first time in September 2016, the award went to Vladislava Agafonova, Kirill Levinson and Alexandra Gorbova for their German-Russian translations.

Facts & figures

This section presents our CR targets, describes the advances we have made in implementing the ten principles of the UN Global Compact, and details our work to promote the United Nations Sustainable Development Goals. The GRI Index documents the extent to which we are fulfilling the GRI G4 standard. Last but not least, the "Recognition and rankings" section reports on the various awards and recognition we have received.

Read More

report profile

We have a long tradition of corporate responsibility reporting, with this being our eighth Corporate Responsibility (CR) Report. This started in 1993 as a series of environmental reports, but then evolved in 2003 into a full CR Report that has since been published every two years.

With transparency as a key goal, we aim to inform our stakeholders of our activities and successes, as well as the challenges we face. Our 2016 Corporate Responsibility Report documents the progress we've made in implementing the principles of the United Nations Global Compact (Communication on Progress) and meets the criteria of the German Sustainability Code (DNK). Our Statement of Compliance with the DNK is publicly accessible in the DNK database.

Reporting framework

This CR report covers the 2015 and 2016 fiscal years and pertains to our entire Group including our subsidiaries in 66 countries. The activities of the U.S.-based life science company Sigma-Aldrich, which we acquired in 2015, are also integrated in this report. Any deviations from this reporting framework are indicated on a case-by-case basis.

Systems for collecting and consolidating data

Since 2005, we've been using a Group-wide electronic data acquisition system to collect environmental and occupational health and safety data, which is input locally at our individual sites and approved following review. To maximize the quality of this data, we support the sites in optimizing their collection processes and their corresponding quality assurance measures. Moreover, our Group function Environment, Health, Safety, Security, Quality (EQ) conducts internal EHS audits that review both the processes and the data provided.

We compile environmental performance indicators from all our production sites across the Group, as well as those storage and research sites that are relevant in terms of their environmental impact and employee count. The scope of consolidation therefore covers all Merck Group sites that have relevant impacts on the environment.

The data on employees and community outreach pertain to our entire Group. All employee master data is continually updated in an SAP-based database. Additional employee data, for instance on ILO core labor standards, are generated on an annual basis using a special data software. We use community data management software to log data pertaining to our community outreach at subsidiary level.

Some employee data is only disclosed for select sites or countries, which is accordingly indicated in the respective text passages.

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. The present report was drafted in accordance with the GRI G4 standard and complies with the "Comprehensive" application level of the GRI guidelines. Moreover, we have taken into consideration the requirements of the capital market for assessing companies' sustainability performance.

In 2016, we performed a materiality assessment to determine the CR topics of relevance to our Group. As part of this process, we conducted an international online survey as well as interviews with key stakeholders in summer 2016. In autumn, we then held an internal materiality workshop at our site in Darmstadt. We have derived the content of this CR report from the results of the materiality assessment, addressing all issues identified as material. Detailed information on the materiality assessment and the materiality matrix can be found under Materiality assessment (p. 19).

Our Executive Board has reviewed and approved this report.

External audit

KPMG AG Wirtschaftsprüfungsgesellschaft has audited the annual financial statements and management report of the Merck Group for the fiscal year spanning January 1 to December 31, 2016 and issued an unqualified opinion. Furthermore, after undergoing a limited assurance audit, our company has received an independent audit certificate for the following criteria:

- identifying material aspects and boundaries, and involving stakeholders
- select management approaches to the material aspects
- CR performance indicators

The additional content provided on the company's websites and external webpages indicated in this report is not part of the information assured by KPMG.

Contact:

We welcome your feedback and are happy to answer any questions.

Merck KGaA
Public Affairs and Corporate Responsibility

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Our next CR Report is scheduled for publication in April 2018.

Indicators

We use indicators to measure and assess our corporate responsibility performance. The following key figures have undergone a limited assurance by KPMG AG Wirtschaftsprüfungsgesellschaft.

Read More

Indicators: Economics

Net sales, operating result (EBIT) and research and development costs, by business sector

€ million	Healthcare	Life Science	Performance Materials	Group[1]
2015				
Net sales	6,934	3,355	2,556	**12,845**
Operating result (EBIT)	1,097	301	878	**1,843**
R&D costs	1,310	197	197	**1,709**
2016				
Net sales	6,855	5,658	2,511	**15,024**
Operating result (EBIT)	1,593	556	823	**2,481**
R&D costs	1,496	260	213	**1,976**

1 As a non-operating segment, Corporate and Other is not shown here as a separate item, but rather under Segment Reporting in our 2016 Annual Report.

Indicators: compliance

Internal audits on corruption and Human Rights Charter

	2013	2014	2015	2016[1]
Number of audits relating to corruption	30	36	49	55
% of audits relating to corruption	64	68	64	68
Number of audits relating to the workplace requirements of our Human Rights Charter	27	32	41	47

1 Includes Sigma-Aldrich as of 2016

In 2015, 17% of all subsidiaries (excluding minority holdings, EMD Millipore Corporation, and Merck KGaA, Darmstadt, Germany) were audited for the period between the third quarter of 2013 and the second quarter of 2014, covering approximately 33% of sales.

In 2016, we audited 12% of all legacy Merck subsidiaries (excluding minority holdings, EMD Millipore Corporation, and Merck KGaA, Darmstadt, Germany) for the period between the third quarter of 2014 and the second quarter of 2015, covering approximately 20% of all sales. We also audited 8% of all Sigma-Aldrich sites, a company acquired in 2015.

Reported compliance violations

	2013	2014	2015	2016[1]
Number of reported compliance incidents	22	26	33	36
Number of confirmed cases	9	11	8	12

1 Includes Sigma-Aldrich as of 2016

Compliance training

	2013	2014[1]	2015	2016[2]
Total number of persons trained on anti-corruption guidelines	**24,168**	**7,519[3]**	**20,404[3]**	**29,764[3]**
% of employees trained on anti-corruption	63	14	43	51
by employee category				
Number of employees Global Grade 10 or higher trained on anti-corruption	12,390	3,071	12,747	14,379
% of employees Global Grade 10 or higher trained on anti-corruption	69	17	64	84
% of employees Global Grade 9 or lower trained on anti-corruption	51	12	22	34
by region (%)[4]				
Europe	–	–	–	54
North America	–	–	–	57
Asia-Pacific (APAC)	–	–	–	38
Latin America	–	–	–	52
Middle East and Africa (MEA)	–	–	–	66

1 In Q1 – Q3 2014, Group Compliance performed a thorough analysis and review of its Compliance Training Program. No courses were scheduled for these quarters.
2 Includes Sigma-Aldrich as of 2016
3 Includes contractors, external supervised workers (e.g. temps) and contract partners working on-site who were trained on anti-corruption guidelines (2015: 3,026, 2016: 3,875).
4 As of 2016, we are also reporting the training rate by region. No such data was tracked for the preceding years.

In order to address the special responsibility held by management personnel, as well as by staff with HR responsibility, these employees are increasingly receiving training on anti-corruption guidelines. This applies to all employees rated Global Grade (GG) 10 or higher.

Our compliance and anti-corruption principles are communicated to all our business partners, who undergo a Business Partner Risk Management (BPRM) process.

Legal actions

	2013	2014	2015[1]	2016
Total number[2] of legal actions pending or completed (for anti-competitive behavior, violations of anti-trust or violations of monopoly legislation)	**3**	**2**	**2**	**2**
pending	2	2	2	2
completed	1	0	0	0

1 Includes Sigma-Aldrich as of 2015

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 2013, pages 132-134 and pages 226-227, no. 48
- Annual Report 2014, pages 130-131 and pages 213-215, no. 48
- Annual Report 2015, pages 128-129 and pages 212-213, no. 27
- Annual Report 2016, pages 135-136 and pages 228-229, no. 26

Indicators: products

Customer privacy[1]

	2013	2014	2015[2]	2016[2]
Total number of substantiated complaints received from outside parties	0	0	0	0
Total number of complaints from regulatory bodies	0	1	0	0
Total number of identified leaks, thefts, or losses of customer data	0	0	0	1

1 This data only reflects incidents classified as significant.
2 The figures exclude Sigma-Aldrich since the integration process is still underway.

Indicators: Employees

We track data on our employees Group-wide. When the legal frameworks are not comparable or no global data is available, the data will then only reflect our employees in Germany (approximately 25% of our workforce).

Employee facts & figures worldwide

Total number of employees

As of Dec. 31	2013	2014	2015[1]	2016
Total number of employees	**38,154**	**39,639**	**49,613**	**50,414**
Men	22,253	23,273	28,997	28,848
Women	15,901	16,366	20,616	21,566

1 Includes Sigma-Aldrich as of 2015

Number of employees by hierarchical level

As of Dec. 31	2013	2014[1]	2015[2]	2016[3]
Total employees	**38,154**	**39,639**	**40,718**	**50,414**
Senior management (Global Grade above 17)	63	63	75	87
Low and middle management (Global Grade 14–17)	1,949	2,108	2,333	2,800
Other employees (Global Grade below 14)	36,142	37,468	38,310	47,527
% of women (total)	**42**	**41**	**41**	**43**
thereof in senior management (Global Grade above 17)	10	10	12	15
thereof in low and middle management (Global Grade 14–17)	498	562	633	817
thereof other employees (Global Grade below 14)	15,393	15,794	16,182	20,734
% of men (total)	**58**	**59**	**59**	**57**
thereof in senior management (Global Grade above 17)	53	53	63	72
thereof in low and middle management (Global Grade 14–17)	1,451	1,546	1,700	1,983
thereof other employees (Global Grade below 14)	20,748	21,673	22,128	26,793
by age group **Up to 29 years old (%)**	**15**	**15**	**15**	**15**
thereof in senior management (Global Grade above 17)	0	0	0	0
thereof in low and middle management (Global Grade 14–17)	5	6	5	8
thereof other employees (Global Grade below 14)	5,901	5,884	5,848	7,411
30 to 49 years old (%)	**64**	**64**	**64**	**62**
thereof in senior management (Global Grade above 17)	27	24	29	35
thereof in low and middle management (Global Grade 14–17)	1,233	1,340	1,469	1,720
thereof other employees (Global Grade below 14)	23,302	24,082	24,680	29,768
50 years or older (%)	**20**	**21**	**21**	**23**
thereof in senior management (Global Grade above 17)	36	39	46	52
thereof in low and middle management (Global Grade 14–17)	711	762	859	1,072
thereof other employees (Global Grade below 14)	6,939	7,502	7,782	10,348

1 Figures do not include the employees of AZ Electronic Materials, a company acquired in July 2014, because our Global Grading System had not yet been implemented for them as of December 31, 2014. These employees are included under "thereof other employees (Global Grade below 14)".

2 As of Dec. 31 2015, the Global Grading System had not yet been implemented for employees of Sigma-Aldrich, a company acquired in November 2015. These figures therefore exclude Sigma-Aldrich.

3 From 2016 on, these figures include Sigma-Aldrich, but as of Dec. 31 2016 the Global Grading System had not yet been implemented for employees of Sigma-Aldrich legal entities in Germany or for employees of Allergopharma. These employees are included under "thereof other employees (Global Grade below 14)".

Average number of employees by functional area

Average number of employees	2013[1]	2014[1]	2015[2]	2016[2]
Group	**38,282**	**38,930**	**41,511**	**50,439**
Thereof women	**not recorded**	**16,110**	**17,180**	**21,136**
Production	9,985	10,176	11,563	14,829
Thereof women	not recorded	3,202	3,642	4,698
Logistics	1,779	2,207	2,581	3,955
Thereof women	not recorded	774	913	1459
Marketing and Sales	12,214	12,113	12,871	14,887
Thereof women	not recorded	4,814	5,204	6,401
Administration	5,106	6,342	6,763	8,190
Thereof women	not recorded	3,557	3,757	4,421
Research and Development	4,433	4,738	5,097	6,249
Thereof women	not recorded	2,534	2,674	3,274
Infrastructure and Other	4,765	3,354	2,636	2,329
Thereof women	not recorded	1,230	990	883

1 Average headcount (HC) 2014 and 2013 is calculated based on the End HC of the last 5 quarters divided by 5.

2 The average employee headcount for 2015 and 2016 is calculated by adding up all employees at the end of each of the last 13 months, and dividing this total by 13. Employees of Sigma-Aldrich, a company acquired in November 2015, are only included in the employee headcount calculations as of November 2015.

Number of employees by region

As of Dec. 31	2013	2014	2015[1]	2016
Total	**38,154**	**39,639**	**49,613**	**50,414**
Employees in Europe	20,013	20,537	23,429	24,438
thereof women	8,755	8,893	10,316	10,884
Employees in North America	4,911	5,092	9,794	10,037
thereof women	2,246	2,272	4,183	4,308
Employees in Asia-Pacific (APAC)	8,862	9,488	11,096	10,754
thereof women	2,947	3,176	3,706	3,981
Employees in Latin America	3,798	3,883	4,352	4,140
thereof women	1,699	1,745	1,986	1,910
Employees in the Middle East and Africa (MEA)	570	639	942	1,045
thereof women	254	280	425	483

1 Includes Sigma-Aldrich as of 2015

External contractors are currently not logged in our employee data system, nor do we currently have any plans to integrate them.

Employees by business sector

As of Dec. 31	2013	2014	2015[1]	2016
Healthcare employees	**17,278**	**17,757**	**18,566**	**18,837**
Thereof women	7,909	8,130	8,522	9,090
Thereof women (%)	46	46	46	48
Life Science employees	**9,837**	**9,796**	**18,611**	**19,178**
Thereof women	4,124	4,134	7,883	7,928
Thereof women (%)	42	42	42	41
Performance Materials employees	**4,709**	**5,995**	**6,228**	**5,469**
Thereof women	1,210	1,498	1,531	1,427
Thereof women (%)	26	25	25	26

1 Includes Sigma-Aldrich as of 2015

Employees by contract type

As of Dec. 31	2013	2014	2015[1]	2016
Total employees	**38,154**	**39,639**	**49,613**	**50,414**
Number of employees with permanent contracts	36,908	38,410	46,454	46,837
Number of employees with temporary contracts	1,246	1,219	3,159	3,577
% of employees with permanent contracts	97	97	94	93
% of employees with temporary contracts	3	3	6	7
full-time employees	34,911	37,573	47,292	48,056
% full-time	95	98	95	95
thereof women	13,524	14,497	18,557	19,457
thereof women (%)	39	39	39	40
part-time employees	1,994	2,066	2,321	2,358
% part-time	6	5	5	5
thereof women	1,839	1,869	2,059	2,109
thereof women (%)	92	90	89	89

1 Includes Sigma-Aldrich as of 2015

New employees

	2013	2014	2015[1]	2016
Total number of new employee hires	**5,007**	**6,212**	**5,710**	**7,085**
by age group				
Up to 29 years old	2,358	2,305	2,088	2,930
30 to 49 years old	2,397	3,361	3,252	3,736
50 or older	252	546	370	419
by gender				
Women	2,051	2,513	2,450	3,388
Men	2,945	3,689	3,260	3,697
by region				
Europe	1,757	2,312	2,119	2,689
North America	526	826	730	1,348
Asia-Pacific (APAC)	2,060	2,298	1,913	2,201
Latin America	548	619	780	636
Middle East and Africa (MEA)	116	157	168	211
Rate of new employee hires[2] (%)	**13**	**16**	**14**	**14**
by age group[3]				
Up to 29 years old	47	37	37	41
30 to 49 years old	48	54	57	53
50 or older	5	9	6	6
by gender[3]				
Women	41	41	43	48
Men	59	59	57	52
by region[3]				
Europe	35	37	37	38
North America	11	13	13	19
Asia-Pacific (APAC)	41	37	33	31
Latin America	11	10	14	9
Middle East and Africa (MEA)	2	3	3	3

1 These figures exclude the 8,975 Sigma-Aldrich employees, who are not classified as new hires because they joined Merck as part of the Sigma-Aldrich acquisition.

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. In consequence of the modified calculation method and the new composition of our regions effective January 1, 2015 corresponding figures for the preceeding years have been retroactively adjusted.

Staff turnover[1]

	2013[2]	2014[2]	2015[3]	2016[3,4]
Total turnover rate	**14.61**	**11.01**	**10.38**	**12.07**
Turnover rate by gender				
Men	13.98	10.75	10.13	12.87
Women	15.00	11.38	10.73	10.96
Turnover rate by age group				
Up to 29 years old	21.55	18.71	17.49	19.20
30 to 49 years old	13.44	9.72	9.69	11.37
50 or older	13.01	9.49	8.08	9.19
Turnover rate by region				
Europe	14.61	7.05	6.22	6.23
North America	10.51	12.45	12.72	11.50
Asia-Pacific (APAC)[5]	not recorded	17.55	15.95	22.37
Latin America[5]	not recorded	13.67	15.29	18.85
Middle East and Africa (MEA)[5]	not recorded	13.62	12.00	10.80
Total number of leavers	**5,573**	**4,364**	**4,168**	**6,087**
by gender				
Men	3,110	2,502	2,386	3,771
Women	2,385	1,862	1,782	2,316
by age group				
Up to 29 years old	1,273	1,102	943	1,464
30 to 49 years old	3,300	2,474	2,505	3,589
50 or older	1,000	788	720	1,034
by region				
Europe	2,367	1,447	1,290	1,490
North America	516	634	638	1,132
Asia-Pacific (APAC)[5]	not recorded	1,665	1,540	2,543
Latin America[5]	not recorded	531	618	814
Middle East and Africa (MEA)[5]	not recorded	87	82	108

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 turnover for fiscal 2013 and 2014 is calculated as follows: Total number of leavers of the past 12 months multiplied by 100 divided by the employee headcount as of December 31.

3 Employee headcount for fiscal 2015 and 2016 is calculated as follows: Total number of leavers from the past 12 months divided by the average employee headcount (see table "average number of employees by functional area") multiplied by 100. These figures exclude Sigma-Aldrich, which is still undergoing integration. In consequence of the modified calculation method for turnover rate, it is only possible to make a limited statement concerning interannual trends.

4 Includes Sigma-Aldrich as of 2016

5 We have no 2013 data for the Asia-Pacific (APAC), Latin America, and Middle East and Africa (MEA) regions, which were realigned in 2015.

Core labor standards of the International Labour Organization (ILO)

As of Dec. 31	2013	2014	2015	2016[1]
% of full-time employees (standard contract, excluding exempts) with contractually stipulated working hours of maximally 48 hours/week[2]	99	99	100	100
% of full-time employees (standard contract) with at least 15 vacation days/year[3]	98	95	97	95
% of female employees with access to maternity leave programs[4]	100	100	100	100
% of employees with the right to collective bargaining[5]	97	97	98	92
% of employees working at companies where collective agreements apply	68	66	71	54
% of sites that rule out complicity in child labor as described in ILO Convention 138	100	100	100	100
Age of youngest employees, excluding apprentices	16	17	17	17

1 Includes Sigma-Aldrich as of 2016
2 ILO: Hours of Work (Commerce and Offices) Convention, 1930 (No. 30)
3 ILO: Holidays with Pay Convention (Revised), 1970 (No. 132)
4 ILO: Maternity Protection Convention (Revised), 1952 (No. 103)
5 ILO: Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)

Local minimum wage

As of Dec. 31	2013	2014	2015	2016[1]
% of sites that guarantee a salary above the local minimum wage[2]	100	100	100	100

1 Includes Sigma-Aldrich as of 2016
2 Minimum wage as stipulated by law, or derived from other provisions such as collective agreements.

The Global Rewards Policy applies across all our subsidiaries worldwide and guarantees a systematic compensation structure. Base pay is oriented on the median base pay, and short-term variable compensation is based on the third quartile of the relevant reference market. All employees within the lowest Grades are paid within this salary band, which corresponds at least to the local minimum wage.

Work-related accidents[1]

	2013	2014	2015[2]	2016
Lost Time Injury Rate (LTIR=workplace accidents resulting in missed days of work per one million man-hours)	**2.2**	**1.8**	**1.4**	**1.3**
by region				
Europe	3.7	2.9	2.6	2.1
North America	0.9	1.0	0.9	1.1
Asia-Pacific (APAC)	0.3	0.5	0.3	0.4
Latin America	2.1	1.3	0.7	0.4
Middle East and Africa (MEA)	1.8	0.9	0.5	1.6
Number of deaths	**0**	**2**	**2**	**0**
by region				
Europe	0	0	1	0
North America	0	0	1	0
Asia-Pacific (APAC)	0	1	0	0
Latin America	0	1	0	0
Middle East and Africa (MEA)	0	0	0	0
by gender				
Women	0	1	1	0
Men	0	1	1	0

1 Including supervised workers
2 Includes Sigma-Aldrich as of 2015

Despite our efforts to prevent accidents, we had two fatal workplace accidents in 2015; one employee died in a car accident in the United States, and in Germany one employee suffered a fatal accident involving a forklift.

Both Merck employees as well as contractors 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.

We have defined the LTIR as a key indicator for the Merck Group. 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 the Merck KGaA sites in Darmstadt and Gernsheim (about 19% of the employees of the Merck Group), we only report work-related illnesses if these have been diagnosed and verified by a physician. In the 2015-2016 period, no cases of work-induced illness were recorded.

Spending on advanced training for employees

€	2013	2014	2015	2016[1]
Average continuing education spending per employee	679	718	775	736

1 Includes Sigma-Aldrich as of 2016

We record and report the costs of vocational training and continuing education for our employees. We are not currently tracking the average number of continuing education hours consolidated at Group level, but we are working on a technical solution.

Employees who regularly receive a performance and development evaluation

	2013[1]	2014[2]	2015[3]	2016[4]
% of employees who receive a performance and development evaluation	**72**	**79**	**88**	**97**
by gender				
Women	75	84	90	97
Men	71	77	87	97
by employee category				
Senior management (Global Grade above 17)	100	97[5]	100	100
Low and middle management (Global Grade 14–17)	100	96[5]	100	100
Other employees (Global Grade below 14)	72	78[5]	88	97

1 The 2013 data is based on a reporting date of March 12, 2014.
2 The 2014 data is based on a reporting date of March 2, 2015.
3 The 2015 data is based on a reporting date of February 29, 2016.
4 From 2016 on, figures include Sigma-Aldrich, but as of Dec. 31 2016, the Global Grading System had not yet been implemented for employees of Sigma-Aldrich legal entities in Germany and of Allergopharma.
5 The fluctuations in participant numbers by employee category can be explained by the process of Merck's acquisition of AZ Electronic Materials.

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 Global Grade 10 and up in the position ranking system that was used in 2016. 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 Global Grade 10. In Germany, all permanent employees have been participating in the Performance and Talent Management Process since 2013. In 2016, a total of 49,000 employees worldwide were involved in the process. The Performance and Talent Management Process is coordinated via our HR Suite IT system.

Internationality of employees

As of Dec. 31	2013	2014[1]	2015[2]	2016[3]
Number of nationalities	114	122	122	129
Number of nationalities in management positions (Global Grade 14 or above)	64	67	64	70
% of non-Germans in management positions (Global Grade 14 or above)	60	60	61	65

1 These figures do not include the employees of AZ Electronic Materials, a company that was acquired in July 2014. As of December 31, 2014, the Global Grading System had not yet been implemented there.
2 These figures do not include the employees of Sigma-Aldrich, a company that was acquired in November 2015. As of December 31, 2015, the Global Grading System had not yet been implemented there.
3 From 2016 on, figures include Sigma-Aldrich. However, as of Dec. 31 2016, the Global Grading System had not yet been implemented for employees of Sigma-Aldrich legal entities in Germany or for employees of Allergopharma.

Employee age by region

As of Dec. 31

Number of employees	Worldwide	North America	Europe (including Germany)	Germany	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2015[1]							
Up to 29 years old	7,565	1,314	2,912	1,624	2,496	666	177
thereof women	3,233	522	1,378	649	898	367	68
30 to 49 years old	31,047	5,117	14,589	6,775	7,651	3,092	598
thereof women	13,242	2,285	6,673	2,674	2,576	1,434	274
50 or older	11,001	3,363	5,928	3,539	949	594	167
thereof women	4,141	1,376	2,265	1,241	232	185	83
Average age	**41.2**	**44.2**	**42.4**	**43.0**	**36.7**	**39.5**	**39.5**
Total employees	**49,613**	**9,794**	**23,429**	**11,938**	**11,096**	**4,352**	**942**
2016							
Up to 29 years old	7,419	1,319	3,087	1,757	2,260	562	191
thereof women	3,331	548	1,470	695	922	312	79
30 to 49 years old	31,523	5,224	15,023	6,938	7,625	2,972	679
thereof women	13,849	2,327	6,985	2,780	2,817	1,405	315
50 or older	11,472	3,494	6,328	3,755	869	606	175
thereof women	4,386	1,433	2,429	1,333	242	193	89
Average age	**41.3**	**44.3**	**42.4**	**42.9**	**36.7**	**39.9**	**39.3**
Total employees	**50,414**	**10,037**	**24,438**	**12,450**	**10,754**	**4,140**	**1,045**

1 Figures include Sigma-Aldrich as of 2015

Global voluntary insurance benefits (voluntarily introduced and (co-) financed)

As of Dec. 31	2013[1]	2014[1]	2015[1]	2016
% of employees with healthcare benefits[2]	–	–	–	90
% of employees with Group accident insurance[3]	–	–	–	39
% of employees with life insurance[4]	–	–	–	57
% of employees with disability insurance (short-term and long-term)[5]	–	–	–	32

1 Since 2016, we've been reporting global voluntary insurance benefits that we offer our employees. No such data was tracked for the preceding years.

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.

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	2013	2014	2015[1]	2016
Present value of all defined benefit obligations as of Dec. 31	2,737	3,813	4,153	4,698
Pension expenses	147	157	210	226

1 Includes Sigma-Aldrich as of 2015

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 Annual Report 2016, Note on Provisions for pensions and other post-employment benefits).

Flexible working hours

As of Dec. 31	2013	2014	2015	2016[1]
% of employees with the option of working flexible hours	75	74	80	78

1 Includes Sigma-Aldrich as of 2016

Employee facts and figures, Germany

Parental leave in Germany[1]

As of Dec. 31	2013	2014	2015	2016
Number of employees with a right to parental leave	254	331	317	359
thereof women (recorded via maternity leave in the respective year)	120	165	149	191
thereof men (recorded via special paternity leave in the respective year)	134	166	168	168
Number of employees who took parental leave[2]	433	507	485	480
thereof women	292	349	301	303
thereof men	141	158	184	177
Number of employees on parental leave who worked part time during their leave	81	99	102	102
thereof women	77	94	99	95
thereof men	4	5	3	7
Number of employees who returned from parental leave	151	187	183	174
thereof women	60	83	51	62
thereof men	91	104	132	112
Return to work rate (%)	34.9	36.9	37.7	36.3
thereof women	20.6	23.8	16.9	20.5
thereof men	64.5	65.8	71.7	63.3
Number of employees still working for Merck one year after their return from parental leave	152	137	184	–[3]
thereof women	57	35	55	–[3]
thereof men	95	102	129	–[3]
Retention rate (%)	93.8	90.7	96.8	–[3]
thereof women	91.9	58.3	98.2	–[3]
thereof men	95.0	112.1	96.3	–[3]

1 Figures only pertain to the Darmstadt and Gernsheim sites in Germany (which accounted for around 20.9% 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 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.

3 Figure will be available on Dec. 31, 2017.

Employees with disabilities[1] (%)

As of Dec. 31	2013	2014	2015	2016
Employees with disabilities[1]	5.0	4.7	4.7	4.5

1 Only pertains to Merck KGaA (which accounted for around 20% of Merck Group employees in 2016, calculations based on the German Social Code IX - SGB IX).

Apprentices

As of Dec. 31	2013	2014[1]	2015[2]	2016[3]
Number of apprentices	516	498	506	576
% of apprentices	5.6	5.4	5.3	4.6

1 Only pertains to Merck KGaA sites in Darmstadt, Gernsheim and Grafing, Germany (which accounted for roughly 24% of the Merck Group's employees in 2014).
2 Only pertains to Merck KGaA (roughly 19% of the Merck Group's total employee headcount in 2015).
3 Reflects only those Merck sites in Germany (approximately 25% of the Group's total workforce in 2016).

Indicators: Environment

Spending on environmental protection, safety and health

€ million	2013	2014	2015	2016[1]
Spending	142	145	148	189

1 Includes Sigma-Aldrich as of 2016

These figures include both investments in as well as internal and external spending on waste and wastewater management, water, occupational safety, fire protection, noise reduction, air pollution prevention, decontamination, preservation of nature and the landscape, climate impact mitigation, and energy efficiency. We do not further break down our spending on environmental protection by type.

Total greenhouse gas emissions (Scope 1 and 2 of the GHG Protocol)[1]

metric kilotons	2006[2]	2013	2014	2015	2016
Total CO_2eq[3] emissions	**790**	**784**	**736**	**729**	**715**
Thereof					
direct CO_2eq emissions	378	417	390	393	386
indirect CO_2eq emissions	412	367	346	336	329
Biogenic CO_2 emissions	**6**	**6**	**11**	**54**	**56**

1 In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the greenhouse gas emissions have been calculated based on the current corporate structure of the reporting year and retroactively adjusted for acquisitions (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 eq = equivalent

The increase in biogenic carbon emissions was caused by the biomass power plants that were commissioned in Goa, India and Jaffrey, New Hampshire (USA) at the end of 2014.

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; CH_4/N_2O negligible; SF_6/NF_3 not available.
- Indirect CO_2 emissions: CO_2.

In 2016, we emitted 0.048 kg of CO_2eq per euro of net sales.

Other relevant indirect greenhouse gas emissions (Scope 3 of the GHG Protocol)

	2013	2014	2015	2016[2]
Total gross other indirect emissions (metric kilotons CO_2eq[1])	**64**	**319**	**349**	**426**
Fuel- and energy-related emissions, not included in Scope 1 or 2 (category 3)	not recorded	97	95	127
Waste generated in operations (category 5)	not recorded	96	123	127
Business travel - air travel (category 6)	63	74	79	103[3]
Business travel - rail travel (category 6)	0.05	0.02	0.02	0.02
Business travel - rental car travel (category 6)	1.3	1.2	1.1	0.6
Employee commuting (category 7)	not recorded	51	51	68
Upstream leased assets (category 8)	not recorded	0[4]	0[4]	0[4]
Processing of sold products (category 10)	not recorded	0[5]	0[5]	0[5]
Downstream leased assets (category 13)	not recorded	0	0	0
Franchises (category 14)	not recorded	0	0	0

1 eq = equivalent
2 Includes Sigma-Aldrich as of 2016
3 This figure covers roughly 80% - 85% of the employees of the Merck Group because the data for the employees of Sigma-Aldrich, acquired in November 2015, are only partially available.
4 Already covered under Scope 1/2 emissions
5 Merck produces a huge variety of intermediate products for various purposes. Due to their many applications and our customer structure, the associated GHG emissions cannot be tracked in a reasonable fashion.

No data is 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	2013[1]	2014	2015	2016
Total emissions of ozone-depleting substances	2.5	2.0	2.5	2.2
CFC-11eq[2]	0.1	0.1	0.1	0.1

1 Includes Sigma-Aldrich from 2013 onwards
2 CFC-11eq is a unit of measure used to compare the potential of various substances to deplete the ozone. Reference figure 1 indicates the potential of CFC-11 to cause the depletion of the ozone layer.

Substances included: R-12, R-22, R-141b, R-402a, R-409a, R-401a.

Source for the emission factors: Montreal Protocol.

Other air emissions

metric kilotons	2013	2014	2015	2016[1]
Volatile organic compounds (VOC)	0.2	0.3	0.3	0.3
Nitrogen oxide	0.2	0.2	0.3[2]	0.2
Sulfur dioxide	0.02	0.02	0.05	0.05
Dust	0.01	0.02	0.06	0.02

1 Includes Sigma-Aldrich as of 2016
2 Figure retroactively adjusted.

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

	2013[1]	2014[1]	2015[1]	2016[2]
% Truck	56	56	53	71
% Boat	37	38	41	18
% Airplane	7	6	6	11

1 The figures for 2013 through 2015 pertain to goods shipped by our Darmstadt, Gernsheim and Hohenbrunn sites in Germany (excluding Sigma-Aldrich).

2 From 2016 on, 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 (including Sigma-Aldrich).

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	2013	2014	2015	2016
Total energy consumption	**2,108**	**2,158**	**2,256**	**2,253**
Direct energy consumption	**1,286**	**1,354**	**1,451**	**1,443**
Natural gas	1,157	1,212	1,212	1,272
Liquid fossil fuels[2]	114	115	104	30
Biomass and self-generated renewable energy	15	27	135	141
Indirect energy consumption	**822**	**804**	**805**	**810**
Electricity	743	707	709	715
Steam, heat, cold	79	97	96	95
Total energy sold	**0.4**	**0.6**	**0.5**	**0.5**
Electricity	0.4	0.6	0.5	0.5
Steam, heat, cold	0	0	0	0

In TJ	2013	2014	2015	2016
Total energy consumption	**7,589**	**7,769**	**8,122**	**8,111**
Direct energy consumption	**4,630**	**4,874**	**5,224**	**5,195**
Natural gas	4,165	4,363	4,363	4,579
Liquid fossil fuels[2]	410	414	374	108
Biomass and self-generated renewable energy	54	97	486	508
Indirect energy consumption	**2,959**	**2,894**	**2,898**	**2,916**
Electricity	2,675	2,545	2,552	2,574
Steam, heat, cold	284	349	346	342
Total energy sold	**1**	**2**	**2**	**2**
Electricity	1	2	2	2
Steam, heat, cold	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 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

2 Light and heavy fuel oil, liquefied petroleum gas (LPG), diesel and gasoline

At our sites in Billerica (MA, USA), Bedford (MA, USA), Molsheim (France), Tel Aviv (Israel), Rome (Italy), Guatemala City (Guatemala), Shizuoka-ken (Japan), and Shanghai (China), we use photovoltaics to produce power. Since 2015, the increase in biomass and self-generated renewable energy consumption has been attributable to the biomass power plants that were commissioned in Goa, India, and Jaffrey (NH, USA) in 2014.

The reduction in liquid fossil fuel consumption primarily stems from a project at our Onahama site in Japan that switched energy generation from kerosene to natural gas.

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 29% of our Group-wide total. At these sites, fossil energy (coal, gas, etc.) accounts for approx. 53%, nuclear energy approx. 15% and renewable energies approx. 32% 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 1,931 GWh for 2016. Based on an estimated global energy efficiency of 85% for heat/steam/cold, this results in a primary energy consumption of 112 GWh for 2016. This yields a total primary energy consumption of 2,043 GWh for 2016. The calculation is based on factors stated in the "Manual for energy management in practice - Systematically reducing energy costs" published by DENA, 12/2012.

In 2016, Merck's energy intensity relative to net sales totaled 0.150 kWh/€ compared to 0.134 kWh/€ in 2015.

Water consumption

millions of m^3	2013	2014	2015[1]	2016
Total water consumption	**9.6**	**11.1**	**13.6**	**13.7**
Surface water (rivers, lakes)	0.8[2]	1.2[2]	1.2[2]	1.2
Groundwater	5.4	6.3	7.0[2]	7.2
Drinking water (from local suppliers)	3.4[2]	3.6[2]	5.4[2]	5.3
Rain water and other sources	0.01	0.01[2]	0.01[2]	0.01

1 Includes Sigma-Aldrich as of 2015
2 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	2013	2014	2015[1]	2016
Water reused	16.6	16.0	23.0	22.7

1 Includes Sigma-Aldrich as of 2015

The increase in reused water in 2015 is attributable to the recirculating cooling system that went online at our facility in Darmstadt, Germany. This system provides recirculating cooling water to both our new co-generation unit as well as our new cold and compressed air generator. The recirculating cooling system largely accounts for the amount 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

	2013	2014	2015[1]	2016
Total wastewater volume (millions of m^3)	**8.6**	**10.1**	**11.8**	**12.1**
Chemical oxygen demand (metric tons of O_2)	756	1,319	1,933	1,535
Phosphorous (metric tons)	7	10	10	12
Nitrogen (metric tons)	77	81	330	303
Zinc (kg)	406[2]	410[2]	498[2]	451
Chromium (kg)	23	36	42	34
Copper (kg)	36	34	84	53
Nickel (kg)	110	128	128	124
Lead (kg)	42	55	54	56
Cadmium (kg)	10	10	13	11
Mercury (kg)	1	1	2	2
Arsenic (kg)	4	4	5	4

1 Includes Sigma-Aldrich as of 2015
2 Figures 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	2013	2014	2015[1]	2016
Total waste	**161**	**228**	**317**	**254**
Hazardous waste disposed[2]	37	53	55	50
Non-hazardous waste disposed[2]	31	55	35	44
Hazardous waste recycled[3]	50	49	73	75
Non-hazardous waste recycled[3]	43	71	154	85

1 Includes Sigma-Aldrich as of 2015
2 Disposed = incineration (without energy recovery) and landfill
3 Disposed = incineration (without energy recovery) and material recycling

The increase in "non-hazardous waste recycled" in 2015 can be attributed to the sharp rise in construction, excavation and demolition waste. Construction, excavation and demolition waste accounted for 49% of our waste in 2015 and 30% in 2016.

Exported/Imported hazardous waste

metric kilotons	2013	2014	2015[1]	2016
Exported[2]	7.1	9.6	5.1	4.6
Imported[3]	0.01	0.003	0.01	0.01

1 Includes Sigma-Aldrich as of 2015
2 Disposal within the EU and the United States.
3 As part of the return system for our cell tests, these kits are brought to our Gernsheim site in Germany for proper disposal.

Waste by disposal method

	2013	2014	2015[1]	2016
Total waste (metric kilotons)	**161**	**228**	**317**	**254**
Disposed waste (metric kilotons)	**67**	**108**	**90**	**94**
Landfilled waste (metric kilotons)	13	37	16	15
Incinerated waste (metric kilotons)	54	71	74	79
Recycled waste (metric kilotons)	**94**	**120**	**227**	**160**
Material recycling (metric kilotons)	69	93	195	128
Waste-to-energy (metric kilotons)	25	27	32	32
Recycling rate (%)	**58**	**53**	**72**	**63**

1 Includes Sigma-Aldrich as of 2015

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 49% of our waste in 2015 and 30% in 2016. In 2015, around 124 metric kilotons of construction, excavation and demolition waste was recycled, with roughly 53 metric kilotons recycled in 2016.

Significant spills

	2013	2014	2015[1]	2016
Total number of significant spills	0	0	0	0

1 Includes Sigma-Aldrich as of 2015

Indicators: community

Spending on community involvement

€ million	2013	2014	2015	2016[1,2]
Total spending	46.2	50.8	100.0	43.0

1 Includes Sigma-Aldrich as of 2016
2 From 2016 on, we are separating spending on patient support programs such as our Erbitux® China Patients Assistance Program 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.

Community involvement spending by region[1]

	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2016					
€ million	10.1	2.3	4.4	1.1	25.1
%	24	5	10	3	58

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.

Focus of our local community involvement[1]

%	2013	2014	2015	2016[2,3,4]
Health	23	33	33	35
Culture and education	42	38	33	36
Environment	10	10	7	5
Disaster relief	6	4	6	2
Other	19	15	21	22

1 Based on number of projects
2 Includes Sigma-Aldrich as of 2016
3 Since 2016, we have integrated our global projects into our community outreach figures, specifically the Global Pharma Health Fund, the Merck Praziquantel Donation Program and the Deutsche Philharmonie Merck. This change in approach was due to the increasingly international nature of our efforts. We are spearheading a rising number of global projects that account for a growing percentage of our project portfolio. To ensure maximal accuracy, we are therefore including all international initiatives in our figures as of 2016.
4 From 2016 on, we are separating spending on patient support programs such as our Erbitux® China Patients Assistance Program from our charitable spending figures.

Motivations for our community involvement[1]

%	2013	2014	2015	2016[2,3,4]
Charitable activities	20	9	3	4
Community investment	59	59	92	87
Commercial initiatives in the community	21	32	5	9

1 Based on total spending on all projects
2 Including Sigma-Aldrich as of 2016
3 Since 2016, we have been integrating our global projects into our community outreach figures, specifically the Global Pharma Health Fund, the Merck Praziquantel Donation Program and the Deutsche Philharmonie Merck. This change in approach was due to the increasingly international nature of our efforts. We are spearheading a rising number of global projects that account for a growing percentage of our project portfolio. To ensure maximal accuracy, we are therefore including all international initiatives in our figures as of 2016.
4 As of 2016, we are separating patient support programs such as our Erbitux® China Patients Assistance Program from our charitable spending.

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.

Goals

Our corporate responsibility goals set the course to be followed for the next several years. This section presents these objectives and reports on the progress we've made towards achieving them.

Legend: New goal | Goal achieved | In progress | Goal not achieved

Products

Access to health

We seek to improve access to health for underserved populations in low- and middle-income countries.

Goal: Monitor and assess the progress and efficacy of our Access to Health programs

Measure(s):	By when:	Progress by end of 2016:	Status:
Develop quantitative and qualitative performance indicators for the 4 A's: Availability, Accessibility, Affordability, and Awareness.	End of 2016	Indicators were developed for the 2014 and 2016 CR report for each A of the "4As of Access" framework.	

Goal: Availability: Address unmet needs through the research, development and refinement of health solutions

Measure(s):	By when:	Progress by end of 2016:	Status:
Develop a pediatric formulation of praziquantel to treat schistosomiasis in children under the age of six	2017 (program to enter Phase III)	In 2015, both the Phase I bioavailability trials in healthy volunteers (South Africa) as well as the swill and spit taste study with school-age children (Tanzania) were completed. In 2016, we launched a Phase II study in Ivory Coast to test the efficacy and safety of two different formulations for orodispersible tablets in schistosomiasis-infected children under the age of six. Results are expected in the course of 2017.	
Develop a new anti-malarial drug	2017 (program to enter Phase I)	In March 2015, we obtained the rights to an investigational promising antimalarial compound from Medicines for Malaria Venture (MMV). The compound potentially represents a novel mechanism of action and is intended to be developed for both treatment and prevention of malaria in young children. The project completed the preclinical phase in 2016 and is progressing to Phase I to start in 2017.	
Develop a new diagnostic kit for measuring the presence and type of malaria parasite, and potentially measure co-infection with HIV based on our Muse Auto CD4/CD4%.	2017 (for start of clinical testing)	In 2016, the feasibility of two malaria assays was validated and the detection levels are meeting the defined TPPs in terms of specificity and sensitivity for new competitive diagnostic assays.	

Goal: Affordability: Address inability to pay

Measure(s):	By when:	Progress by end of 2016:	Status:
Participate in at least one collaboration with a public partner to share our IP and knowledge of infectious and neglected diseases.	End of 2018		
Develop an IP-sharing platform with a non-commercial entity.	End of 2018		

Goal: Awareness: Empower health workers, communities and people

Measure(s):	By when:	Progress by end of 2016:	Status:
Develop an integrated initiative of our Healthcare and Life Science business sectors to raise awareness.	End of 2016	In 2016, we initiated the PPP "Water for Health" in Ghana. Our aim is to raise awareness for water quality and to improve local capacity for water testing. The project will be fully operating in 2017.	
Through dialogue identify key access challenges and opportunities for our A2H strategy.	End of 2018		

Goal: Accessibility: Strengthen supply chains and provide localized solutions

Measure(s):	By when:	Progress by end of 2016:	Status:
Engage stakeholders to address supply chain and delivery issues in developing countries.	End of 2018	We established the dialogue platform (Accessibility Platform). In 2016, two meetings took place.	
Organize one to two meetings of the Accessibility Platform.	End of 2018		
Develop a collaboration to improve point of care delivery in developing countries.	End of 2019		

Safety of chemical products

Our customers should be able to use our chemical products safely.

Goal: Use precautionary principle to establish a globally aligned hazard and risk communication system for all our relevant chemical products in the supply chain

Measure(s):	By when:	Progress by end of 2016:	Status:
Implementation of REACH: Register substances produced in quantities of 1-100 metric tons per year (phase 3 of REACH implementation) and register non-phase-in substances.	Mid-2018	In 2016, we registered 41 phase 3 substances and integrated the relevant substances from the Sigma-Aldrich portfolio into our REACH project.	
Implementation of the Global Product Strategy: Issue product safety summaries for all hazardous substances registered under REACH.	End of 2020	Another five product safety summaries were issued in 2016.	
Projects for hazard communication: Update safety data sheets for non-hazardous chemical products.	End of 2020	We have updated safety data sheets for around 30% of all non-hazardous substances (excluding the Sigma-Aldrich portfolio).	
Harmonize safety data sheets to align with a globally uniform standard.	End of 2020	In the course of integrating Sigma-Aldrich, we created a new standard and harmonized hazard communication for roughly 60% of all shared substances.	

Counterfeit products

We want to reduce the risk of product crime.

Goal: Integrate safety into relevant business processes for Healthcare and Life Science business sectors

Measure(s):	By when:	Progress by end of 2016:	Status:
Identify strategic and commercial data that require greater protection; minimize risks by modifying processes.	End of 2018	We performed risk assessments in our Biopharma business.	

Goal: Step up interdisciplinary collaboration within global security networks

Measure(s):	By when:	Progress by end of 2016:	Status:
Develop Group-wide guidelines that describe duties and processes.	End of 2016	The following guidelines were adopted in 2016: ■ Product Crime Investigation Standard ■ Product Security Standard (risk-based approach to authenticating the supply chain, identifying risks, and ensuring supply chain integrity and security) ■ Product crime officers were appointed for all business sectors and subsidiaries.	

Expand organizational structures; train and certify employees who deal with product-related crime.	Ongoing	We developed and implemented a training program for our product crime officers. Our MACON network was expanded.	
Implement a Group-wide notification system for counterfeit products.	End of 2017	We rolled out a new reporting system for cases of product crime.	

Goal: Educate employees and other target groups on the strategic relevance of counterfeit medicines

Measure(s):	By when:	Progress by end of 2016:	Status:
Host conferences and seminars; best practice sharing and lessons learned through international networks.	End of 2016	We conducted five seminars at sites outside Germany and reported on product crime at internal conferences such as the Global Quality Conference or the Global Drug Safety Academy. Our product crime officers met at a conference in Darmstadt. We established anti-counterfeiting networks in high-risk countries, consisting of internal and external partners.	

Goal: Develop and implement security technology and solutions for supply chain authentication, identification, integrity, and security

Measure(s):	By when:	Progress by end of 2016:	Status:
Pilot a project to improve product safety in high-risk regions of Africa using software-based solutions.	End of 2016		
Support regional activities to counter product crime.	End of 2016	We supported 68 investigations across 24 countries in 2016. We participated in workshops and seminars with law enforcement in the United States, Mexico and Singapore and engaged German federal authorities in dialogue.	
Monitor the number of unreported cases of counterfeit medicines in select countries and step up internet searches to track down trademark infringement and counterfeit products.	End of 2016	We collaborated with internal and external partners in high-risk countries to step up efforts of networks to monitor the Internet for incidents of counterfeiting involving Merck products. We succeeded in significantly raising the detection rate for product crime incidents. Launch "Evaluating product crime in the darknet" project.	
Support regional activities in five high-risk countries.	End of 2017		
Monitor counterfeit pharmaceuticals in conventional distribution channels as well as online sales.	Ongoing		

Transport & storage safety

In the transport and storage of our products, we seek to prevent risks to people and the environment.

Goal: Ensure warehouse and transport safety for our company and our suppliers

Measure(s):	By when:	Progress by end of 2016:	Status:
Integrate all service providers into our audit process.	End of 2016	All service-provider warehouses have been integrated into our audit process. In 2016, we audited six third-party warehouses (2015: 4).	
Integrate all freight forwarders into our audit process.	End of 2017	In 2016, we developed a concept for integrating freight forwarders into our audit process and plan to implement the concept in 2017.	
Roll out improvement programs in countries and regions that handle products with special risks where our audits identified need for improvement.	End of 2016	After a running a pilot program in India in 2015, we successfully made improvements to warehouse and transport safety. In 2016, we also audited suppliers and third-party warehouses to identify improvement opportunities and defined corrective actions.	
Analyze safety-related customer complaints to identify necessary improvements for transport and warehouse safety.	End of 2016	In 2015, we enhanced our packaging concept for certain chemicals. In 2016, we started taking steps to optimize our shipping packaging for customer orders in Asia and South America.	
Harmonize transport and warehouse safety master data through global ERP systems.	End of 2022		

Animal welfare

We work to safeguard the welfare of animals used by our company, contract research organizations, suppliers, and other partners.

Goal: Ensure consistently high quality across our animal facilities

Measure(s):	By when:	Progress by end of 2016:	Status:
Inspect Life Science animal facilities in preparation for potential accreditation: Conduct a feasibility study and make a decision about accreditation.	End of 2018		
Re-accredit relevant animal facilities.	Ongoing	Three animal facilities were re-accredited in 2015 and 2016.	

Goal: Promote the 3Rs

Measure(s):	By when:	Progress by end of 2016:	Status:
Develop a Group-wide 3R program.	End of 2019		

Goal: Ensure animal welfare in our supply chain

Measure(s):	By when:	Progress by end of 2016:	Status:
Identify animal welfare risks in our supply chain and develop a strategy for certifying suppliers.	End of 2017		

Employees

Our employees are key to our success, which makes it imperative for us to attract, develop and retain the right talent.

Diversity

Goal: In 2011, we set the strategic goal of raising the percentage of leadership roles held by women to 25%-30%.

Status: We achieved this objective in 2016. Group-wide, women currently make up 28.8% of management positions.

Goal: By 2021, we aim to have stabilized the percentage of female managers at 30%, and we are continuing our efforts to raise the percentage of women in leadership roles and business units in which they are still underrepresented.

Measure(s):	By when:	Progress by end of 2016:	Status:
Deploy teams at departmental level to develop goals and measures to move women into positions in various units and at various levels.	End of 2021		

Attractive Employer

Goal: Consistently fill at least two-thirds of positions ranked Global Grade 16 and up with internal candidates

Measure(s):	By when:	Progress by end of 2016:	Status:
Use the Talent Management Process to identify suitable employees with management potential and optimize the process to systematically advance them.	Ongoing	In 2016, 81% of our vacant management positions were filled internally.	
Build a talent pool that reflects our demographic structure.	Ongoing	The structure of our talent pool is a reflection of the diversity within our company.	

Goal: Position Merck as an attractive employer for university graduates

Measure(s):	By when:	Progress by end of 2016:	Status:
Participate in university fairs and organize in-house events for graduates; position Merck via employer branding channels.	Ongoing	Thanks to our efforts at fairs and internal events, we succeeded in attracting ten graduates to participate in our Functional Graduate Program by March 31, 2017.	

Good leadership

Goal: We value good leadership, an approach that enables our employees to unlock their full potential and advance in their careers.

Measure(s):	By when:	Progress by end of 2016:	Status:
Have at least 50% of managers rated Global Grade 14+ take part in a management program.	End of 2018	Nearly 50% of our top 400 have taken part in our Global Leadership Program, our latest initiative for top leaders. Similar figures apply to our other management programs (AMP, MFP).	
Implement a regularly occurring process to measure employee engagement in an effort to establish a baseline for engagement and define a target.	Ongoing	At the beginning of 2016, we revised our approach to employee surveys and conducted a company-wide survey. In doing so, we have defined the baseline against which to measure future improvements.	

Health & safety

Goal: Reduce the lost time injury rate Group-wide (to 1.5 or less).

Status: By 2016, we'd reached this objective with an LTIR of 1.3

Measure(s):	By when:	Progress by end of 2016:	Status:
Implement the OSHAS 18001 occupational health and safety management system for all Performance Materials production sites.	End of 2016	By the end of 2016, all Performance Materials production sites had been certified to the international standard OHSAS 18001. Furthermore, our Life Science sites in Buchs (Switzerland), Bangalore (India) and Irvine (UK) have been included in our Group certificate, as have our pharmaceutical operations at our sites in Goa (India), Atsugi (Japan) and Mollet (France).	
Reinforce our safety culture to prevent behavior-related accidents/Roll out our BeSafe! program at all newly acquired sites and monitor ongoing implementation via appropriate performance indicators.	End of 2020		

environment

Environmental stewardship

We want to minimize our environmental footprint and mitigate our impact on the climate as far as possible, which is why we are working to continuously improve energy and resource efficiency while also reducing our greenhouse gas emissions.

Goal: Integrate all production sites in the Group ISO 14001 certificate for environmental management systems

Measure(s):	By when:	Progress by end of 2016:	Status:
At newly acquired production sites, introduce environmental management systems in line with the Merck Group ISO 14001 certificate and certify them accordingly.	Ongoing	Seven Sigma-Aldrich production sites had an ISO 14001-certified environmental management system and were transferred to the Merck Group certificate. Due to the size of the Sigma-Aldrich group and the integration process, the transfer of all sites to the new system must be done gradually. In 2016, the sites started a gap analysis that is still ongoing.	

Climate impact mitigation

Goal: 20% reduction in our direct and indirect greenhouse gas emissions (Scope 1 and 2) by 2020 (2006 baseline).

Status: By the end of 2016, we had lowered our greenhouse gas emissions by around 10% relative to the 2006 baseline, despite growth in our operating business.

Measure(s):	By when:	Progress by end of 2016:	Status:
Systematically examine the energy consumption at our individual production sites.	End of 2020	We continued to systematically examine possible energy savings at our production sites. In line with the EU Directive on energy efficiency, energy audits were conducted at our sites in Eppelheim and Berlin (Germany), as well as in Calais, Meyzieu and Semoy (France). In addition, we also performed energy checks at our sites in Rio de Janeiro (Brazil), Naucalpan (Mexico) and Kankakee, IL (United States).	
Identify potential energy savings and implement appropriate measures.	End of 2020	In 2016, we completed 42 Edison projects (p. 79). Around 60% of the Edison projects planned Group-wide have already been or are being rolled out. In 2017, we intend to launch 81 new projects with the potential to cut CO_2 emissions by around 34,000 metric tons.	
Reduce process-related emissions.	End of 2020	Our Life Science business sector is making a significant contribution to reducing process-related emissions. In 2014, process optimizations resulted in a two-thirds reduction in our process-related emissions per production unit at our facility in Jaffrey, NH (USA). In 2015, we initiated a project to further cut emissions that is scheduled to end in 2017. Other projects are in planning.	

Waste & recycling

Goal: By the end of 2017, set a reduction target for the quantity of waste we generate

Measure(s):	By when:	Progress by end of 2016:	Status:
Implement a waste scoring model to quantify our waste reduction efforts and set a baseline.	End of 2017	We implemented the Waste Scoring Model and expect to have a baseline established by the first quarter of 2017, from which a quantitative target will be set.	

Water management

Goal: Introduce a sustainable water management system at seven appropriate sites in water-stressed areas and reduce their water consumption by 10% by the end of 2020 (2014 baseline).

Status: By the end of 2016, we had reduced our water consumption at relevant sites by around 12% compared with 2014. Going forward, we want to ensure a 10% sustainable reduction in water consumption.

Measure(s):	By when:	Progress by end of 2016:	Status:
To achieve this goal, we need a variety of primarily local measures tailored to our individual sites. One inter-site measure is the creation of a water balance to provide a baseline.	April 2017	To help our sites in their efforts, we provided the necessary expertise in the form of documentation and an Intranet site.	

Goal: Introduce a sustainable water management system at 23 production sites with high water consumption by 2020

Status: Our sites are implementing the water management system in three stages using the CEFIC flagship self-assessment tool. We expect to complete Stage 1 (basic) by April 2017, Stage 2 (progressed) by May 2018 and Stage 3 (advanced) by May 2020.

Measure(s):	By when:	Progress by end of 2016:	Status:
Meet the basic requirements set out in the CEFIC flagship self-assessment tool (Stage 1). These include water quantity and quality evaluations at the sites, as well as an environment analysis.	April 2017	The sites will be asked to provide an initial report on their progress in April 2017.	

suppliers

Goal: Ensure our suppliers adhere to ethical, social, environmental, and compliance standards.

Measure(s):	By when:	Progress by end of 2016:	Status:
Perform a qualitative analysis of the available assessment and audit results and define potential courses of action.	End of 2017		
Create a holistic approach to managing sustainability in global supply chains.	End of 2017		

community

Health

Hand in hand with our partners, we aim to eliminate the tropical worm disease schistosomiasis worldwide.

Goal: Eliminate schistosomiasis in African school children: Since the start of our donation program, 100 million patients have been treated, primarily school-aged children.

Measure(s):	By when:	Progress by end of 2016:	Status:
Incrementally increase annual tablet donation by a factor of ten, from 25 million in 2012 to up to 250 million in 2016.	End of 2016	In 2016, we boosted our production capacity so as to produce 250 million tablets. In collaboration with WHO, we donated more than 200 million of these for distribution in 33 African countries.	
Donate up to 250 million praziquantel tablets annually to WHO for African school children.	Ongoing		
Optimize the praziquantel formulation.	End of 2019	In 2016, the study design for the bioequivalence study was approved. The study will be conducted in 2017.	
Develop a pediatric formulation of praziquantel for children under the age of six.	End of 2019	In 2016, we launched a Phase II study in Ivory Coast to test the efficacy and safety of two different formulations for orodispersible tablets in schistosomiasis-infected children under six. At the same time, we completed preparation of the Phase III study.	
Initiate new partnerships to promote behavioral change in African school children.	Ongoing		
Maintain the educational program and provide WHO with educational booklets to teach children about the disease and ways to prevent it.	Ongoing	In 2016, we expanded the educational program and donated 340,000 educational booklets to WHO for distribution in 10 African countries.	
Position the Global Schistosomiasis Alliance as the key partnering platform for advocacy, implementation, research, communications, and strategy development.	Ongoing		

Minilab

Through the GPHF Minilab™, we seek to fight counterfeit medicines in developing countries and emerging economies.

Goal: Provide and further develop the portable compact GPHF Minilab™

Measure(s):	By when:	Progress by end of 2016:	Status:
Develop new test methods for five active ingredients and expand manuals to describe the new testing methods.	End of 2016	In 2016, the GPHF developed test methods for five new active ingredients, meaning that a total of 85 test protocols are now available. The manuals have been updated accordingly.	✓
Conduct two training seminars on the use of the GPHF Minilab™; sell at least 40 Minilabs.	End of 2016	In 2015 and 2016, the GPHF conducted six Minilab training seminars in Tanzania, Angola, Kenya, Zambia, Rwanda, and Mozambique with well over 100 participants. The GPHF sold a total of 109 Minilabs.	✓
Develop new test methods for five active ingredients and expand manuals to describe the new testing methods.	End of 2017		⚑
Conduct three training seminars on the use of the GPHF Minilab™; sell at least 35 Minilabs.	End of 2017		⚑

Recognition and Rankings

The following overview presents a selection of major ratings and rankings for 2015 and 2016. Information on additional ratings and accolades received by individual businesses or sites can be found in the respective chapter of our 2016 Corporate Responsibility Report, or on our company's website.

Access to Medicine Index

In 2016, Merck moved up to fourth place in the Access to Medicine Index (2014: sixth place). This index assesses 20 pharmaceutical companies with respect to their efforts to improve access to medicine in developing countries. It is published every two years by the Access to Medicine Foundation, an international non-profit organization.

www.accesstomedicineindex.org

Carbon Disclosure Project

In 2016, we scored an A- in the CDP Index, thus achieving "Sector Leader Health Care, Pharma & Biotech" status for climate change reporting in Germany, Austria and Switzerland. As such, Merck is one of the top companies in this sector in the above-mentioned three countries and, ranking fourth, has moved up two places over the previous year. In 2015, we received a C for our performance and a score of 98 out of 100 points for our reporting.

www.cdp.net

Ethibel Sustainability Index (ESI) Excellence Europe and Ethibel EXCELLENCE Investment Register

In 2015, Merck was added to the Ethibel Sustainability Index (ESI) Excellence Europe, which selects the 200 top-rated European companies based on their corporate responsibility performance. We are also included in the Ethibel EXCELLENCE Investment Register.

forumethibel.org

Euronext Vigeo Eurozone 120 Index

Since 2015, Merck has been included in the Euronext Vigeo Eurozone 120 Index, which comprises the 120 highest-ranking European companies in terms of their environmental, social and governance efforts.

www.vigeo-eiris.com

FTSE4Good Index

Since 2008, Merck has been included in FTSE4Good, an internationally leading sustainability index that annually measures the performance of companies demonstrating strong environmental, social and ethical practices.

www.ftse.com

Good Company Ranking

In 2016, Kirchhoff Consult, a management consultancy, published its fifth Good Company Ranking. Among the 30 DAX-listed companies, we took tenth place.

oekom research Sustainability Rating

In 2016, the sustainability ratings agency oekom research AG gave Merck a B- on a scale of D- to A+ (top grade). Merck thus once more achieved Prime Status.

www.oekom-research.com

STOXX® Global ESG Leaders Index

In 2016, Merck 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

Vigeo Eiris Human Rights Study

Vigeo Eiris, a sustainability rating and research agency, analyzed how 3,189 companies meet their social responsibility to respect human rights. Merck ranks among the top 30 companies and achieved a total of 69 out of 100 points (“advanced”).

www.vigeo-eiris.com

sustainable development goals

In 2015, the United Nations adopted the Sustainable Development Goals (SDGs), which are aimed at all countries and organizations across the globe. We too play an active role in achieving these goals.

Our efforts

Under our Corporate Responsibility (CR) strategy (p. 9), we are already working to solve key challenges through efforts in the spheres of health, environment, and culture and education. We especially support SDG 3 (Good Health & Well-Being), SDG 4 (Quality Education) and SDG 7 (Affordable & Clean Energy). To achieve these goals, we join strategic partnerships (SDG 17) that allow us to work hand in hand with other companies, non-governmental organizations and governments.

SDG 3: Good health and well-being

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

Across the globe, approximately 400 million people lack access to effective and affordable medical care, a situation we intend to rectify through our Access to Health strategy (p. 34). Recognizing that we can't solve these challenges alone, we have joined forces with strong partners to work towards a solution.

Examples of our activities:

- Global awareness campaigns (p. 175)
- Eliminating schistosomiasis (p. 97)
- Efficient supply chains for better access to health (p. 39)
- SDG 17: Partnerships to improve healthcare (p. 16)

SDG 4: Quality education

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

The sciences in particular play a key role in the development of pioneering solutions. A well-educated and well-trained workforce is also essential to our future as a science and technology company, which is why we are working to ignite a passion for science in the next generation. To this end, we conduct a number of education projects (p. 100) across our sites worldwide, going to great lengths to provide underprivileged students with access to education.

Examples of our activities:

- Global scholarship programs (p. 183)
- Support for education at our Darmstadt site and at our facilities worldwide (p. 100)
- SDG 17: Partner in "Afrika kommt!" (p. 75), a GIZ managerial program

SDG 5: Gender equality

"Achieve gender equality and empower all women and girls."

- Promoting women's health and economic participation in developing countries (p. 42)
- Attractive working conditions for parents (p. 64)

SDG 6: Clean water and sanitation

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

- Protecting water as a resource (p. 84)
- Clean water at schools in China (p. 97)

SDG 7: Affordable and clean energy

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

Our materials create ultra-efficient solar cells that can be used in innovative applications. Moreover, our products help customers save energy. For instance, state-of-the-art liquid crystals and OLED technology from our Performance Materials business sector make displays more energy-efficient. You can find more information under Sustainable products (p. 29).

Examples of our activities:

- Liquid crystals in windows save energy (p. 180)
- Energy-efficient products (p. 29)
- Materials for innovative photovoltaic technology (p. 29)

SDG 8: Decent work and economic growth

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

- Respect for human rights and compliance with ILO core labor standards (p. 14)
- Social standards in our supply chain (p. 89)

SDG 11: Sustainable cities and communities

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

- Partnership to provide integrated waste disposal and water treatment systems in cities in China

SDG 12: Responsible consumption and production

"Ensure sustainable consumption and production patterns."

- Design for Sustainability (p. 30)
- Preventing and recycling waste (p. 82)

SDG 13: Climate action

"Take urgent action to combat climate change and its impacts."

- Edison, our climate impact mitigation program (p. 79)

SDG 17: Partnerships for the goals

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

- Partnerships to improve healthcare (p. 16)
- Partner in "Afrika kommt!" (p. 75), a GIZ managerial program

GRI content index

The CR Report 2016 is based on the G4 guidelines of the Global Reporting Initiative and meets the criteria for the application level "Comprehensive". The following GRI Index provides an overview of general standard disclosures, the GRI indicators (specific Standard Disclosures) identified as relevant, and where the corresponding contents are described.

Read More

GRI content index

Company and Report Profile

DMA* and Indicators		Comment	Link	External Assurance
Strategy and Analysis				
G4-1	Statement from the most senior decision-maker of the organization		Letter from the CEO (p. 3)	
G4-2	Key impacts, risks, and opportunities		Strategy (p. 5) Goals (p. 132)	
Organizational Profile				
G4-3	Name of the organization		Company profile (p. 6)	
G4-4	Primary brands, products, and services		Company profile (p. 6) Products & Industries	
G4-5	Location of the organization's headquarters		Company profile (p. 6)	
G4-6	Number of countries where the organization operates, and names of countries where either the organization has significant operations or that are specifically relevant to the sustainability topics covered in the report		Company profile (p. 6) List of shareholdings	✔
G4-7	Nature of ownership and legal form		Company profile (p. 6)	
G4-8	Markets served (including geographic breakdown, sectors served, and types of customers and beneficiaries)		Company profile (p. 6) Macroeconomic and Sector-Specific Environment	
G4-9	Scale of the reporting organization		Company profile (p. 6) Indicators Employees (p. 110) Indicators Environment (p. 123) Consolidated Income Statement Consolidated Statement of Changes in Net Equity Consolidated Balance Sheet	✔
G4-10	Total number of employees by employment contract and gender	Supervised workers such as temps are currently not logged in our employee data system. We are investigating possibilities to record information on supervised workers at the Group level.	Attractive employer (p. 64) Indicators: Employees (p. 110)	✔
G4-11	Percentage of total employees covered by collective bargaining agreements		Employee Engagement (p. 72) Indicators: Employees (p. 110)	✔
G4-12	Organization's supply chain		Supply chain standards (p. 90)	
G4-13	Significant changes during the reporting period regarding size, structure, ownership, or its supply chain		Company profile (p. 6) Supply chain standards (p. 90) Fundamental Information about the Group	

G4-14	Whether and how the precautionary approach or principle is addressed by the organization	Transport and warehouse safety (p. 50) Safety and health (p. 70) Environmental stewardship (p. 77) Climate protection (p. 79) Plant and process safety (p. 86)	
G4-15	Externally developed economic, environmental and social charters, principles, or other initiatives to which the organization subscribes or which it endorses	Governance (p. 8) Compliance (p. 11) Human rights (p. 14)	
G4-16	Memberships of associations	Stakeholder dialogue (p. 16) Environmental stewardship (p. 77)	
Identified Material Aspects and Boundaries			
G4-17	Entities included in the organization's consolidated financial statements	Report profile (p. 103) Company profile (p. 6)	✓
G4-18	Definition of report content	Report profile (p. 103) Materiality Analysis (p. 19)	✓
G4-19	Material Aspects identified in the process for defining report content	Materiality Analysis (p. 19)	✓
G4-20	Material aspects within the organization	Materiality Analysis (p. 19)	✓
G4-21	Material aspects outside the organization	Materiality Analysis (p. 19)	✓
G4-22	Effect of any restatements of information provided in previous reports, and the reasons for such restatements	Report profile (p. 103)	✓
G4-23	Significant changes from previous reporting periods in the Scope and Aspect Boundaries	Report profile (p. 103) Materiality Analysis (p. 19)	✓
Stakeholder Engagement			
G4-24	Stakeholder groups engaged by the organization	Stakeholder dialogue (p. 16) Materiality Analysis (p. 19)	✓
G4-25	Basis for identification and selection of stakeholders with whom to engage	Stakeholder dialogue (p. 16) Materiality Analysis (p. 19)	✓
G4-26	Organization’s approach to stakeholder engagement	Stakeholder dialogue (p. 16) Materiality Analysis (p. 19)	✓
G4-27	Key topics and concerns raised through stakeholder engagement	Stakeholder dialogue (p. 16) Materiality Analysis (p. 19)	✓
Report Profile			
G4-28	Reporting period	Report profile (p. 103)	
G4-29	Date of most recent previous report	Report profile (p. 103)	
G4-30	Reporting cycle	Report profile (p. 103)	
G4-31	Contact point for questions	Report profile (p. 103)	
G4-32	GRI Index	GRI Content Index (p. 149)	
G4-33	External Assurance	Report profile (p. 103) GRI Content Index (p. 149)	

Governance

G4-34	Governance structure of the organization	Strategy (p. 5) Management Statement on Corporate Governance	
G4-35	Process for delegating authority for economic, environmental and social topics from the highest governance body to senior executives and other employees	Strategy (p. 5) Procedures of the corporate bodies	
G4-36	Responsibility for economic, environmental and social topics	Strategy (p. 5)	
G4-37	Processes for consultation between stakeholders and the highest governance body	Stakeholder dialogue (p. 16) Materiality Analysis (p. 19) Employee Engagement (p. 72)	
G4-38	Composition of the highest governance body and its committees	Management Statement on Corporate Governance The Executive Board	
G4-39	Indicate whether the Chair of the highest governance body is also an executive officer	Statement on Corporate Governance Management	
G4-40	Nomination and selection processes for the highest governance body and its committees	Diversity and equal opportunity (p. 67) The Executive Board Objectives of the Supervisory Board Empowering women	
G4-41	Processes for the highest governance body to ensure conflicts of interest are avoided and managed	Compliance (p. 11) Information on corporate governance practices	
G4-42	Highest governance body's and senior executive's roles in the development, approval, and updating of the organization's CR strategies, policies, and goals	Strategy (p. 5) Values and compliance Report of the Supervisory Board	
G4-43	Measures taken to develop and enhance the highest governance body's collective knowledge of economic, environmental and social topics	Strategy (p. 5) The Executive Board Statement on Corporate Governance	
G4-44	Evaluation of the highest governance body's performance with respect to governance of economic, environmental and social topics	Board of Partners The Supervisory Board Articles of Association Statement on Corporate Governance	
G4-45	Highest governance body's role in the identification and management of economic, environmental and social impacts, risks, and opportunities	Strategy (p. 5) Report on Risks and Opportunities Statement on Corporate Governance Compliance (p. 11)	✔
G4-46	Highest governance body's role on reviewing the effectiveness of the organization's risk management processes for economic, environmental and social topics	Strategy (p. 5) Report on Risks and Opportunities Report of the Supervisory Board	✔

G4-47	Frequency of highest governance body's review of economic, environmental and social impacts risks, and opportunities		Strategy (p. 5) Report on Risks and Opportunities Report of the Supervisory Board	✓
G4-48	Highest committee or position that formally reviews and approves the organization's sustainability report		Report profile (p. 103)	✓
G4-49	Process for communicating critical concerns to the highest governance body		Compliance (p. 11) Values and compliance	
G4-50	Nature and total number of critical concerns that were communicated to the highest governance body		Compliance (p. 11) Values and compliance	
G4-51	Remuneration policies for the highest governance body and senior executives		Compensation report	✓
G4-52	Process for determining remuneration		Compensation report	✓
G4-53	How stakeholders' views are sought and taken into account regarding remuneration		Attractive employer (p. 64) Compensation report	
G4-54	Ratio of annual total compensation for the organization's highest-paid individual to the median annual total compensation for all employees in the same country	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 G4-54 and G4-55 to be relevant to assessing the fairness of our compensation structures.		

G4-55	Ratio of percentage increase in annual total compensation for the organization's highest-paid individual to the median percentage increase in annual total compensation for all employees in the same country	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 G4-54 and G4-55 to be relevant to assessing the fairness of our compensation structures.	
Ethics and Integrity			
G4-56	Organization's values, principles, standards and norms of behavior		Governance (p. 8) Human rights (p. 14) Compliance (p. 11) Diversity and equal opportunity (p. 67) Good leadership (p. 74)
G4-57	Internal and external mechanisms for seeking advice on ethical and lawful behavior, and matters related to organizational integrity		Compliance (p. 11) Diversity and equal opportunity (p. 67)
G4-58	Internal and external mechanisms for reporting concerns about unethical or unlawful behavior, and matters related to organizational integrity		Compliance (p. 11) Diversity and equal opportunity (p. 67) Supply chain standards (p. 90)

* Disclosure on Management Approach.

✓ KPMG AG Wirtschaftsprüfungsgesellschaft has provided limited assurance on the indicators in the chapter "Facts and figures", including explanatory notes, and chosen DMAs in the online Corporate Responsibility Report for the business year 2016 of Merck KGaA, Darmstadt. You can find the Independent Assurance Report in the Assurance Report (p. 172).

✓ KPMG AG Wirtschaftsprüfungsgesellschaft has audited the Consolidated Financial Statements together with the Group Management's Report for the business year from January 1 to December 31, 2016 of Merck KGaA, Darmstadt. You can find the Independent Auditor's Report in the Auditor's report.

GRI content index

Economic Performance Indicators

DMA* and Indicators		Comment	Link	External Assurance
Aspect: Economic Performance				
G4-DMA	Management Approach		Economic performance Pension schemes Report on Risks and Opportunities Employee Engagement (p. 72)	
G4-EC1	Direct economic value generated and distributed		Consolidated Income Statement Consolidated Cash Flow Statement Information by business sector /country and region Personnel expenses Indicators: Community (p. 130)	✔
G4-EC2	Financial implications and other risks and opportunities for the organization's activities 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 protection (p. 79) Water management (p. 84) Global Compact CoP (p. 169) CDP Report on Risks and Opportunities	
G4-EC3	Coverage of the organization's defined benefit plan obligations		Indicators Employees (p. 110) Pension schemes	✔
G4-EC4	Financial assistance received from government		Accounting: Property, plant and equipment Property, plant and equipment Research and development costs	✔
Aspect: Market Presence				
G4-DMA	Management Approach		Good leadership (p. 74) Diversity and equal opportunity (p. 67) Employee Engagement (p. 72)	

G4-EC5	Ratios of standard entry level wage by gender compared to local minimum wage at significant locations of operation	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. As a company in the pharmaceutical and chemical industries, we employ highly qualified individuals. Our Global Rewards Policy applies to all our subsidiaries worldwide and guarantees a systematic compensation structure. Base pay is oriented to the median base pay, and short-term variable compensation is based on the third quartile of the relevant reference market. The overall compensation package thus exceeds the market median. Even those employees in the lowest pay brackets are paid the local minimum wage at the very least.	Indicators: Employees (p. 110) Human Rights Charter	
G4-EC6	Proportion of senior management hired from the local community at significant locations of operation	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.	Diversity and equal opportunity (p. 67)	
Aspect: Procurement Practices				
G4-DMA	Management Approach		Supply chain standards (p. 90)	✔
G4-EC9	Proportion of spending on local suppliers at significant locations of operation		Supply chain standards (p. 90)	

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GRI content index

Environmental Performance Indicators

DMA* and Indicators		Comment	Link	External Assurance
Aspect: Materials				
G4-DMA	Management Approach	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, material consumption is not a major concern for us. 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 under the respective chapters.	Packaging (p. 32) Reuse and recycling (p. 33) Resource efficiency (p. 82)	
G4-EN1	Materials used by weight or volume	See G4-DMA	Sustainable product design (p. 29) Packaging (p. 32) Resource efficiency (p. 82) Design for Sustainability Green Chemistry	
G4-EN2	Percentage of materials used that are recycled input materials	See G4-DMA	Packaging (p. 32) Reuse and recycling (p. 33) Resource efficiency (p. 82)	
Aspect: Energy				
G4-DMA	Management Approach		Climate protection (p. 79) Environmental stewardship (p. 77) Sustainable product design (p. 29)	✓
G4-EN3	Energy consumption within the organization		Climate protection (p. 79) Indicators: Environment (p. 123)	✓
G4-EN4	Energy consumption outside of the organization		Climate protection (p. 79) Indicators: Environment (p. 123)	✓
G4-EN5	Energy intensity		Indicators: Environment (p. 123)	✓
G4-EN6	Reduction of energy consumption		Climate protection (p. 79) Indicators: Environment (p. 123)	✓
G4-EN7	Reductions in energy requirements of products and services		Sustainable product design (p. 29) Resource efficiency (p. 82) Product examples Performance Materials	

Aspect: Water			
G4-DMA	Management Approach	Water management (p. 84)	✓
G4-EN08	Total water withdrawal by source	Water management (p. 84) Indicators: Environment (p. 123)	✓
G4-EN09	Water sources significantly affected by withdrawal of water	Water management (p. 84)	✓
G4-EN10	Percentage of total volume of water recycled and reused	Water management (p. 84) Indicators: Environment (p. 123)	
Aspect: Emissions			
G4-DMA	Management Approach	Climate protection (p. 79)	✓
G4-EN15	Direct greenhouse gas (GHG) emissions (Scope 1)	Climate protection (p. 79) Indicators: Environment (p. 123)	✓
G4-EN16	Energy indirect greenhouse gas (GHG) emissions (Scope 2)	Climate protection (p. 79) Indicators: Environment (p. 123)	✓
G4-EN17	Other indirect greenhouse gas (GHG) emissions (Scope3)	Climate protection (p. 79) Indicators: Environment (p. 123) Carbon Disclosure Project	✓
G4-EN18	Greenhouse gas (GHG) emissions intensity	Indicators: Environment (p. 123)	✓
G4-EN19	Reduction of greenhouse gas (GHG) emissions	Climate protection (p. 79) Indicators: Environment (p. 123) Carbon Disclosure Project	
G4-EN20	Emissions of ozone-depleting substances (ODS)	Indicators: Environment (p. 123)	✓
G4-EN21	NO_x, SO_x, and other significant air emissions	Indicators: Environment (p. 123)	✓
Aspect: Effluents and Waste			
G4-DMA	Management Approach	Plant and process safety (p. 86) Waste and recycling (p. 82)	✓
G4-EN22	Total water discharge by quality and destination	Water management (p. 84) Indicators: Environment (p. 123)	✓
G4-EN23	Total weight of waste by type and disposal method	Waste and recycling (p. 82) Indicators: Environment (p. 123)	✓
G4-EN24	Total number and volume of significant spills	Plant and process safety (p. 86) Indicators: Environment (p. 123)	✓
G4-EN25	Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel convention annex I, II, III, and VIII, and percentage of transported waste shipped internationally	Indicators: Environment (p. 123)	✓

G4-EN26	Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the organization's discharges of water and runoff		Water management (p. 84)	
Aspect: Products and Services				
G4-DMA	Management Approach		Sustainable product design (p. 29) Packaging (p. 32) Reuse and recycling (p. 33)	
G4-EN27	Extent of impact mitigation of environmental impacts of products and services	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.	Sustainable product design (p. 29) Packaging (p. 32) Reuse and recycling (p. 33)	
G4-EN28	Percentage of products sold and their packaging materials that are reclaimed by category	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.	Packaging (p. 32)	
Aspect: Compliance				
G4-DMA	Management Approach		Environmental stewardship (p. 77)	
G4-EN29	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations		Environmental stewardship (p. 77)	
Aspect: Transport				
G4-DMA	Management Approach		Transport and warehouse safety (p. 50)	
G4-EN30	Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce	We do not consider relevant any data queried under this indicator that goes beyond the data already reported.	Climate protection (p. 79) Transport and warehouse safety (p. 50) Indicators Environment (p. 123)	✔
Aspect: Overall				
G4-DMA	Management Approach		Environment (p. 76)	
G4-EN31	Total environmental protection expenditures and investments by type		Climate protection (p. 79) Indicators: Environment (p. 123)	✔

Aspect: Supplier Environmental Assessment				
G4-DMA	Management Approach		Supply chain standards (p. 90)	✔
G4-EN32	Percentage of new suppliers that were screened using environmental criteria		Supply chain standards (p. 90) Mica supply chain (p. 93)	
G4-EN33	Significant actual and potential negative environmental impacts in the supply chain and actions taken		Supply chain standards (p. 90) Mica supply chain (p. 93)	
Aspect: Environmental Grievance Mechanisms				
G4-DMA	Management Approach		Supply chain standards (p. 90) Compliance (p. 11)	
G4-EN34	Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms	We track all complaints via our central reporting system and categorize them based on their content. In the future we will implement appropriate sub-categories to adequately reflect the specific subject matter of the complaints.	Compliance (p. 11)	

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GRI content index

Social Performance Indicators

Labor Practices and Decent Work

DMA* and Indicators		Comment	Link	External Assurance
Aspect: Employment				
G4-DMA	Management Approach		Attractive employer (p. 64) Diversity and equal opportunity (p. 67) Health and safety (p. 70)	✓
G4-LA1	Total number and rates of new employee hires and employee turnover by age group, gender, and region		Indicators: Employees (p. 110)	✓
G4-LA2	Benefits provided to full-time employees that are not provided to temporary or part-time employees, by significant locations of operation	At Merck KGaA in Darmstadt, Germany (20% 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.	Attractive employer (p. 64) Indicators: Employees (p. 110)	✓
G4-LA3	Return to work and retention rates after parental leave, by gender		Attractive employer (p. 64) Indicators: Employees (p. 110)	✓
Aspect: Labor/Management relations				
G4-DMA	Management Approach		Attractive employer (p. 64) Health and safety (p. 70) Indicators: Employees (p. 110)	
G4-LA4	Minimum notice periods regarding operational changes, including whether these are specified in collective agreements	The regulations on periods of notice vary worldwide. We apply the rules that are in force locally. There is not need for us to track periods of notice at Group level.		
Aspect: Occupational Health and Safety				
G4-DMA	Management Approach		Health and safety (p. 70)	✓
G4-LA5	Percentage of total workforce represented in formal joint management-worker health and safety committees that help monitor and advise on occupational health and safety programs	Occupational health and safety committees are required by law in Germany, which is why all employees of Merck KGaA sites (Darmstadt and Gernsheim, Germany) are represented by such a committee, one per site. These employees account for around 19% of our total workforce. The majority of facilities outside of 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 (p. 70)	

G4-LA6	Type of injury and rates of injury, occupational diseases, lost days, and absenteeism, and total number of work-related fatalities by region and gender	We have identified the lost time injury rate (LTIR) as a key performance indicator for our company.	Health and safety (p. 70) Indicators: Employees (p. 110)	✓
G4-LA7	Workers with high incidence of high risk or diseases related to their occupation		Health and safety (p. 70) Indicators: Employees (p. 110)	
G4-LA8	Health and safety topics covered in formal agreements with trade unions	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. The facilities of Merck KGaA (Darmstadt and Gernsheim - approx. 19% of our total workforce) are subject to bylaws on occupational health and safety.		
Aspect: Training and Education				
G4-DMA	Management Approach		Good leadership (p. 74) Diversity and equal opportunity (p. 67) Attractive employer (p. 64)	✓
G4-LA9	Average hours of training per year per employee by gender and by employee category		Indicators: Employees (p. 110) Compliance (p. 11) Drug safety (p. 46) Chemical product safety (p. 44) Counterfeit products (p. 48) Animal welfare (p. 58) Attractive employer (p. 64) Diversity and equal opportunity (p. 67) Health and safety (p. 70) Good leadership (p. 74) Water management (p. 84) Plant and process safety (p. 86)	✓
G4-LA10	Programs for skills management and lifelong learning that support the continued employability of employees and assist them in managing career endings		Diversity and equal opportunity (p. 67) Attractive employer (p. 64)	
G4-LA11	Percentage of employees receiving regular performance and career development reviews, by gender and by employment category		Attractive employer (p. 64) Indicators: Employees (p. 110)	✓

Aspect: Diversity and Equal Opportunity				
G4-DMA	Management Approach		Diversity and equal opportunity (p. 67) Objectives of the Supervisory Board	✓
G4-LA12	Composition of governance bodies and breakdown of employees per employee category according to gender, age group, minority group membership, and other indicators of diversity.	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 and equal opportunity (p. 67) Indicators: Employees (p. 110) The Executive Board The Supervisory Board Objectives of the Supervisory Board	✓
Aspect: Equal remuneration for women and men				
G4-DMA	Management Approach		Attractive employer (p. 64) Compensation report	
G4-LA13	Ratio of basic salary and remuneration of women to men, by significant locations of operation	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.	Attractive employer (p. 64)	
Aspect: Supplier Assessment for Labor Practices				
G4-DMA	Management Approach		Supply chain standards (p. 90)	
G4-LA14	Percentage of new suppliers that were screened labor practices criteria		Supply chain standards (p. 90) Mica supply chain (p. 93)	
G4-LA15	Significant actual and potential negative impacts for labor practices in the supply chain and actions taken		Supply chain standards (p. 90) Mica supply chain (p. 93)	
Aspect: Labor Practices Grievance Mechanisms				
G4-DMA	Management Approach		Supply chain standards (p. 90) Compliance (p. 11)	
G4-LA16	Number of grievances about labor practices filed, addressed, and resolved through formal grievance mechanisms	We track all complaints via our central reporting system and categorize them based on their content. In the future we will implement appropriate subcategories to adequately reflect the specific subject matter of the complaints.	Supply chain standards (p. 90) Compliance (p. 11)	

Human Rights

DMA* and Indicators		Comment	Link	External Assurance
Aspect: Investment				
G4-DMA	Management Approach		Human rights (p. 14) Compliance (p. 11)	
G4-HR1	Total number and percentage of significant investment agreements and contracts that include human rights clauses or that underwent human rights screening	Our Responsible Sourcing Principles and our Global Policy Business Partner Risk Management identify human rights issues as the foundation for significant investments.	Human rights (p. 14) Compliance (p. 11) Supply chain standards (p. 90) Mica supply chain (p. 93) Merck Responsible Sourcing Principles	
G4-HR2	Total hours of employee training on human rights policies or procedures concerning aspects of human rights that are relevant to operations, including the percentage of employees trained		Human rights (p. 14)	
Aspect: Non-discrimination				
G4-DMA	Management Approach		Diversity and equal opportunity (p. 67)	
G4-HR3	Total number of incidents of discrimination and corrective actions taken		Diversity and equal opportunity (p. 67)	
Aspect: Freedom of association and collective bargaining				
G4-DMA	Management Approach		Supply chain standards (p. 90) Human rights (p. 14) Compliance (p. 11) Human Rights Charter	
G4-HR4	Operations and suppliers identified in which the right to exercise freedom of association and collective bargaining may be violated or at significant risk, and measures taken to support these rights		Supply chain standards (p. 90) Mica supply chain (p. 93)	
Aspect: Child Labor				
G4-DMA	Management Approach		Supply chain standards (p. 90) Human rights (p. 14) Compliance (p. 11) Human Rights Charter	
G4-HR5	Operations and significant suppliers identified as having significant risk for incidents of child labor, and measures taken to contribute to the effective abolition of child labor		Supply chain standards (p. 90) Mica supply chain (p. 93) Indicators: Employees (p. 110)	

Aspect: Forced and Compulsory Labor				
G4-DMA	Management Approach		Supply chain standards (p. 90) Human rights (p. 14) Compliance (p. 11) Human Rights Charter	
G4-HR6	Operations and suppliers identified as having significant risk for incidents of forced or compulsory labor, and measures to contribute to the elimination of all forms of forced or compulsory labor		Supply chain standards (p. 90) Mica supply chain (p. 93)	
Aspect: Assessment				
G4-DMA	Management Approach		Human rights (p. 14) Compliance (p. 11)	
G4-HR9	Total number and percentage of operations that have been subject to human rights reviews or impact assessments		Human rights (p. 14) Compliance (p. 11) Indicators: Compliance (p. 107)	✔
Aspect: Supplier Human Rights Assessment				
G4-DMA	Management Approach		Supply chain standards (p. 90) Human rights (p. 14) Compliance (p. 11)	✔
G4-HR10	Percentage of new suppliers that were screened using human rights criteria		Supply chain standards (p. 90) Mica supply chain (p. 93) Human rights (p. 14) Compliance (p. 11)	
G4-HR11	Significant actual and potential negative human rights impacts in the supply chain and actions taken		Supply chain standards (p. 90) Mica supply chain (p. 93) Human rights (p. 14) Compliance (p. 11)	
Aspect: Human Rights Grievance Mechanisms				
G4-DMA	Management Approach		Supply chain standards (p. 90) Human rights (p. 14) Compliance (p. 11)	
G4-HR12	Number of grievances about human rights impacts filed, addressed, and resolved through formal grievance mechanisms	We track all complaints via our central reporting system and categorize them based on their content. In the future we will implement appropriate sub-categories to adequately reflect the specific subject matter of the complaints.	Supply chain standards (p. 90)	

Society

DMA* and Indicators		Comment	Link	External Assurance
Aspect: Anti-Corruption				
G4-DMA	Management Approach		Compliance (p. 11) Values and compliance	
G4-SO3	Total number and percentage of operations assessed for risks related to corruption and the significant risks identified		Compliance (p. 11) Values and compliance Indicators: Compliance (p. 107)	✓
G4-SO4	Communication and training in anti-corruption policies and procedures		Governance (p. 8) Compliance (p. 11) Indicators: Compliance (p. 107)	✓
G4-SO5	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 (p. 11) Report on Risks and Opportunities	✓
Aspect: Public policy				
G4-DMA	Management Approach		Stakeholder dialogue (p. 16) Code of conduct	
G4-SO6	Total value of political contributions by country and recipient/ beneficiary		Stakeholder dialogue (p. 16) Code of conduct Disclosure on donations to PACs (EMD Serono)	
Aspect: Anti-competitive behavior				
G4-DMA	Management Approach		Compliance (p. 11) Values and compliance Report on Risks and Opportunities	
G4-SO7	Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes		Indicators: Compliance (p. 107)	✓
Aspect: Compliance				
G4-DMA	Management Approach		Compliance (p. 11) Report on Risks and Opportunities	
G4-SO8	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with laws and regulations	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Indicators: Compliance (p. 107) Report on Risks and Opportunities	
Aspect: Supplier Assessment for Impacts on Society				
G4-DMA	Management Approach		Supply chain standards (p. 90) Compliance (p. 11)	✓
G4-SO9	Percentage of new suppliers that were screened using criteria for impacts on society		Supply chain standards (p. 90)	
G4-SO10	Significant actual and potential negative impacts on society in the supply chain and actions taken		Supply chain standards (p. 90) Mica supply chain (p. 93)	

Aspect: Grievance mechanisms for Impacts on Society				
G4-DMA	Management Approach		Supply chain standards (p. 90) Compliance (p. 11)	
G4-SO11	Number of grievances about impacts on society filed, addressed, and resolved through formal grievance mechanisms	We track all complaints via our central reporting system and categorize them based on their content. In the future we will implement appropriate sub-categories to adequately reflect the specific subject matter of the complaints.	Supply chain standards (p. 90) Compliance (p. 11)	

Product Responsibility

DMA* and Indicators		Comment	Link	External Assurance
Aspect: Customer health and safety				
G4-DMA	Management Approach		Drug safety (p. 46) Chemical product safety (p. 44) Sustainable product design (p. 29) Report on Risks and Opportunities	
G4-PR1	Percentage of significant product and service categories for which health and safety impacts are assessed for improvement		Drug safety (p. 46) Chemical product safety (p. 44) Sustainable product design (p. 29)	
G4-PR2	Total number of incidents of non-compliance with regulations and voluntary codes concerning health and safety impacts of products and services during their life cycle, by type of outcomes	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Report on Risks and Opportunities	
Aspect: Product and service labelling				
G4-DMA	Management Approach		Drug safety (p. 46) Chemical product safety (p. 44) Responsible marketing (p. 52) Interactions with health systems (p. 61)	
G4-PR3	Type of product and service information required by the organization's procedures for product and service information and labeling, and percentage of significant product and service categories subject to such information requirements	Within our businesses, product labels are both important and mandatory. All pharmaceuticals and chemicals are subject to reporting and notification requirements that we fulfill. The individual requirements are reported in the respective chapters.	Drug safety (p. 46) Chemical product safety (p. 44)	
G4-PR4	Total number of incidents of non-compliance with regulations and voluntary codes concerning product and service information and labeling, by type of outcomes		Drug safety (p. 46) Chemical product safety (p. 44) Report on Risks and Opportunities	

G4-PR5	Results of surveys measuring customer satisfaction	Within the scope of our B2B activities, we maintain close contact with our customers and endeavor to find out their needs and their opinion of us as business partners. Individual customer survey results, which are used for strategy development, are completely confidential	Stakeholder dialogue (p. 16)	
Aspect: Marketing communications				
G4-DMA	Management Approach		Responsible marketing (p. 52) Report on Risks and Opportunities	
G4-PR6	Sale of banned or disputed products		Responsible marketing (p. 52)	
G4-PR7	Total number of incidents of non-compliance with regulations and voluntary codes concerning marketing communications, including advertising, promotion, and sponsorship by type of outcomes	With regard to marketing activities, we do not report on the number of regulation violations or breaches of voluntary rules of conduct. As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities.	Responsible marketing (p. 52) Report on Risks and Opportunities	
Aspect: Customer privacy				
G4-DMA	Management Approach		Clinical trials (p. 55) Compliance (p. 11)	
G4-PR8	Total number of substantiated complaints regarding breaches of customer privacy and losses of customer data		Clinical trials (p. 55) Indicators: Products (p. 109)	✓
Aspect: Compliance				
G4-DMA	Management Approach		Compliance (p. 11) Report on Risks and Opportunities	
G4-PR9	Monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of products and services	As applicable, we report on risks from litigation and legal proceedings in our Report on Risks and Opportunities. We do not report the monetary value of fines.	Report on Risks and Opportunities Indicators: Compliance (p. 107)	✓

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Global Compact

2016 Communication on progress in implementing the ten principles of the UN Global Compact

We have been a UN Global Compact participant since 2005. As a signatory of the initiative, we commit 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 encourages its signatories to actively engage in propagating the principles within their own sphere of influence.

The following table presents the key measures we took in 2015 and 2016 to support and implement the principles of the Global Compact.

WE SUPPORT

Link: www.unglobalcompact.org

UNGC principles:	Key measures in 2015 and 2016:	Relevant GRI indicators:	Reference:
Human rights			
Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights	■ Performed human rights self-assessments across our sites ■ Conducted supplier assessments and audits under the Together for Sustainability (TfS) initiative ■ Donated 300 million praziquantel tablets to the World Health Organization for the treatment of the worm disease schistosomiasis	G4-HR2, G4-HR7, G4-HR8, G4-HR9, G4-HR12, G4-SO1, G4-SO2	Human rights (p. 14) Standards in the supply chain (p. 90) Health (p. 97)
Principle 2: Businesses should support and respect the protection of internationally proclaimed human rights	■ Performed human rights self-assessments across our sites ■ Conducted CR audits of suppliers and collected supplier self-assessments ■ Conducted supplier assessments and audits under the Together for Sustainability (TfS) initiative	G4-HR1, G4-HR10–11	Human rights (p. 14) Standards in the supply chain (p. 90)

Labor standards

Principle 3: Businesses should uphold the freedom of association and the effective recognition of the rights to collective bargaining	■ Conducted internal audits on workplace aspects of our Human Rights Charter ■ Performed human rights self-assessments at our sites ■ Conducted CR audits of suppliers and collected supplier self-assessments ■ Conducted supplier assessments and audits under the Together for Sustainability (TfS) initiative	G4-11, G4-HR4, G4-LA4	Human rights (p. 14) Compliance (p. 11) Employee engagement (p. 72) Standards in the supply chain (p. 90)
Principle 4: Businesses should support the elimination of all forms of forced and compulsory labor	■ Performed human rights self-assessments at our sites ■ Conducted internal audits on workplace aspects of our Human Rights Charter ■ Conducted CR audits of suppliers and collected supplier self-assessments ■ Conducted supplier assessments and audits under the Together for Sustainability (TfS) initiative	G4-HR6	Human rights (p. 14) Compliance (p. 11) Standards in the supply chain (p. 90)
Principle 5: Businesses should support the effective abolition of child labor	■ Performed human rights self-assessments at our sites ■ Conducted internal audits into workplace aspects of our Human Rights Charter ■ Conducted CR audits of suppliers and collected supplier self-assessments ■ Conducted supplier assessments and audits under the Together for Sustainability (TfS) initiative ■ Attended the Mica Summit on the mica supply chain in Delhi, India	G4-HR5	Human rights (p. 14) Compliance (p. 11) Standards in the supply chain (p. 90) Mica supply chain (p. 93)
Principle 6: Businesses should support the elimination of discrimination in respect of employment and occupation	■ Conducted internal audits on workplace aspects of our Human Rights Charter ■ Reached our goal to increase percentage of leadership roles occupied by women; set new goal for 2021 ■ Expanded internal diversity programs ■ Provided global SpeakUp Line for employees to report discrimination anonymously	G4-10, G4-EC5–6, G4-LA1, G4-LA3, G4-LA9, G4-LA11–13, G4-HR3	Human rights (p. 14) Compliance (p. 11) Diversity and inclusion (p. 67)

Environment

Principle 7: Businesses should support a precautionary approach to environmental challenges	■ Obtained ISO 14001 Group certificate for environmental management ■ Annually reduced CO_2 emissions (reduction target by 2020: 20% versus 2006 baseline) ■ Implemented more than 400 climate impact mitigation projects since 2012 ■ New goal: Introduce sustainable water management system at high-use sites by 2020 ■ Implemented measures to ensure product safety (such as REACH, GHS and our Global Product Strategy) ■ Develop and implement Merck Waste Score	G4-EC2, G4-EN1, G4-EN3, G4-EN8, G4-EN15–17, G4-EN20–21, G4-EN27, G4-EN31	Environmental stewardship (p. 77) Climate impact mitigation (p. 79) Resource efficiency (p. 82) Water management (p. 84) Waste and recycling (p. 82) Sustainable product design (p. 29) Drug safety (p. 46) Chemical product safety (p. 44) Transport and warehouse safety (p. 50)
Principle 8: Businesses should undertake initiatives to promote greater environmental responsibility	■ Performed ISO 50001 audits (energy management) of 13 sites ■ Reduced average CO_2 emissions of our business car fleet by 12% compared to 2013 (goal for 2020: 30% reduction); reduced maximum CO_2 emissions for new company vehicles ■ Offered employees sustainable mobility options such as rental bicycles ■ Conducted internal and external EHS audits ■ Performed energy checks at our sites ■ Labeled products ■ Took back packaging	G4-EN1–34	Climate impact mitigation (p. 79) Plant and process safety (p. 86) Transport and warehouse safety (p. 50) Water management (p. 84) Waste and recycling (p. 82) Drug safety (p. 46) Chemical product safety (p. 44) Recovery and reuse (p. 33)
Principle 9: Businesses should encourage the development and diffusion of environmentally friendly technologies	■ Performed product life cycle analyses ■ Developed sustainable products	G4-EN6–7, G4-EN19, G4-EN27, G4-EN31	Sustainable products (p. 29) Performance Materials

Anti-corruption

Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery	■ Consolidated our antitrust and anti-competition principles into a single Group-wide guideline ■ Performed internal corruption audits ■ Reviewed compliance standards of our business partners ■ Strategically reorganized our Group function Compliance ■ Trained employees on anti-corruption ■ Provided global SpeakUp Line for employees to report corruption anonymously ■ Published first EFPIA transparency report	G4-56–58, G4-SO3–SO6	Compliance (p. 11)

Assurance Report

Independent Assurance Report[1]

To the Executive Board of Merck KGaA, Darmstadt

We have performed an independent limited assurance engagement on disclosures on the stakeholder dialogue and the materiality analysis, selected qualitative and quantitative disclosures on the sustainability performance including the accompanying explanatory notes in the chapter "Facts & figures – Indicators" and selected disclosures on management approaches in the "Corporate Responsibility Report 2016" (further "Report") of Merck KGaA, Darmstadt (further "Merck") for the fiscal year 2016 published at http://reports.merckgroup.com/2016/cr-report.

The selected disclosures on management approaches included in the scope of the assurance engagement apply to the aspects Procurement Practices, Energy, Water, Emissions, Effluents and Waste, Employment, Occupational Health and Safety, Training and Education, Diversity and Equal Opportunity, Supplier Environmental Assessment, Supplier Human Rights Assessment, as well as Supplier Assessment for Impacts on Society each described in the subchapters "Our principles".

The selected qualitative and quantitative disclosures on the sustainability performance and the management approaches included in the scope of the assurance engagement are marked with the symbol ✔ in the GRI G4 Content Index, published at http://reports.merckgroup.com/2016/cr-report/facts-figures/gri-content-index.

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 accurate preparation of the Report in accordance with the Reporting Criteria. Merck applies the principles and standard disclosures of the G4 Sustainability Reporting Guidelines of the Global Reporting Initiative, the Corporate Accounting and Reporting Standard (Scope 1 und 2), and the Corporate Value Chain (Scope 3) Standard of World Resources Institute/World Business Council for Sustainable Development, as described in the section of the Report "Report profile", as Reporting Criteria.

This responsibility of the legal representatives 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 have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants (IESBA-Code), which is founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behavior.

The quality assurance system of the KPMG AG Wirtschaftsprüfungsgesellschaft is based on the International Standard on Quality Control 1 "Quality Control for Audit, Assurance and Related Service Practices" (ISQC 1) and, in addition on national statutory requirements and professional standards, especially the Professional Code for Certified Accountants as well as the joint statement of WPK (Chamber of Public Accountants) and IDW (Institute of Public Auditors in Germany): Requirements for quality assurance in the auditing practice (VO 1/2006).

Practitioner's Responsibility

Our responsibility is to express a conclusion based on our work performed and the evidence obtained on the information disclosed in the above-mentioned assurance scope.

Nature and extent of the 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 that we comply with our professional duties and plan and perform the assurance engagement to obtain a limited level of assurance to preclude that the above mentioned qualitative and quantitative sustainability disclosures are not prepared, in all material respects, in accordance with the aforementioned Reporting Criteria. 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 the audit procedures is subject to the auditor's own judgement. This includes the assessment of the risk of material misstatement in the Report under consideration of the Reporting Criteria.

Within the scope of our engagement, we performed amongst others the following procedures when conducting the limited assurance:

- 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 indicators, 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, as well as carrying out internal control procedures on the data including the explanatory notes.
- Visits to the sites Darmstadt (Germany) and Gernsheim (Germany) as well as Sante Meyzieu (France) and Martillac (France) to assess local data collection, validation and reporting processes and the reliability of the reported data.
- Evaluating internal and external documentation, to determine whether qualitative and quantitative information is supported by sufficient evidence and presented in an accurate and balanced manner.
- An analytical review of the data and trend explanations submitted by all sites for consolidation at 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, 2016 of Merck KGaA with regard to audit procedures on those information and indicators that were derived from those consolidated financial statements.
- An evaluation of the overall presentation of the information, including the explanatory notes, within the scope of our engagement.

Conclusion

Based on the procedures performed and evidence received to obtain limited assurance, nothing has come to our attention that causes us to believe that the disclosures for the business year 2016 included in the scope of this engagement, published in the report and marked with the symbol ✓ in the GRI G4 Content Index are, in all material respects, not prepared in accordance with the Reporting Criteria.

Purpose of the assurance report

This assurance report is issued based on an assurance engagement agreed upon with Merck. The assurance engagement to obtain limited assurance is issued on behalf of Merck and the assurance report is solely for information purposes of Merck on the results of the assurance engagement.

Limited liability

This assurance report must not be used as basis for (financial) decision-making by third parties of any kind. We have responsibility only towards Merck. We do not assume any responsibility for third parties.

Frankfurt am Main, 12. April 2017

KPMG AG
Wirtschaftsprüfungsgesellschaft
[Original German version signed by:]

Fischer
Wirtschaftsprüferin
[German Public Auditor]

Glöckner
Wirtschaftsprüfer
[German Public Auditor]

[1] Our engagement applied to the German version of the Corporate Responsibility Report 2016. This text is a translation of the Independent Assurance Report issued in German language, whereas the German text is authoritative.

MERCK

MAGAZINE

enriching lives

INTERVIEW WITH DR. SHINTA PRIMASARA

Dr. Shinta Primasara (36) from North Sumatra, Indonesia, is the mother of three children. Muhammad Harits Zaki (10), Amirah Fatimah (4) and Azizah Aisyah (6 months) all suffer from hypothyroidism. Even though Primasara is herself a physician, it took a long time to find a diagnosis for her first child and get proper treatment.

Interview

Dr. Primasara, what made you think that something was wrong with your oldest child Muhammad Harits?

As a baby, my son initially seemed very healthy; up to six months old, his progress was normal for his age. He would occasionally come down with a fever or diarrhea, but nothing that would have worried me. I noticed something was wrong when he was nine months old. Harits could not sit up on his own; but his pediatrician still didn't think anything was seriously wrong. Later, our son's development became regression, and we took him to see a neurologist to figure out the cause. Harits was diagnosed with thyroid hormone deficiency (hypothyroidism). We then consulted an endocrinologist, who prescribed hormone thyroid treatment.

How is your son doing today?

The hormone deficiency caused by hypothyroidism impacts brain development, which is why my son's mental development was delayed. He has severe learning difficulties, cannot do things on his own and his hearing is impaired so that he can only hear low-pitched sounds.

You are a doctor yourself. How did you take the diagnosis?

At first I was shocked when I learned of the diagnosis – it had never even crossed my mind. This disease was rarely heard of when I was in college. I didn't expect it, as Harits's early development was normal. I also didn't know that I suffered from hypothyroidism when I was pregnant. Screening for hypothyroidism is thus essential to diagnosing the disorder in newborns.

Your daughters were also diagnosed with a thyroid disorder, but luckily this happened right after birth.

I have learned a lot about thyroid disease and now understand it. It is quite difficult to identify clinical symptoms in newborns, as they do not appear immediately. In both of my pregnancies with my daughters, I received treatment for hypothyroidism. They were both screened for hypothyroidism four or five days after birth and were subsequently also diagnosed with the disease. Thanks to prompt treatment, they are both developing normally, for which I am very grateful.

Indonesia: Thyroid awareness

Indonesia has one of the highest levels of thyroid disorder in Southeast Asia. Yet only 1% of patients receive proper treatment. Children particularly suffer from the effects of this disease because the hormonal imbalance can impact their development.

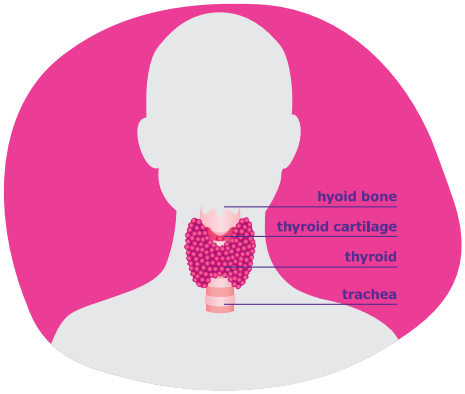
We want to educate the public on thyroid disorders. Since 2014, we've been working with the Indonesian government to accomplish exactly that. Within the "Set yourself free from Thyroid" campaign, we are hosting events such as symposia, lectures and seminars for physicians and the public. Above all, however, we're working to promote hypothyroidism screening of newborns across the country. Although decreed a standard procedure by the Indonesian government in 2014, implementation so far has been slow. Our experts are currently partnering with the Indonesian Pediatric Society to develop a manual on pediatric thyroid disorders that will help pediatricians to diagnose the disease.

20 Million

In 2016, we reached approximately 20 million people through our worldwide thyroid awareness campaigns. More than 14,500 individuals received thyroid checkups.

The control tower of the metabolism

The butterfly-shaped thyroid gland is the primary regulator of the body's metabolism. Its main job is to produce thyroid hormones – messengers that are needed to make sure the tissues and organs of the body work properly and at the right speed. Through its hormones, this gland controls all bodily tissues and organs. A thyroid disorder means that the thyroid gland is either producing and releasing too much (overactivity/hyperthyroidism) or too little (underactivity/hypothyroidism) thyroid hormone into the bloodstream, which can accelerate or slow down one's metabolism. There are many possible symptoms. For example, some people who suffer from thyroid disease may experience excessive sweating or restlessness, while others may be fatigued and depressed.



Thyroid Aware website

"Catching butterflies" – across the globe!

Merck is working to raise global awareness of the thyroid gland and possible disorders. Hand in hand with Thyroid Federation International (TFI), we've been supporting International Thyroid Awareness Week for the last nine years. Held in May every year, the 2016 campaign was called "Catching Butterflies: Spotting the Symptoms of Thyroid Disorders in Children". A survey we commissioned in 2016 revealed that 84% of mothers worldwide could not correctly identify typical symptoms of thyroid disorders in their children.

In response, we collaborated with TFI to develop a film, a children's book and an informational brochure for parents. These tools feature two butterfly cartoon characters called "Hypo" and "Hyper", who explain the symptoms of hyperthyroidism and hypothyroidism. Worldwide, 34 of our sites supported this campaign through initiatives such as social media activities, drawing contests, info fairs, and free checkups for children.

"Millions of people around the world suffer from some form of thyroid disease. Most of them, however, are unaware of their condition. They grapple with health limitations that could easily be alleviated with the right treatment. Thyroid Federation International aims to change this and is working to raise awareness of thyroid disorders."

Ashok Bhaseen
President of Thyroid Federation International

Greater awareness

Initially, many diseases go undetected. People often know too little about diseases such as diabetes, multiple sclerosis (MS) and cancer. Our company has in-depth knowledge and expertise regarding these diseases. We therefore run global awareness campaigns in which we work closely with various partners such as patient advocacy groups. Many of our employees get involved in these initiatives as well. In addition to external campaigns, we also regularly organize awareness campaigns within our own company.

Merck More than a Mother website

17

In 2015 and 2016, we organized 17 awareness campaigns around the world on diseases such as cancer, diabetes, multiple sclerosis, and thyroid disorders.

Dispelling the stigma of infertility

Since launching our More than a Mother campaign in 2015, we have been working in partnership with ministries of health and social welfare, academia, parliaments, and fertility societies to raise awareness about infertility prevention and break the stigma around infertile women in Africa. This initiative, originally launched in Kenya, was expanded in 2016 to Uganda, Nigeria, Tanzania, Ghana, Central African Republic, and Ivory Coast, where we are providing practical training for embryologists and fertility specialists in an effort to build fertility care capacity on the continent. We are also helping governments define policies to improve access to safe and effective fertility care. In 2016, we furthermore helped more than 1,000 affected women to set up their own business and thus achieve financial independence. The More than a Mother campaign is championed by the first ladies of Nigeria, Central African Republic and Sierra Leone. It is publicized through social media to spread awareness of the stigmatization endured by these women and share their stories.

"Advocating for better health creates a ripple effect, uplifting entire families, communities and future generations. We are proud to support disease awareness campaigns around the world in order to take medical education in developing countries to the next level. By promoting global access to health services, we are taking a significant step toward achieving the United Nations Sustainable Development Goals."

Belén Garijo
Executive Board member and CEO Healthcare

Educating the public in rural India

With our Su-Swastha project, we are working to improve the quality of healthcare in rural India. We educate both the public and physicians in these regions on commonplace health problems and how to treat them. For instance, experts provide information on coughs and childhood illnesses, explaining ways to prevent them. In addition, we offer free check-ups for patients and continuing education for physicians.

MAGAZINE

exploring the future

INTERVIEW WITH JOHANNES CANISIUS

Johannes Canisius, who holds a PhD in Chemistry, is one of the minds behind our latest vision for liquid crystal technology. Since 2012, the 49-year old Merck employee has been working with his team on the development of liquid crystal windows (LCWs). Head of the LCW business field within our Performance Materials business sector, Canisius explains the benefits of this innovative application.

Interview

You and your team have developed a new way to shade windows from the sun. What inspired you?

When the sun shines into an office, the bright light warms up the room and makes it hard to see – so you put down the blinds. But the problem is that these darken the room, meaning you then have to turn on a light. And people often use air conditioning to cool the room down. We asked ourselves whether there might not be a better, more sustainable solution. We have essentially put sunglasses on the windows. Our liquid crystal technology allows the level of incoming light to be adjusted at the touch of a button. If the sun is shining, the room can be immediately darkened, which means it is less prone to heating up. This technology reduces the amount of energy consumed by air conditioning and lighting. Blinds can be done away with altogether, boosting the general feel good factor – with an uninterrupted view of the great outdoors, people become more creative and productive!

Seems like a brilliant idea – how did it come about?

Our company is the world market leader in liquid crystal technology. For a long time, we focused our efforts on reducing the energy consumed by the liquid crystal displays of smartphones, tablets and TVs. But then in 2012 we realized that we could use our liquid crystals for so much more. We heard about the Dutch start-up Peer+, a small team that was experimenting with liquid crystals in windows. We partnered with them for two years before acquiring the company. With our ideas and expertise, we complement each other perfectly.

What role does sustainability play in your work?

Fortunately, it plays a major role. Every day, I have the chance to work on new, sustainable ideas. In developing our liquid crystal window technology, we received a lot of support from the Executive Board, even during challenging stages. The drive to blaze new trails requires top-down buy-in, which we definitely have at our company!

Saving energy

Our liquid crystal windows can help save energy. Since they absorb a portion of the sunlight and therefore the heat, the room does not grow as warm, reducing the need to use air conditioning. Light still enters the building, just not so bright that it's blinding. People no longer need to draw the curtains or drop the blinds, nor do they need to turn on the lights. All in all, liquid crystal windows can thus save up to 40% of the energy that would normally be used for air conditioning or lighting.

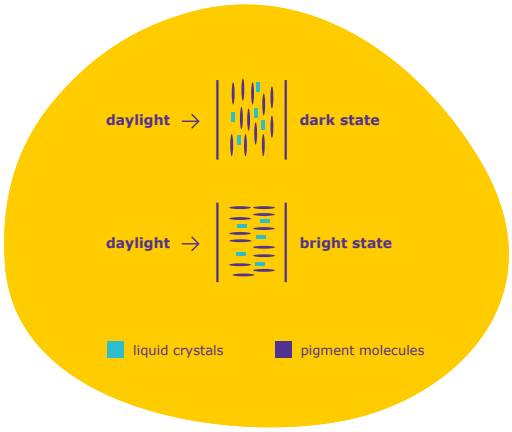
Up to

40 %

Buildings outfitted with liquid crystal windows consume up to 40% less energy otherwise required for air conditioning or lighting.

Liquid crystal windows as a sunshade – how it works

A mixture of liquid crystals and pigment molecules is placed between two panes of glass. The alignment of these crystals changes when an electrical current is applied. When users push the button to alter the current, the liquid crystals arrange the pigment molecules so that they absorb more or less light, depending on their positioning. This controls how much light the window transmits. If it's set to "bright", light penetrates the window. If darkened, light and heat are absorbed – but it's still possible to see out.



Producing their own electricity

Liquid crystal windows could be made to generate their own electricity. The liquid crystal mixture can be designed so that it functions as an optical waveguide. Incoming light would be conducted to the inner frame of the window, which contains small solar cells. These would then produce enough electricity to enable the windows to operate.

Conserving resources

Buildings with giant window façades have one major problem: it takes a lot of time, effort and money to block the sun. Electric blinds require repairs - and it is expensive as well as time-consuming to install a new motor. As a result, large office buildings often have all the motors changed at once, even the ones that still work, thereby wasting a lot of materials. With our liquid crystal windows, however, blinds are no longer needed. These windows require practically no maintenance and are 100% recyclable.

100 %

Our liquid crystal windows are 100% recyclable after the end of their useful life.

"Our people have creative ideas and develop innovative and sustainable solutions with the full backing of our company. Johannes Canisius' team is a quintessential example: Their liquid crystal windows have taken our liquid crystal technology in a completely new direction and will soon be an integral component of state-of-the-art architecture and sustainable building management."

Walter Galinat
Executive Board member and CEO Performance Materials

Cool to the touch

At our global headquarters in Darmstadt, we have already installed our liquid crystal windows in our modular Innovation Center as well as our OLED materials production building. "During the summer, you can immediately feel the room cool down when the windows are darkened and the sunlight is blocked out," says Johannes Canisius, reporting on the successful test phase.

The feel-good factor

Displays? No problem! But windows? With our new technology, we were faced with the major challenge of breaking into the market of the construction industry, a sector that is relatively conservative when it comes to innovations. However, modern architecture is increasingly catering to the feel-good factor, which played right to our strengths. Over the last several years, the percentage of glass used in both private homes and large office complexes has increased exponentially. This is the perfect time for our liquid crystal windows.

"Modern buildings are becoming more and more like living organisms, where the façade works like our skin in keeping the interior comfortable. Like in a human body, all parts of a building must function in harmony. Our liquid crystal windows fit the bill perfectly because they can be seamlessly integrated with other lighting and climate controls in a building, optimally making use of available daylight and all working together to make the building a pleasant place to be."

Caspar van Oosten
CEO Merck Window Technologies, co-developer of the LCW technology, founder and joint owner of the start-up Peer+

Commercializing liquid crystal windows

Our windows are on the verge of market launch, and our first production facility in Veldhoven (Netherlands) is scheduled for completion some time in 2017. Our initial target group will be the premium architecture segment, where large window façades envelop high rises and corporate headquarters, and the task of regulating the incident sunlight is complicated and expensive. Once these windows have established a firm foothold in this sector, we will turn our attention to the mass market. We believe that liquid crystal windows will soon become the window of choice.

5 years

It took 40 people – among them engineers, scientists, and quality managers – five years to develop our liquid crystal windows, from the initial idea in 2012 to market maturity in 2017.

MAGAZINE

fostering talent

INTERVIEW WITH BHAVYA VIJAY VAKIL

Bhavya Vijay Vakil, a medical professional from Mumbai, India, knew early on that he wanted to be a doctor. Yet his family could not afford to send him to university. Thanks to financial support from the Merck Scholarship Program, Bhavya has made his dream come true. Now 26 years old, he works as an anesthesiology resident in Mumbai.

Interview

Why did you want to become a doctor?

I come from a humble background. My father was an engineer but worked as a teacher – that was his passion. My mother is a housewife. Until the eighth grade, I'd never really considered what I wanted to be when I grew up. But then my father died of a heart attack – that day, I knew that I wanted to become a doctor and help people.

How did you achieve your goal?

It was very difficult at first. After my father's death, we had little money and I needed tutoring at school. My mother had no idea how she would pay for it. When I was in tenth grade, my uncle happened to read about Merck's scholarship program in the newspaper. That was my window of opportunity – I applied immediately.

… and you were accepted. Do you still remember the moment you heard the good news?

When Merck called to tell me I'd won a scholarship, it was one of the most pivotal moments of my life. I'd never dreamed it would actually happen! I was sure I'd messed up the application. Far from it – I'd been accepted! I was unbelievably grateful.

What form of support has Merck provided?

Starting in 2006, Merck covered 90% of my tuition at the Maharashtra University of Health Sciences. This support lasted for about seven years. There are many local scholarships available in India, but Merck's is one of the most extensive. However, Merck also expects good performance and continually checks on the progress of scholarship recipients. I had to get good grades in my classes to keep the scholarship, which kept me really motivated. And ultimately, I succeeded!

You are now a medical resident. Do you have new goals?

I am currently working as an anesthesiology resident at a hospital in Mumbai. This comes with a great deal of responsibility, and I have to maintain high levels of concentration at work. I enjoy it a lot and would like to continue in this field of medicine. After finishing my residency, I would like to go to London and apply for the fellowship offered by the Royal College of Anaesthetists. For anesthesiologists, successful completion of this fellowship comes with a lot of cachet. Afterwards, however, I would like to return to Mumbai. It's my home; it's where my friends and family live. I want to be with them and serve my nation.

A springboard …

… for great dreams: Our Merck India Charitable Trust (MICT) has been providing scholarships to underprivileged students since 2005. These scholarships cover a five- to seven-year period, generally enough for recipients to pay for their tuition fees and study materials. Since the scholarship's launch, 54 recipients have successfully completed their degrees and found good jobs, primarily in the fields of IT and medicine.

"With this scholarship, Merck is nurturing the future of the nation. We believe that a lack of financial resources should not be a barrier to young talent reaching their full potential and achieving a respectable life. That is why we have made a long-term commitment of financial support to these talented students who are starting a new phase in their education."

Anand Nambiar
Managing Director of Merck in India

275 students

We are currently funding university degrees for 275 students in Mumbai and Goa, India.

Finally going to school – Other projects in India

We procure mica used in the production of effect pigments for the cosmetics industry from Jharkhand, India. Many children and adolescents in this region do not attend school. We are collaborating with the IGEP Foundation to remedy this situation. In Jharkhand, we operate three schools with adjacent nursery schools along with a vocational training center for tailoring and carpentry, which provide services to 500 children and teenagers. At a fourth school, we provide scholarships that enable 200 children access to a basic school education.

China and Ghana: Supporting the health experts of tomorrow

Because young, skilled individuals are key to the future success of entire regions, we are committed to facilitating education in other developing and emerging countries as well. Since 2011, for instance, we've been awarding two-year scholarships to talented students in China who come from an economically disadvantaged background. We are focusing our support particularly on medical and pharmacology students at Fudan University in Shanghai. Fudan University is one of the most renowned academic institutions in China and ranks among the top 100 universities worldwide. To date, 600 students have benefited from our scholarships, with 120 in 2016 alone. Recipients have included PhD fellows and graduates working towards an advanced degree.

Furthermore, in 2016 our Healthcare business in China launched a scholarship program for MBA students enrolled in the National School of Development (NSD) of Beijing University. In Ghana, Nigeria and Kenya, we award prizes to outstanding students on an annual basis.

Progress through curiosity

"With the constantly changing kaleidoscope of new issues we encounter and completely new forms of collaboration, we are always searching for inquisitive, capable young people who share our passion for science and technology. We are therefore committed to inspiring children and teenagers to explore the sciences. To this end, we promote a number of educational projects – particularly in the communities near our sites across the globe."

Kai Beckmann
Executive Board member and Chief Administration Officer

Jugend forscht: Three decades of pioneering spirit

"Jugend forscht" is Europe's largest youth science and technology competition. We have been supporting this initiative for more than 30 years. Since 1996, we have also been hosting the state-level competition held in the German Federal State of Hesse, and have hosted the nationals twice. We have been selected to host the nationals again in 2018 and are already looking forward to it. Furthermore, 80% of the Hessian Jugend forscht competitors came from schools with which we partner.

Having fun in the lab

Gilding copper coins, removing rust from iron, isolating pigments from carrots: young students are curious and love to experiment. They have ample opportunity to explore their curiosity in our top-notch Junior Lab, a facility that is perfectly equipped for school classes. In October 2016, we launched a similar learning laboratory for biology known as the "livfe BioLab". This is an initiative that links classroom lessons with trending topics and modern methods of biological research. We partner with the Technical University (TU) of Darmstadt in the operation of both laboratories.

More than

20,000

Since 2008, more than 20,000 students have paid a visit to the Merck-TU Darmstadt student chemistry lab, where they've tinkered about and conducted experiments.

Inspiring teachers

Teachers also need inspiration. For many years, we have been supporting more than 60 schools in Darmstadt and Gernsheim by providing class materials and continuing education for teachers. Our efforts here focus on subjects in which we're experts, such as chromatography, spectroscopy and lab safety.

When science makes sparks fly

Launched in 2016, our SPARK volunteering program works to bring science to life. It motivates employees across the Life Science business sector to volunteer to share their scientific knowledge with students at schools in 192 cities around the world. To date, around 4,500 employees have provided exciting insights into the world of science in classrooms and at Merck sites in 36 countries. More than 60,000 pupils have put on lab coats and had fun conducting hands-on experiments.

Glossary

3R principle

The international guiding principle for all animal testing. The number of laboratory animals used as well 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).

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.

Biosimilars

Officially approved subsequent versions of innovator biopharmaceutical products made by a different sponsor after the original product's patent or exclusivity expires. Based on guidance from the EMA (European Medicines Agency), biosimilars must demonstrate comparability, or biosimilarity, to an existing approved product.

Chromatography

A technique used to separate mixtures.

CLP

The European CLP regulation (Classification, Labelling and Packaging of Substances and Mixtures) is based on the Globally Harmonized System (GHS) of Classification and Labelling of Chemicals.

CO_2eq

CO_2 equivalent: This indicates how much a specified quantity of a specific greenhouse gas has contributed to the greenhouse effect and uses 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 the Merck Group. 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.

Disease burden

The impact of a health problem, often measured in terms of quality-adjusted life years or disability-adjusted life years, both of which quantify the number of years lost due to disease.

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 that is done in preparation for a business transaction.

Ecotoxicology

Focuses on the effects of substances on the ecosystem.

EHS

Environment, Health and Safety describes environmental management, health protection and occupational safety throughout the company.

End-user declaration

A binding customer statement regarding the intended use of a product.

Essential medicines

Defined by the World Health Organization as "those drugs that satisfy the healthcare needs of the majority of the population".

Exposure

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.

GHS

Globally Harmonized System of Classification and Labelling of Chemicals: An international standard system to classify chemicals that covers labeling as well as safety data sheets.

Global Grade

Merck uses a market-oriented method to rate positions within the company. The Merck Group has 23 Global Grades that enable a consistent rating system for positions across the organization.

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.

GMP

Good Manufacturing Practices is a system for ensuring that products are consistently produced and controlled according to quality standards. These guidelines are used in the production of medicines, pharmaceutical active ingredients and cosmetics, as well as foodstuffs and feed.

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.

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 caused by burning fossil fuels).

GxP

The general term for good (anything...) practice quality guidelines and regulations that are used in many fields, including the medical, pharmaceutical and pharmaceutical chemistry industries.

Hackathon

Portmanteau from the words hacking and marathon. A hackathon is an event attended by people from different professional backgrounds. Teams are given a few hours or days to develop innovative solutions and ideas for predefined issues or challenges.

HazCom 2012

A U.S. OSHA 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.

IATA

International Air Transport Association

ICH

The aim of the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) is to promote uniform assessment criteria for product registration in Europe, the United States and Japan. The ICH makes recommendations toward achieving greater harmonization in the interpretation and application of technical guidelines and requirements for pharmaceutical product registration.

In vitro

Procedures involving components of an organism that have been isolated from their usual biological surroundings (e.g. test tube experiments).

In vivo

Latin for "within the living", this term describes processes that take place within a living organism.

Interpharma

A federation of research-based pharmaceutical companies in Switzerland.

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.

Least developed countries (LDC)

Countries that, according to the United Nations, exhibit the lowest indicators of socioeconomic development.

Liquid crystals (LC)

Liquid crystals are 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.

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.

Merck Competency Model

This model describes the behaviors needed to drive our strategic orientation and success. These behaviors therefore provide key guidance for all learning and development activities.

Merck Employee Engagement Survey

This survey is conducted annually to measure the engagement of our employees and to gauge the twelve drivers thereof.

Mutagen

A substance that changes the DNA of an organism.

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.

OHSAS

The Occupational Health and Safety Assessment Series (OSHAS) is an international occupational health and safety management system.

OLED

Organic light-emitting diodes are a new technology for displays and lighting.

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.

Organizational Health Index (OHI)

An index developed by the consulting firm McKinsey that uses pre-defined parameters to benchmark companies against peers in the same industry, of the same size, orientation, etc. One component of the process is an employee survey on the organization's performance capacity.

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.

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 support program

Any organized system providing services, direct patient or patient-caregiver interactions that are intended and designed to educate patients about certain diseases, help patients with access to and/or the management of prescribed medication and/or disease outcomes, or provide healthcare professionals with support for their patients.

Pharmacovigilance

The continual, systematic monitoring of a drug's safety.

Phase I study

Phase I clinical trials test a new biomedical intervention in a small group of people (e.g. 20-80) for the first time to evaluate safety (e.g. 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/

Product safety summaries

Intended to provide a general overview of the chemical substance and its use. It cannot take the place of a safety data sheet.

PS-VA

Abbreviation for polymer-stabilized vertical alignment: A polymer layer pre-aligns the molecules inside the display in a certain direction. In the black state, the liquid crystals are not exactly vertical, but slightly tilted, which allows the liquid crystals to switch more quickly. The light transmittance of the display is significantly higher, thus reducing the backlighting, one of the most costly components to produce.

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.

Reproductive health

The term covers various areas such as pregnancy, sexually transmitted diseases, contraception, and infertility.

RID

Regulation concerning international carriage by rail.

Schistosomiasis

A parasitic disease spread in warm lakes and ponds by snails that serve as intermediate hosts.

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 Merck.

Spontaneous report

An unsolicited communication by healthcare professionals or consumers to a company, regulatory authority or other organization that describes one or more adverse drug reactions in a patient who was given one or more medicinal products and that does not derive from a study or any organized data collection scheme.

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 cells

Undifferentiated cells with the potential to develop into many different cell types that carry out different functions.

Sugar cane bagasse

A fibrous waste product of sugar refining, which is left when sugarcane stalks are crushed to extract their juice.

Sunshine laws

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.

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.

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